

# Creating Positive User Experiences For Audiences Of Proximity Marketing And Pervasive Advertising

What synergistic combination of emergent and social technology creates optimal customer engagement with consumer brands within the physical retail space?

Masters Thesis – September 2018

Andrew Keats - w1663560 MSc Interaction Design & Computing

w1663560@my.westminster.ac.uk

Supervisor: Ashif Tejani



## **Abstract**

The purpose of this thesis was to explore various user experiences simulating a location based interaction with an wirelessly connected physical device, acting as the trigger of a web-based, smartphone pervasive advertising experience. Different user experiences were presented to user research participant for evaluation and comparison, all diverging from one common control experiment. The advertisements combine various technologies such that based on participant feedback the best combination can be identified; these elements are Social Media, Digital Rewards, and Augmented Reality. The core of all advertisements is constant, that being the use of a Bluetooth Internet of Things notification that invokes the smartphone interaction. This document covers the design of the study and consequent outcome which suggest which demographics out of the UK population would be most likely to engage in this form of advertising and also which combinations are most effective. The findings ultimately suggest that females under forty are more likely to engage for the incentive of a reward that can be redeemed later but younger males can be persuaded to an-gage if there is a game element to the interaction

# Table of Contents

---

Introduction .....	4
Literature Review .....	5
Methodology .....	6
Research .....	6
Literature survey .....	6
Technical research .....	7
Design of the Study .....	7
Experiment list.....	7
Designing Out Bias.....	8
Implementation .....	9
User Experience Design .....	9
Visual Designs.....	11
Development .....	13
User Experience Research.....	16
Preparatory work .....	16
Conducting the User Research.....	18
Data Analysis .....	21
Data Pre-processing .....	21
Qualitative data .....	21
Quantitative data.....	22
Interpretation of Results.....	22
UX and Design Deliverables.....	23
Persona and Wireframes .....	23
Persona .....	23
Wireframes .....	24
Branding Assets.....	32
Fave Bottle and Label .....	32
User Research Results .....	36
Basic Participant Data .....	36
Familiarity with technology .....	38
Weakness in the sample set .....	41
Initial Findings .....	41
Component Perception .....	42
Preferred Experiment.....	43
Evaluating Feedback Through Experiment Qualities .....	49
Facet Evaluation Summaries.....	53
Multiple Facet Comparison.....	55
Scaled Geometric Mean of Experiment Facets.....	57

Cumulative Rankings.....	58
Combining Rankings With Facet Means.....	59
Examining Demographic for the Top Three Experiments Relative To the Baseline.....	60
Evaluation of Top Three Experiments Over The Baseline .....	63
Interpretation and Conclusion .....	64
Participant Concerns .....	64
Scope for Improvement.....	66
Interpretation of Results.....	67
Probable Audience.....	67
Efficacy of Characteristics .....	67
Further Research .....	68
Annotated Bibliography .....	69
Appendices .....	73

# Introduction

---

Our physical and digital environments are becoming more & more overcrowded with advertising; increasingly, the intended audience is acclimated to the noise of current forms of advertising media. The question for future advertising, is how to create more captivating interactions that stand-out from the competition while delivering deeper relationships between user & brand? In the near future, the overlapping concepts of Proximity Marketing and Pervasive Advertising are likely to converge in ways that create context aware interactions, triggered by the user's location which are able to provide richer engagement with the user; by leveraging data that is not available to traditional forms of advertising, like personal data or environmental data the new forms of interactive physical advertising will be able to connect with their audience to a degree greater than ever before. Up until now, only online advertising has been able to take advantage of contextual data and user data to deliver more relevant advertising to the user; the advent of the Internet of Things, which promises to lead to ubiquitous computing, creates a paradigm shift where all sort of objects and locations will be online and connected to data sources. With this new found power, the interaction between the physical space and people needs to be well executed lest it invoke negative reactions from consumers, that is to say users may not feel comfortable with these new experiences should they appear to infringe on privacy. What will be needed is a well balanced approach to instigating these new interactive experiences and requesting consensual use of personal data. All that being said, the purpose of this study has been to create a series of interactive adverts that test audience perceptions to novel forms of advertising. Of course there are limitations as to what can be tested in one study, so these advertising experiences were built around a core premise, that an Internet of Things enabled physical space would be the trigger point for an advertisement that would be launched on a user's smartphone. The other technologies that were being explored in the study were Social Media, Augmented Reality and a form of Digital Reward. Seven variations were constructed based on the control experiment and all eight experiments were presented to participants of the study over course of ten days such that they were able to compare and contrast the experiences. The user experience experiments were conducted in a fictional context, using a mocked environment which had been set up within some hired office space, with users sourced through online community forums and from local businesses. Once the data had been gathered, the data was analysed in various ways in an attempt derive conclusive evidence as to which type of advertisement would be most effective and for which demographic of the population. What follows is a documentation of the work involved creating the content, running the user experience study, and the results it delivered.

# Literature Review

---

The facet of daily life this project aims to examine and expand upon is that of the interface between marketeer and consumer. With the rise of the web, e-commerce, social-media and online advertising the way users would interact with the products and services was re-imagined (Mangold and Faulds, 2009, p357–365). As Mangold and Faulds explore in their paper, there is now a more public relationship that has become more bi-directional than weighted towards the brand just broadcasting.

The convergence of technologies has often had the ability to transform the way we live and like the impact of the smartphone, the Internet of Things is set to trigger a paradigm shift that will transform the way we interact with the world around us; this future digital connectedness is set to re-invent advertising (Krumm, 2011, p66–73). Like the 2011 Pervasive Computing article by Krumm suggests, advertising could be the 'killer app' for ubiquitous computing this century, helping induce the roll-out of infrastructure.

For over a decade the potential for a digitally connected environment has been considered a reality with the use of low cost radio technology (Riekki et al., 2006, p40–46). However, it is only in recent years that it has become truly viable thanks to improvements in technology, such as telecommunications infrastructure and low-energy computing power like BLE (Kallas, 2016).

The experience of engagement between consumer and provider has become more and more important as our post-industrial society has developed, the product or service itself is not the only differentiator, now the relationship between the two parties is also prized as a means of ensuring repeat business from customers (II and Gilmore, 1998). As 'Welcome to the Experience Economy' points out, the experience a brand provides the end consumer is increasingly the focus of the relationship.

Lastly, brand loyalty is a somewhat intangible target that businesses aim for to secure future success and new technology will attempt to improve for businesses (Kowalewski et al., 2017)( Making blockchain real for customer loyalty programs | deloitte us, no date), allowing them to better track loyalty and its impact on their business. Further to this, solutions that utilise a mixture of technology will be able to create a more engaging experience for the customer (Scholz and Smith, 2016, p149–161) and even create experiences that reward the user for their participation (Ramos, 2016).

# Methodology

---

The methodology for this project can be broken down into X major tenets of this kind of study. These are: Research; User Experience Study Design; Preparatory Implementation; User Experience Research; Data Analysis; and finally Interpretation of Results. The initial phase was one of research into prior work with regard to academic study but also existing technology (both software and hardware) pertinent to the project. Once the first phase was complete, research did not entirely stop but continued to inform the implementation stage which was made of many parts, given the complex nature of a multi-faceted project of this nature. In conjunction with the technical research there was a requirement to consider the overall design of the experiment and how the user research was to be conducted. Upon approaching completion of creating all the necessary software, visual content and configurations in order to conduct the research, it was time to invite potential testers to take part in the study. After a minimum sample size has been reached it was then possible to process the data in order to be able to later discern meaningful findings from the experiments. Naturally, interpretation of the results is the last phase which has been a matter of taking a second look at the quantitative data in conjunction with the qualitative feedback in order to posit not only where the most successful experiments but also to discuss room for improvement.

## Research

Preliminary research was not only a way to provide a framework of context for the project but it was also essential to making appropriate technical design decisions.

## Literature survey

Supporting secondary data was acquired through university library resources and search features as well as Google Scholar; external providers of research papers such as Springer, IEEE and ACM was used to gather relevant papers. Other relevant material was collected when it was extremely pertinent to the project and insufficient academic content existed; examples of these kinds of sources are online publications, blogs, company websites and corporate whitepapers and case studies. Where possible long form literature such as books will be sourced but given the bleeding-edge nature of the project most artefacts will be journal articles and research papers or online sources. All secondary research was be collated and categorised with a reference manager (RefWorks) in order to help organise the body of research and search through the contents. These secondary sources were used to inform and frame the user testing, analysis and findings.

## Technical research

Given the scope of the project, it was not possible to deliver the project in the given time frame without taking advantage of third party libraries; the intent is to investigate the relevant open-source libraries that are suitable to assist in realising the implementation. This research is documented below, with justifications provided for the libraries and any other software chosen for inclusion in the project. Hardware research is also covered.

## Design of the Study

The study was designed to fulfil the criteria of comparing and contrasting various location sensitive mobile advertisements that had a bedrock of an Internet of Things device prompting the launch of web content on a smartphone with one control experiment used various combinations of Augmented Reality (AR), Social Media, and Digital Rewards. It was also necessary to consider at this early stage what the baseline experience would be, and given that email capture is a common experience among users exposed to advertising and marketing material, this seemed an appropriate yet simple interaction to use as the control. To satisfy the idea of having explored enough permutations, it was important to consider what was the minimum number of experiments could be created in order to have at least one experiment to cover any given combination of the previously listed technologies. This is important to point out because when the order of advertisement composition is given more emphasis the potential number of combinations increases dramatically; given the time constraints, where more than one technology was combined on top of the control experiment, only one ordering was selected, using an approximate heuristic: the Social Media element would come last when combined with anything else; the Augmented Reality game experience would come first; when the Digital Reward was present along side Augmented Reality, the view before entering the game would mention the chance of gaining Digital Reward after completion of the game. It would be naive to suggest that other ways to combining these elements would not have the potential to produce other results and this is an area where the study could be scaled to be more thorough, time permitting.

## Experiment list

Below is a table defining the composition of the eight experiments created in order to show the combination of aforementioned technologies. The first experiment was the control baseline experiment and the number attributed to the various combinations was used internally throughout the study and will therefore be used when describing the feedback and results.

Table 1: List of experiments and their composite elements.

<b>Experiment</b>	<b>Alias ID</b>	<b>IoT Beacon</b>	<b>Interactive AR</b>	<b>Blockchain Reward</b>	<b>Social Media</b>
1	iotb-x-x-x	✓			
2	iotb-iar-x-x	✓	✓		
3	iotb-br-x-x	✓		✓	
4	iotb-sm-x-x	✓			✓
5	iotb-iar-br-x	✓	✓	✓	
6	iotb-iar-sm-x	✓	✓		✓
7	iotb-br-sm-x	✓		✓	✓
8	iotb-iar-br-sm	✓	✓	✓	✓

## Designing Out Bias

Thanks to the instruction of a mentor, thought was given to a potential issue with the feedback which could then be mitigated. The risk was that should every participant undertake the experiments in the same order, then that repetition would introduce a bias into the results that would otherwise not be present. The rationale behind this was that the users would inevitably become more familiar with the experiences as a whole as they continued from one advert variant to another; in addition to this, there was a likelihood that the users might start to tire towards the end of their overall session. These two factors could have potentially cause the overall results to unfairly favour the experiments in the middle of the group. The solution to reducing the risk of bias was to ensure that the order in which the participants interacted with the experiment was randomised, though the decision was made to keep the control experiment at the beginning as its relative simplicity made it most suitable to introduce the users to the concept. At this point no implementation details had been considered in depth but it was prudent to devise this strategy.

# Implementation

The implementation phase constituted a significant portion of the study and was composed of following distinct efforts.

- User Experience Design
- Visual Designs
- Prototype Server Development
- Test Runner Development

## User Experience Design

The User Experience design work was in two parts. Firstly it was important to create a Persona as a bedrock for the rest of the work. Secondly, wireframes were created to visually describe the user journey for each of the advertisement variations; it was at this stage that some critical decisions were made about the user experience, which ultimately shaped the study.

### Persona creation

One core concept of User Experience Design is the Persona which was helpful in creating the rest of the work. The Persona, being a fictional yet believable for the experience being developed allows the design and development of software and experiences without designing just for one person. While in this case only one Persona was created, the aim was to encapsulate in this fictional character the optimal qualities that it was supposed the perfect candidate for the advertisements would possess. There is a little bit of creative guess work involved in this stage, especially when creating a persona from scratch without having previous user research, from an earlier iteration to work with. Preferably, this kind of User Experience Research is continuous and iterative, changing and refining the understanding of the potential users.

The persona creation made use of a previously created template, that was re-used to create a brand new character to build the projects around. The sorts of traits you can see described in the persona are all that would make this person, were they real, potentially very receptive to novel forms of advertising instigated by an Internet of Things (IoT) enabled device. Melanie Thompson, as the persona was dubbed, was made to be a adopter of mobile contactless payments, regular player of games (on consoles and smartphone), and a frequent sharer of personal experiences on Social Media; She was also designed to be keen on saving money or getting money back from existing loyalty

schemes. A royalty free image was used to give the persona a face and all of the imagined personality was composited using LibreOffice Draw (an open-source alternative to Microsoft PowerPoint).

!! insert persona image

## Wireframes

The Wireframes were created in Lean UX manner, though using online software called Figma to allow for a degree of fidelity while creating reference material to work against. These wireframes were created within the context of each other experiment in order to scrutinise the difference between the user journeys; it's also worth noting that for the purpose of the user experience study, the design iterations were effectively created in parallel; in taking this approach, there was some discretionary design decisions at this stage that led to user interfaces that were not necessarily reflective of how a real-world example might be executed. For clarity, in order to look at user perceptions of the composition each experiment, the user journeys were designed to force the participants of the study to go down a particular path; this was justified as a design choice because among the the entirety of the experiments were permutations, that covered the other scenarios.

The choice of Figma as the wireframing tool was ultimately down to three compelling qualities: The software is accessible both in Desktop and Web form meaning it's easy to continue work from one device to another; Figma has an easy-to-user, comprehensive feature set, including some very strong vector design tools (comparable with other market leaders in the UX Design space), reusable components, and clickable prototypes; It also has a feature complete student offering for free.

One of the most significant design decisions made at this point in the project was to define the initial context of the experience as a vending machine. The experiments were intended to explore the various combinations of technology - as previously mentioned IoT, Social Media, Augmented Reality, and Digital Rewards - rather than comparing different starting contexts; it's worth recognising that, it's very likely that a different starting point for the scenarios would lead to different participant feedback due to the participant assumptions based on the initial context. That is to say that while the choice of vending machine was intended to create a plausible situation for a contactless payment that also led to an IoT triggered advertisement on the smartphone, different people load the context with different contextual backstories; the assumed location of the vending machine was left to the individual, so while some might have imagined a more social surrounding like a canteen, others could and in fact did, imagine situations where the vending machine was in a more high footfall location. The personally envisaged place in

which the advertisement is triggered undoubtedly influenced the individuals' perceptions of the experience, especially with regards to how much time they might have to spare or how transient that experience might normally be.

Another peculiarity of the UX designs that might have had some unforeseen consequences, was to begin and end every advert variant with the same opening and closing screens. Each experiment launched from the IoT device landed on a view that messaged to the user "Thank You" and they ended with a view stating "Amazing", with the intent that these elements would help signify the beginning and end of the individual advertising experiences. This may have been an unnecessary distraction for some participants, not least because over the course of the experiments, this repetition seemed to have the side-effect of mesmerising some participants, causing them to 'zone-out'.

## Visual Designs

The Visual Designs are distinct from the UX work because they were created as part of building the mock advertising that the participants were to experience, as opposed to working documents. These design fall into two categories, those that were largely ad-hoc based on the UX wireframes for the mobile screens, and those that were necessary to create the background scenario.

## Mobile Screen Designs

The mobile phone screen designs were largely influenced by the UX wireframes, and were designed in the browser as part of the development process; this lean approach enabled a faster development process and allowed for more effort to be focused on elements absent from the wireframes. Designing in the browser enabled more time to address the transition effects between the views/stages of the adverts, as well as the animations belonging to a given view. The content utilised HTML 5, CSS and JavaScript, so the animations made heavy use of CSS animations and transitions coupled with JavaScript to trigger the view state changes. The content was designed for exclusively for mobile given the limited time frame and the scope of the experiment being smartphone centric; further design and development would look to target larger handheld devices such as tablet which might also be used if to hand in a real-world situation. Designing for Laptop or Desktop was largely pointless and therefore excluded.

## Building the Brand

Beyond just creating passable advertising material, it became apparent that for the experiments to run as smoothly as possible, trying to create experiences as true to life as possible was worth attempting. To that end, despite the artificial surroundings of the

office space from which the User Research was conducted, the experience could simulate reality by building a convincing (yet imaginary) soft drink brand to provide a more concrete framework of context. Consequently extra work went into fleshing out the idea of the 'Fave' soft drink brand that was already partially nascent in the wireframes. The main drawback with this is that a brand of consumable product is rarely universally accepted, especially if it doesn't have an extremely high level of utility. So, as the qualitative feedback will attest, developing a more defined visual aesthetic and brand tone, probably induced some negative reception for some even if it also had a net positive effect; it's hard to say whether changes would be made to this aspect of the experiments were the experiments to be recreated, given the requirement of some form of attachment to the commodity being tested as part of the study.

In terms of actual artwork that was created as part of building 'Fave', the fictional soft-drink brand, there was the creation of a 'Fave' branded vending machine, a 3D mesh of a 'Fave' bottle, and a custom bottle label.

## **Fave Bottle and Label**

The 'Fave' bottle was the first visual asset to be created as it was integral to the more conventional views constituting the various adverts as well as being a major part of the proof-of-concept Augmented Reality game experience. Further to this, to make a convincing brand, the bottle needed to have a label that looked sufficiently like a genuine commercial product; a flat render of the 3D bottle with wrapped label was used as part of the two-dimensional views, while a 3D mesh was created for use in the Augmented Reality part coupled with the re-use of the label as a texture. The creation of the label was almost entirely done in Adobe Photoshop, using guidelines from the Figma UX designs. The creation of the bottle was a more elaborate effort as it was initially easier to create the mesh using 3DS Max but the bottle required converting into the correct file format using Blender.

## **Fave Vending Machine**

The 'Fave' branded vending machine, was created to help participants momentarily live within the devised scenario as though it were real; the caveat being that what was presented to the user was actually a one metre wide, two metre tall banner with the front facade of a vending machine. Not only was it important that the image on the banner conveyed the brand but another focus on the artwork was to suggest through the design that this vending machine would accept contactless payments. The notion of the user touching their phone to the vending machine in order to pay was a critical part of the entry into the rest of the experiences and with that in mind, this point of contact was designed to stand out visually against the rest of the design. One last element that made

up the final look of the vending machine was an AR (Augmented Reality) marker, as a late addition due to workflow requirements and was attached to the banner with adhesive tape. This marker asset was designed to use the 'Fave' branding, which may not have helped with the intuitiveness of its function among some users and in hindsight, exploring other options might improve experiment experiences for the testers.

## Development

Development of the project experiments involved two elements that directly interacted with together by way of the test users, and another piece of software was written in order to conduct the experiments. For the sake of familiarity and its strength as a language for quick prototyping, every single bit of software written for this project used JavaScript; strictly speaking whenever the NodeJS runtime was being used, then the codebase took advantage of a popular superset of JavaScript called TypeScript (open source and invented at Microsoft by Anders Hejlsberg, one of the creators of C#). Using TypeScript was a design decision because of pre-existing familiarity with the Technology and the benefit of type safety that it adds to JavaScript; ultimately, the TypeScript code is resolved to JavaScript by the 'transpiler'. All code was backed up to GitHub throughout the development process to safeguard against data loss. WebStorm was the IDE of choice when working with NodeJS while a special Espruino IDE was also required, when working with the IoT beacon.

## IoT Beacon Setup

Hot beacons were bought for the sole purpose of transmitting an Eddystone URL to the smartphone. Using Eddystone URL technology had a key benefit for prototyping over other forms of Bluetooth Low Engender (BLE) protocols, specifically this is that other options require some form of beacon registration with a centralised service like the one operated by Google; conversely, the Eddystone URL format allow the developer to broadcast a static URL directly from the device rather than being indirectly resolved through the third-party service. For the sake of redundancy, in case there was a failure with an IoT beacon that couldn't be quickly fixed, multiple devices were purchased. Two of the beacons were of a typical specification and setup involving a password and the use of a smartphone app to edit the beacon configuration, including the URL it broadcasts. A third device was purchase that can be considered a more generalised IoT and sensor device that happens to include BLE hardware; it was this device, called a PuckJS that is built to run JavaScript from firmware which gets pushed to the microcontroller from the Espruino IDE. In this case, the URL was hard-coded as part of the small program written to initialised the BLE features of the device. With both types of beacon, the Eddystone URL protocol requires a string length no longer than character aside from the URL scheme, meaning that a URL shortening service was required, for the sake of redirecting to the

long-form URL address for the adverts. For the sake of concentrating on the user research study, a third party URL shortening service was used, hosted by Google but in theory an independent entity could host their own shortening service. Further research into the nature of the broadcasting signal would be of interest were this project extended, as will be described under the section documenting the actual user research. One final point to mention is that the shortened URL given to the beacons to broadcast were set up to resolve to a static redirect endpoint that was built into the Experiment Server, the reason for which will also become clearer as the methodology explained further.

## Experiment Server

The different advertisements were all build using a shared codebase with the intent of being hosted on the same server, using the Express HTTP library on top of the NodeJS runtime. The CSS styling was mostly written in a technology called SCSS to aid in code reuse when designing and developing the animations and transitions. The HTML was generated using a form of server-side templating technology called EJS which was picked for its simplicity as a framework and in turn the relative rapidity of development. Client-side JavaScript was created to simulate button and form interactions as well as a few time delayed animations; these files were hosted separately from any server-side JavaScript logic which was mostly used for URL routing and a small amount of persistent server-side state. The routing logic was no more complicated than it needed to be, with a homepage just for the ease of manually accessing the experiment URLs, then routing to each of the experiments and lastly a simple redirect endpoint as well as another endpoint that acted as entry point for the mechanism that set which URL the redirect endpoint would point to. To clarify, the most complicated internal workings of the server were exposed by a GET HTTP request that would update which experiment would be accessed from the static redirect URL; this is a very insecure method of accomplishing this outcome but was justified since no sensitive data is permanently stored on the server. That being said, if any of this codebase were to be adapted for a production environment, this would be one of the first thing to have to change. No database technology was required to deliver any of the experiences but it was possible to add a user's email address to the server when updating the redirect value, reasons for which will be explained under the user research methodology.

Initially the idea was to run the whole experiment with local servers on a local network conducting the experiment in a closed environment over Wi-Fi. This was mistakenly in the attempt to keep things simple. One technical issue caused this strategy to be changed however and that turned out to be the requirement for web browsers to only offer user consented web-cam over the HTTPS protocol; prior to finding this out during the development stage everything was running over HTTP. The reason for requiring access to the web-cam may not seem obvious but any Augmented Reality experience makes use of a camera as well as superimposed content. So, once work began on the AR scene, this

requirement presented itself and a quick and simple solution was sourced, in the form of free Heroku hosting of the web-server codebase; the decision to go with Heroku was made because of ease of deployment and automatic HTTPS configuration, in addition to the basic hosting being free. Like some of the other choices made to deliver these experiments, this would probably not translate into a production choice but a quick and easy option that meant more time could be spent working on the AR game content.

## **Augmented Reality Game**

The AR game was more a proof-of-concept, to illustrate the potential for this experience to be presented over the web to a mobile device and demonstrate the prospective impact this technology could have on interactive advertising. Given the main goal didn't focus on gameplay or performance, this led to some experiential issues that would ideally be resolved were the experiment to be rebuilt for an improved iteration. To that end, the whole Augmented Reality element would probably be revisited without the use of A-Frame (a technology developed by Mozilla to enable easy construction of 3D scenes) because in conjunction with spatial recognition via the web-cam, this could become a clunky experience at times; it's also relevant that the mobile device used was a 2014 model Samsung, so it's likely a new phone used for testing would have improved the latency in processing the scene. The kernel of the AR game idea was that the user would be able to play a tune on three bottles of 'Fave' soft-drink with staggered levels of drink within the bottles, to indicate different notes created by the different bottles. The AR game would play the user a three note melody (while enlarging the bottle that was currently being 'played') and the user was meant to repeat the pattern. The presentation of the bottles would be triggered by the program identifying the previously mentioned AR marker through the camera, such that the bottles would float in front of the vending machine. The stretch goal of the game element was to enable the microphone as well it create some form of directional blowing over the bottles to imitate actually blowing over the tops of bottles; this was de-scoped quite soon given a significant technical issue that was to arise. The use of third-party libraries (as well as A-Frame, a library called ARJS was used to support the Augmented Reality features) made it difficult to fix an issue to do with the 3D spatial mappings between the web-cam and the 3D objects; while the bottles would render without issue, there was an issue with targeting bottles with click events, though this was not an issue when test on a PC, only mobile devices. The AR element was consequently made simpler to ensure some form of interactivity as a challenge but mitigating for the inability for individual bottles to be targeted; with that in mind the solution was that any click on the screen after the tune had completed would replay the tune. With more time, this part of the experience could certainly be improved but the best was made of the situation.

## Command Line Test Runner

One last piece of bespoke software that needs to be discussed is the Command Line Test Runner. This was also written in TypeScript in order to be run from NodeJS. The purpose of this application was to facilitate the running of the experiments with the individual participants. This application relied on a console like Command Line Interface (CLI) that would do a variety of things to fulfil the design of the study; the console style functionality took advantage of a NodeJS library called Vorpal, in order to allow an easy way to create a persistent CLI instead of just a script that would run once before exiting the JavaScript runtime. One key function this application is able to do is create a pseudo random sequence of numbers based on an email address provided by a participant of the study; using a third-party NodeJS library called Chance, the Test Runner is able to leverage the Mersenne Twister algorithm to create a repeatable but seemingly random set of values; this functionality was critical in satisfying the randomisation of the order in which the users would experience the advertising experiments. The participants' email address and number sequence was able to be saved off as a JSON file for the purpose of not only anonymising the feedback dataset but also to re-order the individual user feedback so the feedback could be correctly compared between the participants. In addition to generating the pseudo-random numbers and saving that data for processing, the CLI was able to interact with the Experiment Server by making the requisite HTTP requests to the server in order to switch which experiment would then be used by the static redirect URL; it was able to do this so it was relatively painless to cycle through the experiments with a customised sequence for every new user. All of the functionality built into this application made the running of the experiments much easier than would have been possible otherwise, even to the extent that with two devices running the CLI it was actually possible have two participants engaging with the study at the same time, alternating between which of their sequences were active.

## User Experience Research

The methodology for the User Experience Research can be seen as two parts: -  
Preparatory Work - Conducting the User Research

### Preparatory work

The preparatory work as described in the following passages explains greater detail how potential participants for the study were engaged with; how those potential candidates for taking part in the study were converted into actual participants of the research; what measures were taken to gain consent from participants to ensure their feedback was usable as part of the analysis.

## Gathering Interested Parties

Once the experiments were collectively nearing a state of readiness for users to test, a more active effort was made to reach out to the local community. The office space from which the study was being conducting was located in a business park in Peckham, South East London and that in itself provided a pool of potential experiment testers; the majority of people in the business park run their own independent business so it would have been naive to assume that most people would be able to take part, though in the end about a quarter of the study was made up of people from this group. One other ways the users were sourced were various Facebook community groups, specifically covering the Surrey Quays, New Cross, Peckham and Deptford areas. As well as those options another resource was the neighbourhood community social network called Nextdoor.

## Ethics and Consent

When looking to find interested member of the public online or in person, as well as continuing with further correspondence the users were assessed to be: adults; of sound enough mind and not to be considered vulnerable in any way. Potential participants were given sufficient information before attending the study to have some understanding of what might be involved and once the were ready to go forward, the experiments were discussed in comprehensive detail before the potential participants were asked for their consent to proceed with them as testers of the experiences. The consent form went into written detail about the experiments which had be verbally described, as well as provided opt-in options for their likenesses to be capture in photos or video. At the end of the experiment there was a further consent form so that each participant could reflect on what they had been asked to do and choose whether or not their feedback should be used as part of the study. Additionally, the participants had the option to request the data analysis derived from the collective (and anonymised) feedback. One last point of note is that the consent forms were integrated into the Google Forms (hosted on the University G Suite offering) feedback questionnaire that was used to gather the users responses to the experiments; this has the benefit of supplying all relevant persons one document for evaluation or to fill in.

## Incentivisation

Part of gathering interest from members of the public to take part in the study was to offer a small to moderate recompense for their time and effort. As such, every participant was provided with a £20 Amazon voucher - via email - for their contribution. Some participants were not interested in the voucher and simply intrigued in what the

experiments might be like but the decision was made that unless a user were to insist on not receiving a voucher, all would be treated equally. Once that was explained to the experiment testers, no-one refused the voucher.

## Conducting the User Research

During the practical part of the user research study, a fictional scenario was described to each user whereby the premise of the interactions started off with the user wishing to purchase their favourite drink from a vending machine; as the situation was devised to involve mobile adverts triggered by a smartphone contactless payment, this was also explained. In accordance with the experiments involving a smartphone, the users were provided with a smartphone for the testing session; importantly, the smartphone was one running Android OS, which was necessary to take advantage of BLE beacon recognition at the operating system level. The fact that the Android operating system can pick up transmissions from BLE devices was a feature necessary in order for the user to be able to view an on-screen notification which was essentially a link to the advertising material. Aside from this technical detail, the only other information was given to users with regard to the smartphone was how dismiss the lock-screen. No other guidance was provided to participants with regards to the experiment in order that they could be observed as impartially as possible when interacting with each user journey.

## Validity of Research

In order to ensure that the data gathered was not skewed based on any learnt behaviour across the experiments, the order in which the experiments were randomised thanks to the Command Line Test Runner. With this strategy, the results gathered seem to have successfully not been influenced by a bias based on a common, fixed experiment order.

Perhaps another measure that could have improved the quality of the data with regards to the validity of the research might have been to provide more background context for the fictional scenario.

## Documentation of the Research

The majority of the data gathered from running the user experience test sessions was obtained through the user feedback form. Some photo observations were taken alongside one video recording. Some ancillary observations were silently noted to see if there were any issues with the experiment that would not be captured from the user feedback itself. As previously mentioned, where possible when two participants were wishing to undertake the experiments at the same time, then this was accommodated; typically one

user would take between thirty and sixty minutes to complete an entire test session, while conducting parallel sessions took between fifty and seventy minutes so it was sometimes more suitable, especially if the participants had come along as a pair.

## **Photo and Video Evidence**

Even though most participants were prepared to have their photo taken and be recorded on video, the data gathered in this manner has been relatively sparse. The main reason for this was that the time taken with each user would have increased by at least thirty percent by a rough estimation and the amount of data to process would have been too much to handle given the scope and time-frame of the project. Having said that, User Experience Research principles do tend to promote these complementary methods of data gathering and I would agree that when there is a team involved and/or the amount being tested isn't quite so large, this is the ideal testing scenario. As an example of the extra depth this data can deliver, the video evidence will be provided as supporting evident and demonstrates not only how it can be useful to record the user interacting with the interfaces but also how it can be used to gather data in a more thoughtful interview manner where the participant is able to reflect on the experiences more.

## **User Feedback**

For the purpose of efficiently gathering data, this study has relied most heavily on participants answering questions in response to the experience using the University G Suite hosted feedback form. Not only did this format lend itself to rudimentary data gathering of basic demographic data and a little data concerning existing familiarity the technology present in the experiment, it also provided great utility for gathering data and processing it given the need to randomise the experiment orders. The fact is that working with a text based digital format made the task of mapping user feedback to the corresponding experiments much easier than had the task involved transposing additional data from another medium and then having to merge that data into a common dataset of results. This was a conscious design decision based on the requirement to shuffle the experiment order and it was decided to be a reasonable compromise; one crucial reason why this approach was considered acceptable was that users were still able to provided qualitative feedback, albeit having to write it themselves.

The structure of the feedback form was such that after a participant had consented to the study, they were required to enter data regarding their email address, age, and gender. Following on from that basic demographic data gathering was a question used to gather binary data regarding familiarity with: email on smartphones; mobile gaming; mobile payments; and AR experiences.

A print version of the feedback form is available to examine as part of the appendices section but to summarise the design of the feedback form, the majority of the body is a repetition of the same set of questions 8 times; this generalised approach to gathering feedback relating to each experiment made it easy to compare the experiments. This questionnaire structure also removed the technical challenge of asking questions only relevant to a particular experiment experience without having to shuffle the online form; it's actually not certain that this would have been a feasible option and the option of not using the University G Suite to capture data would have created another set of restrictions. Given these conditions, the way the user feedback was gathered can be considered more than acceptable, given the circumstances.

The sections provided for each experiment provided the opportunity for qualitative feedback as well as qualitative feedback based on some characteristics that could be applied to all experiments:

- Enjoyment
- Annoyance
- Ease of use
- Brand connection
- Engagement
- Persuasiveness
- Interest

Each of the characteristics mentioned above (described as 'facets' during the analysis) were presented to the user per experiment, with mandatory scalar questions and optional long-form feedback text fields. Using this approach it was possible to capture essential sentiment data but also allowed more willing participants to provide more detailed feedback. In order for the experiment testers to have each test fresh in their mind, they would fill in feedback immediately after completing one experience before going back to interacting with a new advert variant.

After all the feedback sections aimed at individual experiments, there was a summary section, mainly focused on gathering: overall popularity scores; finding out general feedback regarding the elements composing the experiments; and more general feedback regarding the experiments study itself. To help participants identify the experiments at the end when being asked to compare them, they were provided with the wireframes to make it easier to decide their preferences.

# Data Analysis

This subsection describes the processes involved after the conducting the practical element of the user research. This includes the pre-processing of the data making it ready to work with as well as how the qualitative and quantitative data has been treated. Aside from the pre-processing stage, all data analysis involved the use of the language R, via an IDE called R Studio, in order to work on the results.

## Data Pre-processing

The data from the online user feedback was easily downloaded from the G Suite service and saved as an Excel file. However, at this stage the data was not ready for analysis because the user feedback for each user was ordered according to the individual's designated sequence as previously described. In order to resolve this issue, it was necessary to create a script to reorder the feedback so that the tabular data had the correct data in each column accounting for the requirement to respect the feedback sequence. Any attempt at undertaking this task manually was ruled out early on when the complexity of the effort involved became apparent. As with other code written, the preference was to write a script in TypeScript to be run as JavaScript through NodeJS; this script took advantage of an existing third-party NodeJS library called 'xlsx' that allowed for the data to be easily parsed into a JSON format which was then easily manipulated, respecting the data before saving out an updated Excel format. All in all, this turned out to be a longer task than was anticipated as more and more non-trivial requirements came to light as the data was traversed and transposed. Despite the unforeseen complexity in creating a script to pre-process the dataset, a manual approach would have been more susceptible to human error, whereas the script could be tested and validated iteratively until there was absolute confidence that the output was correct. This script was also used to replace the participant email addresses with an ID to anonymise the data.

## Qualitative data

Some qualitative responses were noted down informally as the participants were interacting with the experiments, pausing between experiment to explicitly express an opinion, or at the end of their session with a brief discussion. That being said, the bulk of the qualitative data captured was as part of the user feedback form and this has been the easier to collate as it was easy to extract as part of the data analysis conducted using R Studio. These qualitative sections of the feedback form were designed open ended questions that could elicit long-form answers from the participants. Fundamentally these particular responses have formed the latter half of the data analysis document (presented as part of the appendices), without any modification, just some categorisation of the

responses; for example, all participant response for a given experiment are grouped together as opposed to grouping all feedback by respondent. Advanced sentiment analysis would have been interesting to attempt but this idea was de-scoped due to time constraints and the already sizeable amount of analysis that had been undertaken.

## Quantitative data

That quantitative data was extensively mined and manipulated to explore the possibility of any meaningful patterns of perception using R, in R Studio. Most of the analysis conducted was around the scalar feedback provided framed through the user's age and gender demographic data. Data gathered around the participants relationship to their mobiles and AR was also capture for further analysis of the results outside of the analysis document. The analysis document was not meant to come to conclusive findings but instead provide ways of looking at the data that could be interpreted within this document as a means of coming to a more definitive summation as part of the Interpretation of Results chapter. The data was distilled so that it could be easily portray in various graphical form, the idea being that it might be possible to determine any strong preference for a given experiment, either universally across all participant or within sub-groups. As is discussed in the analysis document, UK population census data was used where it was appropriate to weight the various age and gender subsets to more properly reflect the population. This was in response to evaluating the spread of participants and when seeing that it was not well aligned to the actual population count. Using the weighting was not always appropriate though as it could only be use where a participants response would normally count as a single unit (like a vote) rather than a relative rating.

## Interpretation of Results

As can be seen in the following chapter, the data analysis document has been distilled, with the findings considered to be most pertinent lifted and described in the Results chapter. Next, the Discussion chapter has been used to more conclusively discuss the outcome of the study. It is at this point that the qualitative feedback has also been reflected upon to consider ways the study could have been improved as well as considering the positive feedback and negative concerns raised by the participants. Ultimately, the intent has been to not only address the feasibility of a real-world version of one of more of these forms of advertisement but also look at where this research could be continued.

# UX and Design Deliverables

## Persona and Wireframes

### Persona

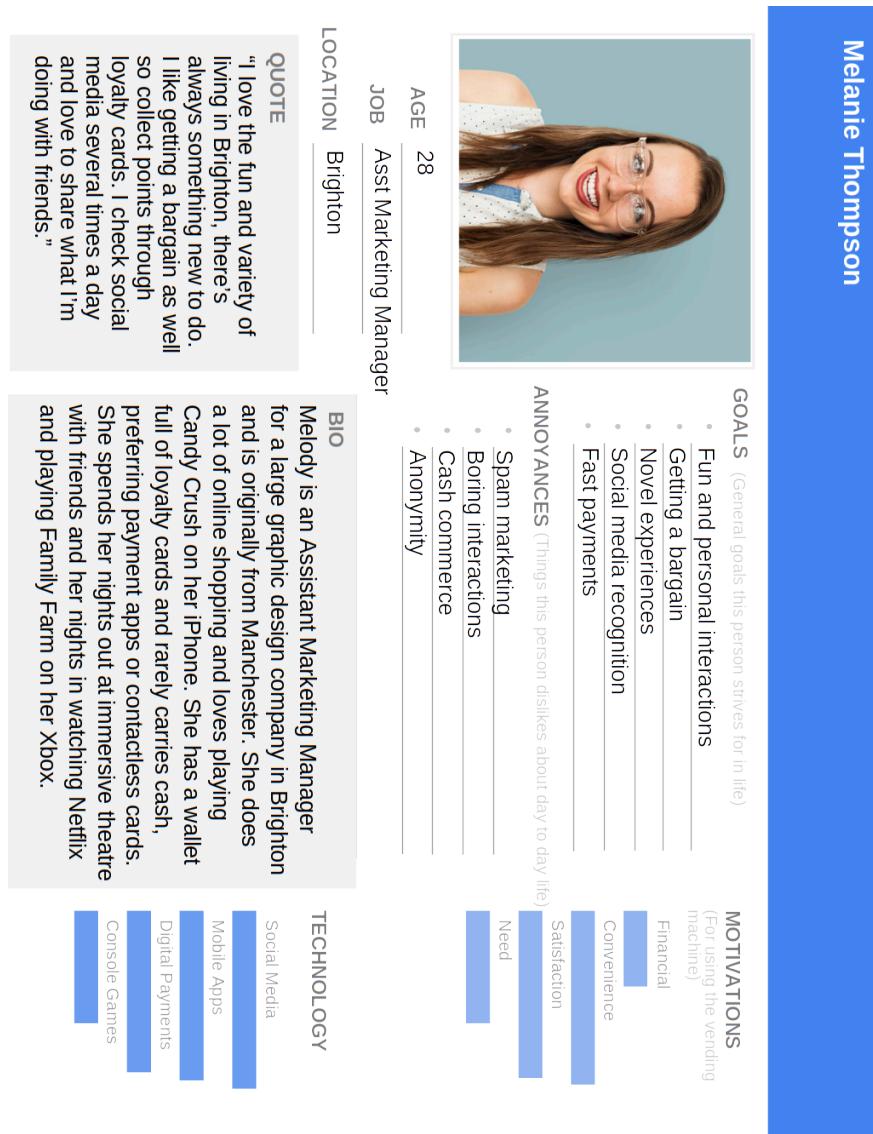


Figure 1: User Persona

# Wireframes

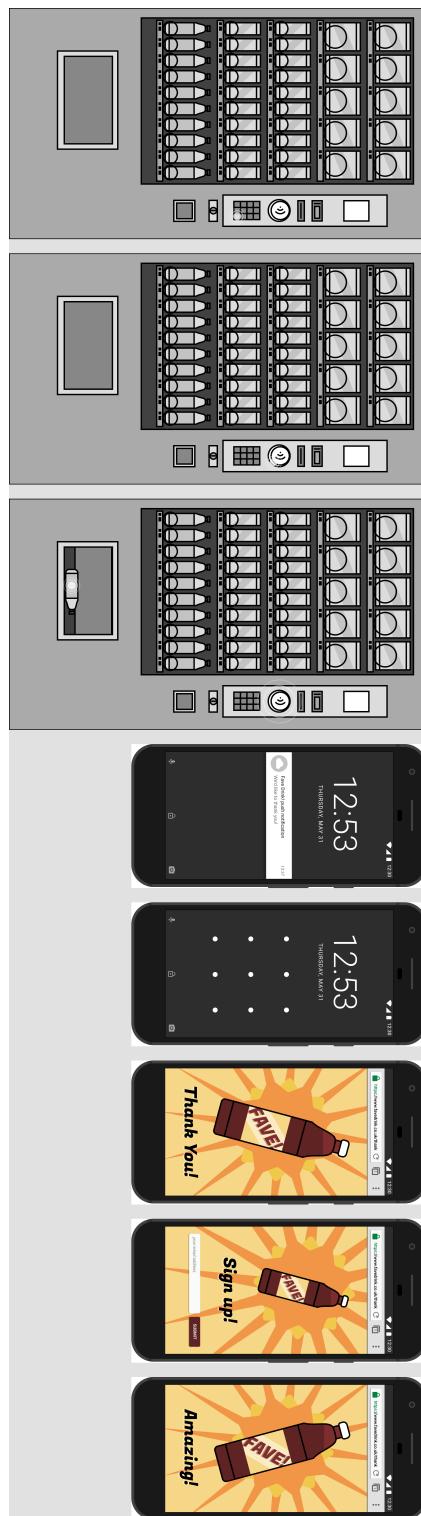


Figure 2: Wireframes Exp 1

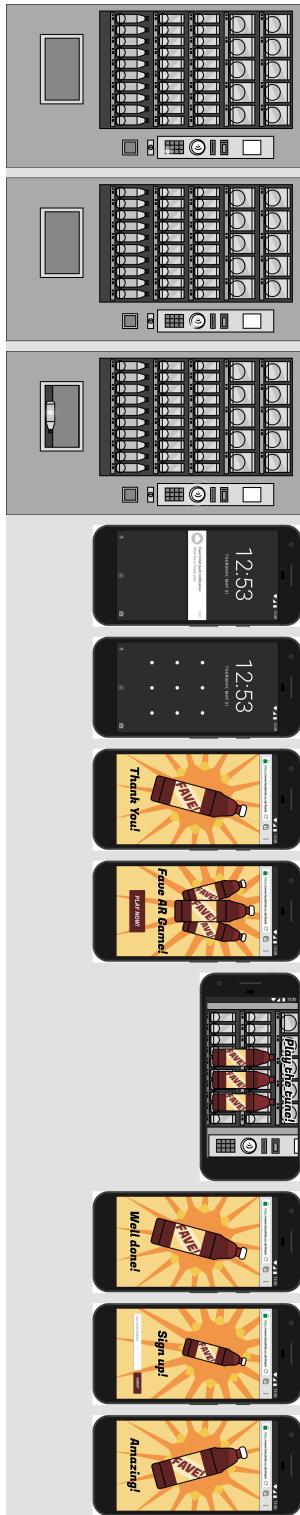


Figure 3: Wireframes Exp 2

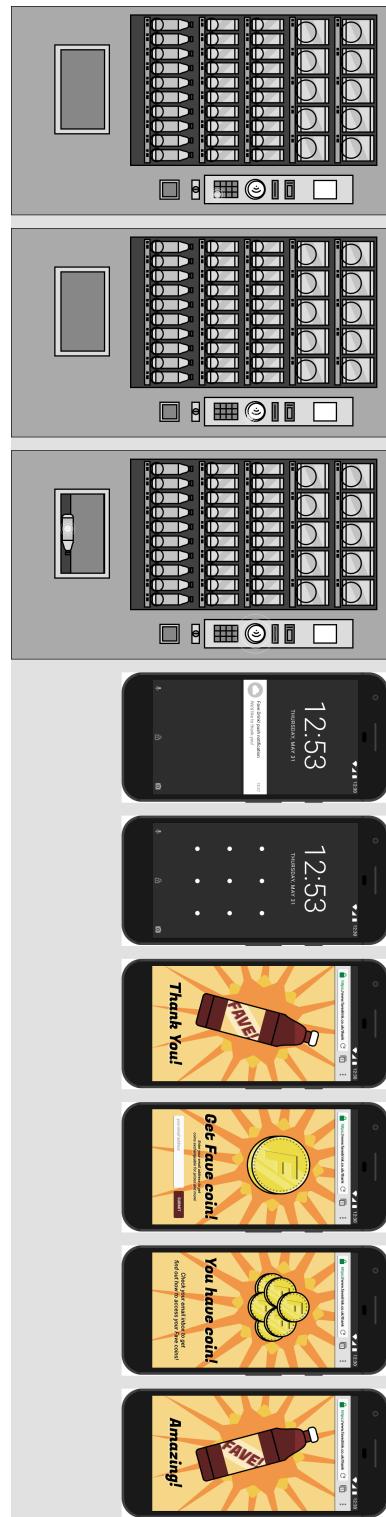


Figure 4: Wireframes Exp 3

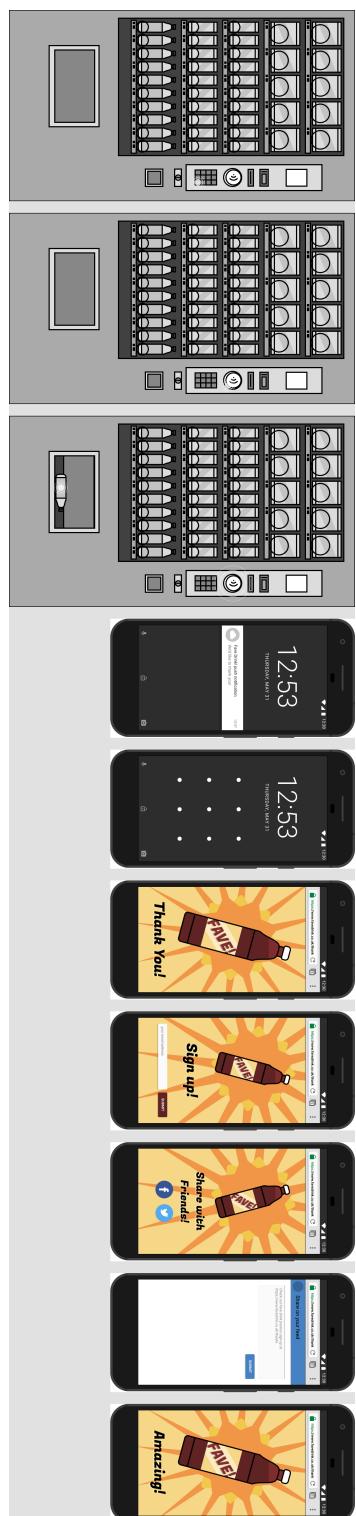


Figure 5: Wireframes Exp 4

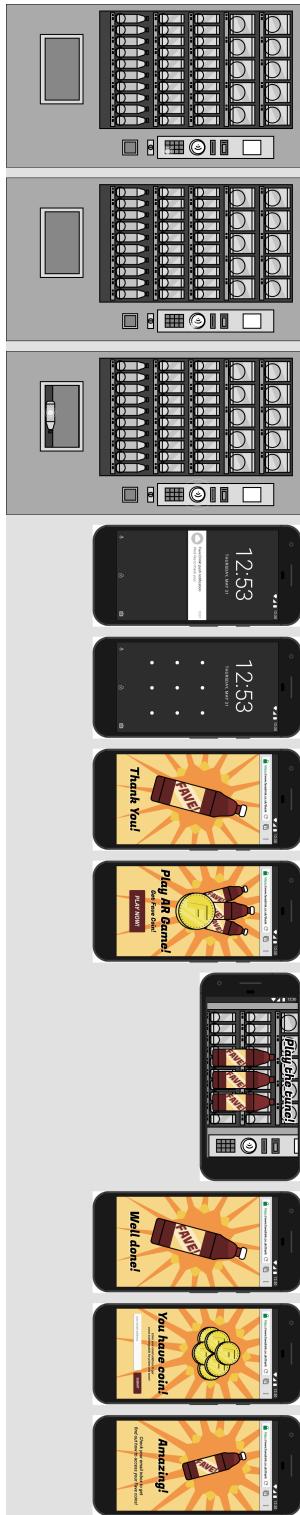


Figure 6: Wireframes Exp 5

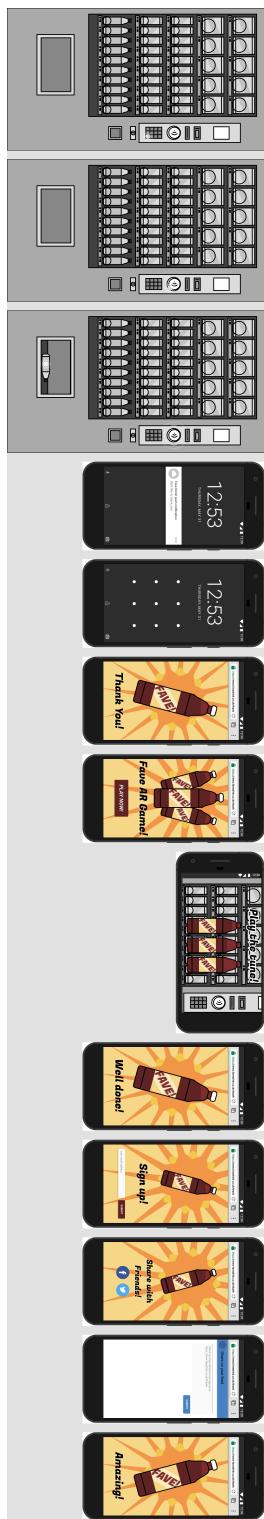


Figure 7: Wireframes Exp 6

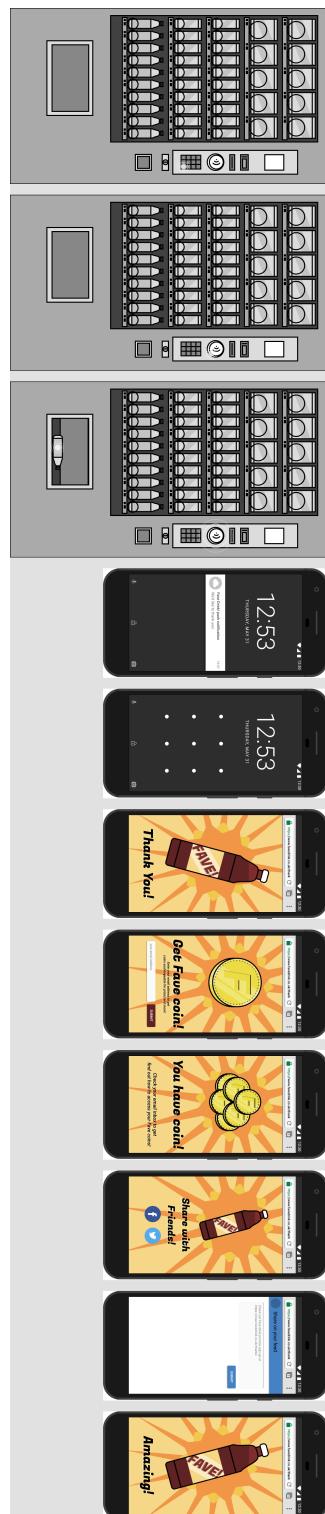


Figure 8: Wireframes Exp 7

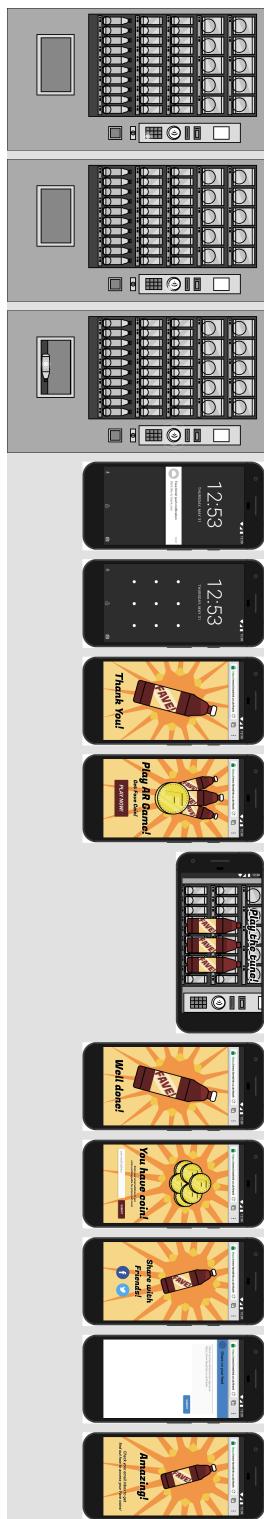


Figure 9: Wireframes Exp 8

# Branding Assets

## Fave Bottle and Label



Figure 10: Fave soft-drink bottle



Figure 11: Fave soft-drink label



Figure 12: Fave soft-drink vending machine design



Figure 13: Fave soft-drink vending machine banner

# User Research Results

This chapter provides a selection of data presentations, be that in tabular form, graphical representation or both. The assessment of the quantitative data spans over 50 sides of A4 and the aggregation of qualitative data is a similar length, so it's impractical to present all the data in this chapter. The entire set of data evaluation can be found as part of the appendices. This chapter will concentrate on the ways that the data was examined that are most significant to dissertation, with regard to best possible outcomes.

## Basic Participant Data

What follows is some minimal demographic information about the 23 participants that made up the group of experiment testers, as well as some information concerning their experience with technology relevant to the study.

There participants were mostly male be a ratio of about 3:2, the younger age groups were better represented, however the gender disparity was greater among those younger age groups with a stronger male representation for those under 35 (about 5:2). This was down to the participants that were able to take part.

Table 2: Gender Demographics

<b>Gender</b>	<b>Count</b>
Female	9
Male	14

Table 3: Age Demographics

<b>Age group</b>	<b>Count</b>
18-24	1
25-29	5
30-34	7
35-39	3
40-44	2
45-49	1
50+	4

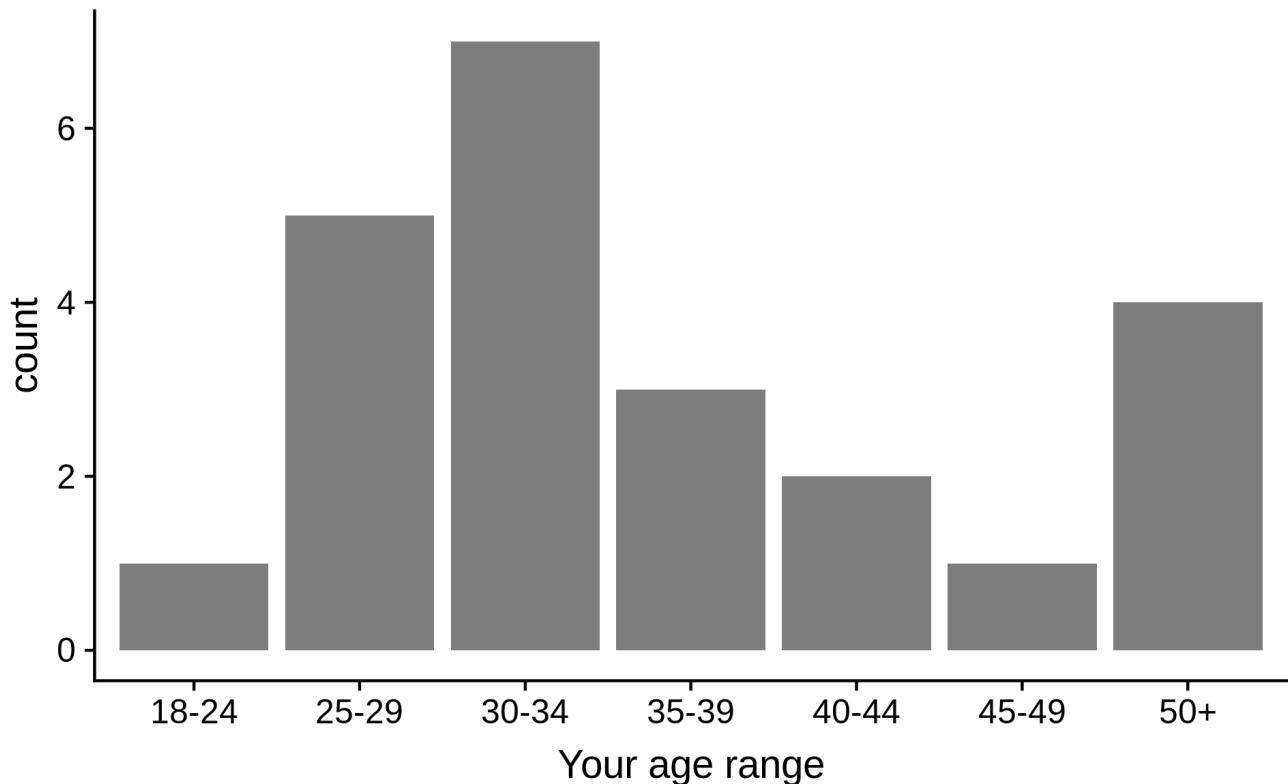


Figure 14: Age Demographics

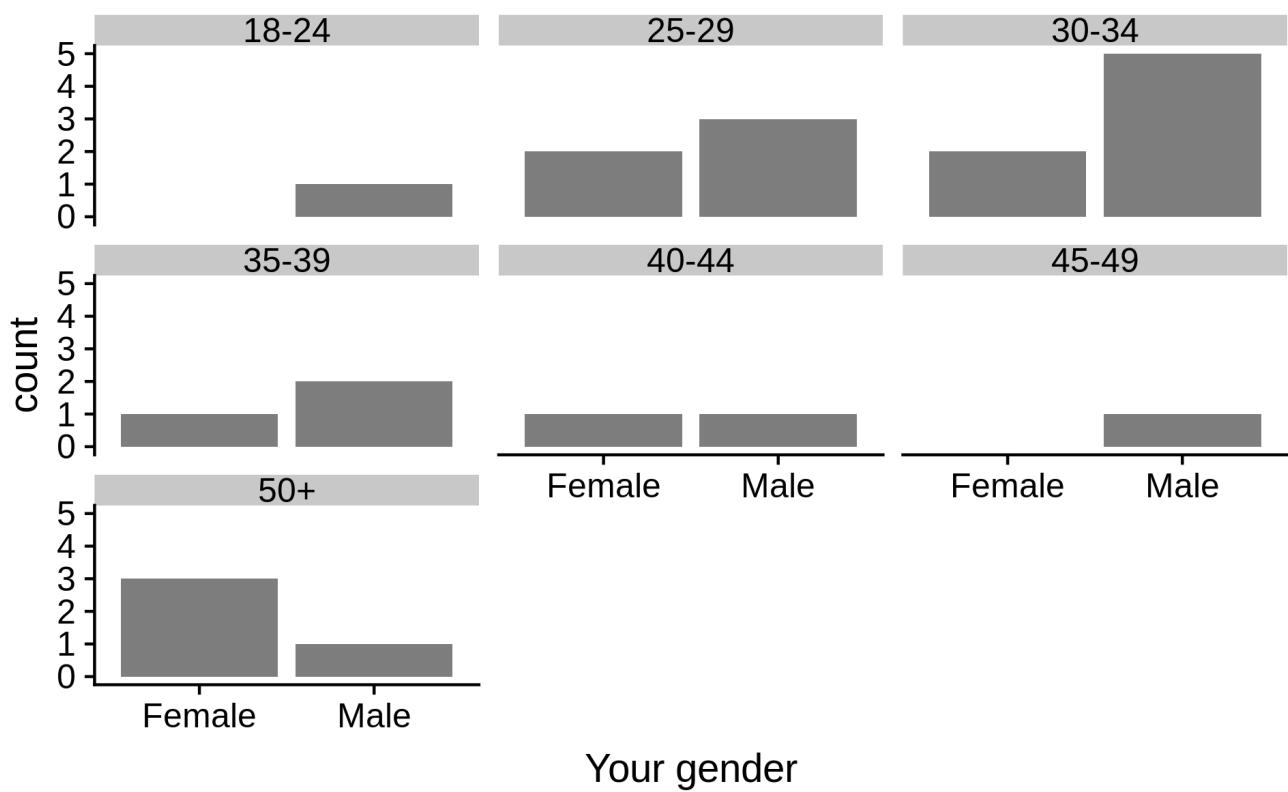


Figure 15: Age and Gender Demographics

## Familiarity with technology

Data was also captured from each participant to assess their familiarity with technology, specifically smartphone usage for various interactions and AR. These results are helpful to provide context for the results of the experiments.

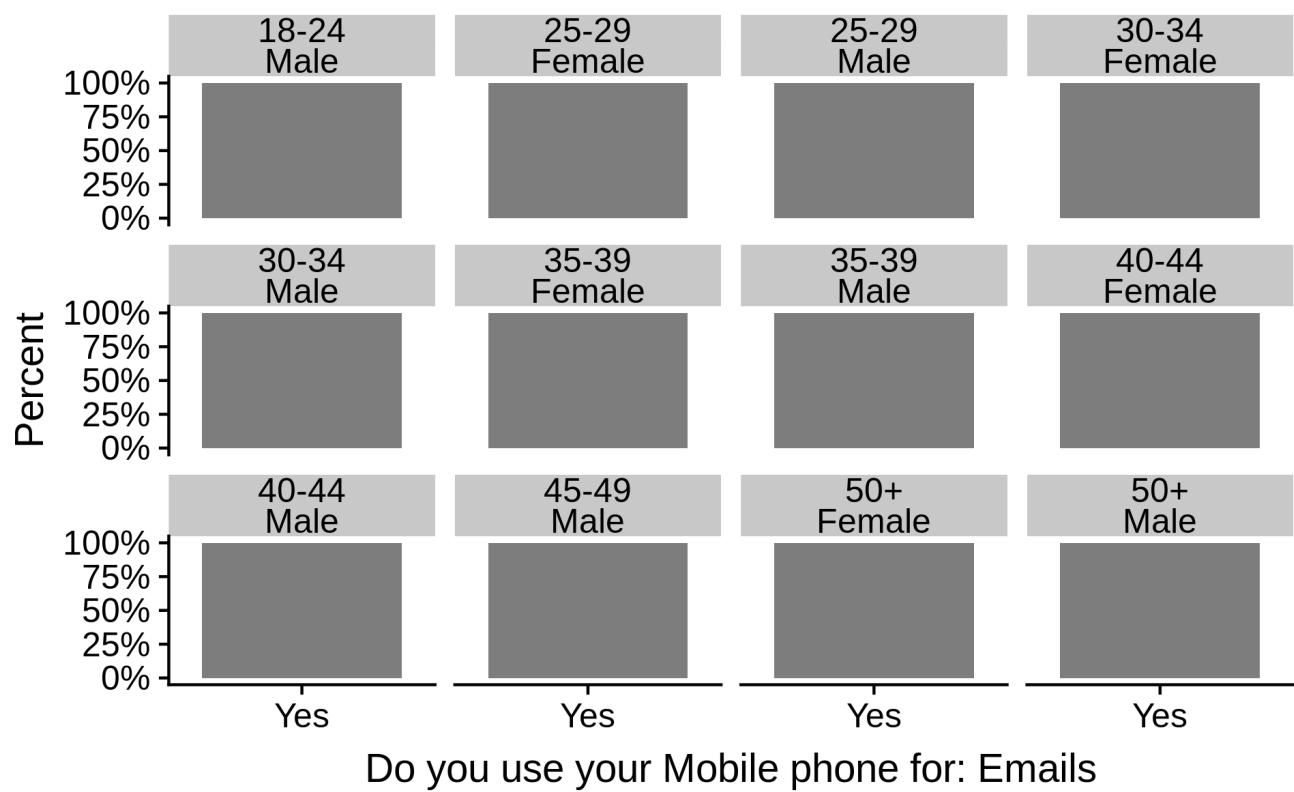


Figure 16: Mobile Email Use Across Age and Gender Groups

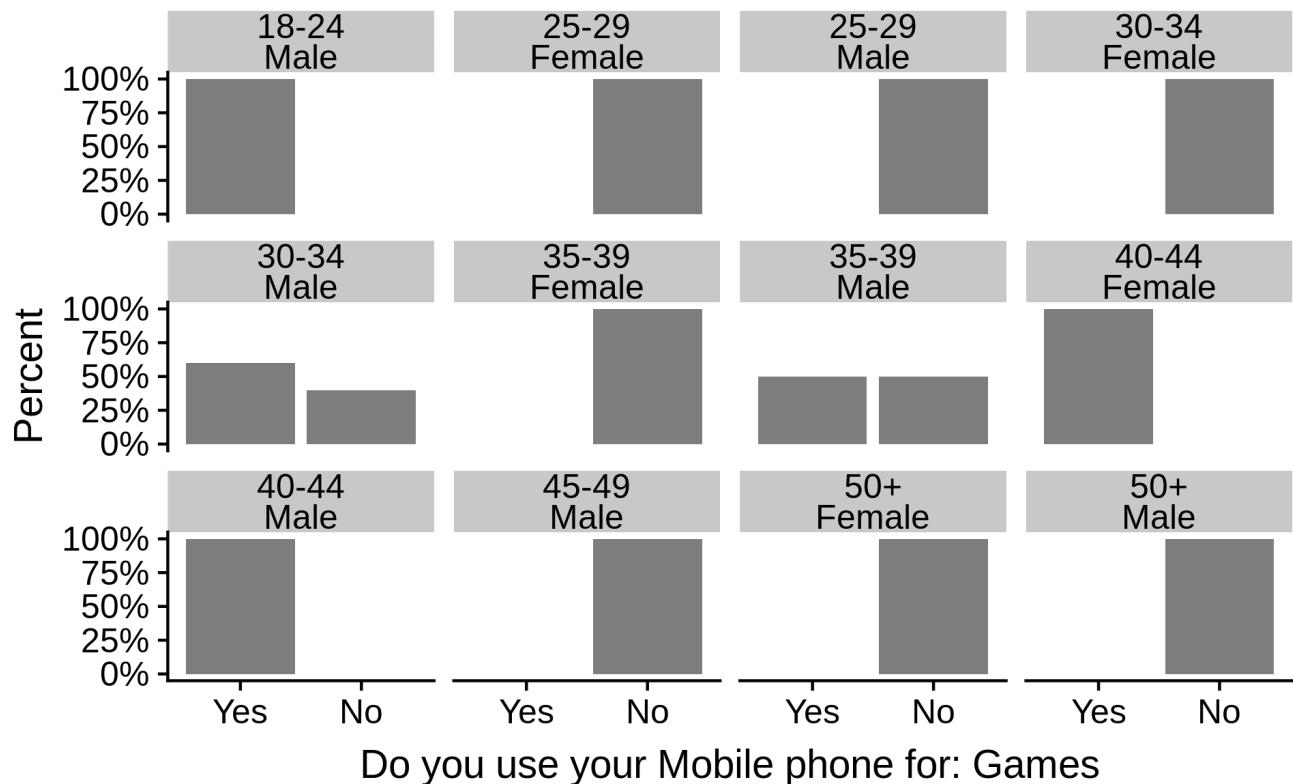


Figure 17: Mobile Game Use Across Age and Gender Groups

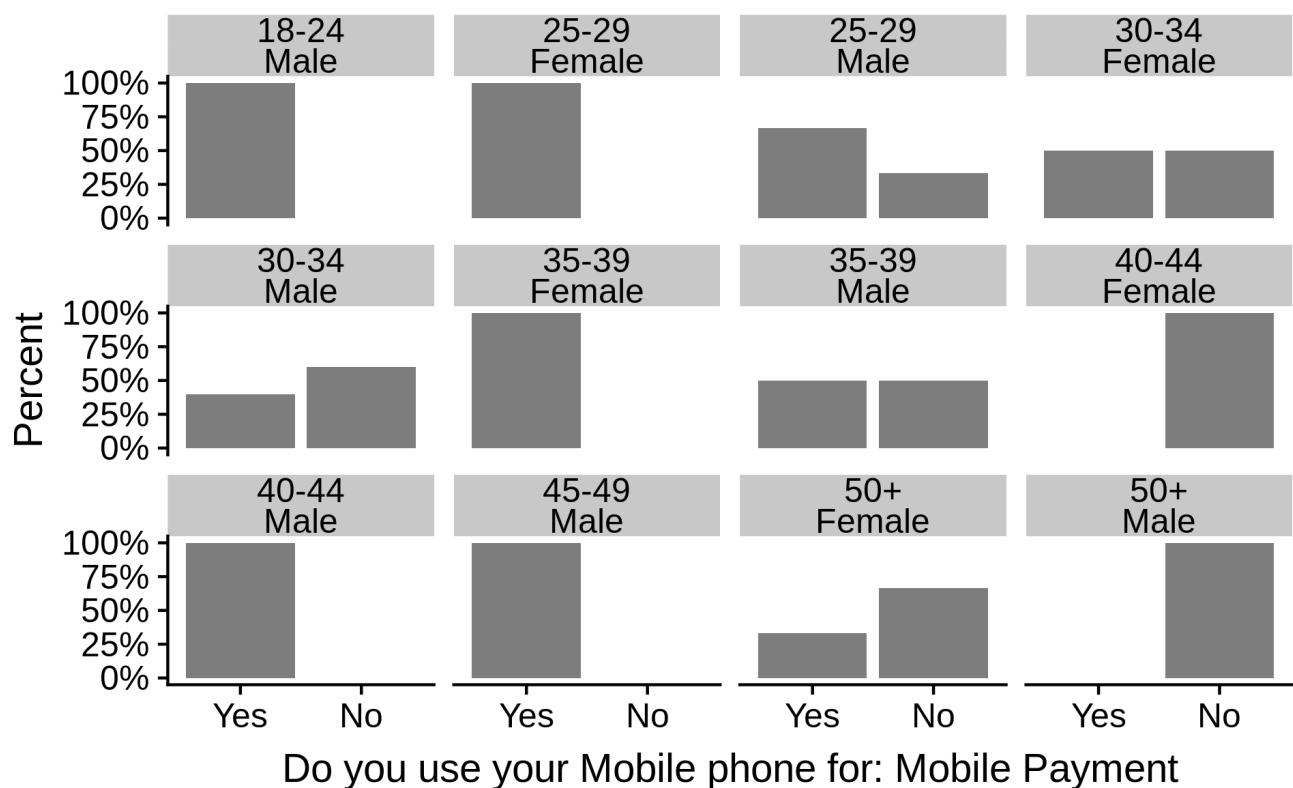


Figure 18: Mobile Payment Use Across Age and Gender Groups

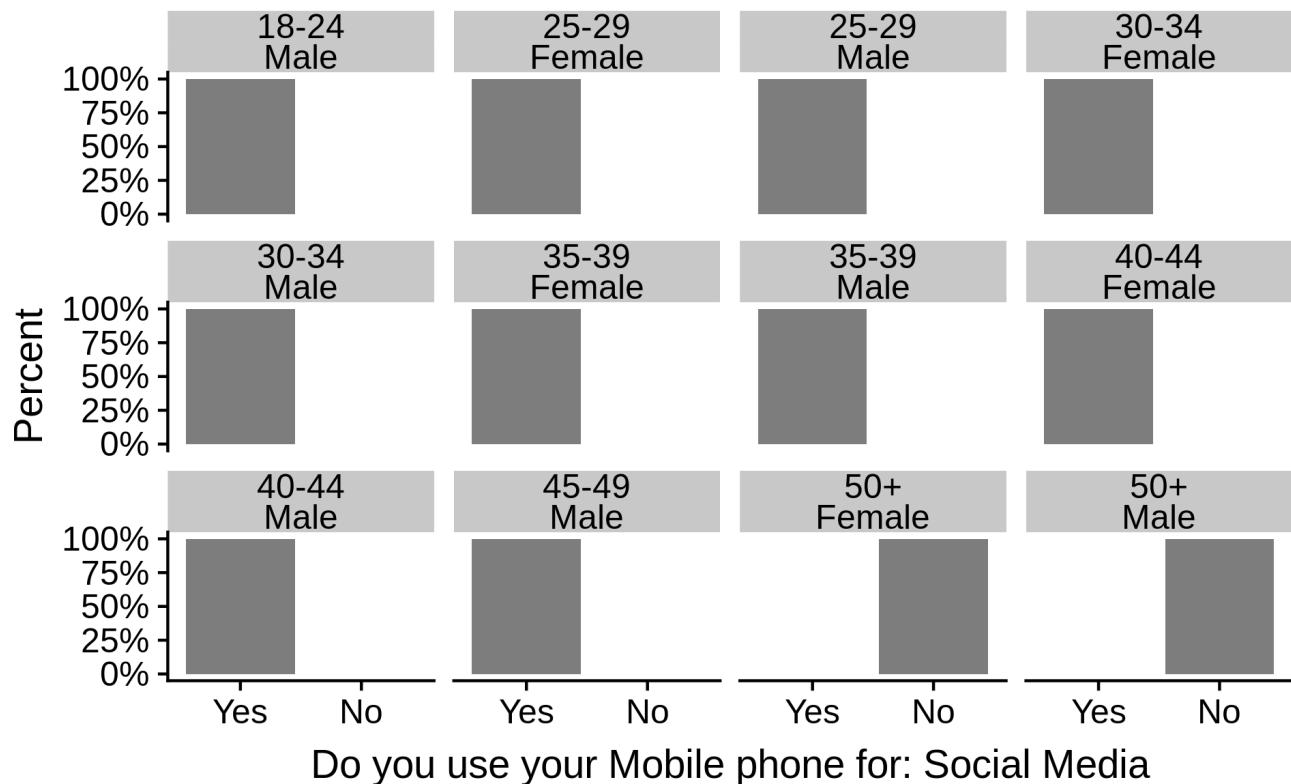


Figure 19: Mobile Social Media Use Across Age and Gender Groups

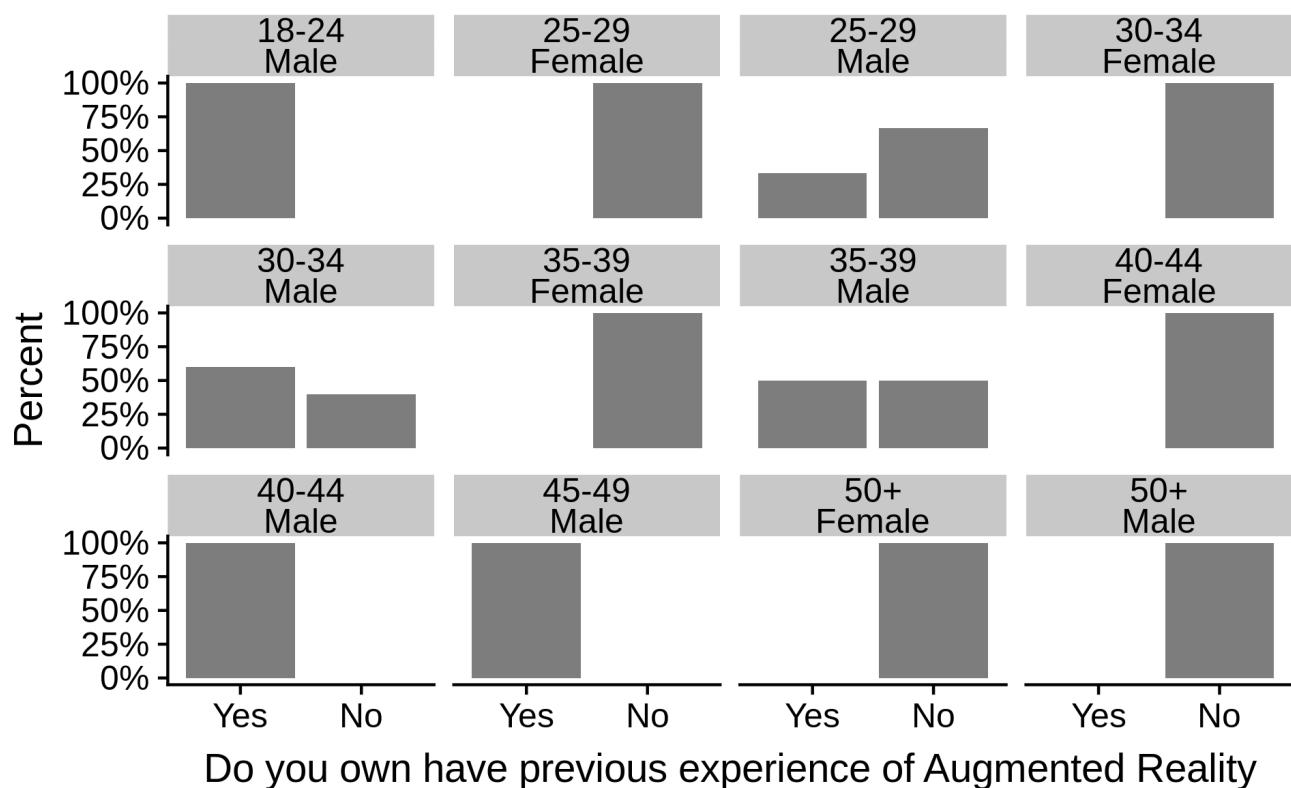


Figure 20: Augmented Reality Familiarity Across Age and Gender Groups

All participants accessed their emails on their mobile phones and every single demographic that was captured by the study, apart from those over fifty used social media on their mobile phones. Participants at the older end of the spectrum appear not to play games on their mobile phones, nor do those in the young age groups of this sample of users whereas the middle age groups 30-34, 35-39, and 40-44 seem to be more inclined to play games on their mobile phones. Broadly speaking using a smartphone to make mobile payments is more popular among females but more significantly those of both genders in the younger age groups show a higher frequency of mobile payment, with the frequency declining with age. The data also suggest familiarity with Augmented Reality to be more frequent among males with no prior experience for females of any age group. Any correlation between age and familiarity cannot be said to be linear, though the 50+ age group was the only male demographic to have no prior experience.

## Weakness in the sample set

The 18-24 and 45-49 age groups were populated by just one participant each, consequently feedback for these demographics were the least reliable; the next least reliable age groups are the 40-44 and 35-39 age groups, in that order. Note having at least one person of each gender to cover the age ranges can be considered a major point of concern, and ideally age demographic subset would each have at least five to ten people to allow for more variation of opinion within a given demographic. One way the disparity in sample size per age group was for mitigated, to some merged age groups allowing for a broader trend analysis but with greater sample sizes per age group and this can be seen in the following analysis. Another technique used to allow age groups that were under represented to count for the amount they should with regard to normal population distribution for the UK was to apply proportionate weighting to the answers based on the demographics of the country. This kind of weight adjustment is common practice in order to allow the results to better reflect the population.

## Initial Findings

What follows is some basic evaluation of the experiments based on some simple question regarding the component parts of the experiments and the participants favourite experiment experience. These results provide more context from which later examination of the data can be compared.

# Component Perception

Two components that are included in all the experiments, in fact being the bedrock of all interactions are the use of a smartphone for the bulk of the interaction and the IoT BLE beacon prompting the phone. The following box plot graphs indicate how these fundamental element were received by the testers.

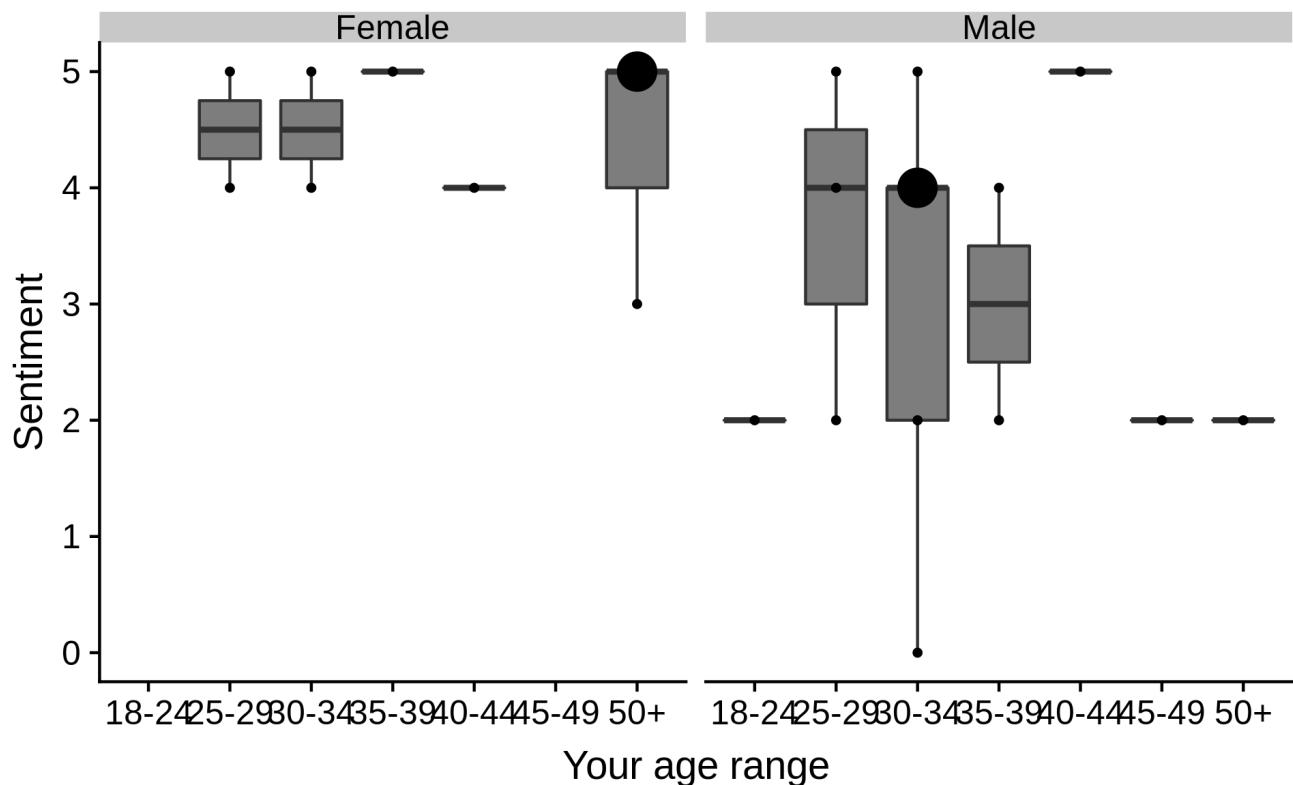


Figure 21: Perception of Experiment Mobile Interactions

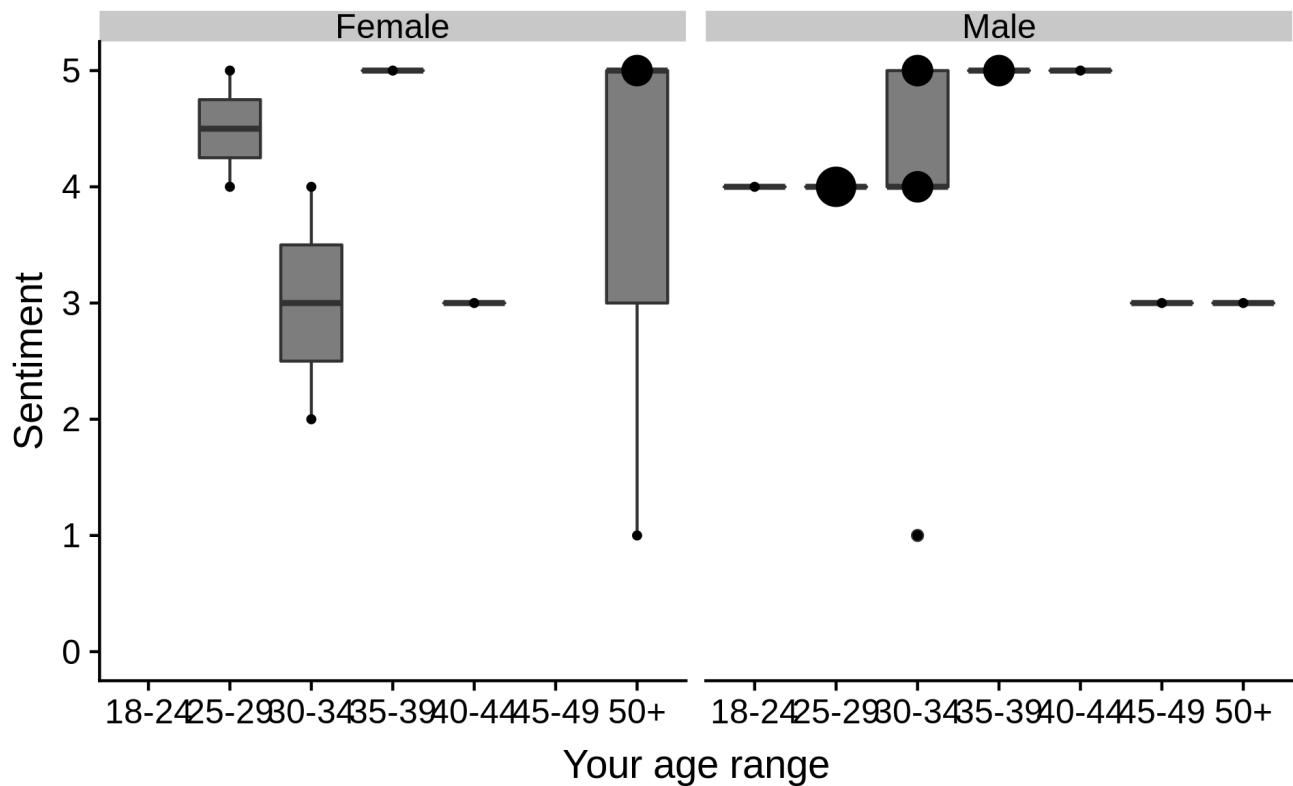


Figure 22: Perception of Experiment IoT

Broadly speaking most participant across every demographic, with the exception of a few outliers, were comfortable with the idea of using a smartphone as part of these interactions. The IoT element has more polarising results with more overall positivity from the entire subset of females when compared to males, which not only had greater variation but a significant number of scores below the top half of the sentiment scale.

## Preferred Experiment

The question about which experiment was the user's preferred experience gave the participants a choice just to pick one experiment out of the eight variations. This makes it an appropriate example to demonstrate how the result may differ if they were to take into account the relative population of the demographic subsets.

Table 4: Preferred Experiment

<b>Preferred Exp</b>	<b>Count</b>
#1	3
#2	1
#3	11
#4	0
#5	5
#6	0
#7	2
#8	1

Table 5: Preferred Experiment

<b>Preferred Exp</b>	<b>Weighted Count</b>
#1	5.023257
#2	1.390666
#3	7.363726
#4	0.000000
#5	3.942898
#6	0.000000
#7	1.555085
#8	1.192840

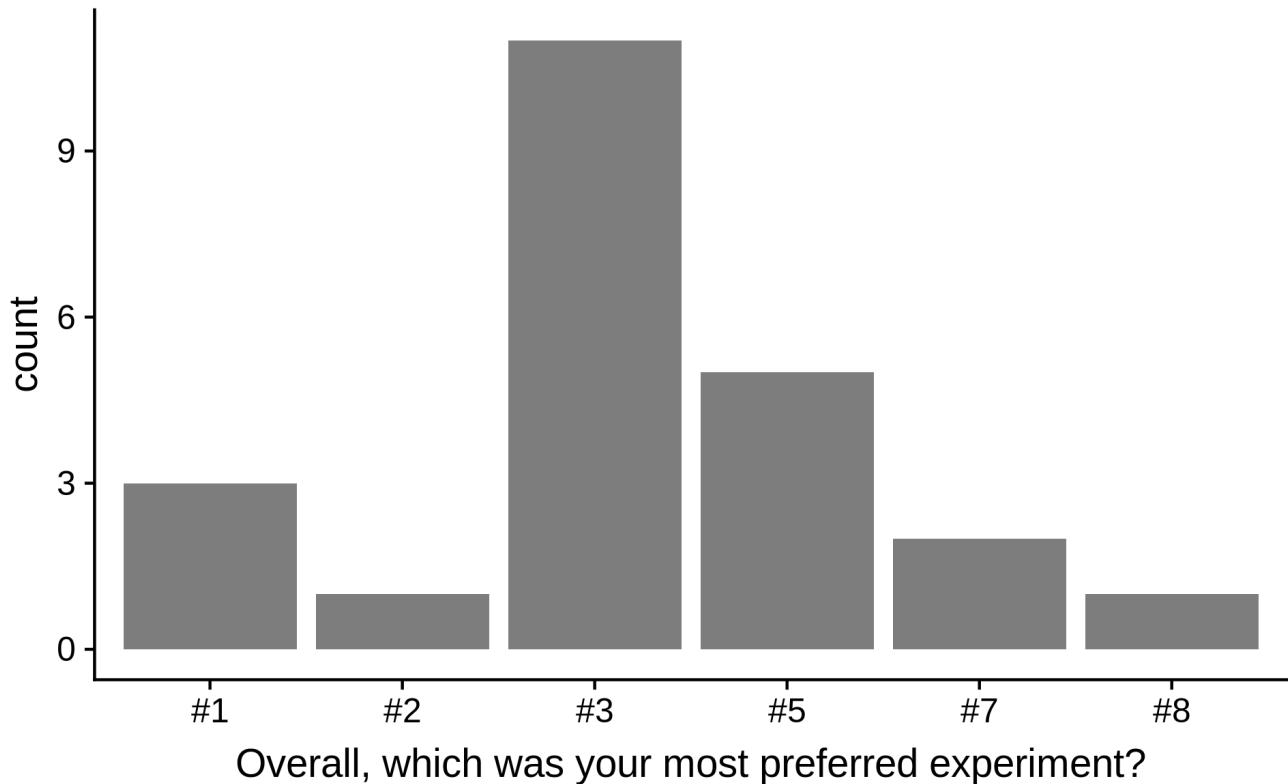


Figure 23: Preferred Experiment

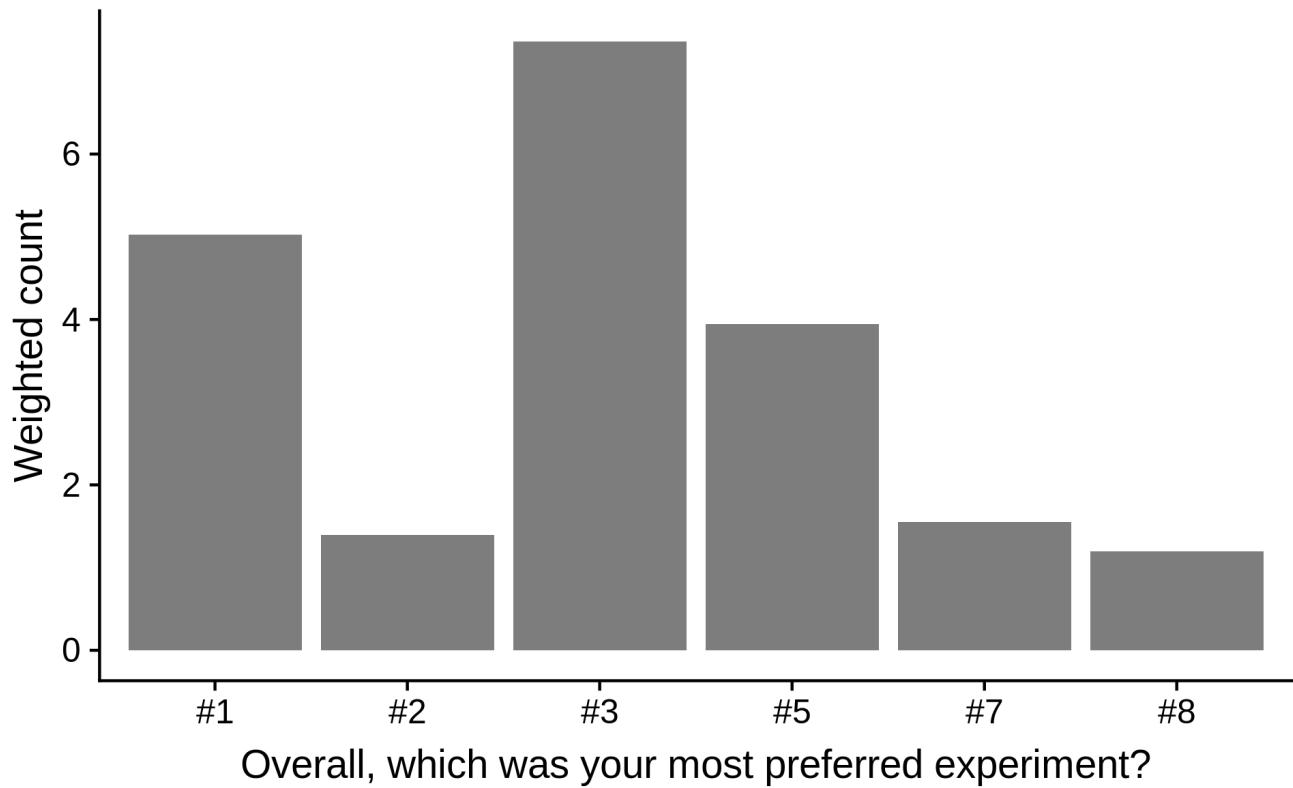


Figure 24: Preferred Experiment Weighted for Population

Experiment #3 was the most popular while the experiments #4 and #6 did not get a single vote; Experiment #3 was the simplest interaction that involved an element of reward. Looking at these relatively crude results, those experiments - excluding the baseline - that also scored better rewarded the user. Experiments #4 and #6 also happen to incorporate the Social Media element without the Digital Reward. Figure 24 demonstrates how weighting users feedback can change the findings, in this case with #1 being more highly regarded.

## Preferred Experiments by Age Group

This next graph is an example of the granularity with which the data can be studied but also the potential flaws in doing so. In this case the relatively small sample size manages to demonstrate how it's not necessarily possible to gain truly meaningful data if the results are examined too finely.

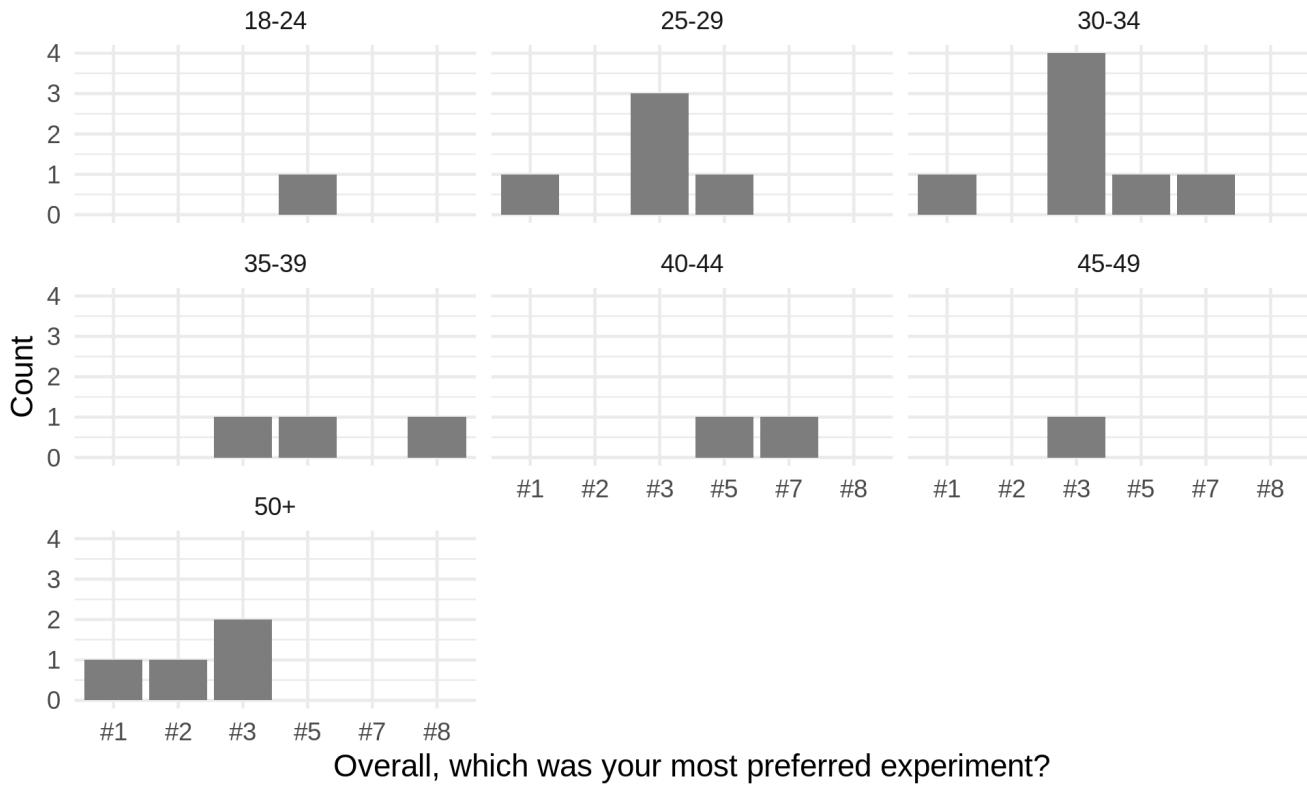


Figure 25: Preferred Experiment Across Age Groups

While the data suggests results that can point to preferences within all age groups, when two age demographics only contain one participant (18-24, 45-49) as well as the 40-44 age group only having two and the 35-39 group only having three, then if the findings are looked at in this level of detail, it's not wise to attribute too much confidence to the results. The larger the sample size for a given sub-group, the more confidence can be given to findings even if the analysis is covering a broader group of people.

## Preferred Experiments Across Age and Gender With Weighted Values

Given the previous example, what follows is an example of how the data was transformed with the intent of making the data more likely to present results that can be more confidently considered as representative of the general public.

Table 6: Most Preferred Experiments Adjusted for Population Weighting and Aggregated Age Groups

<b>Preferred experiment</b>	<b>Your age range</b>	<b>Your gender</b>	<b>Weight</b>	<b>Weight percent</b>
#3	18-29	Female	0.6102901	0.5000000
#5	18-29	Female	0.6102901	0.5000000
#1	30-34	Female	0.5834226	0.5000000
#3	30-34	Female	0.5834226	0.5000000
#7	35-44	Female	1.3224872	0.5257713
#8	35-44	Female	1.1928405	0.4742287
#2	45+	Female	1.3906661	0.3333333
#3	45+	Female	2.7813323	0.6666667
#1	18-29	Male	0.4038044	0.1659284
#3	18-29	Male	0.8076089	0.3318569
#5	18-29	Male	1.2221926	0.5022147
#3	30-34	Male	0.6977944	0.6000000
#5	30-34	Male	0.2325981	0.2000000
#7	30-34	Male	0.2325981	0.2000000
#3	35-44	Male	0.5879894	0.2384573
#5	35-44	Male	1.8778167	0.7615427
#1	45+	Male	4.0360299	0.7570416
#3	45+	Male	1.2952884	0.2429584

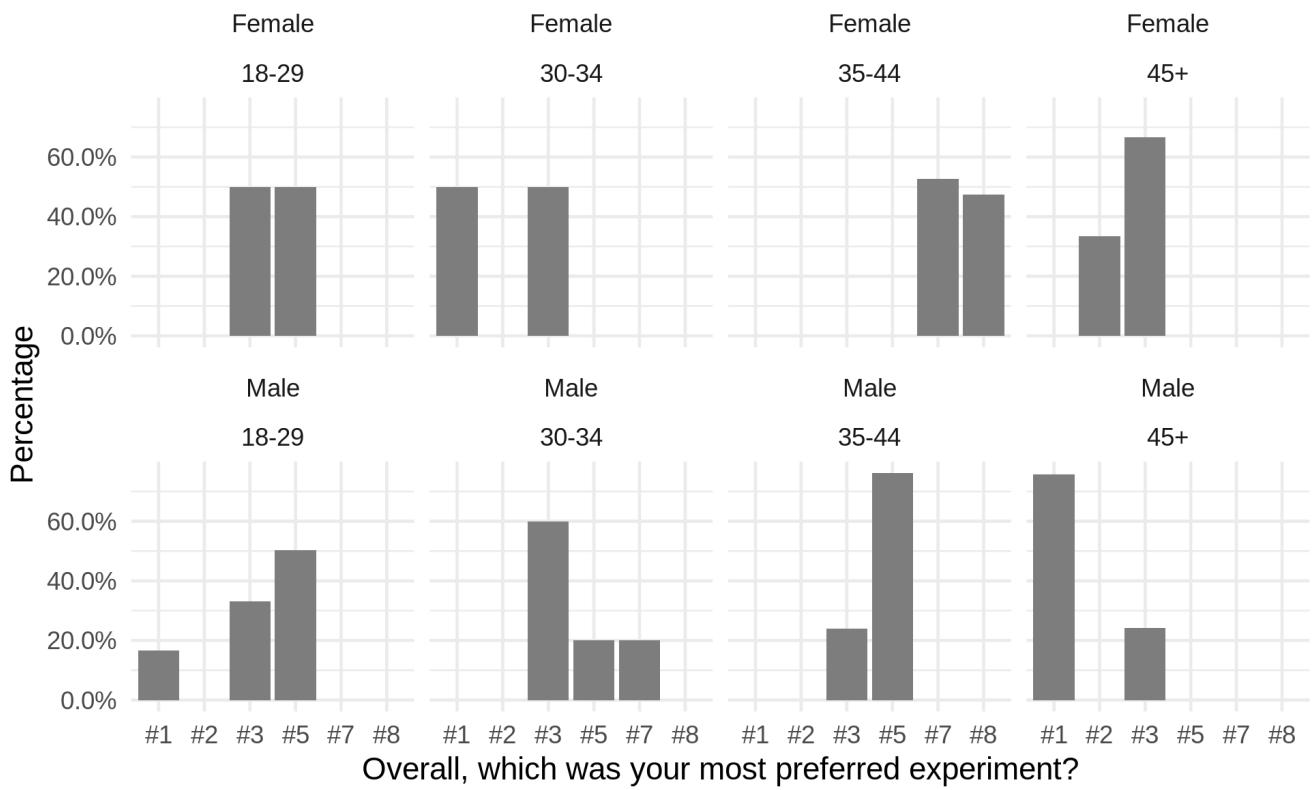


Figure 26: Most Preferred Experiments Adjusted for Population Weighting and Aggregated Age Groups

Now that there are larger age demographic subsets it's more possible to get competing values for the preferred experiment. With the increased likelihood of competing results comes greater confidence that if a given value is noticeably greater than another, then it represents something meaningful pertaining to public perception. In this case in particular, it is now more reliable to suggest that experiment #3 is the most popular experience for the 30-34 and 45+ groups while #5 is most popular with the youngest age group and males in the 35-44 bracket. Nevertheless, this evaluation isn't definitive and shouldn't be taken as fact in any way as it is only one way the data has been examined; in particular, this evaluation relies on fewer data points to come to these suggestions. Ostensibly, the more data points used when trying to derive meaning, the greater the potential for accuracy, so long as the observations used are relevant to the question looking to be answered.

# Evaluating Feedback Through Experiment Qualities

Another way of inspecting the feedback is to not take an angle that filters based on the human properties of the participants but instead looks at the properties of the experiments. The experiments were scored by the test users against various properties (described as 'facets' within the study report) the experiments could possess. The feedback questionnaire required mandatory evaluation of these characteristics using a scalar metric, based on the level of agreement with the statement related to the potential attributes of each experiment.

To re-iterate, the facets of the experiments intended to be measured were:

- Enjoyment
- Annoyance
- Ease of use
- Brand connection
- Engagement
- Persuasiveness
- Interest

This perspective of analysis makes it easier to compare the experiments against one another on a more nuanced level that has less to do with the users (at this stage) and more about how the experiences felt to the users in ways that would be otherwise difficult to quantify. It is because of this that the approach to interpreting the data can add extra value through a different lens. A high level description of what the following graphs depicts is provided but for further detail, the full report in the appendix is available.

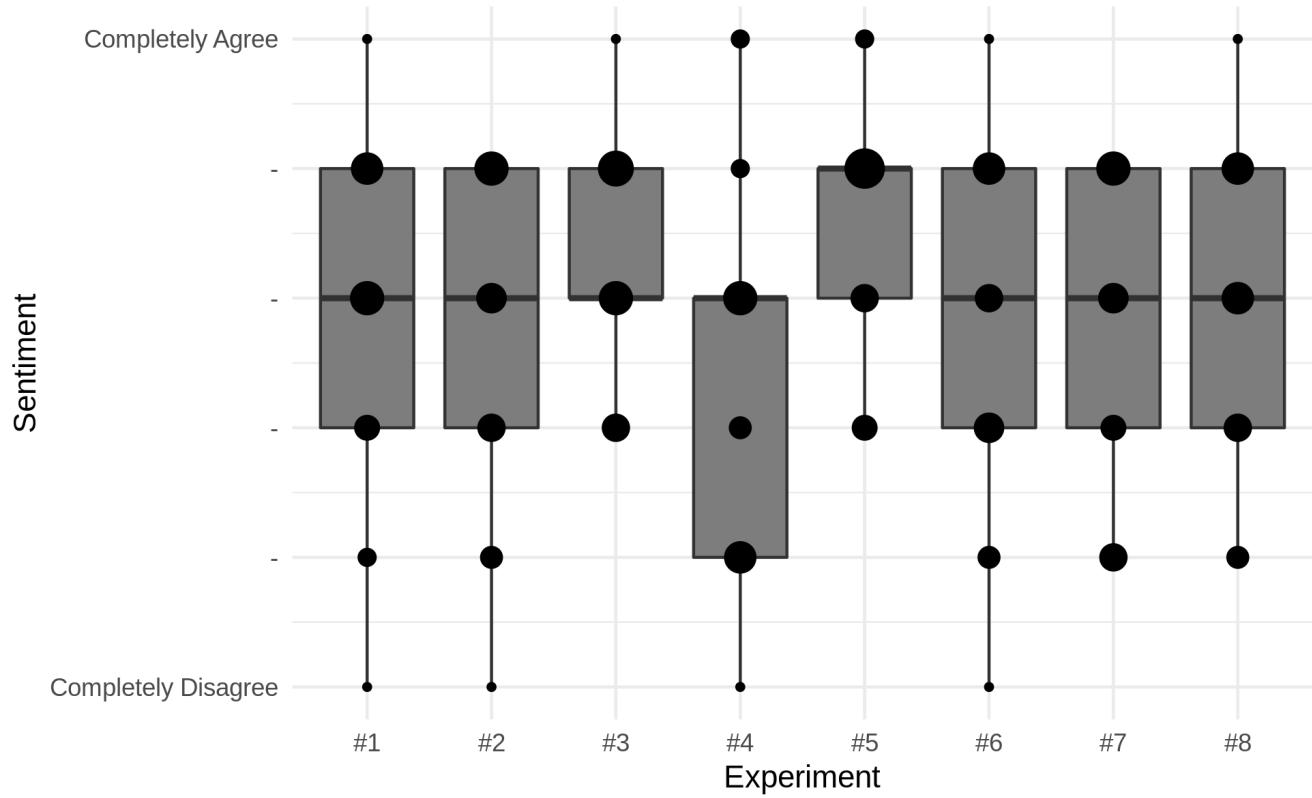


Figure 27: Experiment Facet: Enjoyment

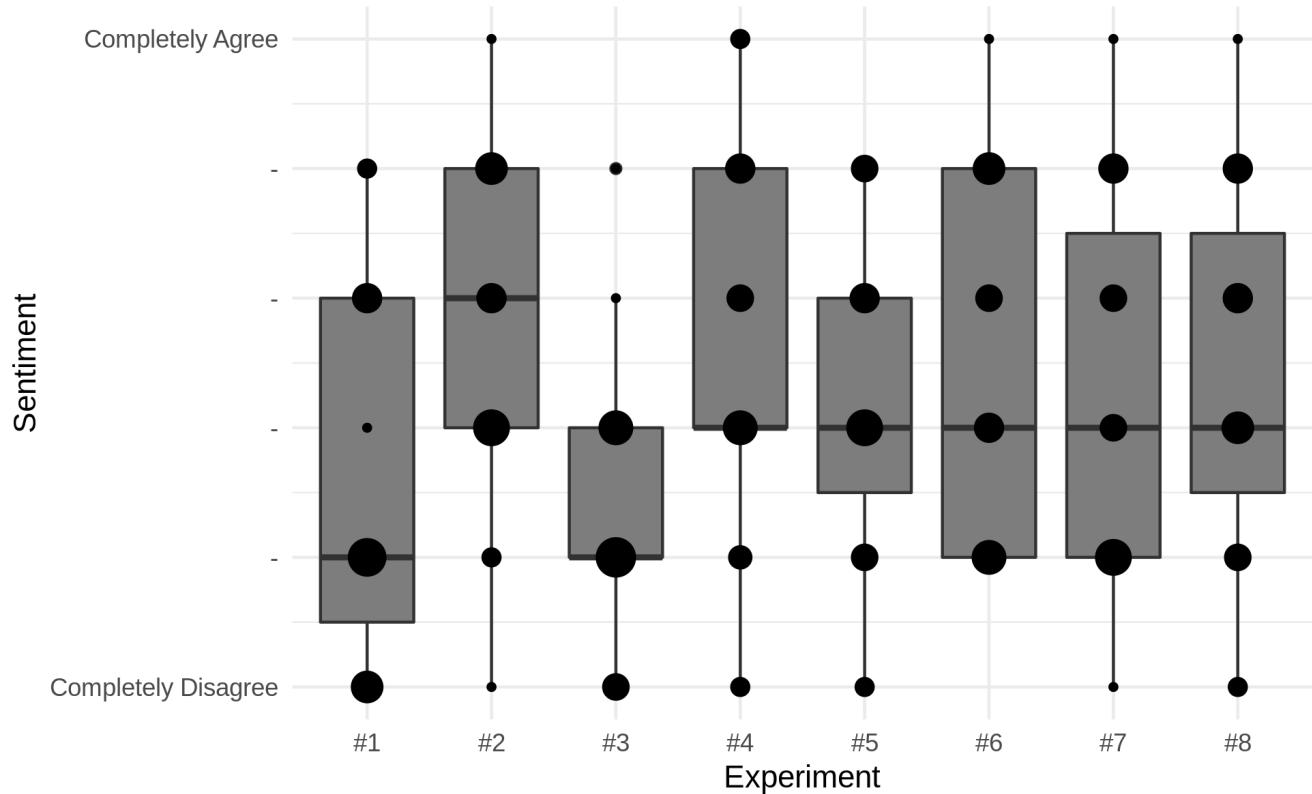


Figure 28: Experiment Facet: Annoyance

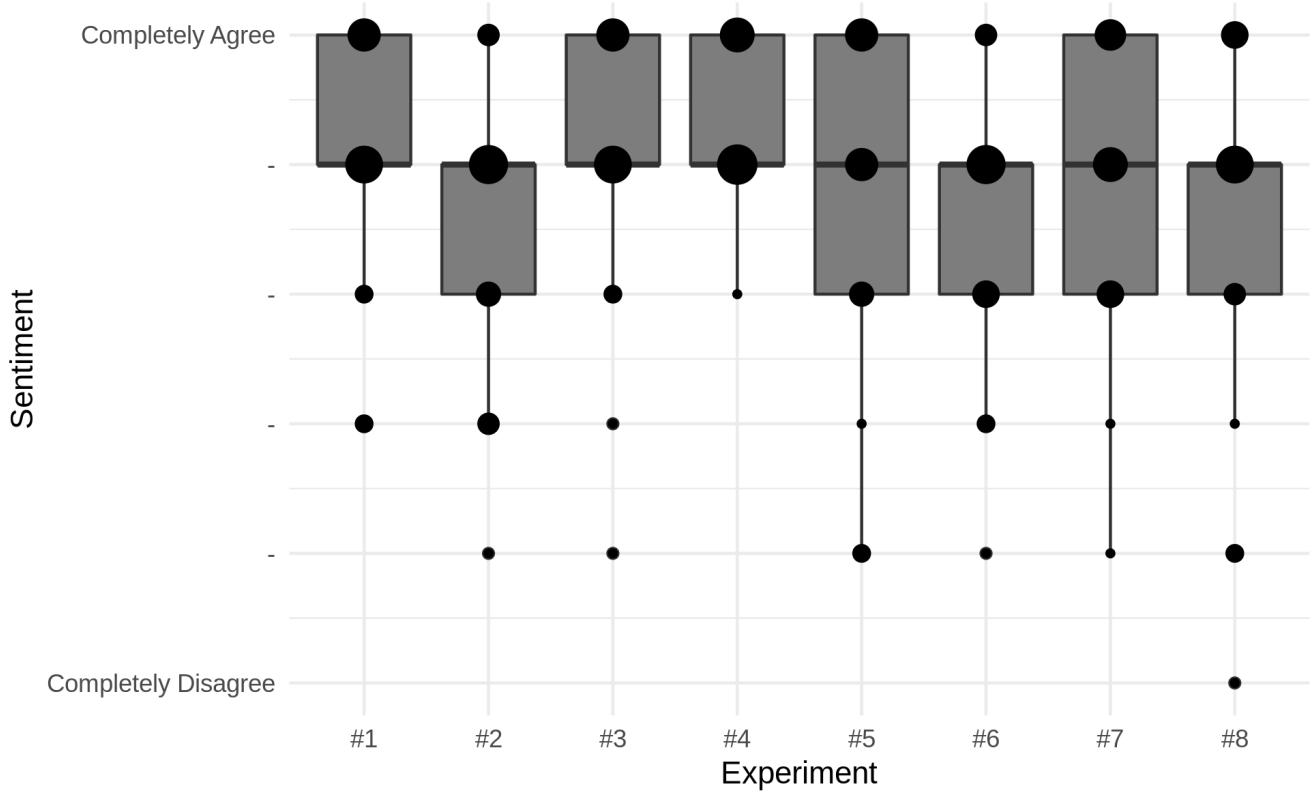


Figure 29: Experiment Facet: Ease of use

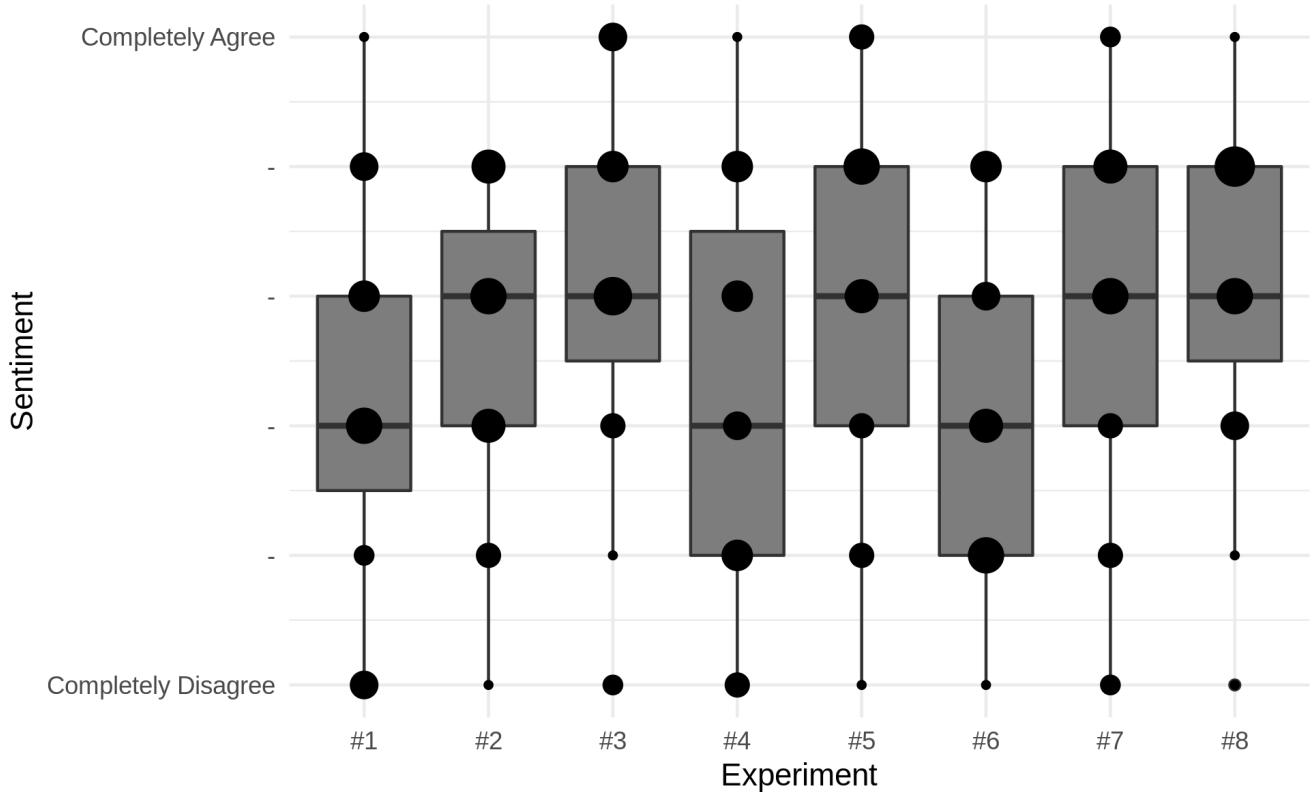


Figure 30: Experiment Facet: Brand connection

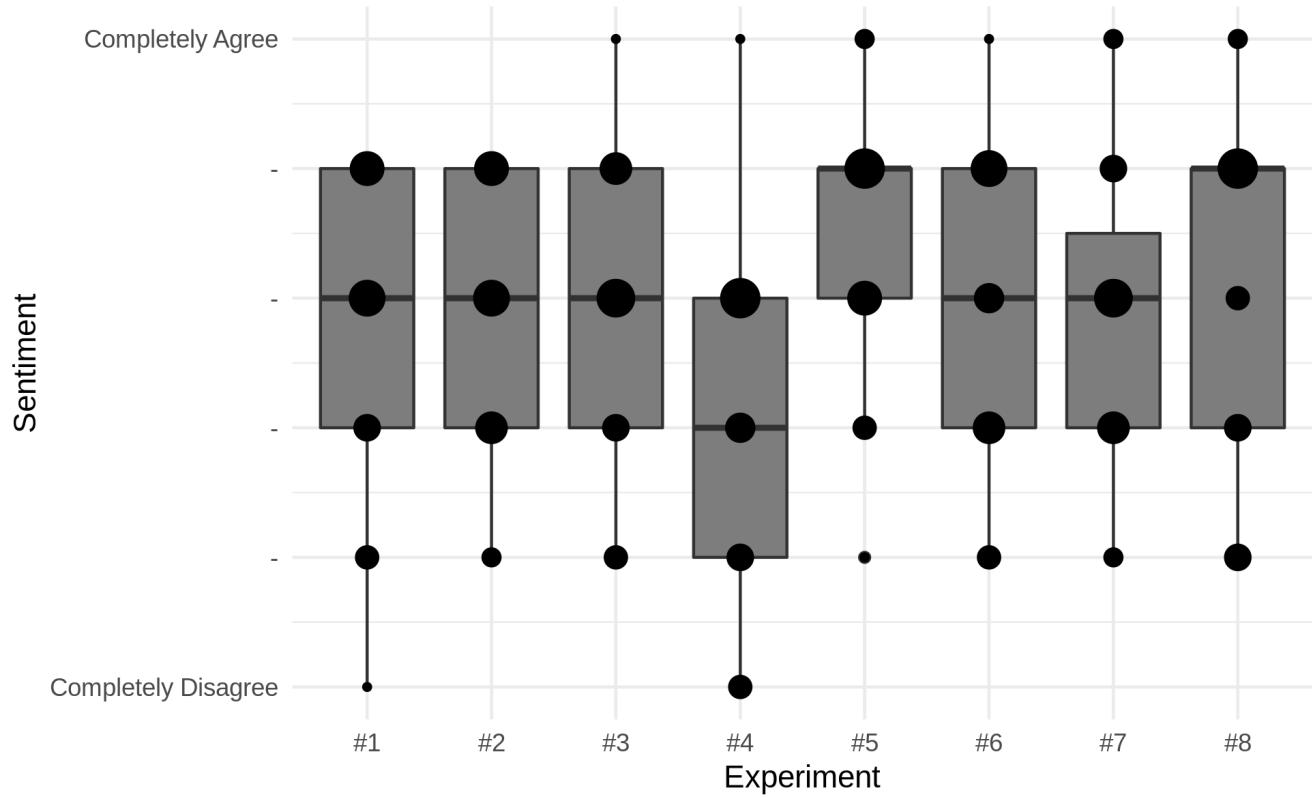


Figure 31: Experiment Facet: Engagement

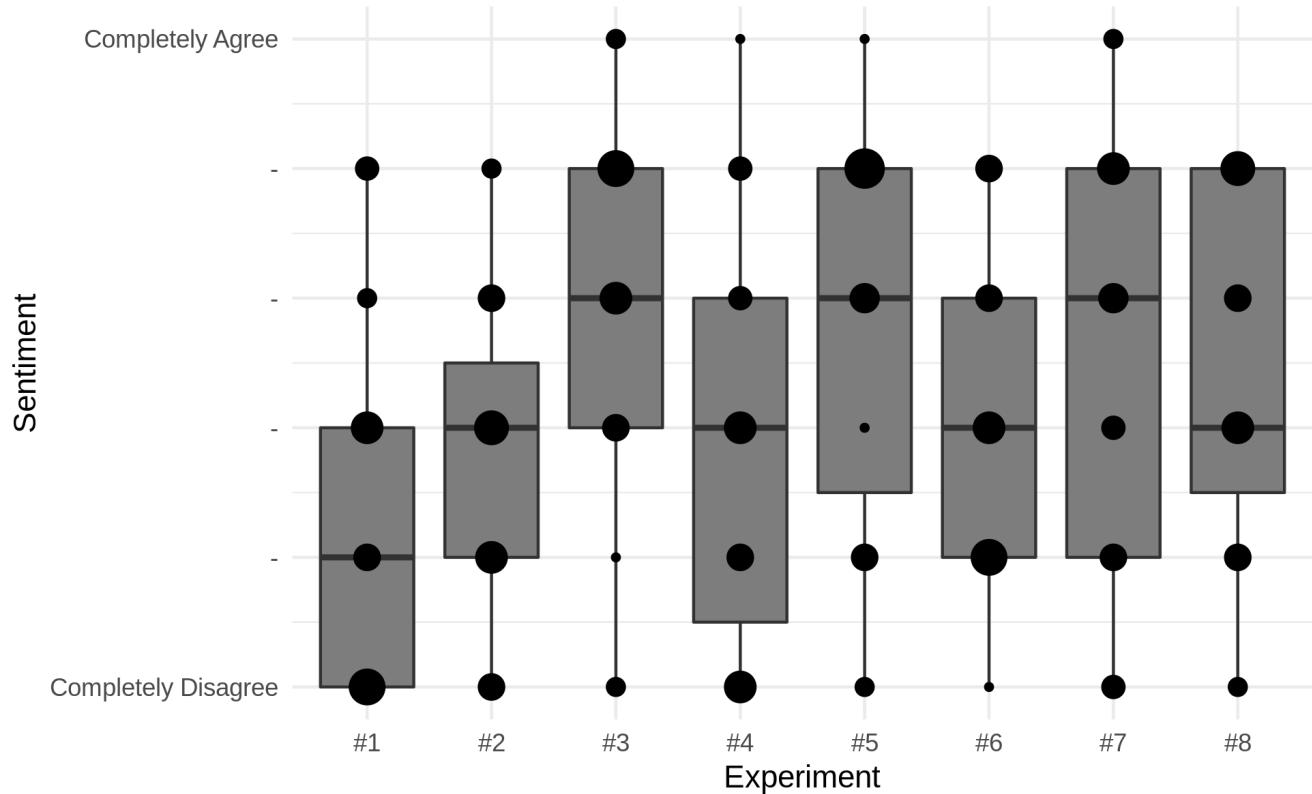


Figure 32: Experiment Facet: Persuasiveness

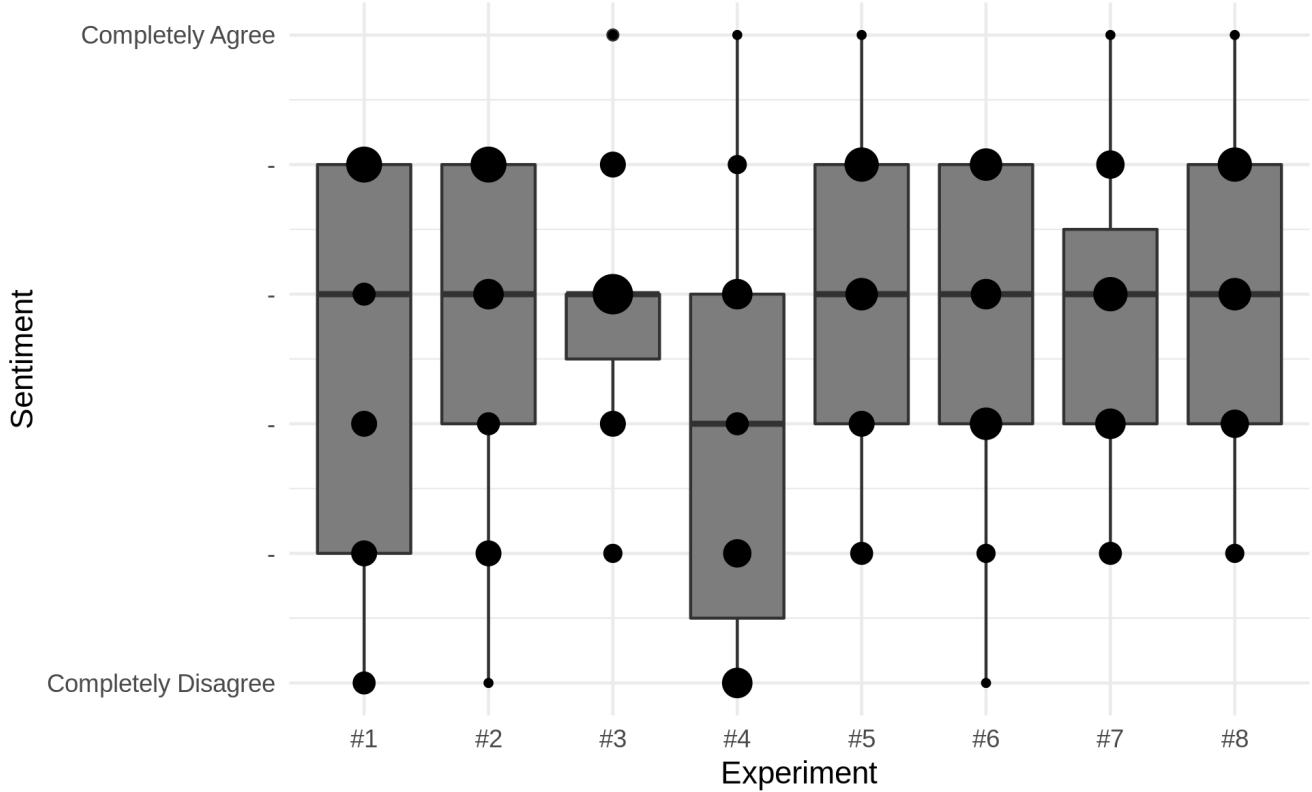


Figure 33: Experiment Facet: Interest

## Facet Evaluation Summaries

### Enjoyment

Figure 27 shows experiments #3 (Digital Reward) and #5 (Digital Reward, Augmented Reality) have the most positive results with ranges that are mostly positive and very much skewed to the top end. With greater inspection it appears that #5 is considered most enjoyable because the candlestick median line is the highest of all experiments, just one below the maximum value on the scale.

### Annoyance

The lowest median lines in figure 28 suggest that, experiments #1 (baseline) and #3 (Digital Reward) were considered least annoying, with both having median lines drawn at the second lowest position on the scale; experiment #1 has a longer candlestick, indicating more variation in participant scores for this quality when compared to experiment #3 which is more skewed to the bottom.

## Ease of use

It is easy to see from figure 29 that all experiences scored well in this category but the top three experiment for ease of use in ascending order are #3 (Digital Reward), the baseline #1, and #4 (Social Media); all three of these experiment have the majority of participant scores in the top two points on the scale but while #3 and #1 have a distribution that includes scores in the lower half of the y scale, #4 was considered easy to use to greater or lesser degrees by every participant.

## Brand connection

Experiments #3 and #8 are the experiments that could potentially connect users with a brand the most according to figure 30. These two experiments have lower quartiles at the halfway mark with most scores in the positive half of the scale. Determining which experiment between #3 or #8 has most potential brand connection by looking at the candlesticks is not straightforward. Experiment #8 is less evenly distributed, with a stronger concentration around the second and third positions on the y axis and far fewer at the extremes; this means that #8 is more consistent but #3 had the potential to deliver stronger sentiment among the participants.

## Engagement

The most engaging experiments by participant scores both have median lines that at the second highest position on the scale, though they have quite different patterns of distributions; figure 31 suggests experiment #8 is the second most engaging experiment experience, having more scores towards the lower half compared to #5, which has almost entirely scored in the top half of the scale, and thus the most engaging.

## Persuasiveness

According to figure 32 experiments #3 and #5 are the most persuasive, however the candlestick weighting of #5 is lower than #3, making the Digital Reward only experiment (#3) supposedly more persuasive than the combined experience of Digital Reward and Augmented Reality (#5).

## Interest

Looking at figure 33, six out of the eight experiments have the same median line on their respective candlesticks but #5 and #8 are marginally more positive for this category; the experiment composed of every element has perhaps just slightly more votes towards the top end of the scale but they could ostensibly be considered more or less equally interesting.

## Multiple Facet Comparison

Another interesting way of comparing the experiment is by plotting the mean of the scalar values for each of the facets for each of the experiments to be viewed alongside one another. Using a type of graph known as a Radar or Spider plot, it is possible to create a shape that is an abstraction of the characteristics of the experiments. If all characteristics are on a scale that is perceived as better as it rises, then the size of the area created by the graph can be a visual demonstration of the overall performance of the experiment; to that end, the one scalar metric that was initially on a scale that moved towards a an increasingly negative position has been inverted such that for the purposes of these graphs the levels of Annoyance have become levels of non-Annoyance.

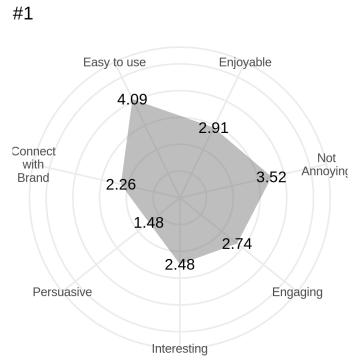


Figure 34: Experiment Facets: Experiment

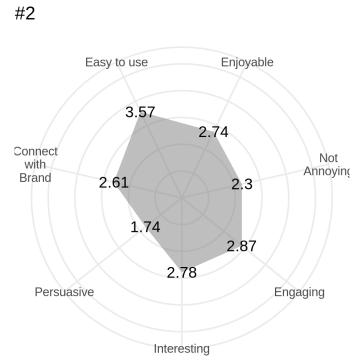


Figure 35: Experiment Facets: Experiment 2

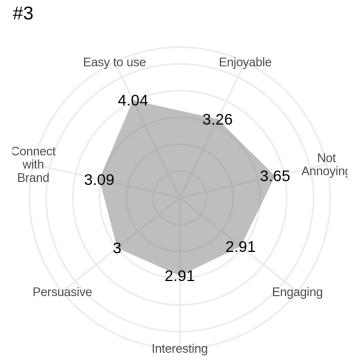


Figure 36: Experiment Facets: Experiment

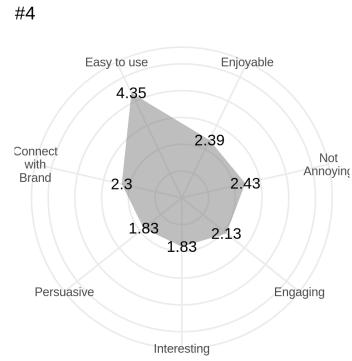


Figure 37: Experiment Facets: Experiment 4

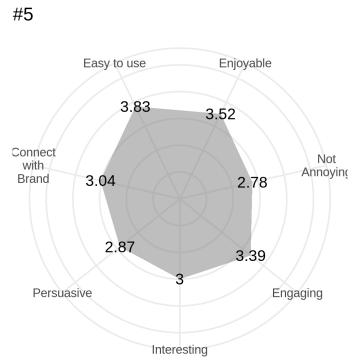


Figure 38: Experiment Facets: Experiment

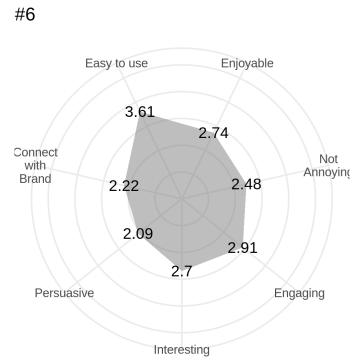


Figure 39: Experiment Facets: Experiment 6

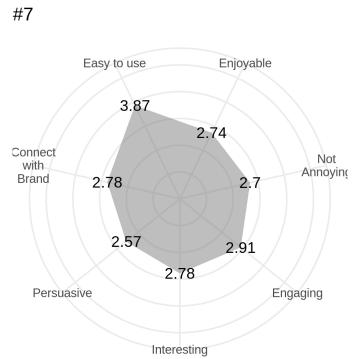


Figure 40: Experiment Facets: Experiment

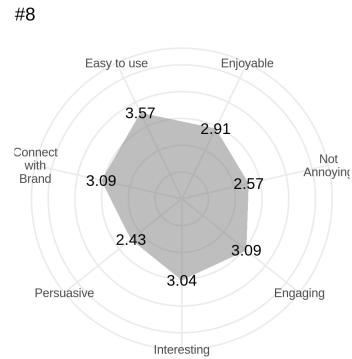


Figure 41: Experiment Facets: Experiment 8

# Scaled Geometric Mean of Experiment Facets

While the two-dimensional shapes are interesting to look at they are as easy to interpret as a single value to represent all facets at once. Given that the idea is to get one numeric value from a dataset that has been represented as a shape, it seems logical to consider this in terms of a geometric 2D shape being converted into a one-dimensional vector. Instead of just taking a normal median of the facets (which were already median values derived from every participant's scoring), it is possible to use a geometric mean to prevent an extreme results disproportionately affecting the final median value.

Because the difference between the mean values is relatively subtle, the values have also been rescaled between 0 and 1 such that the lowest result is now 0 and the greatest value is now 1; doing this helps with observing the deltas more easily.

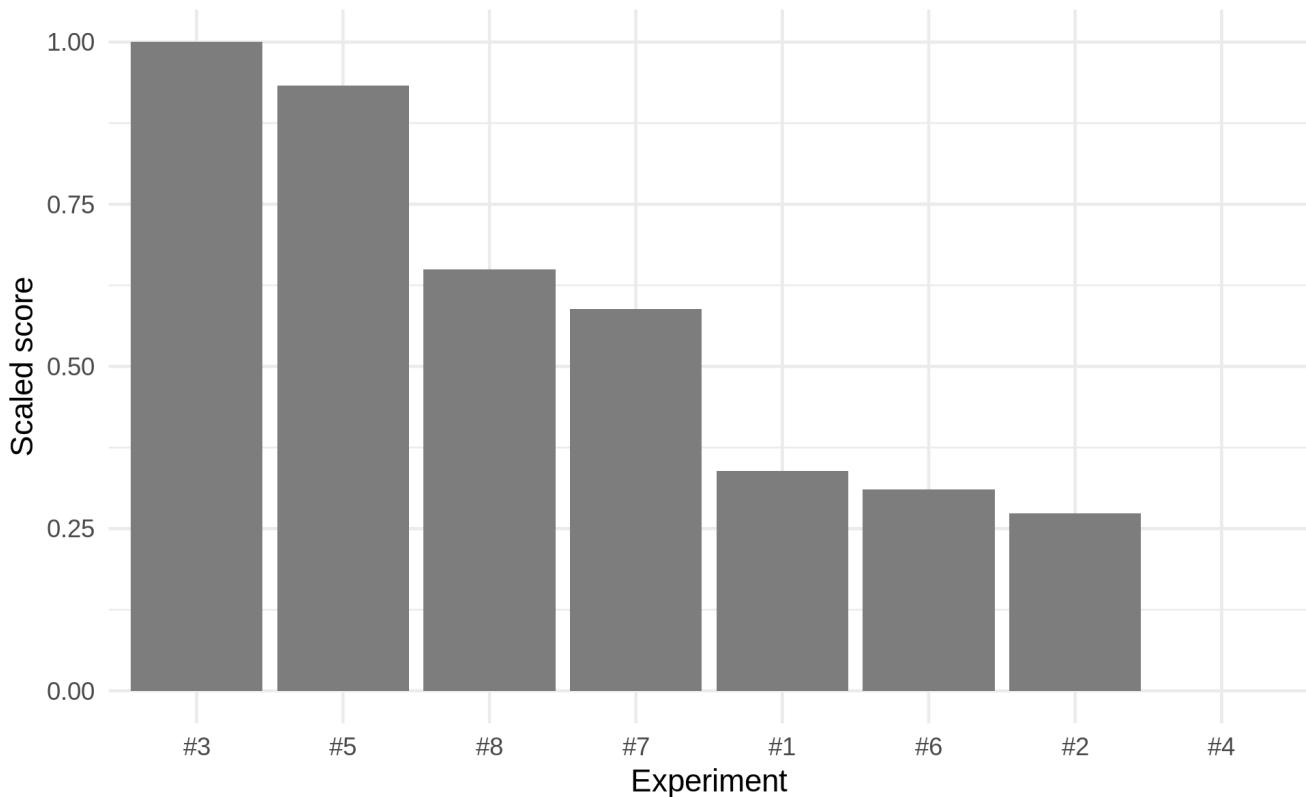


Figure 42: Geometric Means of Experiment Facets

What this data transformation allows is a way to assess the entire set scalar values provided by the testers during the feedback stages, for every variation of the advertising experience. Essentially this is a way of comparing each experiment based on the user perception of the attributes instead of relying on a single vote of the most favoured option. This approach to the data starts to take into account the cumulative effect of strong positive feedback for experiments that were so obviously popular based on a

single metric; if an experiment managed to deliver an enjoyable experience but in a way that wasn't extreme and polarising then this was as way looking at the data will highlight the otherwise unrecognised potential. This technique promotes experiments that are more universally positive even if they lack a majority measure of acceptance from the user base. When this project is trying to determine the most successful form of advertising for this relatively new form of interaction with a brand, universality is less important than being able to define an audience that could be receptive to the experience.

## Cumulative Rankings

Another way to get more granularity out of the users feedback was to ask them to not only cast a vote for their most preferred version of the advertisement but also require that they rank every experiment in order of best experience to worst. This will inevitably provide more detail about the success of a given experience by allowing the experiment to collect positive scores even if it was not an outright favourite for any given participant. The derivation of these values involved another reasonable use of inversion of the users original responses because they were explicitly requested to rank in descending order so that a rank of 1 would be understood as the best possible rank; to turn the ranking values into points, the 8 potential rankings were inverted so that a top rank of '1' would become a score of seven while the bottom rank of '8' would give a score of zero. The interpretation below also include scaled values so that the scores have been adjusted so that the highest values it 1 and the rest descend towards 0. Scaling the values allows for two or more values to be compared more easily which in turn allows for more ways to combine the observations so that more subtle insights can be allowed to surface.

Table 7: Scaled Means Rankings Values

<b>Mean score</b>	<b>Exp</b>	<b>Scaled mean score</b>
5.39130434782609	#3	1.0000000
4.78260869565217	#5	0.8571429
4.56521739130435	#1	0.7142857
3.43478260869565	#7	0.5714286
2.82608695652174	#2	0.4285714
2.52173913043478	#8	0.2857143
2.34782608695652	#6	0.1428571
2.1304347826087	#4	0.0000000

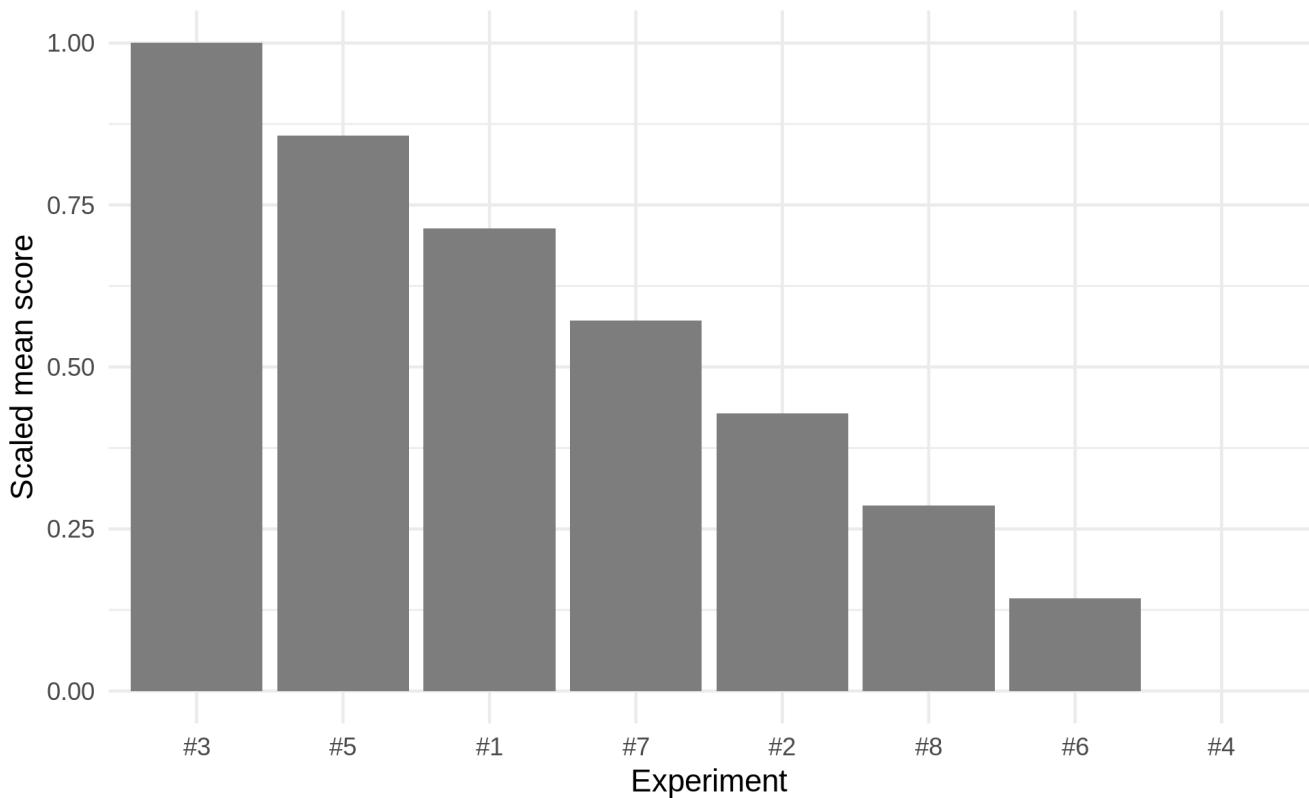


Figure 43: Scaled Means Rankings Values

These results show a different order of preference when the user is asked to pick their second and third best experiments and those experiments are scored to reflect this. Experiments #3 and #5 preserve their top positions but the other experiments in the middle ground have been shuffled a little compared to the previous assessments of popularity. At the lower end change is less likely and the very worst scoring experiment, #4 does not get evaluated as being any better than before.

## Combining Rankings With Facet Means

Having scaled the results for the rankings and the facet means, it is possible to take two vectors, a value from 0 to 5, the other between 0 and 7 and merge them so that the final output is a value to effectively takes the two ways the user has been aped to consider the experiments and interpret those in a way that is potentially more reflective of their instinctive perceptions. The outcome of multiplying these two calculated values for each experiment is effectively a sum of ***characteristics*** with ***relative rank*** to produce a value that is a way of allowing the facets of an experiment to still hold value while being ***corrected*** by the user when reflecting on the entire session as a whole.

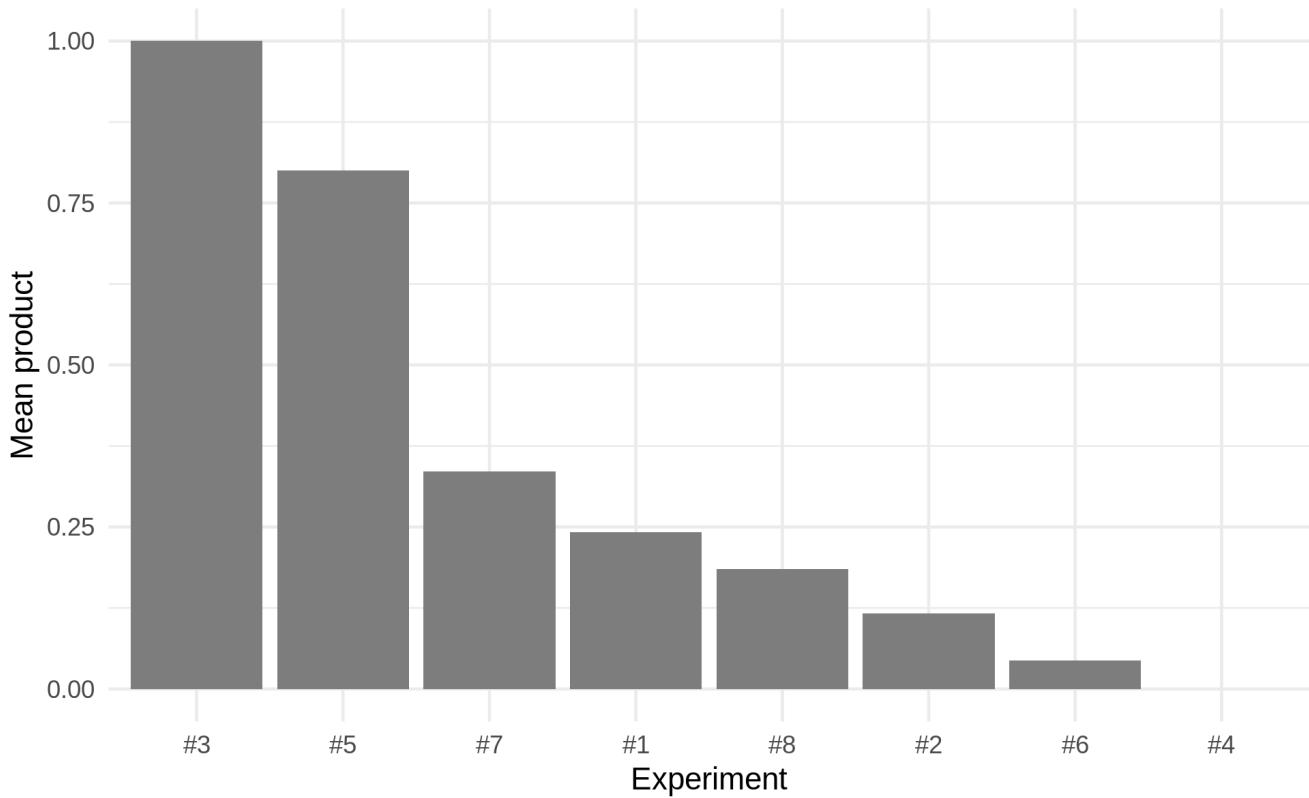


Figure 44: Scaled Sum of Rankings and Facets

By multiplying these two sets of values, it emphasises which experiments were received most positively suggesting that there are two clear leaders followed by a third place experiment that all apply a Digital Reward element. The two lowest ranking experiments incorporate the Social Media component and exclude the Digital Reward.

## Examining Demographic for the Top Three Experiments Relative To the Baseline

Many more stages of interrogation of the data was undertaken before the following graphs were obtained but these are the final output of the analysis. Incorporating many of the techniques demonstrated earlier, experiments #3, #5, #7 are evaluated against #1 (the baseline control experiment) across the age and gender demographics of the users. The evaluation of the experiments compared to the baseline allows the experiments to be compared not only against each other but also using the control experiment as a benchmark; to do this, the individual users' facet means for #1 have been used to create a personal unit from which the other experiments can be compared. The idea behind this arose because (as can be seen in the full report) there were tendencies for certain

demographics to score everything more highly or more negatively; by creating personal baseline units for comparison, any bias based on the individual's general outlook could be reduced and in doing so, attempt to equalise the weight of each persons opinions.

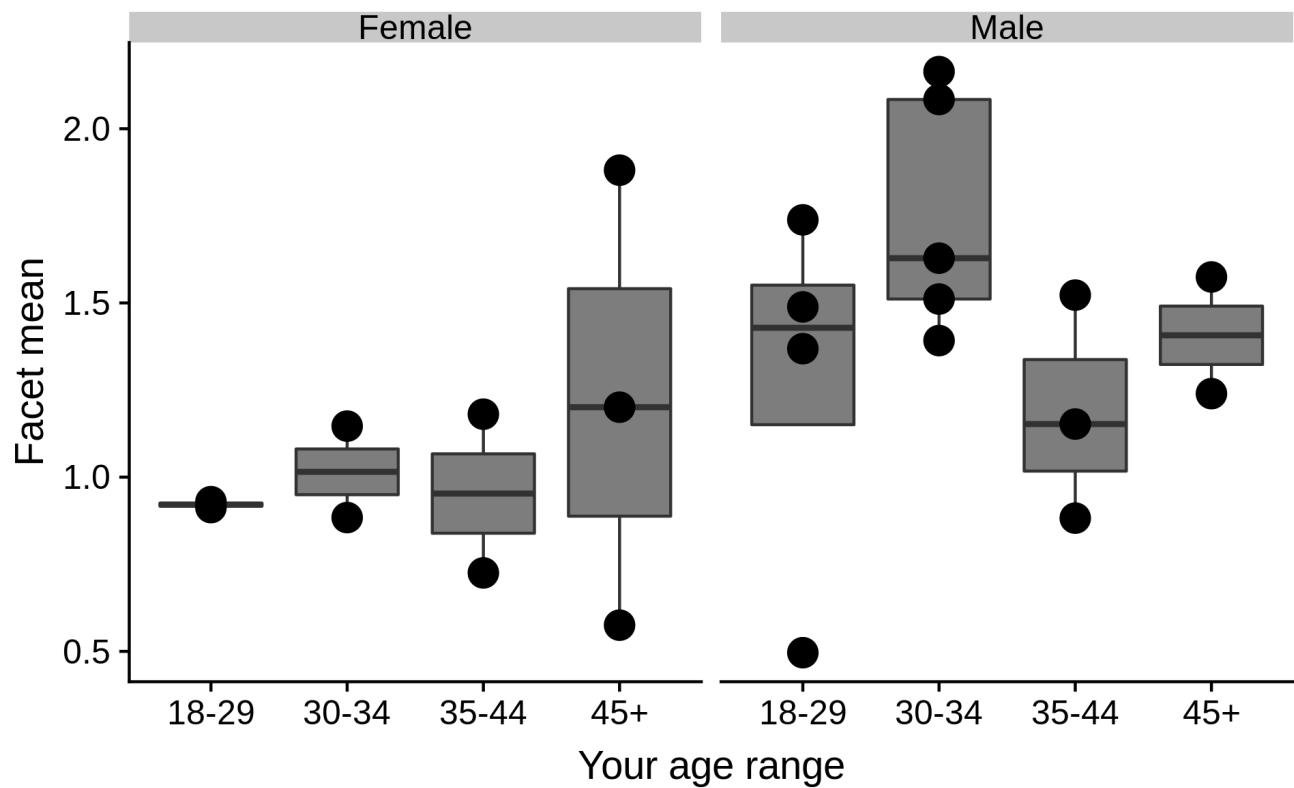


Figure 45: Facet Means for Experiment #3 Over Baseline Across Gender and Age

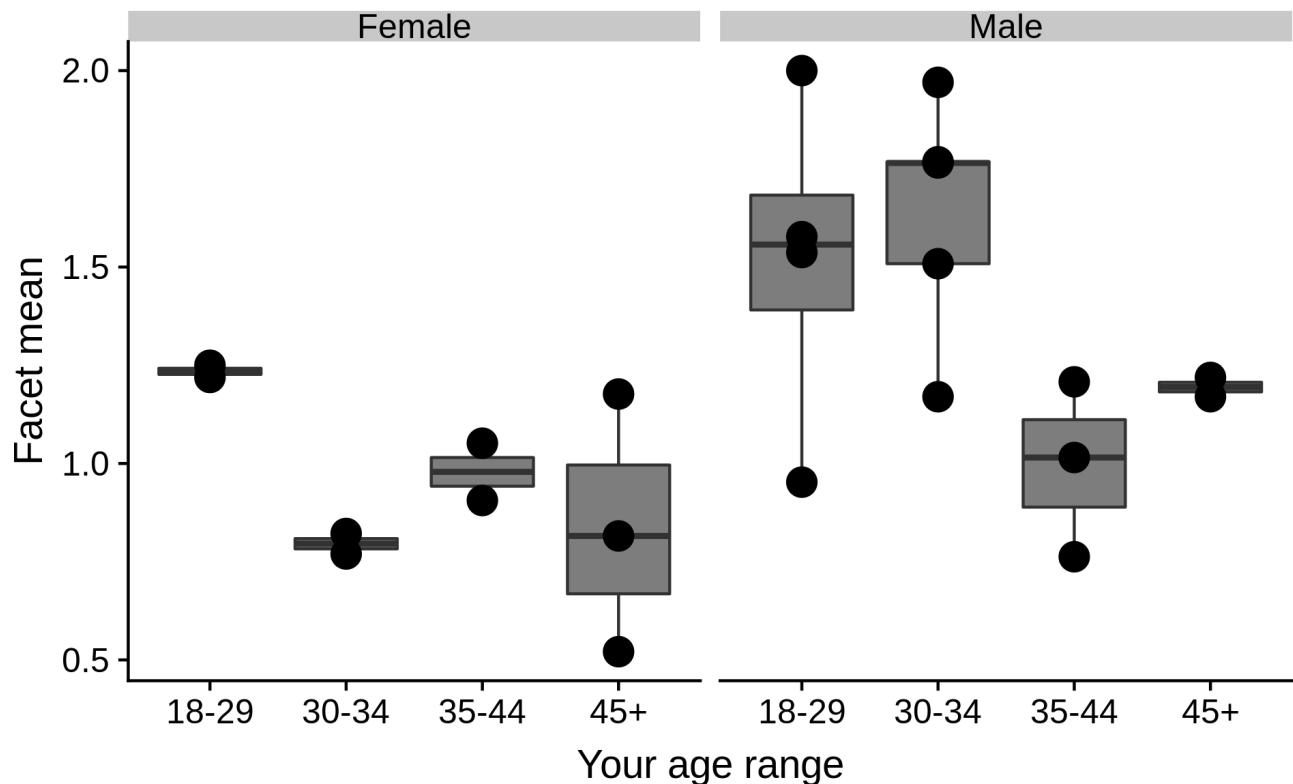


Figure 46: Facet Means for Experiment #5 Over Baseline Across Gender and Age

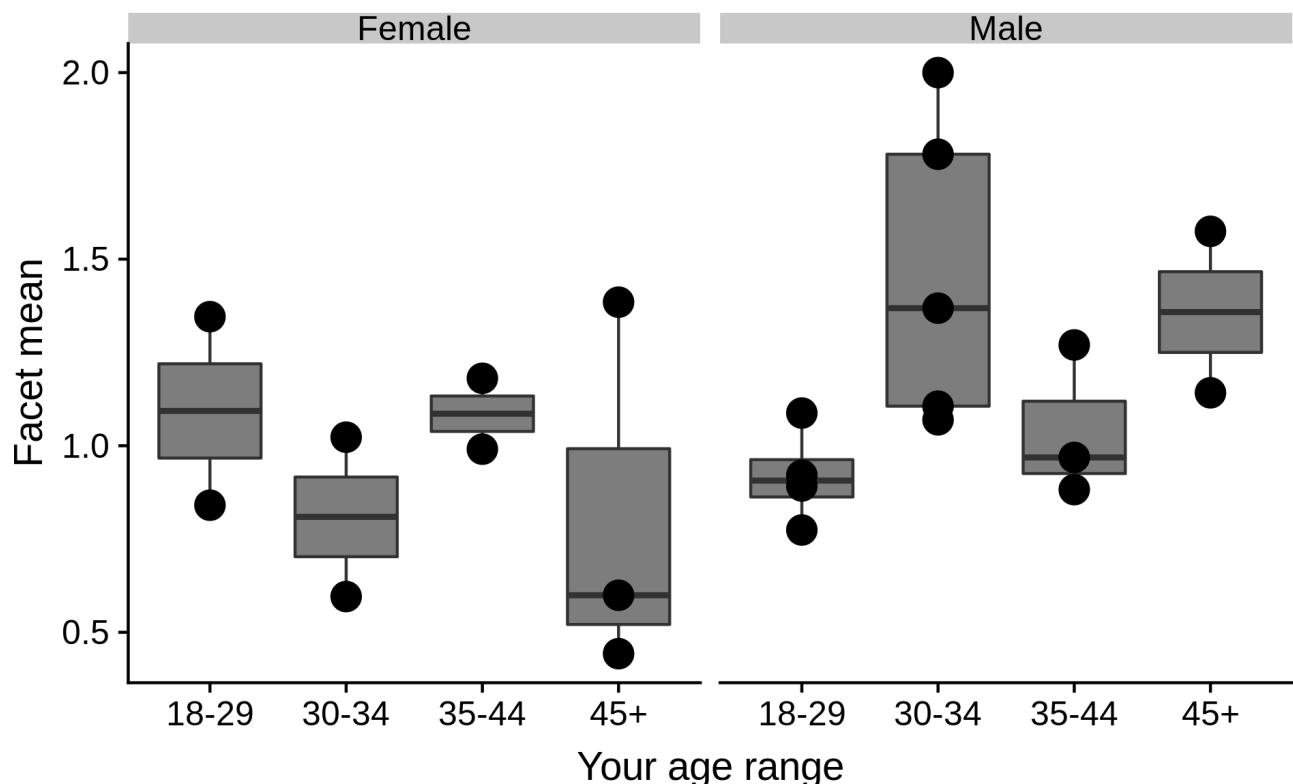


Figure 47: Facet Means for Experiment #7 Over Baseline Across Gender and Age

# Evaluation of Top Three Experiments Over The Baseline

## Experiment 3

Figure 45 illustrates that when #3 is compared against the baseline, almost all the males actually rated this more positively, whereas for females the experience was not significantly better or worse, with the exception of the 45+ group that had a median line around 1.25. Males in the 30-34 age group were most positive overall with nearly all participants in this demographic scoring this experiment fifty percent higher than the baseline.

## Experiment 5

As demonstrated in figure 46, experiment #5 was most successful relative to the baseline for the males in the 30-34 and 18-29 groups having median lines over 1.5. The only female demographic to receive this experiment positively over the baseline is the 18-29 age group.

## Experiment 7

Experiment #7 (as seen in figure 47) scored most positively against the baseline for the males in the 30-34 and 45+ age groups, followed by females in the 18-29 and 35-44 demographics. The 35-44 males had a neutral experience relative to the baseline, while all other age groups had less positive experiences.

# Interpretation and Conclusion

---

## Participant Concerns

As is to be expected with this form interaction with technology, not all of the feedback was positive. This section aims to record the most highlight the prevalent sentiments that were wary of or absolutely in opposition to the entire idea of this form of interaction. What follows are some excerpts from the qualitative feedback that exemplify some of the most popular or interesting concerns.

as there were several steps to go through, although i enjoyed the interactive element, when you are in a rush and on the go you might not have time to play the game

Firstly thank you for being welcoming and supportive. My experience of these experiments has been to recognise how much technology intrudes into purchasing experiences and my view is that the more our purchasing is tracked by technology the more our freedoms and autonomy are threatened. I am very ambivalent now about loyalty incentives because they track my life and I find this intrusive. Most people are involved with social media and this technology re-in-forces the power of social media. This is of concern to me, especially as I am aware of the risks to mental health that social media presents and especially to young people who I believe are mainly targetted by this technology.

Massively disliked the social media aspect, especially if there's no reward

A little apprehensive sharing something trivial like a drink preference to my social media feed

I'm sorry but there is not anything persuasive about this. I don't care about the coins as they are worth 1000th of a penny or whatever and when I look in my email I will find emails telling me that I have earnt very little so this could be a source of annoyance each time I use a vending machine

worrying trend increasing of contactless fraud and phone hacking- would need to see better use of phone payment as simply being in the same room sets it off

I think there needs to be an option for people to take their drink and go rather than engage in the technology. The technology might be welcomed by some people but not everyone wants to go through this especially giving their email address.

The quotes above are taken directly from participant feedback. These citations reflect concerns that were not exclusive to the individuals but also expressed in other words by other testers. It is clear that there will be some resistance to this form of advertising, not least because people are becoming more aware of how valuable their personal information is and that they would rather maintain a higher level of privacy that has previously been the norm. This attitude is not shared across all ages though, and younger age groups were less likely to voice this sort of concern, especially if the interaction was swift. Sharing one's relationship with a brand also seems to be perceived in a poor light in a general sense and especially if there is no obvious incentive for doing so. Additionally, the reward for engaging with the experience needs to be as clear as possible in order to deliver a positive feedback loop. If users are not given a concrete idea of what they have to gain, they are far less likely to take part and consequently, even less likely to propagate the idea.

# Scope for Improvement

The AR element is fun for being new(ish) and different, but forcing the customer to stay near the vending machine to play might put me off. I could feel awkward standing in front of the machine or i might have places to be. | would be good to reward for things like - coins go to your favourite charity / rewards for using provided bins - maybe using qr codes to register disposal etc. and reward | |No social media, make rewards better or make prizes traded for rewards amazing, AR game better or not at all, email okay (to be expected) but only in return for coins or not at all - all other aspects good | |The social media element needs more incentive, and there should be more explanation on why I am getting the notification and how it benefits me before i am asked to do anything, the gaming thing is fun - but if you're in a rush it would be good to be able to have an option to 'play later' | |Game with coin was best - however also shorter versions of this advert |

i like the game idea, especially if its fun and quick. Making the game result tied to the amount of fave coins awarded could make the game more engaging and make me look forward to buying my next can of sweet sweet Fave!

I do believe that there would be added value if the app were to have a login that offered a loyalty card and was added as a smartphone wallet so that one could chose there favourite drink and just automatically wave their phone at the vending machine pick up their drink and leave.

There were many suggestions that were specific to the experiments and the features therein; the full report in the appendix documents these suggestions but as they are, generally speaking, comments around implementation details they are not sufficiently abstract to be considered applicable to the entire study. One suggestion that was frequently mentioned was in relation to the nature of the Digital Reward: Firstly a more explicit declaration of how many points would better compel the user; if the interface were able to display the user's entire accumulation of Digital Reward this would also help

motivate the user to collect points; if the interaction could message a suggested value of accrued points in terms of a real world commodity this would help to give meaning to the Digital Reward.

While the augmented reality game was more of a proof-of-concept demonstration, some feedback around this part of the experience was quite insightful with regards to a real world implementation: it could be more challenging, a certain level of difficulty could make it more interesting; the game could influence the reward, should a reward be offered, the better you perform the more points you get; if the augmented reality marker that instigated the game was on the bottle label rather than the vending machine then people could play the game away from the original location.

## Interpretation of Results

### Probable Audience

Given that the starting point for these interactive advertisements is the use of a mobile phone as a means of payment in reality this form of marketing is only going to be exposed to those that are comfortable with using their mobile phone as a wallet. Additionally there is the assumption that the user has Bluetooth enabled on their smart phone. With that in mind the feedback data suggests that the target market is under forty years of age and more likely to be female. In contrast if the use of augmented reality is part of the real world experience then the demographic that engages most is more likely to be male.

### Efficacy of Characteristics

Discerning meaning from the feedback is not straight forward but it's clear that certain elements are more compelling than others. The social media element was widely eschewed which was expressed not only in the qualitative feedback but also in the quantitative scoring of the experiments that included this feature. The worst performing experiment was #4 which only used social media on top of the baseline. Users also tended to prefer an experience that was relatively quick so experiment #8 which was composed of every possible aspect of the study was not regarded favourably, not just because of the inclusion of social media but also because the interaction was prolonged relative to the other experiments. All experiments that had an element of reward for the user scored well, with experiment #3 scoring highest and being composed only of the baseline and Digital Reward feature. The augmented reality experience was polarising being broadly well received by younger demographics and not the older age groups, but it

was most effective when combined with Digital Reward. Looking at the best performing experiments compared to the baseline allows for the composite features of them to be compared independently of the common characteristics of all experiments.

## Further Research

Eight unique experiments were created to be compared against one another with the intent of finding which were the most successful at generating a positive connection between a person and a commercial product. As described in the methodology for the design of the study there are potentially many more variations. A more thorough undertaking would include variations that are not present in this study and are composed of the same elements but ordered differently. Nevertheless the findings from this study can be used as a way of refining which elements to explore in more detail; considering this, any further research can omit the social media aspect and expand the study of location based interactive advertisements involving incentives and playfulness.

# Annotated Bibliography

---

II, B.J.P. and Gilmore, J.H. (1998). *Welcome to the experience economy*.

. Available from <https://hbr.org/1998/07/welcome-to-the-experience-economy>

## **Annotation:**

This article in the Harvard Business Review from the late 1990s is a well regarded document cited as the origin of the term 'Experience Economy' and all that entailed. To sum up, the authors Pine and Gilmore extrapolated that businesses mature over time from selling goods, to services and then experiences; even the businesses that still sell goods or services, tend to offer services or experiences - perhaps for free - as part of their offering to consumers. This is because as any given market matures and becomes more competitive, the consumer becomes more sophisticated in their expectations of what a company should offer and what kind of relationship should exist between provider and consumer. It's this shift to experience being such an important element of the retail dynamic that still makes this angle relevant, especially for touch points that have untapped potential like point-of-sale and physical advertising.

Kallas, R. (2016). *Proximity marketing - what, how, why?*

. Available from <https://www.unacast.com/post/proximity-marketing-what-how-why>

## **Annotation:**

Unacast are provider of location data based services with strong credentials and as such this blog post on proximity mining acts as a great primer on the topic. It's also useful in highlighting that sometimes technology comes in waves, and market adoption materialise in the first instance but peripheral developments afterwards, can allow for more uptake on successive periods of interest; in particular a technological ecosystem that could mean the world is ready for proximity marketing.

Kowalewski, D., McLaughlin, J. and Hill, A.J. (2017). *Blockchain will transform customer loyalty programs*.

. Available from <https://hbr.org/2017/03/blockchain-will-transform-customer-loyalty-programs>

## **Annotation:**

This Harvard Business review article is a great introduction to the potential for blockchain technology to be used in a disruptive way to revolutionise loyalty programs. It's not entirely positive and sensibly covers risk involved. Ultimately the take-home message is that there's a strong business case for blockchain based loyalty tokens to replace current means used by loyalty programmes or discounting campaigns, if only to better track loyalty token redemption.

Krumm, J. (2011). Ubiquitous advertising: The killer application for the 21st century. *IEEE Pervasive Computing*, 10 (1), 66–73.

. Available from <http://ieeexplore.ieee.org/document/5396316>

**Annotation:**

This article is a comprehensive look at the idea that one of the most significant uses for ubiquitous computing in the future will inevitably be to fundamentally impact the nature of advertising. It covers privacy concerns which are a major issue but also focuses on the smart use of technology to make advertising more relevant to the individual. Another noteworthy point raised is that there are already cases whereby exposure to advertising can be exchanged for something that directly benefits the user. This point in particular, I relate to the notion that the advertising experience can reward the user with some form of redeemable token.

Making blockchain real for customer loyalty programs | deloitte us (no date).

. Available from <https://www2.deloitte.com/us/en/pages/financial-services/articles/making-blockchain-real-customer-loyalty-rewards-programs.html>

**Annotation:**

Insight into the potential for blockchain for loyalty programs from one of the world's leading accountancy firms; this article makes a strong business case for the use of blockchain but also focuses on the customer and reasons why the technology could create positive feedback thanks to speed, ease of use, and security of the blockchain. Other key points are: customers increasingly value rewards as part of their relationships with products and services; there's potentially for a token ecosystem to arise that could act as a helpful clearing system (marketplace) for unwanted tokens that doesn't yet exist. The accompanying pdf report goes into further detail about the benefits both to business and consumers. The qualities described are good examples of how blockchain could be a really good fit for modern interaction with digital advertising.

Mangold, W.G. and Faulds, D.J. (2009). *Social media: The new hybrid element of the promotion mix*. *Business Horizons*, 357-365

. Available from <https://www.sciencedirect.com/science/article/pii/S0007681309000329>

**Annotation:**

This paper exemplifies how social media has real value for brands promoting their products or services thanks to its ability to mix the customer word of mouth, peer to peer communication, with the traditional 'broadcast' mode of brand promotion. The argument is that this form of blended communication is able to increase consumer engagement. The paper goes on to outline techniques and strategies to maximise on the prospective increase in engagement. It is this element of the paper that is so pertinent to this thesis proposal, which is similarly, looking to find the most compelling user experience within the defined scope.

Ramos, B. (2016). *Innovation in loyalty programs: Augmented reality mobile application for discount offers*.

. Available from <https://www.dbbest.com/blog/augmented-reality-mobile-application-discount-offers/>

**Annotation:**

Despite only being a short blog post, this brief case study by DB Best Technologies of their Reward Hunter app, is a concrete example of prior art where it comes to investigating a combination of Augmented Reality and rewarding the user with some form of loyalty token tied to a brand. The nature of the app, which is in part a game, is a very direct form of gamifying the experience which also makes use of location data as part of the AR experience.

Riekki, J., Salminen, T. and Alakarppa, I. (2006). Requesting pervasive services by touching rfid tags. *IEEE Pervasive Computing*, 5 (1), 40-46.

. Available from <http://ieeexplore.ieee.org/document/1593570>

**Annotation:**

This article from a 2006 issue of Pervasive Computing provides an example of how a phone can be the vehicle of an interaction but the instigator of the interaction is an external physical element using some form of radio technology. Moreover, the ideas described in the article are of similar intent to this thesis proposal but demonstrate that after over a decade of technological progress, the means of implementation will differ and

it is worth seeing if that will make any significant difference to the outcome. This article describes user experience testing as part of this study, making it a good source of insight into an appropriate methodology.

Scholz, J. and Smith, A.N. (2016). *Augmented reality: Designing immersive experiences that maximize consumer engagement*. *Business Horizons*. 149–161

. Available from <http://www.sciencedirect.com/science/article/pii/S0007681315001421>

**Annotation:**

This paper by Scholz and Smith is a thorough examination of the state of AR Marketing as of 2016. Given that this was published only 2 years ago, the insight in this paper is still fresh and will prove helpful when designing the experiments that involve AR as part of the experience, especially since it has advice for improving the AR experience with regard to 'user-brand engagement'. Further to this, the paper has this notion of 'entanglement' and the various qualities that work together to create this phenomenon; this is something that could plausibly help inform the design of the user research questionnaires of this thesis.

# Appendices

---

# IoT Advertising User Feedback 01

Please find below the consent section, which you are required to complete in order for us to work with your answers.

Your feedback is important in order to create a positive experience. Please fill this survey and let us know your thoughts (your answers will be anonymous).

Your email address is required only to compensate you with a voucher for your time and effort. Should you wish to be provided with the findings they can be emailed to you once the research is complete.

**\*Required**

## 1. Email address \*

---

## PARTICIPATION INFORMATION SHEET

---

Title of Study: MSc Interaction Design and Computing (PMMGM01F)

Project: Dissertation - Creating Positive User Experiences For Audiences Of Proximity Marketing And Pervasive Advertising

Researcher: Andrew Keats.

Supervisor: Ashif Tejani

You have been invited to take part in a usability/user experience study I am conducting on Internet-of-Things triggered smartphone advertising experiences.

I want to give you a little more information about what you are about to undertake and give you time to ask any questions or give any feedback you might have both before and after the experiment. I am asking you for your opinions & insight regarding novel forms of mobile advertising interaction and how those experiences could be made as positive as possible. Our goal is to record your responses to the following experiments and find out what you like or dislike about them; as well as this we'd like to gauge your attitudes towards the characteristics and limitations of these experiences, and suggestions for improvement. This in turn will feed into how to improve upon the ideas and find the best solution. Finding out more about your thoughts will help us better understand user experience problems and how we can develop an improved experience.

You are to be presented with 8 experiments, each lasting a 1 or 2 minutes followed by the rest of the questionnaire for you to provide feedback.

The 8 experiments will all start with the same scenario of a simulated transaction with a vending machine that prompts an advertising interaction to begin on a smartphone. The smartphone will be provided for the purposes of the experiment.

I will record the data you provide and will make notes, then compare your responses from the questionnaire amongst other data.

This research is being undertaken as part of my studies for the MSc Interaction Design and Computing programme and specifically as part of my Dissertation at the University of Westminster.

In summary, the study involves you:

Interacting with 8 user experience experiments, totalling between 8 and 16 minutes.

Completing one questionnaire that takes approximately 8 to 16 minutes to complete.

Please note:

- There is no right or wrong answer. If you have any questions, comments or become confused while you are answering the questions, please indicate. If you ever feel that you are lost or cannot complete a question that you have been given, also indicate this below.
- Please always keep in mind that we are not testing you, but we are gathering information about the

experiences. We want and need your honest feedback about the experiences!

- Your participation in this research is entirely voluntary.
- You have the right to withdraw at any time without giving a reason.
- You have the right to ask for your data to be withdrawn as long as this is practical, and for personal information to be destroyed.
- Your responses will be made anonymous, and will be kept confidential unless you provide explicit consent to do otherwise.
- No individuals would be identifiable from any collated data.
- All computer data files will be encrypted and password protected. The researcher will keep files in a secure place and will comply with the requirements of the Data Protection Act.
- If you wish, you can receive information on the results of the research. Please indicate on the consent form if you would like to receive this information.

The researcher can be contacted by email ([w1663560@my.westminster.ac.uk](mailto:w1663560@my.westminster.ac.uk)) .

If you have a complaint about this research project you can contact the Dissertation Supervisor, Ashif Tejani by e-mail ([A.Tejani@my.westminster.ac.uk](mailto:A.Tejani@my.westminster.ac.uk)) or by telephone (0207 911 5000 ext. 64513).

Thank you for your participation.

## 2. Are you happy to proceed? \*

*Tick all that apply.*

I have read the participation sheet and am able to take part in the research.

## Feedback for experiment #1

Having experienced experiment #1, your feedback on it is much appreciated.

### 3. I found the experience enjoyable \*

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

### 4. If you enjoyed any part(s) in particular, please describe what you enjoyed:

---

---

---

---

---

### 5. I found the experience annoying \*

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**6. If you were annoyed by any part(s) in particular, please describe what annoyed you:**

---

---

---

---

---

**7. I found the experience engaging \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**8. If you found any particular part(s) engaging, please describe what:**

---

---

---

---

---

**9. I found the experience interesting \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**10. If you found any particular part(s) interesting, please describe what:**

---

---

---

---

---

**11. I found the experience to be persuasive \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**12. If you found any particular part(s) persuasive, please describe what:**

---

---

---

---

**13. The experience connected me with the brand? \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**14. If you found any part(s) in particular, connected you with the brand, please describe what:**

---

---

---

---

**15. I found the experience easy to use \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**16. If you found any part(s) in particular, difficult to use, please describe what:**

---

---

---

---

---

**17. What was the best part of the experience?**

(Optional)

---

---

---

---

---

**18. What was the worst part of the experience?**

(Optional)

---

---

---

---

---

**19. Do you have any suggestions for improvement?**

(Optional)

---

---

---

---

---

## **Feedback for experiment #2**

Having experienced experiment #2, your feedback on it is much appreciated.

**20. I found the experience enjoyable \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**21. If you enjoyed any part(s) in particular, please describe what you enjoyed:**

---

---

---

---

---

**22. I found the experience annoying \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**23. If you were annoyed by any part(s) in particular, please describe what annoyed you:**

---

---

---

---

---

**24. I found the experience engaging \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**25. If you found any particular part(s) engaging, please describe what:**

---

---

---

---

---

**26. I found the experience interesting \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**27. If you found any particular part(s) interesting, please describe what:**

---

---

---

---

**28. I found the experience to be persuasive \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**29. If you found any particular part(s) persuasive, please describe what:**

---

---

---

---

**30. The experience connected me with the brand? \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**31. If you found any part(s) in particular, connected you with the brand, please describe what:**

---

---

---

---

---

**32. I found the experience easy to use \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**33. If you found any part(s) in particular, difficult to use, please describe what:**

---

---

---

---

---

**34. What was the best part of the experience?**

(Optional)

---

---

---

---

---

**35. What was the worst part of the experience?**

(Optional)

---

---

---

---

---

**36. Do you have any suggestions for improvement?**

(Optional)

---

---

---

---

**Feedback for experiment #3**

Having experienced experiment #3, your feedback on it is much appreciated.

**37. I found the experience enjoyable \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**38. If you enjoyed any part(s) in particular, please describe what you enjoyed:**

---

---

---

---

**39. I found the experience annoying \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**40. If you were annoyed by any part(s) in particular, please describe what annoyed you:**

---

---

---

---

**41. I found the experience engaging \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**42. If you found any particular part(s) engaging, please describe what:**

---

---

---

---

**43. I found the experience interesting \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**44. If you found any particular part(s) interesting, please describe what:**

---

---

---

---

**45. I found the experience to be persuasive \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**46. If you found any particular part(s) persuasive, please describe what:**

---

---

---

---

---

**47. The experience connected me with the brand? \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**48. If you found any part(s) in particular, connected you with the brand, please describe what:**

---

---

---

---

---

**49. I found the experience easy to use \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**50. If you found any part(s) in particular, difficult to use, please describe what:**

---

---

---

---

---

**51. What was the best part of the experience?**

(Optional)

---

---

---

---

---

**52. What was the worst part of the experience?**

(Optional)

---

---

---

---

---

**53. Do you have any suggestions for improvement?**

(Optional)

---

---

---

---

---

## **Feedback for experiment #4**

Having experienced experiment #4, your feedback on it is much appreciated.

**54. I found the experience enjoyable \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**55. If you enjoyed any part(s) in particular, please describe what you enjoyed:**

---

---

---

---

---

**56. I found the experience annoying \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**57. If you were annoyed by any part(s) in particular, please describe what annoyed you:**

---

---

---

---

**58. I found the experience engaging \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**59. If you found any particular part(s) engaging, please describe what:**

---

---

---

---

**60. I found the experience interesting \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**61. If you found any particular part(s) interesting, please describe what:**

---

---

---

---

---

**62. I found the experience to be persuasive \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**63. If you found any particular part(s) persuasive, please describe what:**

---

---

---

---

---

**64. The experience connected me with the brand? \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**65. If you found any part(s) in particular, connected you with the brand, please describe what:**

---

---

---

---

---

**66. I found the experience easy to use \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**67. If you found any part(s) in particular, difficult to use, please describe what:**

---

---

---

---

**68. What was the best part of the experience?**

(Optional)

---

---

---

---

**69. What was the worst part of the experience?**

(Optional)

---

---

---

---

**70. Do you have any suggestions for improvement?**

(Optional)

---

---

---

---

## **Feedback for experiment #5**

Having experienced experiment #5, your feedback on it is much appreciated.

**71. I found the experience enjoyable \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**72. If you enjoyed any part(s) in particular, please describe what you enjoyed:**

---

---

---

---

**73. I found the experience annoying \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**74. If you were annoyed by any part(s) in particular, please describe what annoyed you:**

---

---

---

---

**75. I found the experience engaging \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**76. If you found any particular part(s) engaging, please describe what:**

---

---

---

---

---

**77. I found the experience interesting \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**78. If you found any particular part(s) interesting, please describe what:**

---

---

---

---

---

**79. I found the experience to be persuasive \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**80. If you found any particular part(s) persuasive, please describe what:**

---

---

---

---

---

**81. The experience connected me with the brand? \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**82. If you found any part(s) in particular, connected you with the brand, please describe what:**

---

---

---

---

**83. I found the experience easy to use \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**84. If you found any part(s) in particular, difficult to use, please describe what:**

---

---

---

---

**85. What was the best part of the experience?**

(Optional)

---

---

---

---

**86. What was the worst part of the experience?**

(Optional)

---

---

---

---

**87. Do you have any suggestions for improvement?**

(Optional)

---

---

---

---

## **Feedback for experiment #6**

Having experienced experiment #6, your feedback on it is much appreciated.

**88. I found the experience enjoyable \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**89. If you enjoyed any part(s) in particular, please describe what you enjoyed:**

---

---

---

---

**90. I found the experience annoying \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**91. If you were annoyed by any part(s) in particular, please describe what annoyed you:**

---

---

---

---

---

**92. I found the experience engaging \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**93. If you found any particular part(s) engaging, please describe what:**

---

---

---

---

---

**94. I found the experience interesting \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**95. If you found any particular part(s) interesting, please describe what:**

---

---

---

---

---

**96. I found the experience to be persuasive \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**97. If you found any particular part(s) persuasive, please describe what:**

---

---

---

---

**98. The experience connected me with the brand? \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**99. If you found any part(s) in particular, connected you with the brand, please describe what:**

---

---

---

---

**100. I found the experience easy to use \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**101. If you found any part(s) in particular, difficult to use, please describe what:**

---

---

---

---

**102. What was the best part of the experience?**

(Optional)

---

---

---

---

**103. What was the worst part of the experience?**

(Optional)

---

---

---

---

**104. Do you have any suggestions for improvement?**

(Optional)

---

---

---

---

## **Feedback for experiment #7**

Having experienced experiment #7, your feedback on it is much appreciated.

**105. I found the experience enjoyable \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**106. If you enjoyed any part(s) in particular, please describe what you enjoyed:**

---

---

---

---

---

**107. I found the experience annoying \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**108. If you were annoyed by any part(s) in particular, please describe what annoyed you:**

---

---

---

---

---

**109. I found the experience engaging \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**110. If you found any particular part(s) engaging, please describe what:**

---

---

---

---

---

**111. I found the experience interesting \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**112. If you found any particular part(s) interesting, please describe what:**

---

---

---

---

**113. I found the experience to be persuasive \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**114. If you found any particular part(s) persuasive, please describe what:**

---

---

---

---

**115. The experience connected me with the brand? \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**116. If you found any part(s) in particular, connected you with the brand, please describe what:**

---

---

---

---

---

**117. I found the experience easy to use \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**118. If you found any part(s) in particular, difficult to use, please describe what:**

---

---

---

---

---

**119. What was the best part of the experience?**

(Optional)

---

---

---

---

---

**120. What was the worst part of the experience?**

(Optional)

---

---

---

---

---

**121. Do you have any suggestions for improvement?**

(Optional)

---

---

---

---

**Feedback for experiment #8**

Having experienced experiment #8, your feedback on it is much appreciated.

**122. I found the experience enjoyable \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**123. If you enjoyed any part(s) in particular, please describe what you enjoyed:**

---

---

---

---

**124. I found the experience annoying \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**125. If you were annoyed by any part(s) in particular, please describe what annoyed you:**

---

---

---

---

**126. I found the experience engaging \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**127. If you found any particular part(s) engaging, please describe what:**

---

---

---

---

**128. I found the experience interesting \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**129. If you found any particular part(s) interesting, please describe what:**

---

---

---

---

**130. I found the experience to be persuasive \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**131. If you found any particular part(s) persuasive, please describe what:**

---

---

---

---

---

**132. The experience connected me with the brand? \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**133. If you found any part(s) in particular, connected you with the brand, please describe what:**

---

---

---

---

---

**134. I found the experience easy to use \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**135. If you found any part(s) in particular, difficult to use, please describe what:**

---

---

---

---

---

**136. What was the best part of the experience?**

(Optional)

---

---

---

---

**137. What was the worst part of the experience?**

(Optional)

---

---

---

---

**138. Do you have any suggestions for improvement?**

(Optional)

---

---

---

---

## Overall feedback for all experiments

Having experienced all experiments your feedback comparing them would be much appreciated.

**139. I was comfortable with the interactions being triggered by IoT wireless \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**140. Do you have any thoughts on the the wireless IoT device triggering the interaction?**

(Optional)

---

---

---

---

**141. I was comfortable with the interactions happening on a smartphone \***

*Mark only one oval.*

- Completely disagree
- Somewhat disagree
- Slightly disagree
- Slightly agree
- Somewhat agree
- Completely agree

**142. Do you have any thoughts on the the smartphone element of the interaction?**

(Optional)

---

---

---

---

**143. Overall, which was your most preferred experiment? \***

*Mark only one oval.*

- #1
- #2
- #3
- #4
- #5
- #6
- #7
- #8

**144. Why was this your most preferred experiment?**

---

---

---

---

**145. Overall, which was your least preferred experiment? \***

*Mark only one oval.*

- #1
- #2
- #3
- #4
- #5
- #6
- #7
- #8

**146. Why was this your least preferred experiment?**

---

---

---

---

**147. Could you please rate the experiments in order of preference? \***

*Mark only one oval per row.*

	Rank #1	Rank #2	Rank #3	Rank #4	Rank #5	Rank #6	Rank #7	Rank #8
Experiment #1	<input type="radio"/>							
Experiment #2	<input type="radio"/>							
Experiment #3	<input type="radio"/>							
Experiment #4	<input type="radio"/>							
Experiment #5	<input type="radio"/>							
Experiment #6	<input type="radio"/>							
Experiment #7	<input type="radio"/>							
Experiment #8	<input type="radio"/>							

**148. Lastly, do you have any other feedback regarding the experiments?**

(Optional)

---

---

---

---

## **Consent Form**

Title of Study: MSc Interaction Design and Computing (PMMGM01F)

Project: Dissertation - Creating Positive User Experiences For Audiences Of Proximity Marketing And Pervasive Advertising

Researcher: Andrew Keats.

**149. Please check the following accordingly**

*Tick all that apply.*

- I have been given the Participation Information Sheet and/or had its contents explained to me.
- I have had an opportunity to ask any questions and I am satisfied with the answers given.
- I understand I have a right to withdraw from the research at any time and I do not have to provide a reason.
- I understand that if I withdraw from the research any data included in the results will be removed if that is practicable (I understand that once anonymised data has been collated into other datasets it may not be possible to remove that data).
- I would like to receive information relating to the results from this study.
- I confirm I am willing to be a participant in the above research study.
- I note the data collected may be retained in an archive and I am happy for my data to be reused as part of future research activities. I note my data will be fully anonymised (if applicable).

**Feedback survey complete!**

Thanks so much for taking the time to take part in the research study. We hope it hasn't taken too much of your time. Feel free to get in touch if you have any questions.

- Send me a copy of my responses.

---

Powered by



# User Research Analysis

---

**"An analysis of the user feedback for the eight different advertising experience experiments."**

Andrew Keats

08 September 2018

# Table of Contents

---

- Pre-processing the data
  - Getting participant consent
- A little look at the demographics
  - Weakness in the sample set
  - Familiarity with technology.
  - Mobile phone use for emails.
  - Mobile phone use for games
  - Mobile phone use for mobile payments
  - Mobile phone use for social media
  - Familiarity with Augmented Reality.
  - Perception of the IoT element of experiments
  - Perception of the interactions using smartphone
- Some basic popularity analysis
  - Looking at the basic popularity through the cross section of gender and age.
    - Preferred experiments by gender
    - Least preferred experiments by gender
  - Adjusting for population
  - Adjusting age group subset for sample size disparity.
    - Preferred experiments by age group
    - Least preferred experiments by age group
    - Most and Least preferred experiments by age group, adjust for age group sample sizes.
    - Most and least preferred experiments adjusted for population weighting and aggregated age groups
  - Most preferred results for age and gender demographics
- Comparing facets of the experiments
  - Facet: I found the experience enjoyable
  - Facet: I found the experience annoying
  - Facet: I found the experience engaging
  - Facet: I found the experience interesting
  - Facet: I found the experience to be persuasive
  - Facet: The experience connected me with the brand
  - Facet: I found the experience easy to use
- Looking at facets of the experiments as a whole.
  - Scaled geometric mean of experiment facets
- Looking at the experiments based on cumulative ranking values
- Multiplying the results of cumulative ranings and facet means
- Examining the demographics of the participants for the three most popular experiments

- Demographics for participants preferring Experiment #3
  - Demographics for participants preferring Experiment #5
  - Demographics for participants preferring Experiment #7
- Examining the demographics of the participants with preferences for the most extreme experiments
  - Demographics for participants preferring Experiment #1
  - Demographics for participants regarding Experiment #8
- Dividing experiment scores over the baseline
  - Experiment #3 scores over the baseline
  - Experiment #5 scores over the baseline
  - Experiment #7 scores over the baseline
  - Experiment #8 scores over the baseline
- Qualitative feedback
  - Experiment #1
  - Experiment #2
  - Experiment #3
  - Experiment #4
  - Experiment #5
  - Experiment #6
  - Experiment #7
  - Experiment #8
  - Summary feedback

# Pre-processing the data

---

There were a total of 23 unique respondents. The data needed to be re-ordered before it could be analysed because every participant experienced the advertising in a randomised unique order in order to mitigate for various biases, like 'learnt behaviour', tiredness or boredom over time. The responses have also been anonymised for the sake of the respondents privacy; to that end, their email addresses were the most personal data variable recorded and when analysing the data, the dataset has email addresses replaced with an id.

## Getting participant consent

This questionnaire incorporated a consent form at the beginning so that participants had to consent first before answering any questions relating to the topics being investigated.

```
#going to import the Excel spreadsheet of our questionnaire
# results dataset
feedback.raw <- read_excel("../data/iot-advertising-user-
feedback-01-responses_processed.xlsx")
uk_census.age_sex_raw <- read_csv("../uk-
data/Data_AGE_SEX_UNIT_18_69.csv")

uk_census.age_sex_data <- select(uk_census.age_sex_raw,
  starts_with("F"))
uk_census.age_sex_sizes <-
  as.numeric(as.vector(unlist(slice(uk_census.age_sex_data,
  2))))
uk_census.age_sex_trimmed <-
  t(as.data.frame(as.numeric(as.vector(unlist(uk_census.age_sex_s
  as.character(unlist(uk_census.age_sex_data[1,])))))

#uk_census.age_sex_subs <- subset(uk_census.age_sex_trimmed,
#  select=colnames(uk_census.age_sex_trimmed)[-grep("Total",
#  colnames(uk_census.age_sex_trimmed))])
uk_census.age_sex_with_pc <-
  bind_rows(as.data.frame(uk_census.age_sex_trimmed),
  as.data.frame(uk_census.age_sex_trimmed /
  rowSums(uk_census.age_sex_trimmed, na.rm = TRUE)))
uk_census.age_sex_with_pc_collapsed <-
  uk_census.age_sex_with_pc

#rm(uk_census.age_sex_sizes, uk_census.age_sex_trimmed,
#  uk_census.age_sex_subs, uk_census.age_sex_with_pc)
```

```

rm(uk_census.age_sex_sizes, uk_census.age_sex_trimmed,
  uk_census.age_sex_with_pc)

#Replacing NA value with 0
uk_census.age_sex_with_pc_collapsed[is.na(uk_census.age_sex_with_-
  <- 0

#Merging columns to match age group of the feedback
uk_census.age_sex_with_pc_collapsed <-
  within(uk_census.age_sex_with_pc_collapsed,
`Age : Age 18 to 24 - Sex : Males - Unit : Persons` <-
`Age : Age 18 to 19 - Sex : Males - Unit : Persons` +
`Age : Age 20 to 24 - Sex : Males - Unit : Persons`)
uk_census.age_sex_with_pc_collapsed <-
  within(uk_census.age_sex_with_pc_collapsed,
`Age : Age 18 to 24 - Sex : Females - Unit : Persons` <-
`Age : Age 18 to 19 - Sex : Females - Unit : Persons` +
`Age : Age 20 to 24 - Sex : Females - Unit : Persons`)
uk_census.age_sex_with_pc_collapsed <-
  within(uk_census.age_sex_with_pc_collapsed,
`Age : Age 50 and over - Sex : Males - Unit : Persons` <-
`Age : Age 50 to 54 - Sex : Males - Unit : Persons` +
`Age : Age 55 to 59 - Sex : Males - Unit : Persons` +
`Age : Age 60 to 64 - Sex : Males - Unit : Persons` +
`Age : Age 65 to 69 - Sex : Males - Unit : Persons`)
uk_census.age_sex_with_pc_collapsed <-
  within(uk_census.age_sex_with_pc_collapsed,
`Age : Age 50 and over - Sex : Females - Unit : Persons` <-
`Age : Age 50 to 54 - Sex : Females - Unit : Persons` +
`Age : Age 55 to 59 - Sex : Females - Unit : Persons` +
`Age : Age 60 to 64 - Sex : Females - Unit : Persons` +
`Age : Age 65 to 69 - Sex : Females - Unit : Persons`)
#removing columns that have been merge
uk_census.age_sex_with_pc_collapsed <-
  subset(uk_census.age_sex_with_pc_collapsed, select = -c(
`Age : Age 18 to 19 - Sex : Males - Unit : Persons`,
`Age : Age 18 to 19 - Sex : Females - Unit : Persons`,
`Age : Age 20 to 24 - Sex : Males - Unit : Persons`,
`Age : Age 20 to 24 - Sex : Females - Unit : Persons`,
`Age : Age 50 to 54 - Sex : Males - Unit : Persons`,
`Age : Age 50 to 54 - Sex : Females - Unit : Persons`,
`Age : Age 55 to 59 - Sex : Males - Unit : Persons`,
`Age : Age 55 to 59 - Sex : Females - Unit : Persons`,
`Age : Age 60 to 64 - Sex : Males - Unit : Persons`,
`Age : Age 60 to 64 - Sex : Females - Unit : Persons`,
`Age : Age 60 to 64 - Sex : Females - Unit : Persons`,
`Age : Age 60 to 64 - Sex : Females - Unit : Persons`

```

```

`Age : Age 65 to 69 - Sex : Males - Unit : Persons`,
`Age : Age 65 to 69 - Sex : Females - Unit : Persons`))

# re-ordering columns
uk_census.age_sex_with_pc_collapsed <-
  uk_census.age_sex_with_pc_collapsed[,  

    str_sort(names(uk_census.age_sex_with_pc_collapsed))]

factors.yes_no <- c('Yes', 'No')

exp_key.enjoyable = "I found the experience enjoyable";
exp_key.annoying = "I found the experience annoying";
exp_key.engaging = "I found the experience engaging";
exp_key.interesting = "I found the experience interesting";
exp_key.persuasive = "I found the experience to be persuasive";
exp_key.connected = "The experience connected me with the  

  brand?";
exp_key.easy = "I found the experience easy to use";

exp_keys = c(exp_key.enjoyable, exp_key.annoying,  

  exp_key.engaging, exp_key.interesting, exp_key.persuasive,  

  exp_key.connected, exp_key.easy);

#Takes the column and iterates over the values comparing each  

  row to the fullData example and filling in blanks where the  

  entry is absent; all vectors will have the same length as  

  fullData once complete.
fill_vector_with_sparse <- function(vec, fullData) {
  if (is.vector(vec) && is.vector(fullData)) {
    for (i in seq_along(vec)) {
      for (ii in seq_along(fullData)) {
        if ((length(vec[[i]]) < ii) || (vec[[i]][ii] != fullData[ii]))
          {
            vec[[i]] <- insert(vec[[i]], ii, NA)
          }
        }
      }
    }
  }
  return(vec)
}

#Takes the column and iterates over the values comparing  

  converting vectors into strings.
convert_vector_to_string <- function(vec, delim = ", ") {

```

```

if (is.vector(vec)) {
  for (i in seq_along(vec)) {
    vec[[i]] <- paste(vec[[i]], collapse = delim)
  }
}
return(vec)
}

#Takes a numeric column and scales the values according to the
# range for numeric values in the questionnaire
scale_numeric_by_range <- function(vec) {
  if (is.vector(vec) && is.numeric(vec)) {
    vec <- rescale(vec, to=c(-1, 1), from=c(0, 5))
  }
}
return(vec)
}

#Takes a numeric column and scales the values according to the
# range for numeric values in the questionnaire
scale_numeric_by_range <- function(vec) {
  if (is.vector(vec) && is.numeric(vec)) {
    vec <- rescale(vec, to=c(-1, 1), from=c(0, 5))
  }
}
return(vec)
}

# Geometric mean for a vector
geo_mean = function(x, na.rm=TRUE){
  exp(sum(log(x[x > 0])), na.rm=na.rm) / length(x))
}

#Radar coordinate function for ggplot polygon
coord_radar <- function (theta = "x", start = 0, direction = 1)
{
  theta <- match.arg(theta, c("x", "y"))
  r <- if (theta == "x")
  "y"
  else "x"
  ggproto("CordRadar", CoordPolar, theta = theta, r = r, start =
    start,
    direction = sign(direction),
    is_linear = function(coord) TRUE)
}

```

```

#Now to make the data the right format/type
feedback.formatted <- feedback.raw

#Factors
factors.gender <- c('Female', 'Male', 'Other', 'Prefer not to
say')
feedback.formatted$`Your gender` <-
  factor(feedback.formatted$`Your gender`, factors.gender)
factors.age_range <- c('18-24', '25-29', '30-34', '35-39', '40-
44', '45-49', '50+', 'Prefer not to say')
feedback.formatted$`Your age range` <-
  factor(feedback.formatted$`Your age range`, factors.age_range)
feedback.formatted$`Do you own have previous experience of
Augmented Reality` <- factor(feedback.formatted$`Do you own
have previous experience of Augmented Reality`,
factors.yes_no)
factors.exp_num <- paste("#", 1:8, sep = "")
feedback.formatted$`Overall, which was your most preferred
experiment?` <- factor(feedback.formatted$`Overall, which was
your most preferred experiment?`, factors.exp_num)
feedback.formatted$`Overall, which was your least preferred
experiment?` <- factor(feedback.formatted$`Overall, which was
your least preferred experiment?`, factors.exp_num)
factors.exp_rank <- paste("Rank #", 1:8, sep = "")
feedback_rank_cols <- select(feedback.formatted,
  starts_with("Could you please rate the experiments in order of
preference?"))

for (col in colnames(feedback_rank_cols)) {
  feedback.formatted[[col]] <- factor(feedback.formatted[[col]],
  factors.exp_rank)
}

#Numeric
for (idx in 0:7) {
  for (key in exp_keys) {
    if (idx != 0) {
      key = paste(key, "__", idx, sep = "")
    }

    feedback.formatted[[key]] <-
      as.numeric(feedback.formatted[[key]])
  }
}

```

```

rm(idx, key)
feedback.formatted$`I was comfortable with the interactions
being triggered by IoT wireless` <-
as.numeric(feedback.formatted$`I was comfortable with the
interactions being triggered by IoT wireless`)
feedback.formatted$`I was comfortable with the interactions
happening on a smartphone` <- as.numeric(feedback.formatted$`I
was comfortable with the interactions happening on a
smartphone`)

#multiple strings
factors.mobile_usage <- c('Emails', 'Games', 'Mobile Payment',
'Social Media')
factors.mobile_usage_t <- paste("Do you use for Mobile phone
for:", factors.mobile_usage)
feedback.formatted$`Do you use for Mobile phone for (select all
that apply)` <-
fill_vector_with_sparse(strsplit(feedback.formatted$`Do you
use for Mobile phone for (select all that apply)`, ", "),
factors.mobile_usage)
feedback.formatted$`Do you use for Mobile phone for (select all
that apply)` <-
convert_vector_to_string(feedback.formatted$`Do you use for
Mobile phone for (select all that apply)`)
feedback.formatted <- separate(feedback.formatted, "Do you use
for Mobile phone for (select all that apply)",
factors.mobile_usage_t, ", ", convert = TRUE)

for (idx in seq_along(factors.mobile_usage_t)) {
mobile_col_key = factors.mobile_usage_t[idx]
mobile_col = feedback.formatted[mobile_col_key]
feedback.formatted[mobile_col_key] <-
factor(ifelse(is.na(mobile_col), "No", "Yes"), factors.yes_no)
}
rm(mobile_col, mobile_col_key, idx)

```

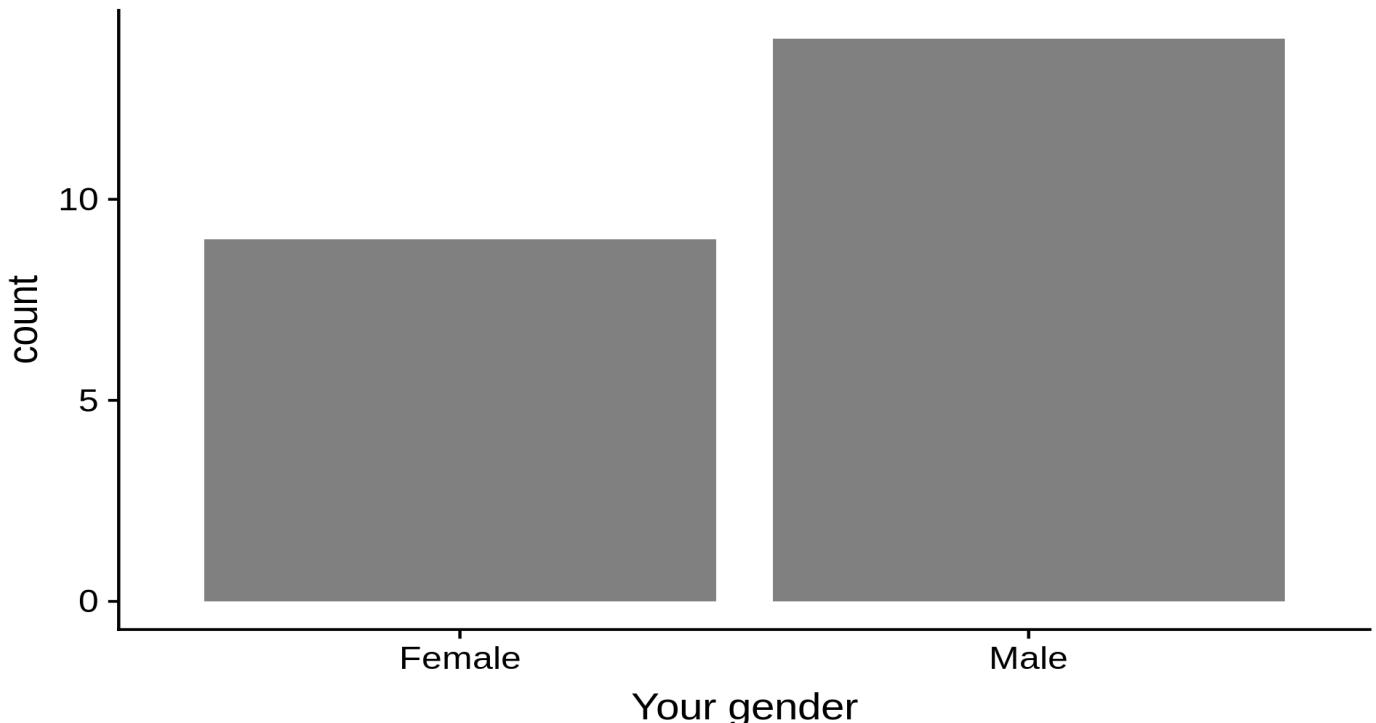
# A little look at the demographics

There participants were mostly male be a ratio of about 3:2, the younger age groups were better represented, however the gender disparity was greater among those younger age groups with a stronger male representation for those under 35 (about 5:2). This was down to the participants that were able to take part.

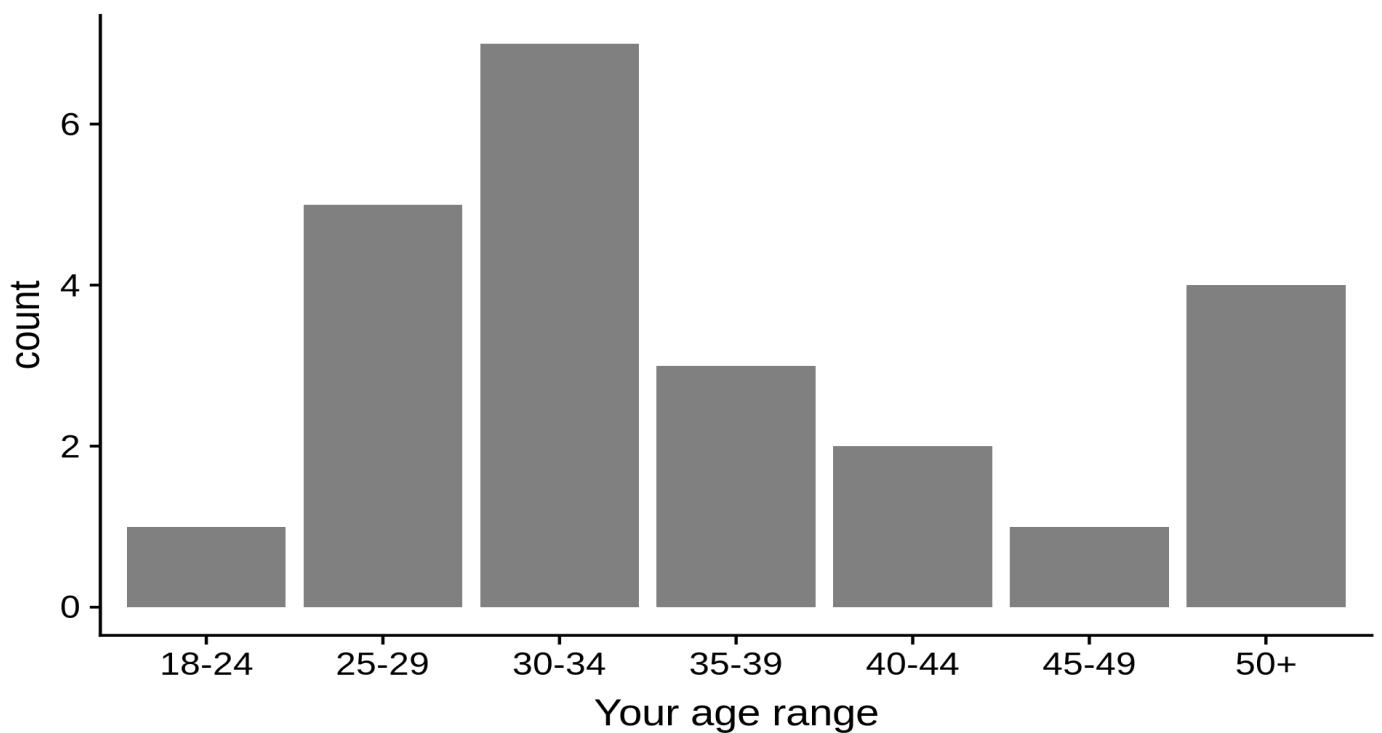
```
kable(table(feedback.formatted$`Your gender`), col.names =  
      c("Gender", "Count"))
```

Gender	Count
Female	9
Male	14
Other	0
Prefer not to say	0

```
ggplot(feedback.formatted, aes(x = `Your gender`)) +  
  geom_bar(stat="count", fill=styles.color_grey)
```



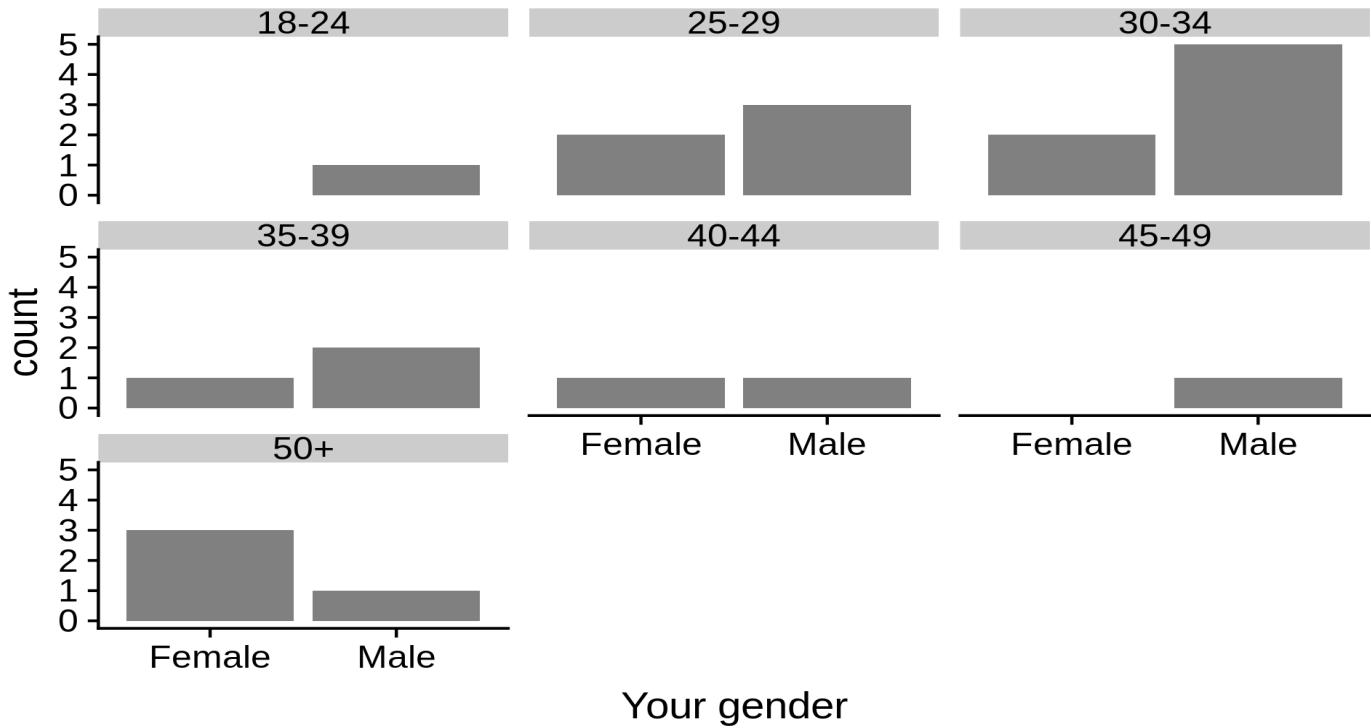
```
ggplot(feedback.formatted, aes(x = `Your age range`)) +  
  geom_bar(stat="count", fill=styles.color_grey)
```



```
kable(table(feedback.formatted$`Your age range`), col.names = c("Age group", "Count"))
```

Age group	Count
18-24	1
25-29	5
30-34	7
35-39	3
40-44	2
45-49	1
50+	4
Prefer not to say	0

```
ggplot(feedback.formatted, aes(x = `Your gender`)) +
  geom_bar(stat="count", fill=styles.color_grey) +
  facet_wrap(~`Your age range`)
```



## Weakness in the sample set

The 18-24 and 45-49 age groups were populated by just one participant each, so the feedback for these demographics are the least reliable; the next least reliable age groups are the 40-44 and 35-39 age groups, in that order. One way for mitigating the disparity in sample size per age group, would be to analyse the results using some merged age groups allowing for a broader trend analysis but with greater sample sizes per extended age group; that is to say, using aggregated age groups like 18-29, 30-39 and 40+. Another technique that can be used is to apply proportionate weighting to the answers based on the demographics of the country (in this case the United Kingdom) where the study has taken place; this can help adjust the results to better reflect the total population if the body of participants doesn't reflect the make-up of the population.

```

feedback.with_weights <- feedback.formatted
#feedback.with_weights <- within(feedback.with_weights,
  'weighting', )
#feedback.formatted$`Your age range` 
feedback.age_and_gender <- table(feedback.formatted$`Your age
  range`, feedback.formatted$`Your gender`)
#removing row and columns that are empty
feedback.age_and_gender <- as.data.frame(feedback.age_and_gender[ 
  nrow(feedback.age_and_gender), 1:2]) %>% `colnames<-`(`c("age", " 
  "count")) 

feedback_count <- sum(feedback.age_and_gender$count)
feedback.age_and_gender$pc <- feedback.age_and_gender$count / 
  feedback_count
  
```

```

feedback_weights = c()
uk_pcs = c()

for (idx in 1:nrow(feedback.age_and_gender)) {
  current_row = feedback.age_and_gender[idx,]
  current_age = substr(as.character(current_row$age), start = 1,
    stop = 2)
  current_gender = as.character(current_row$gender)

  uk_pc_col = select(uk_census.age_sex_with_pc_collapsed,
    contains(current_age)) %>% select(contains(current_gender,
      ignore.case = FALSE))
  uk_pc = uk_pc_col[2,]
  study_pc = feedback.age_and_gender[idx,]$pc

  feedback_weights[idx] = ifelse(study_pc != 0, uk_pc/study_pc,
    0)
  uk_pcs[idx] = uk_pc
}

rm(current_row, current_age, current_gender, uk_pc_col,
  study_pc, uk_pc)

feedback.age_and_gender$uk_pc <- uk_pcs
feedback.age_and_gender$weight <- feedback_weights

rm(uk_pcs)

feedback_weights = c()

for (idx in 1:nrow(feedback.with_weights)) {
  current_row = feedback.with_weights[idx,]
  current_weight = filter(feedback.age_and_gender, gender ==
    as.character(current_row`Your gender`), age ==
    as.character(current_row`Your age range`))$weight

  feedback_weights[idx] = current_weight
}

feedback.with_weights$weight <- as.numeric(feedback_weights)

rm(feedback_count, idx, feedback_weights)

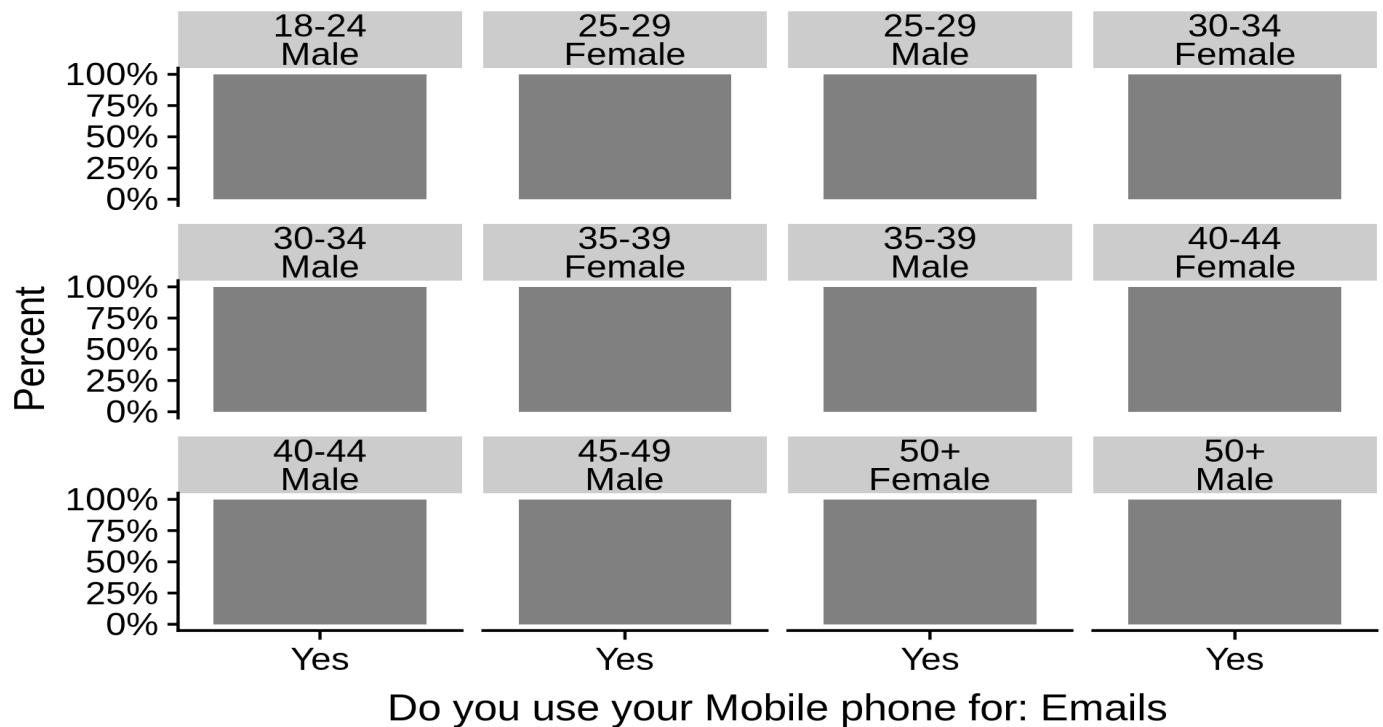
```

# Familiarity with technology

Data was captured from each participant to assess their familiarity technology with regards to smartphone usage for various interaction. These results are helpful to provide context for the results of the experiments.

## Mobile phone use for emails.

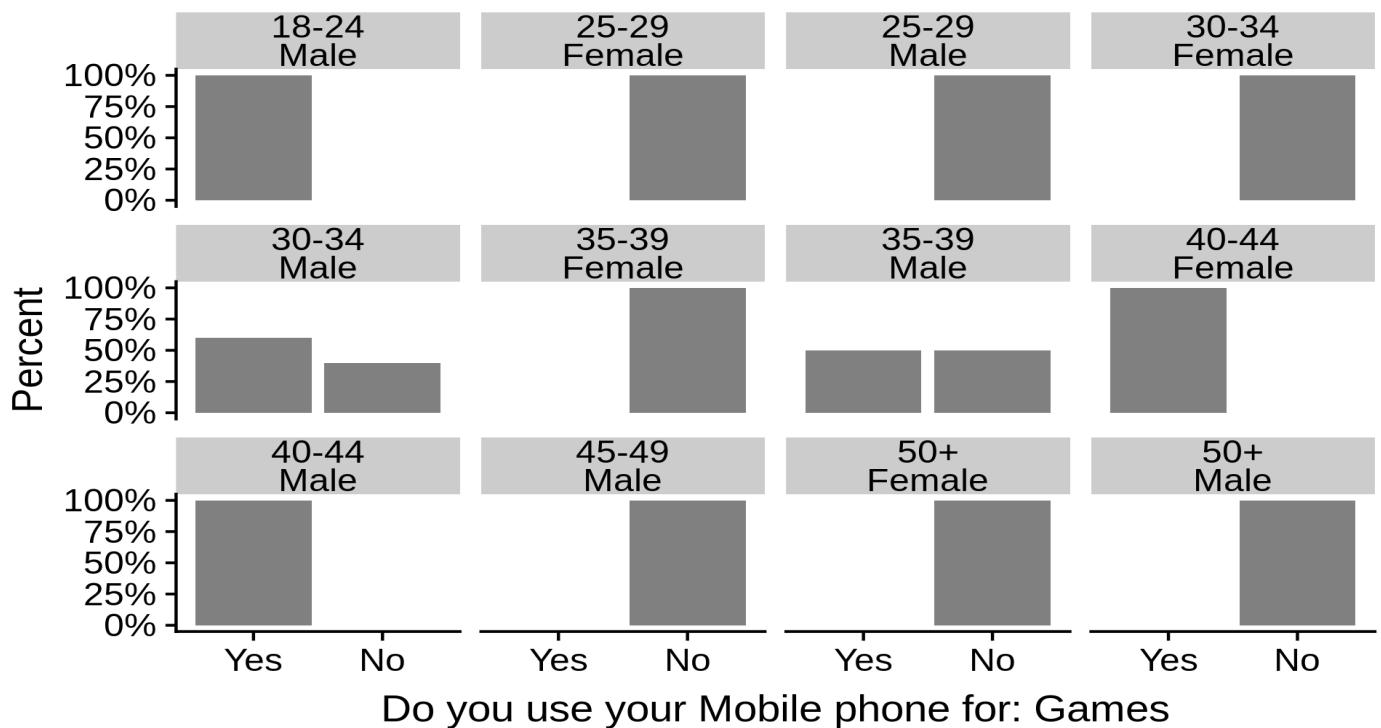
```
feedback.use_email <- melt(select(feedback.formatted, `Your gender`, `Your age range`, `Do you use for Mobile phone for: Emails`))  
ggplot(feedback.use_email, aes(x = `Do you use for Mobile phone for: Emails`, group = `Your gender`)) +  
  geom_bar(stat="count", fill=styles.color_grey, aes(y = ..prop.., fill = factor(..x..))) +  
  scale_y_continuous(labels = scales::percent) +  
  xlab('Do you use your Mobile phone for: Emails') +  
  ylab('Percent') +  
  facet_wrap(~`Your age range` + `Your gender`)
```



All participants accessed their emails on their mobile phones.

# Mobile phone use for games

```
feedback.use_games <- melt(select(feedback.formatted, `Your gender`, `Your age range`, `Do you use for Mobile phone for: Games`))  
ggplot(feedback.use_games, aes(x = `Do you use for Mobile phone for: Games`, group = `Your gender`)) +  
  geom_bar(stat="count", fill=styles.color_grey, aes(y = ..prop.., fill = factor(..x..))) +  
  scale_y_continuous(labels = scales::percent) +  
  xlab('Do you use your Mobile phone for: Games') +  
  ylab('Percent') +  
  facet_wrap(~`Your age range` + `Your gender`)
```

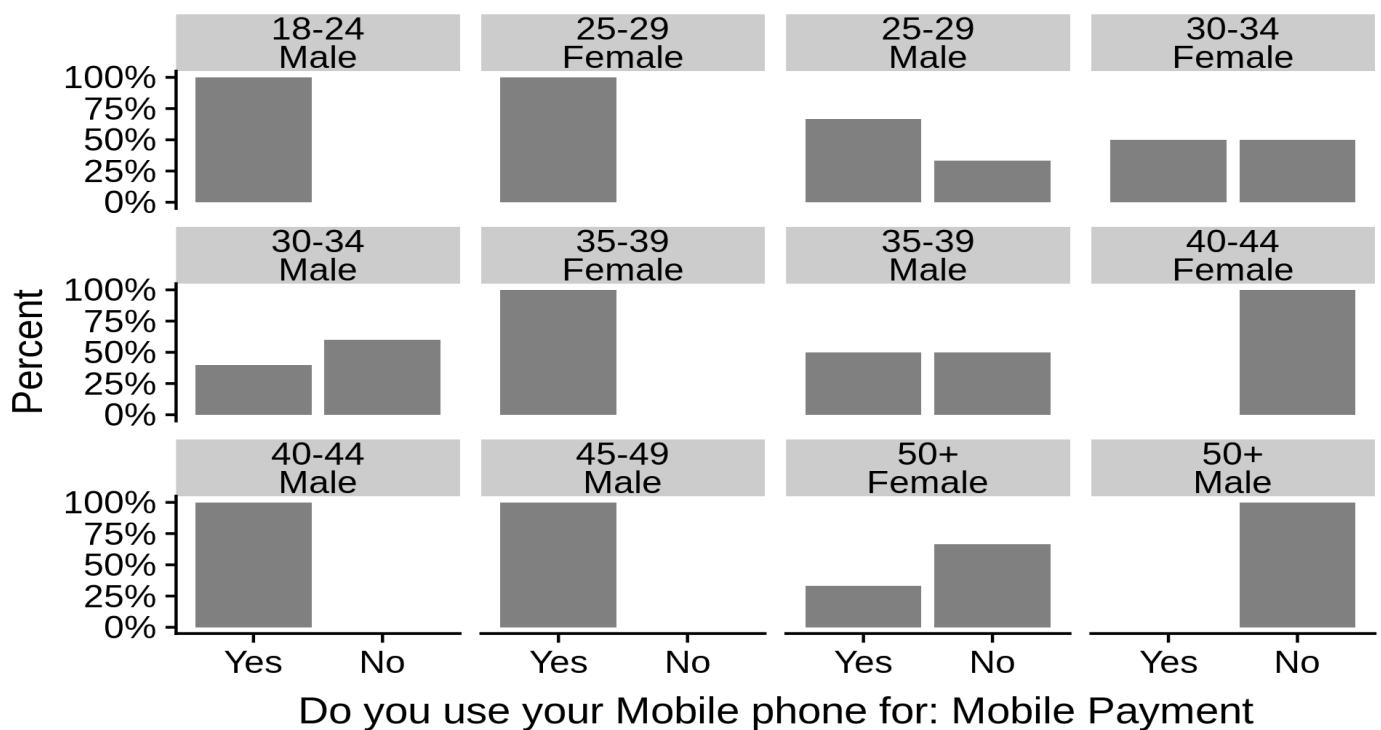


Participants at the older end of the spectrum appear not to play games on their mobile phones, nor do those in the young age groups of this sample of users. It is the middle age groups 30-34, 35-39, and 40-44 that seem to play games on their mobile phones.

# Mobile phone use for mobile payments

```
feedback.use_mobile_payment <- melt(select(feedback.formatted,
  `Your gender`, `Your age range`, `Do you use for Mobile phone
  for: Mobile Payment`))

ggplot(feedback.use_mobile_payment, aes(x = `Do you use for
  Mobile phone for: Mobile Payment`, group = `Your gender`)) +
  geom_bar(stat="count", fill=styles.color_grey, aes(y =
  ..prop.., fill = factor(..x..))) +
  scale_y_continuous(labels = scales::percent) +
  xlab('Do you use your Mobile phone for: Mobile Payment') +
  ylab('Percent') +
  facet_wrap(~`Your age range` + `Your gender`)
```



Broadly speaking using a smartphone to make mobile payments is more popular among females but more significantly those of both genders in the younger age groups show a higher frequency of mobile payment, with the frequency declining with age.

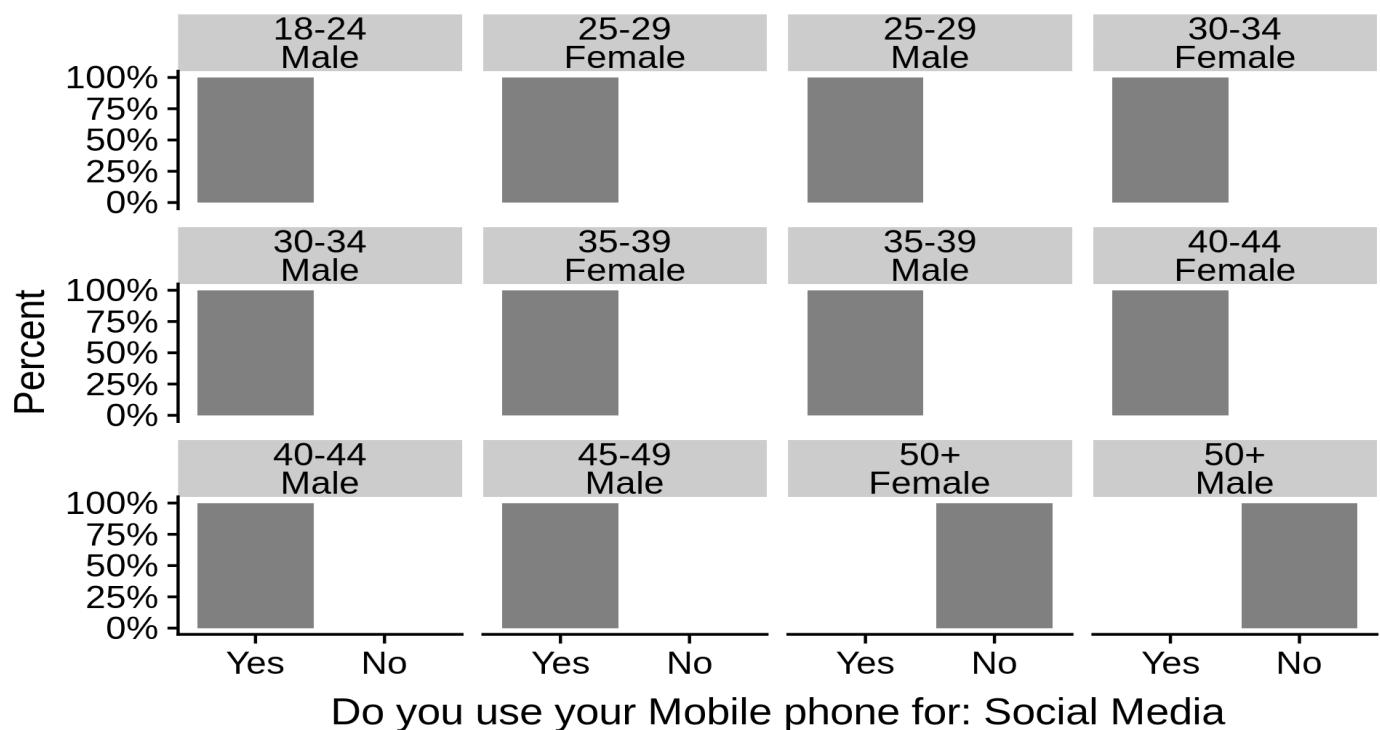
# Mobile phone use for social media

```

feedback.use_social_media <- melt(select(feedback.formatted,
  `Your gender`, `Your age range`, `Do you use for Mobile phone
  for: Social Media`))

ggplot(feedback.use_social_media, aes(x = `Do you use for
  Mobile phone for: Social Media`, group = `Your gender`)) +
  geom_bar(stat="count", fill=styles.color_grey, aes(y =
  ..prop.., fill = factor(..x..))) +
  scale_y_continuous(labels = scales::percent) +
  xlab('Do you use your Mobile phone for: Social Media') +
  ylab('Percent') +
  facet_wrap(~`Your age range` + `Your gender`)

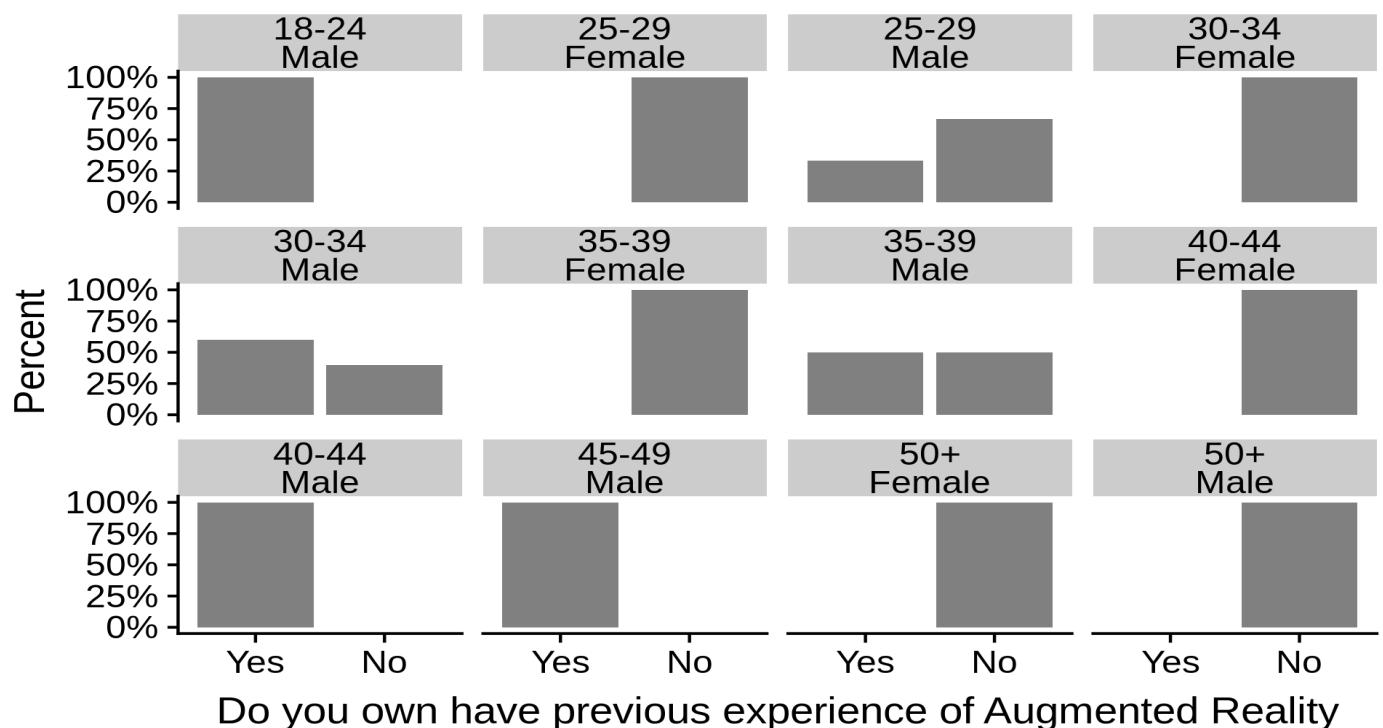
```



Every single demographic that was captured by the study, apart from those over fifty used social media on their mobile phones.

# Familiarity with Augmented Reality

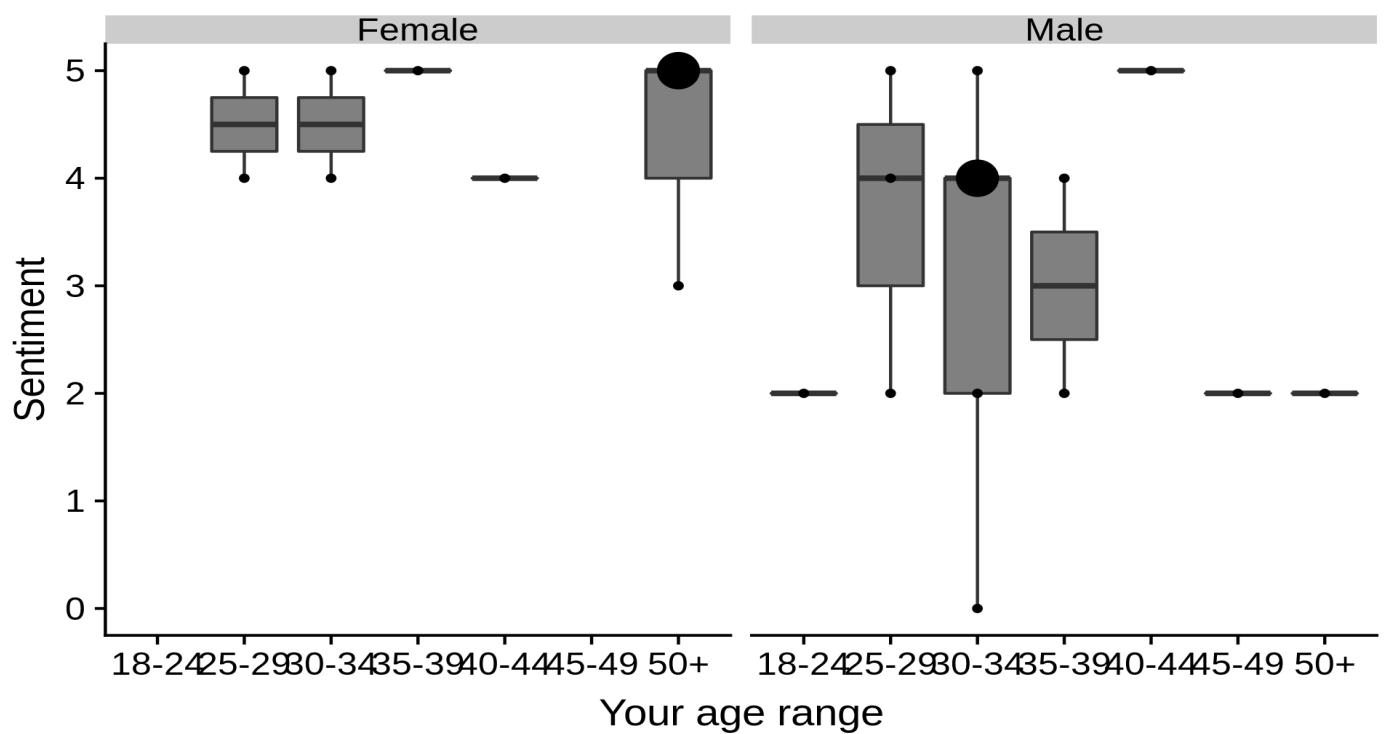
```
feedback.use_augmented_reality <-
  melt(select(feedback.formatted, `Your gender`, `Your age
range`, `Do you own have previous experience of Augmented
Reality`))
ggplot(feedback.use_augmented_reality, aes(x = `Do you own have
previous experience of Augmented Reality`, group = `Your
gender`)) +
  geom_bar(stat="count", fill=styles.color_grey, aes(y =
..prop.., fill = factor(..x..))) +
  scale_y_continuous(labels = scales::percent) +
  xlab('Do you own have previous experience of Augmented
Reality') +
  ylab('Percent') +
  facet_wrap(~`Your age range` + `Your gender`)
```



Familiarity with Augmented Reality appear to be more frequent among males with no prior experience for females of any age group. Any correlation between age and familiarity cannot be said to be linear, though the 50+ age group was the only male demographic to have no prior experience.

# Perception of the IoT element of experiments

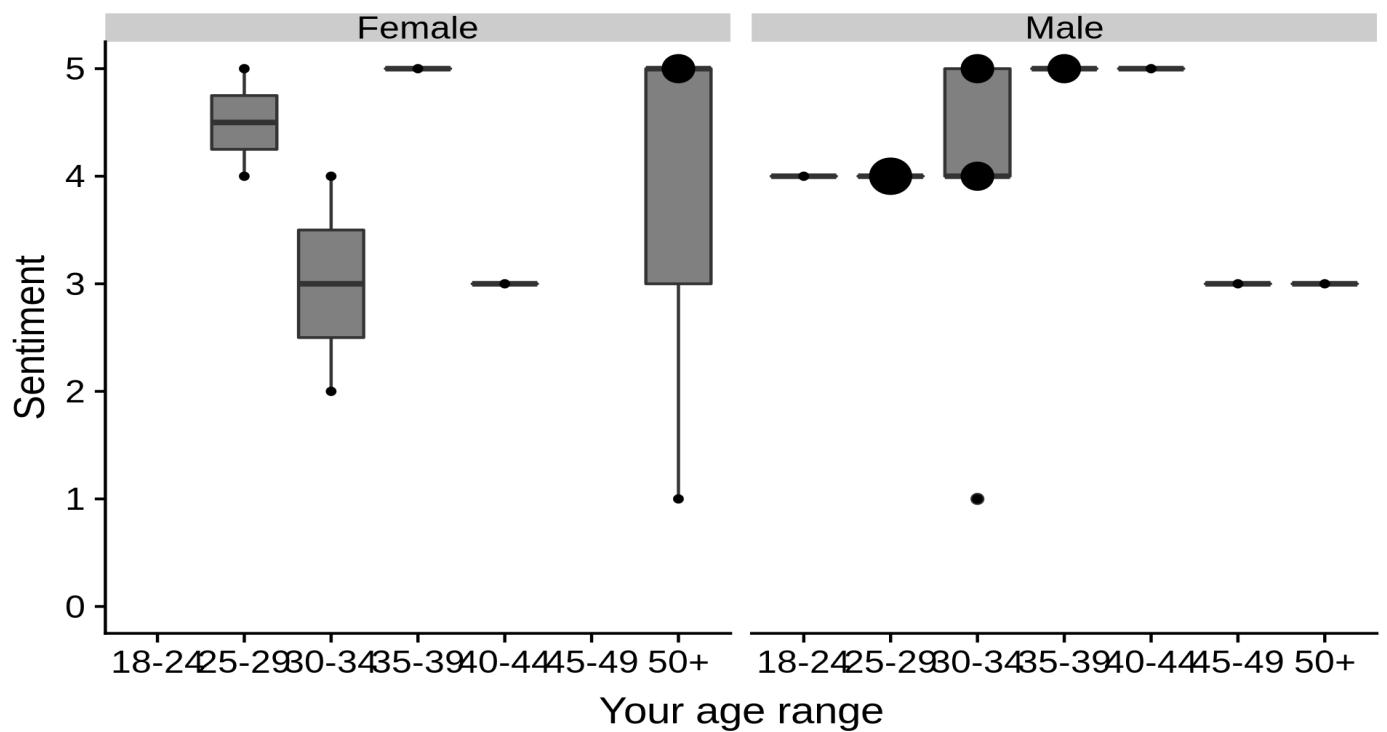
```
ggplot(feedback.formatted, aes(x = `Your age range`, y = `I was  
comfortable with the interactions being triggered by IoT  
wireless`)) +  
  geom_boxplot(fill=styles.color_grey) +  
  geom_count(show.legend=F) +  
  ylab("Sentiment") +  
  scale_y_continuous(limits = c(0, 5)) +  
  facet_wrap(~`Your gender`)
```



There appears to be more overall positivity from the entire subset of females when compared to males, which not only had greater variation but a significant number of scores below the top half of the sentiment scale.

# Perception of the interactions using smartphone

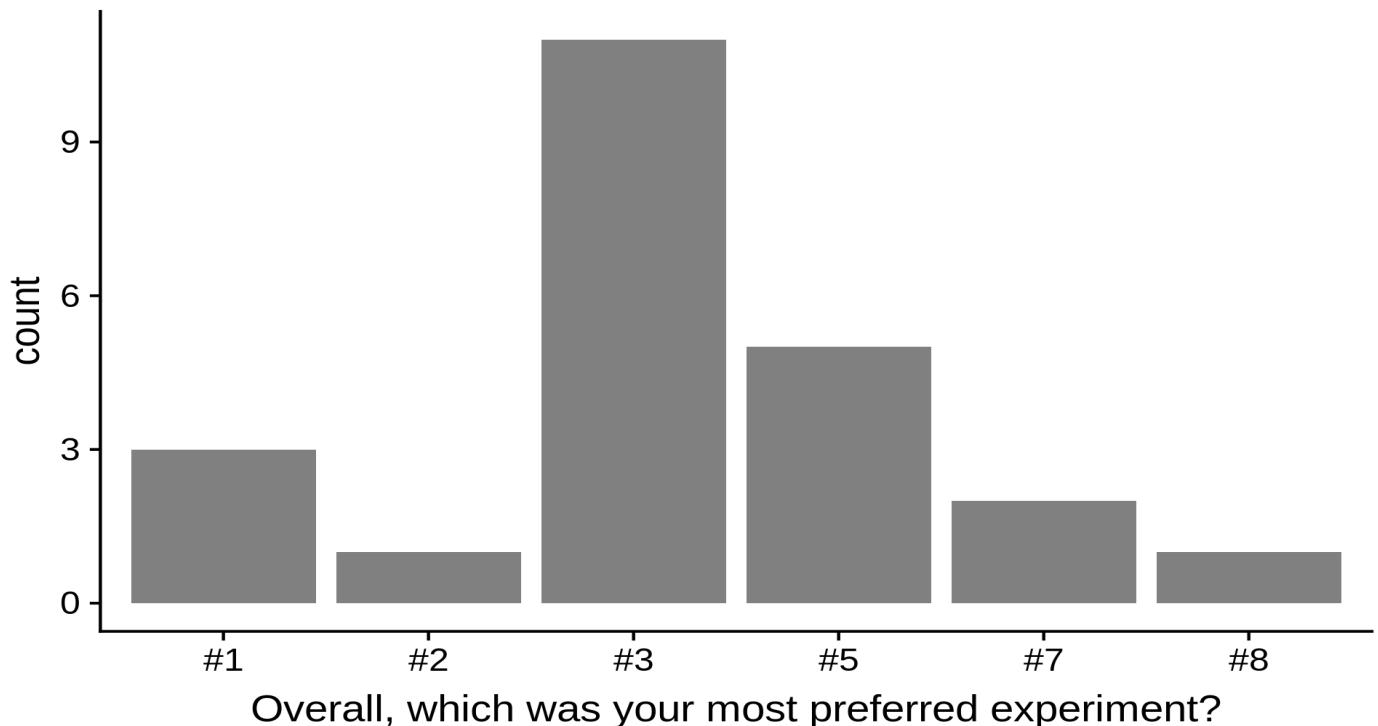
```
ggplot(feedback.formatted, aes(x = `Your age range`, y = `I was  
comfortable with the interactions happening on a smartphone`))  
+  
geom_boxplot(fill=styles.color_grey) +  
geom_count(show.legend=F) +  
ylab("Sentiment") +  
scale_y_continuous(limits = c(0, 5)) +  
facet_wrap(~`Your gender`)
```



Broadly speaking most participant across every demographic, with the exception of a few outliers, were comfortable with the idea of using a smartphone as part of these interactions.

# Some basic popularity analysis

```
ggplot(feedback.formatted, aes(x = `Overall, which was your  
most preferred experiment?`)) + geom_bar(stat="count",  
fill=styles.color_grey)
```

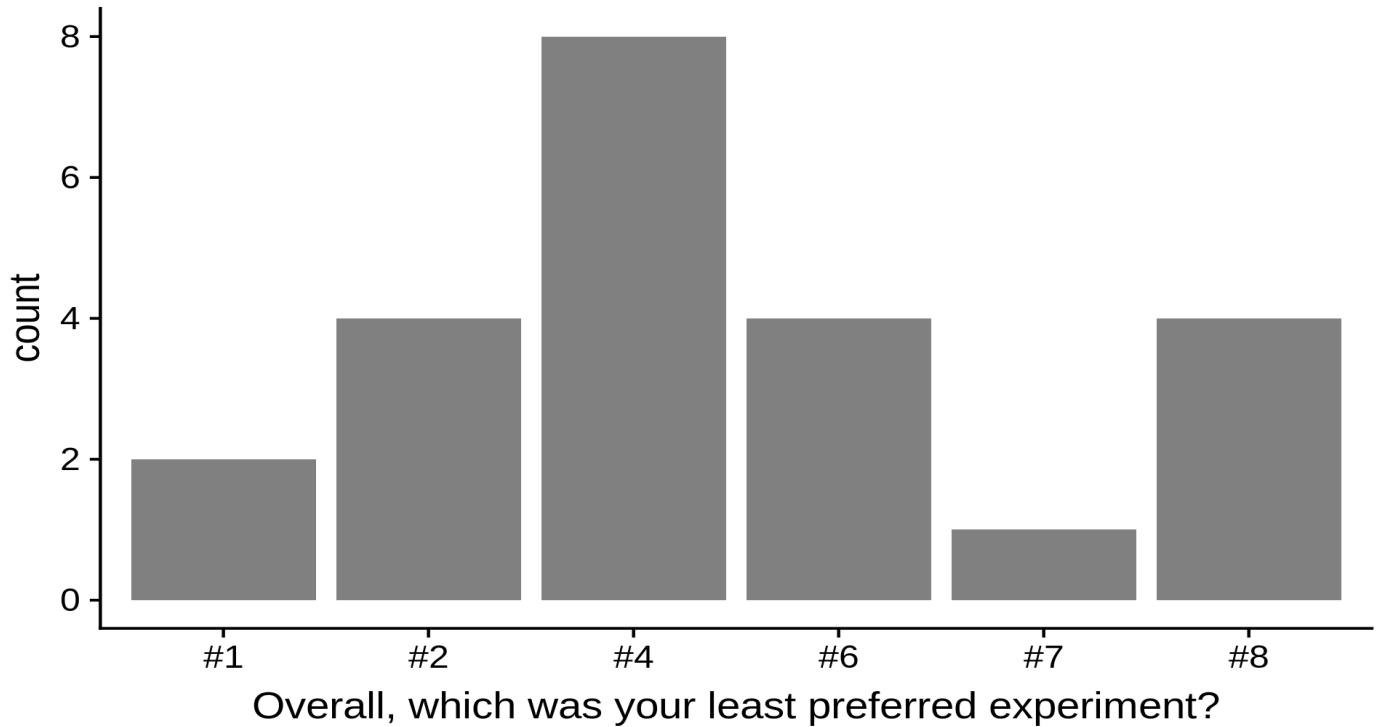


```
kable(table(feedback.formatted$`Overall, which was your most  
preferred experiment?`), col.names = c("Preferred Exp",  
"Count"))
```

Preferred Exp	Count
#1	3
#2	1
#3	11
#4	0
#5	5
#6	0
#7	2

Preferred Exp	Count
#8	1

```
ggplot(feedback.formatted, aes(x = `Overall, which was your least preferred experiment?`)) + geom_bar(stat="count", fill=styles.color_grey)
```



```
kable(table(feedback.formatted$`Overall, which was your least preferred experiment?`), col.names = c("Least preferred Exp", "Count"))
```

Least preferred Exp	Count
#1	2
#2	4
#3	0
#4	8
#5	0
#6	4
#7	1

Least preferred Exp	Count
#8	4

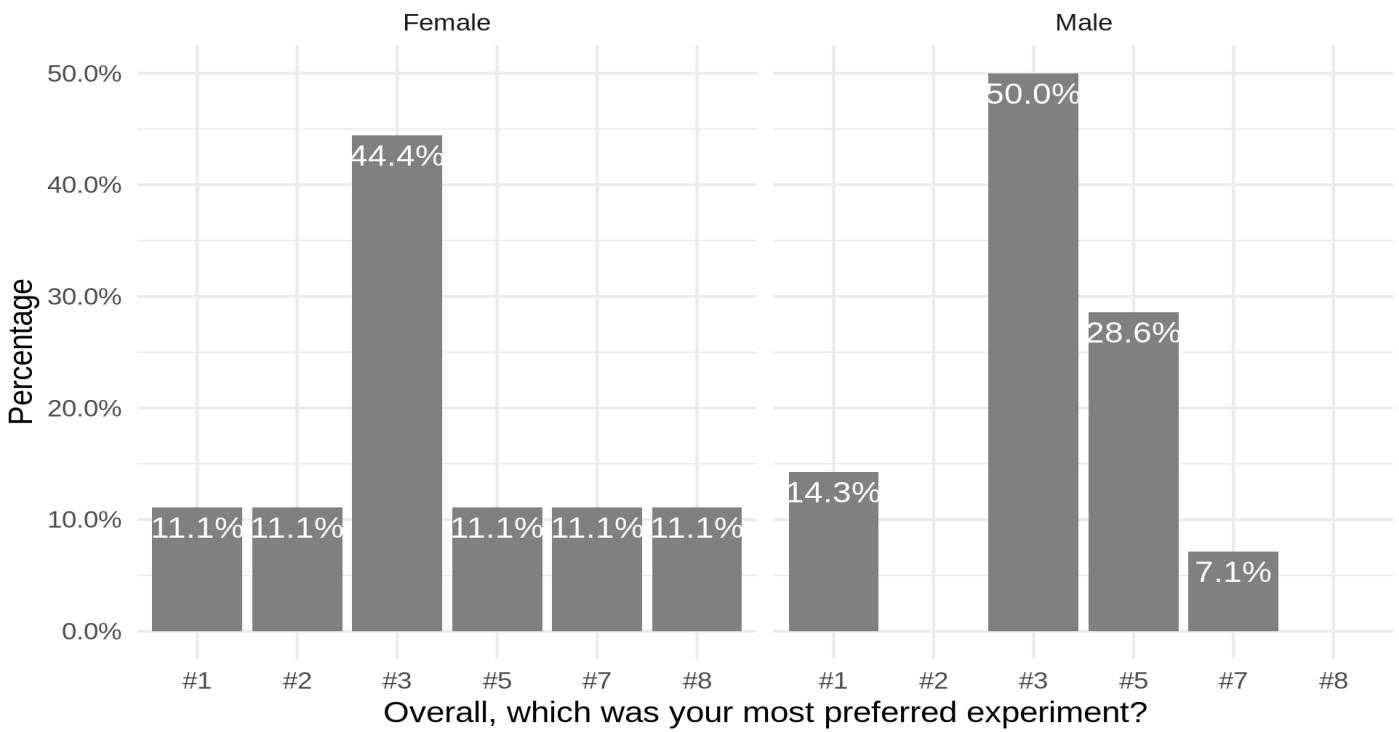
According to the summary questions that asked the participants which were their most and least favourite of the experiences, Experiment #3 was the most popular while the Experiment #4 was the least; Experiment #3 was the simplest interaction that involved an element of reward, while experiment #4 was the simplest interaction that involved a social media element. Even looking that the results of these relatively crude results, it's clear that of the preferred experiments, those that rewarded the user were looks upon more favourably and an interaction that provides nothing but an opportunity to promote the advert on Social Media is not well regarded.

## Looking at the basic popularity through the cross section of gender and age.

More insight can be inferred when looking at the results at a more granular level. And the following graphs looks to explore how age and gender affect the perception of the experiments.

### Preferred experiments by gender

```
ggplot(feedback.formatted, aes(x = `Overall, which was your
most preferred experiment?`, group = `Your gender`)) +
  geom_bar(stat="count", fill=styles.color_grey, aes(y =
..prop.., fill = factor(..x..))) + facet_grid(~`Your gender`)
+
  geom_text(aes( label = scales::percent(..prop..), y= ..prop..
), stat= "count", vjust = 1.5, color = "white") +
  scale_y_continuous(labels=percent) +
  ylab("Percentage") +
  theme_minimal()
```

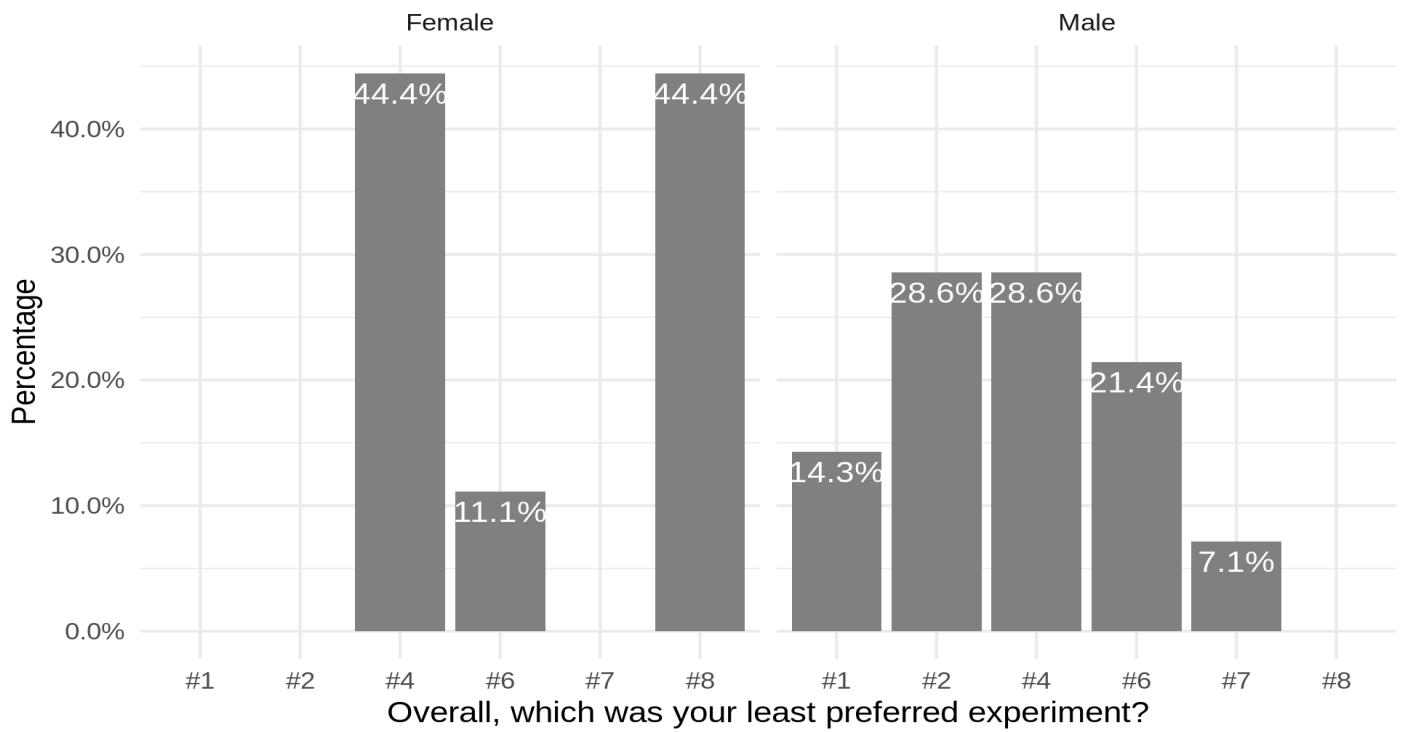


When comparing female and male opinions the same experiment, #3 comes out on top with less of the overall vote but more definitively for the female group; the female results for preference are more spread over the experiments with no clear second place so #3 has a clear margin ahead of the other experiments; the male preferences on the other hand, are for fewer experiments out of the total set of eight, with a stronger preference for #3 but also a clearer order of descending preference. For the males in the study, the second more preferred experiment is #5 which like #3 includes a loyalty coin element but it combines this with the Augmented Reality game; third and fourth place go to #1 - the simplest interaction (with the email capture baseline) - and #7 - comprised of loyalty coins and social media - respectively.

What is clear from these responses is that most appealing element in this form or advertising would be the offer of some form of reward. It can also be inferred that when a reward is combined with another element it elevates to popularity of the other element, though it appears most successful on its own.

## Least preferred experiments by gender

```
ggplot(feedback.formatted, aes(x = `Overall, which was your least preferred experiment?`, group = `Your gender`)) +
  geom_bar(stat="count", fill=styles.color_grey, aes(y = ..prop.., fill = factor(..x..))) + facet_grid(~`Your gender`)
  + geom_text(aes(label = scales::percent(..prop..), y= ..prop.. ), stat= "count", vjust = 1.5, color = "white") +
  scale_y_continuous(labels=percent) +
  ylab("Percentage") +
  theme_minimal()
```



When it comes to the most disliked experiments, for the female subset the results are very polarised with most votes being shared equally between #4 and #8. Both of these experiments involve the Social Media element, which for #4 is the only addition to the baseline, while #8 is the combination of all the experiment elements into one extended experience. The only other experiment to be voted for as the least preferred experiment by female participants was #6 which is the combination of Augmented Reality and Social Media.

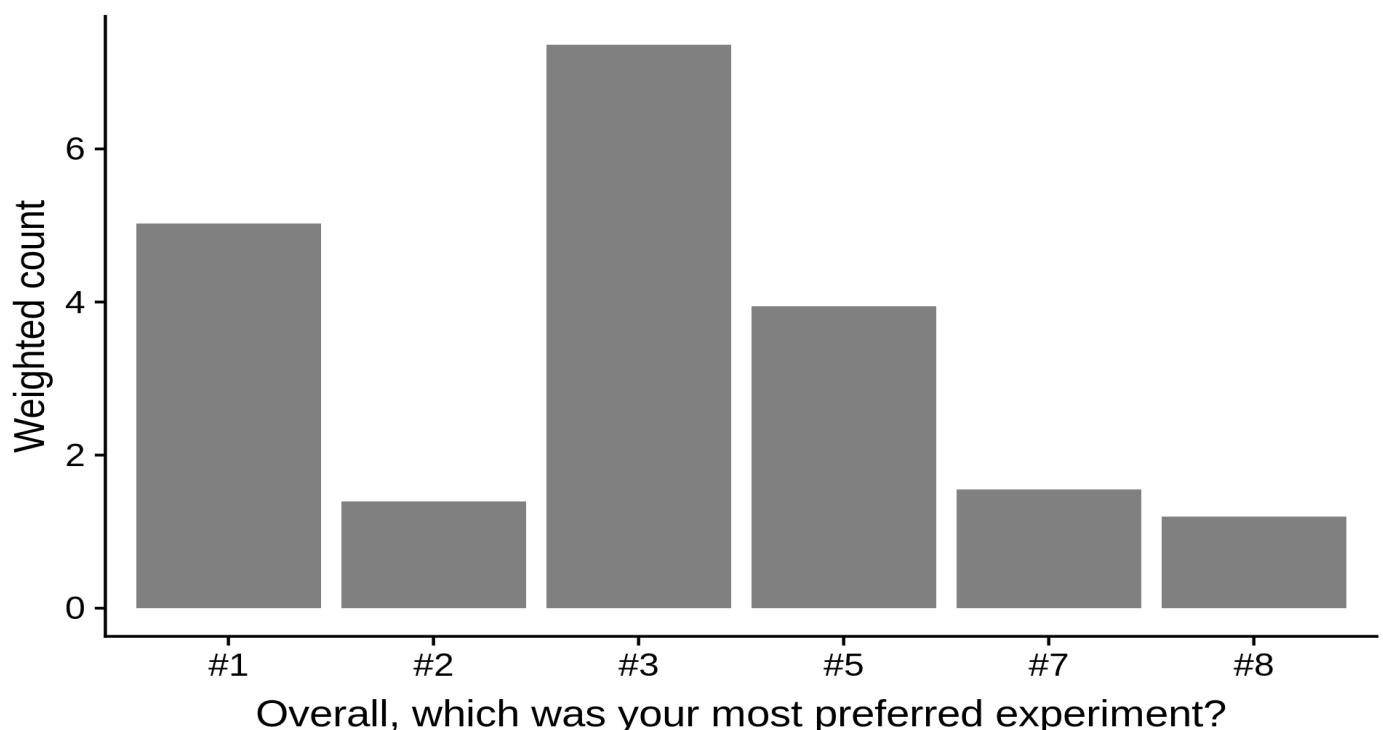
With regards to the male participants results for the least preferred experiments, there is more variation with the top spot being shared between #2 and #4; this suggest some overlap with the female participants with regard to the dislike of Social Media as exclusively presented in #4 but also some dislike of the use of Augmented Reality on its own as demonstrated by #2. The next least popular experiment for males was also #6 while the remaining votes cast went to #1 (the baseline) and #7 (Loyalty Reward, Social Media) in that order.

What can be strongly inferred here is that regardless of gender the presence of a Social Media sharing element is least appealing, possibly having a negative impact on experiences that involved other elements. There is some evidence to suggest that the Augmented Reality element is not always well received.

# Adjusting for population

Using UK census data it's possible to compare the percentage of demographics with the percentage for those demographics within the group of participants. The following graphs are an example of what the results might be like for a larger sample size.

```
ggplot(feedback.with_weights, aes(x = `Overall, which was your most preferred experiment?`, y= `weight`)) +  
  geom_bar(stat="identity", fill=styles.color_grey) +  
  ylab("Weighted count")
```

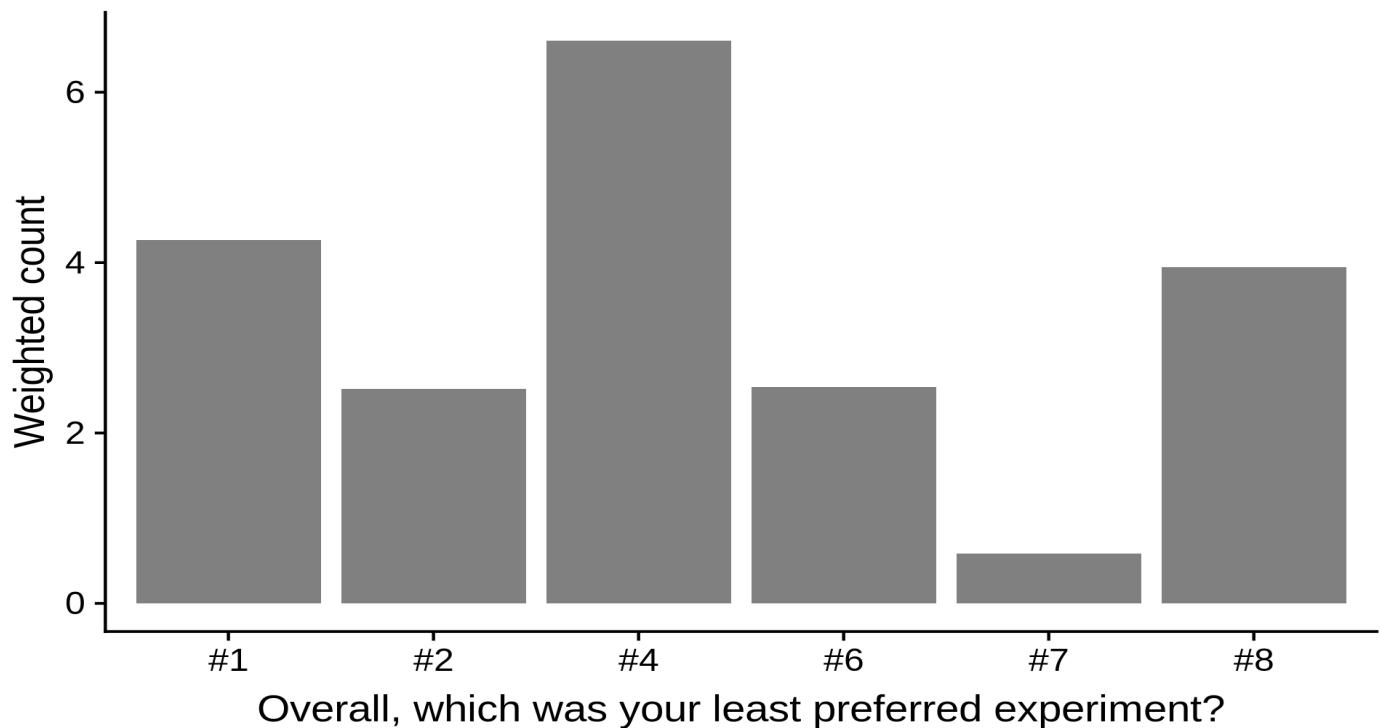


```
kable(xtabs(`weight` ~ `Overall, which was your most preferred experiment?`, data=feedback.with_weights), col.names = c("Most preferred Exp", "Count"))
```

Most preferred Exp	Count
#1	5.023257
#2	1.390666
#3	7.363726
#4	0.000000

Most preferred Exp	Count
#5	3.942898
#6	0.000000
#7	1.555085
#8	1.192840

```
#kable(aggregate(weight ~ `Overall, which was your most
preferred experiment?`, feedback.with_weights, sum))
ggplot(feedback.with_weights, aes(x = `Overall, which was your
least preferred experiment?`, y= `weight`)) +
  geom_bar(stat="identity", fill=styles.color_grey) +
  ylab("Weighted count")
```



```
kable(xtabs(weight ~ `Overall, which was your least preferred
experiment?`, data = feedback.with_weights), col.names =
c("Least preferred Exp", "Count"))
```

Least preferred Exp	Count
#1	4.2686280
#2	2.5142193
#3	0.0000000

Least preferred Exp	Count
#4	6.6074773
#5	0.0000000
#6	2.5419811
#7	0.5879894
#8	3.9481774

With weighting based on population demographics, experiment #1 happens to take the second place for both the most preferred and least preferred experiment. In addition to this, experiment #8 becomes less popular by ranking 3rd amongst the least preferred results.

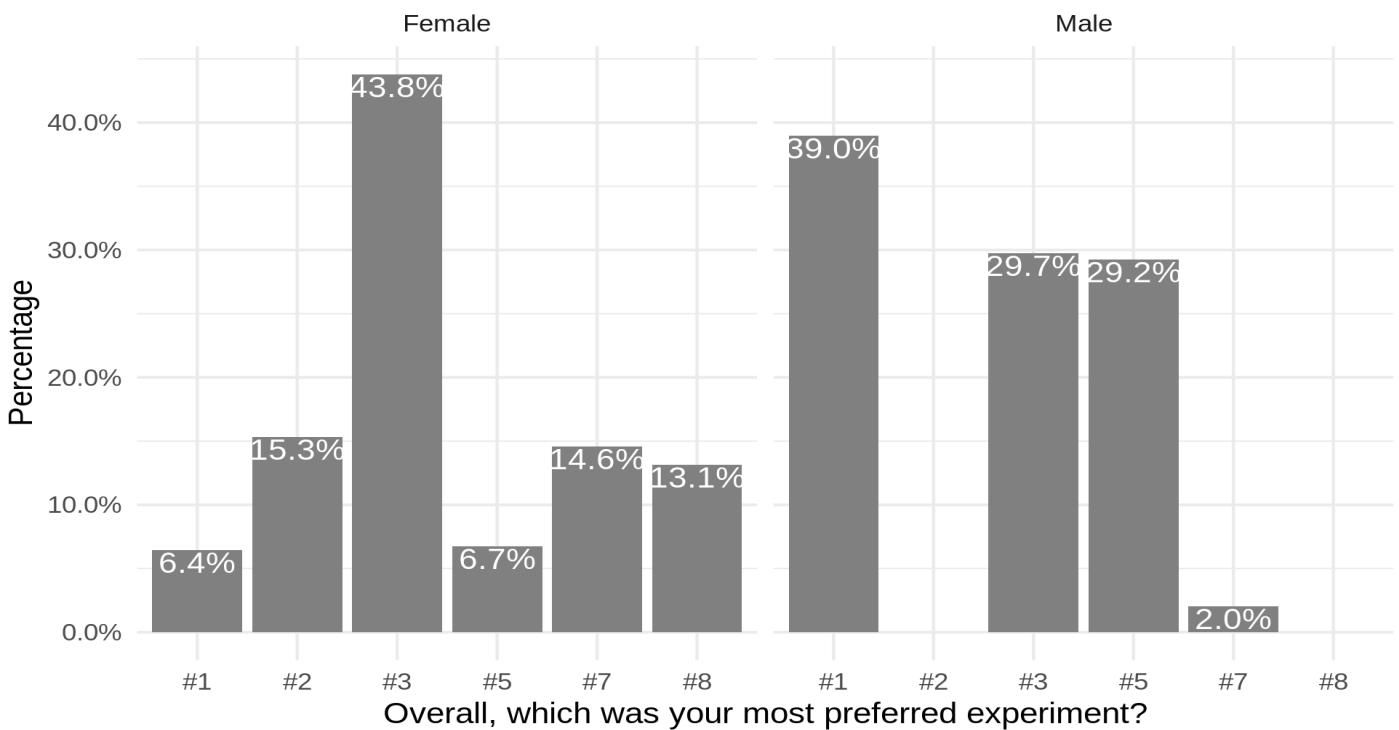
```
feedback.m_preferred_exp <- aggregate(weight ~ `Overall, which
was your most preferred experiment?` + `Your gender`,
feedback.with_weights, sum)
feedback.m_preferred_exp <- feedback.m_preferred_exp %>%
  group_by(`Your gender`) %>% mutate(weight_pc =
  weight/sum(weight))
kable(feedback.m_preferred_exp)
```

Overall, which was your most preferred experiment?	Your gender	weight	weight_pc
#1	Female	0.5834226	0.0642907
#2	Female	1.3906661	0.1532456
#3	Female	3.9750450	0.4380335
#5	Female	0.6102901	0.0672514
#7	Female	1.3224872	0.1457326
#8	Female	1.1928405	0.1314461
#1	Male	4.4398343	0.3896738
#3	Male	3.3886811	0.2974165
#5	Male	3.3326075	0.2924951
#7	Male	0.2325981	0.0204146

```

ggplot(feedback.m_preferred_exp, aes(x = `Overall, which was
your most preferred experiment?`, y = weight_pc, group = `Your
gender`)) + geom_bar(stat="identity", fill=styles.color_grey,
aes(y = weight_pc, fill = factor(..x..))) + facet_grid(~`Your
gender`) +
geom_text(aes( label = scales::percent(weight_pc), y= weight_pc
), stat= "identity", vjust = 1.125, color = "white") +
scale_y_continuous(labels=percent) +
ylab("Percentage") +
theme_minimal()

```



With population weighting the lack of a clear second place spot for preferred experiment amongst the female participants has been replaced by a definite cascade of preference with experiment #2 taking second position. For the male participants, weighting has led to experiment #1 being the most popular.

```

feedback.l_preferred_exp <- aggregate(weight ~ `Overall, which
was your least preferred experiment?` + `Your gender`,
feedback.with_weights, sum)
feedback.l_preferred_exp <- feedback.l_preferred_exp %>%
  group_by(`Your gender`) %>% mutate(weight_pc =
  weight/sum(weight))
kable(feedback.l_preferred_exp)

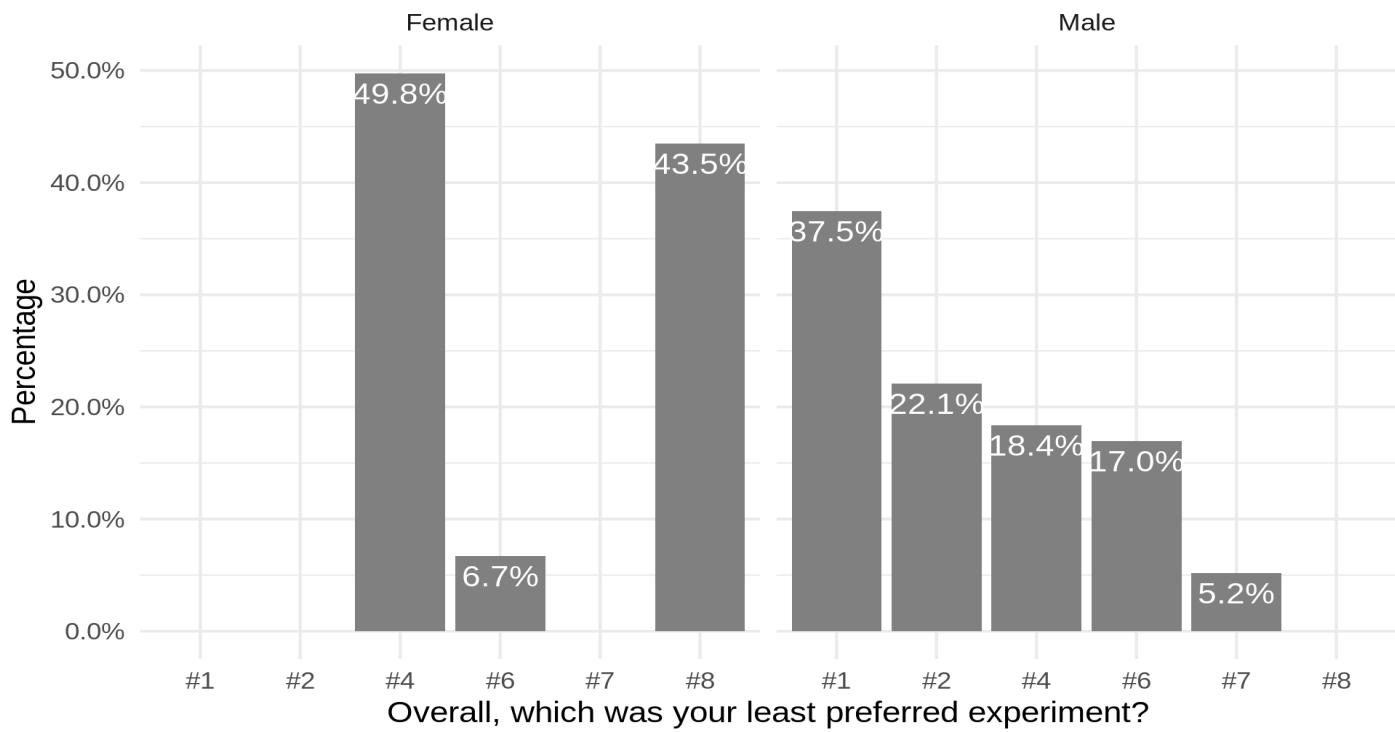
```

---

**Overall, which was****your least preferred****Your gender****experiment?**

		<b>weight</b>	<b>weight_pc</b>
#4	Female	4.5162839	0.4976758
#6	Female	0.6102901	0.0672514
#8	Female	3.9481774	0.4350728
#1	Male	4.2686280	0.3746474
#2	Male	2.5142193	0.2206671
#4	Male	2.0911934	0.1835391
#6	Male	1.9316910	0.1695400
#7	Male	0.5879894	0.0516064

```
ggplot(feedback.l_preferred_exp, aes(x = `Overall, which was
  your least preferred experiment?`, y = weight_pc, group =
  `Your gender`)) + geom_bar(stat="identity",
  fill=styles.color_grey, aes(y = weight_pc, fill =
  factor(..x..))) + facet_grid(~`Your gender`) + geom_text(aes(
  label = scales::percent(weight_pc), y = weight_pc ), stat=
  "identity", vjust = 1.5, color = "white") +
  scale_y_continuous(labels=percent) +
  ylab("Percentage") +
  theme_minimal()
```



Population weighting has only had the slightest effect on the results for the female participants' least preferred experiment but it does adjust the results enough such that experiments #4 and #8 are no longer at an equal level; now, #4 (Social Media only) is least preferred just ahead of #8, the most complex experiment. For male participants the weighting causes experiment #1 to become least preferred.

The fact that for the males' responses, experiment #1 is both most preferred and least preferred experiment seems like an anomalous result; however if it's not, it negates the possibility of experiment #1 being a meaningful result either way. What this highlights is that using these two basic metrics is not enough to determine a clear picture of not just which experiments are at the top or bottom of the scale but also how to determine the popularity of the experiments in between.

## Adjusting age group subset for sample size disparity

Because the population weighting has such a dramatic effect given the use of large weightings in conjunction with small sample sizes, it's worth looking at creating larger groups with more equal sample subset sizes. Given the total sample size is twenty-three, having four sample subsets, consisting of six, seven, five, and five participants respectively should provide more balanced results; these new age groupings will be 18-29, 30-34, 35-44, and 45+.

```
feedback.adjusted_age_groups <- feedback.with_weights
feedback_age_group_18_29 <-
  filter(feedback.adjusted_age_groups, `Your age range` == "18-24" | `Your age range` == "25-29")
```

```

feedback_age_group_18_29$`Your age range` <- "18-29"
feedback_age_group_30_34 <-
  filter(feedback.adjusted_age_groups, `Your age range` == "30-
  34")
feedback_age_group_30_34$`Your age range` <- "30-34"
feedback_age_group_35_44 <-
  filter(feedback.adjusted_age_groups, `Your age range` == "35-
  39" | `Your age range` == "40-44")
feedback_age_group_35_44$`Your age range` <- "35-44"
feedback_age_group_45_plus <-
  filter(feedback.adjusted_age_groups, `Your age range` == "45-
  49" | `Your age range` == "50+")
feedback_age_group_45_plus$`Your age range` <- "45+"
feedback.adjusted_age_groups <- rbind(feedback_age_group_18_29,
  feedback_age_group_30_34, feedback_age_group_35_44,
  feedback_age_group_45_plus)
feedback.adjusted_age_groups$`Your age range` <-
  factor(feedback.adjusted_age_groups$`Your age range`, c("18-
  29", "30-34", "35-44", "45+"))

rm(feedback_age_group_18_29, feedback_age_group_30_34,
  feedback_age_group_35_44, feedback_age_group_45_plus)

```

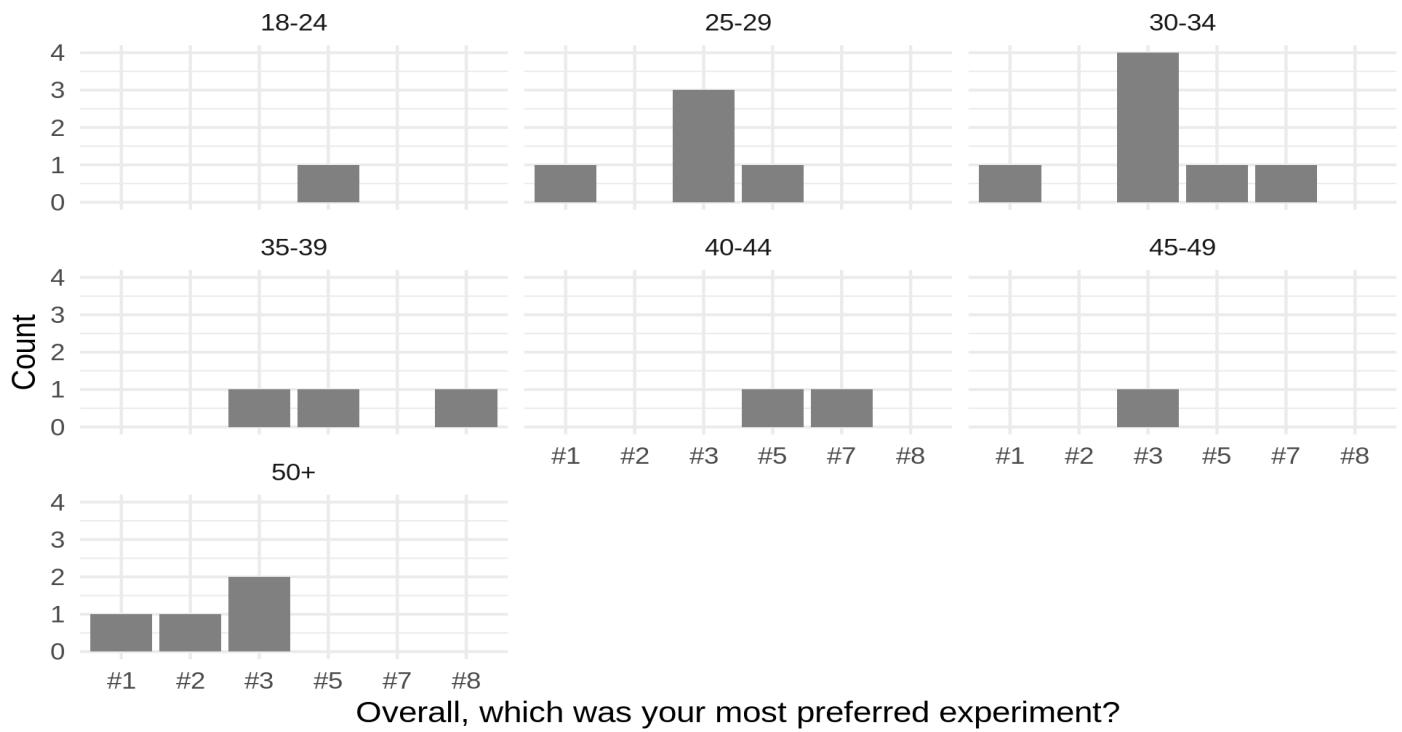
To see if there's any benefit for creating larger subsets for age groups we first need to use the original groupings in order to compare and contrast.

## Preferred experiments by age group

```

ggplot(feedback.formatted, aes(x = `Overall, which was your
most preferred experiment?`)) + geom_bar(stat="count",
fill=styles.color_grey) + facet_wrap(~`Your age range`) +
ylab("Count") + theme_minimal()

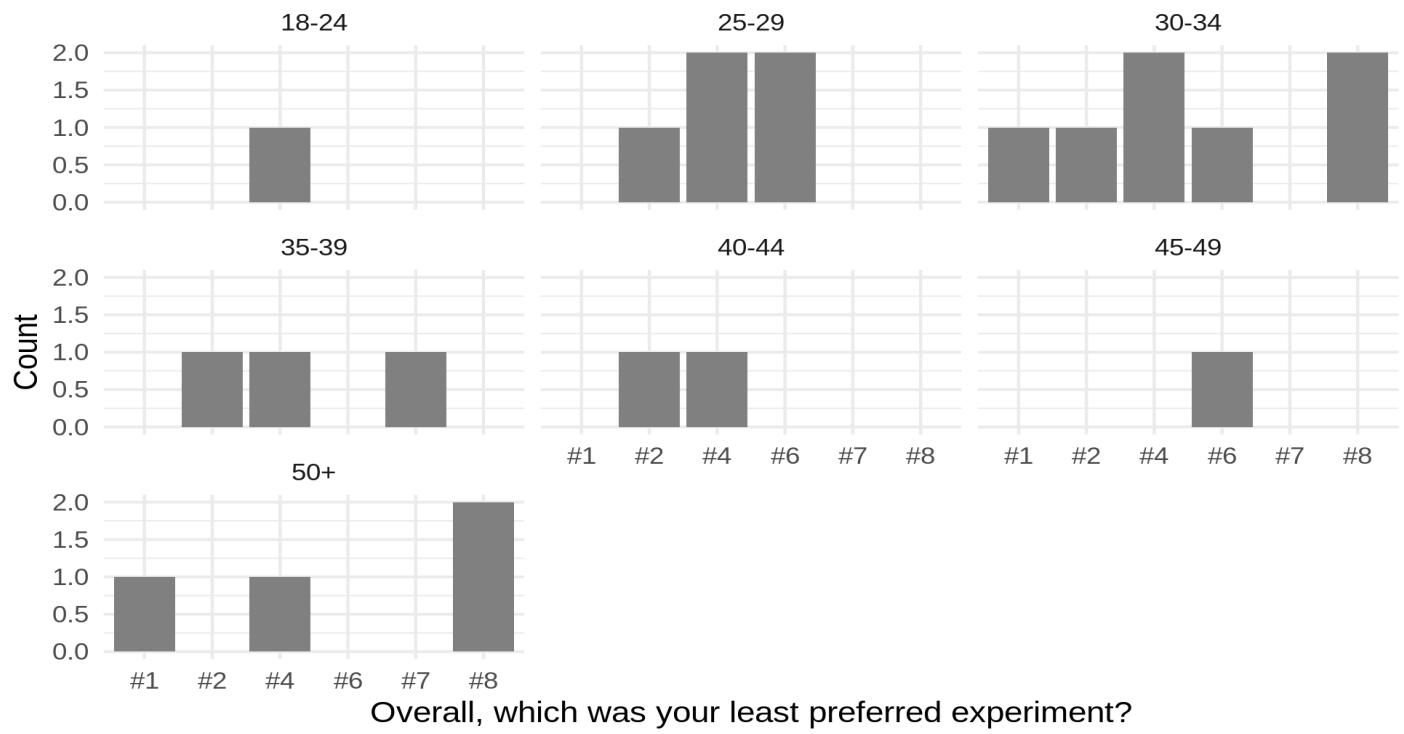
```



While experiment #3 is the most popular experiment, when the results are broken down into age group some extra detail emerges; it would appear that the shorter interaction experiences, like #1 (baseline), #2 (Augmented Reality), and #3 (Loyalty Reward) are preferred more by the older age groups, while longer experiences which include Augmented Reality, like #5 (Augmented Reality, Loyalty Reward) and #7 (Loyalty Reward, Social) are better received by younger demographics. It is worth noting however that the baseline experiment received votes from the 25-29 and 30-34 age groups as well as the 50+ age group and all three groups showed a distinct preference for the Loyalty Reward only experiment (#3).

## Least preferred experiments by age group

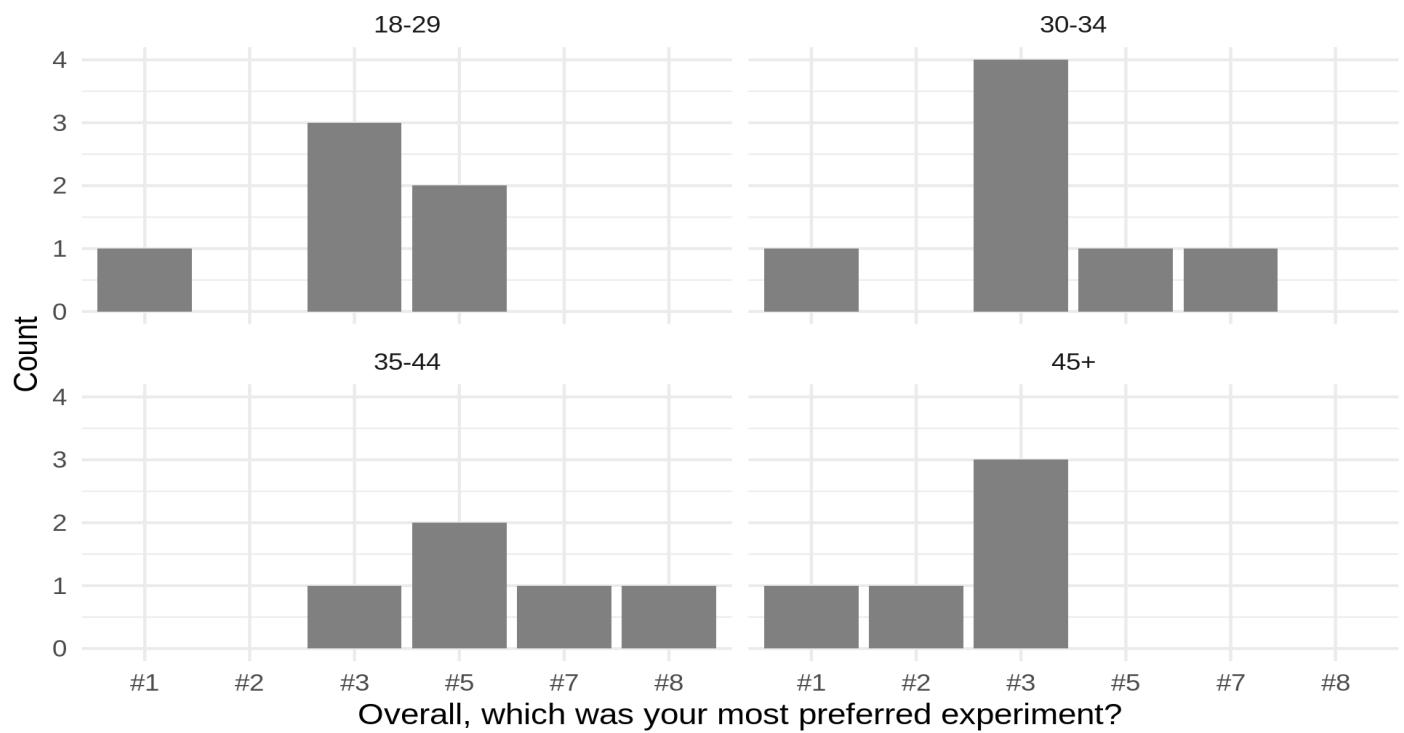
```
ggplot(feedback.formatted, aes(x = `Overall, which was your least preferred experiment?`)) + geom_bar(stat="count", fill=styles.color_grey) + facet_wrap(~`Your age range`) + ylab("Count") + theme_minimal()
```



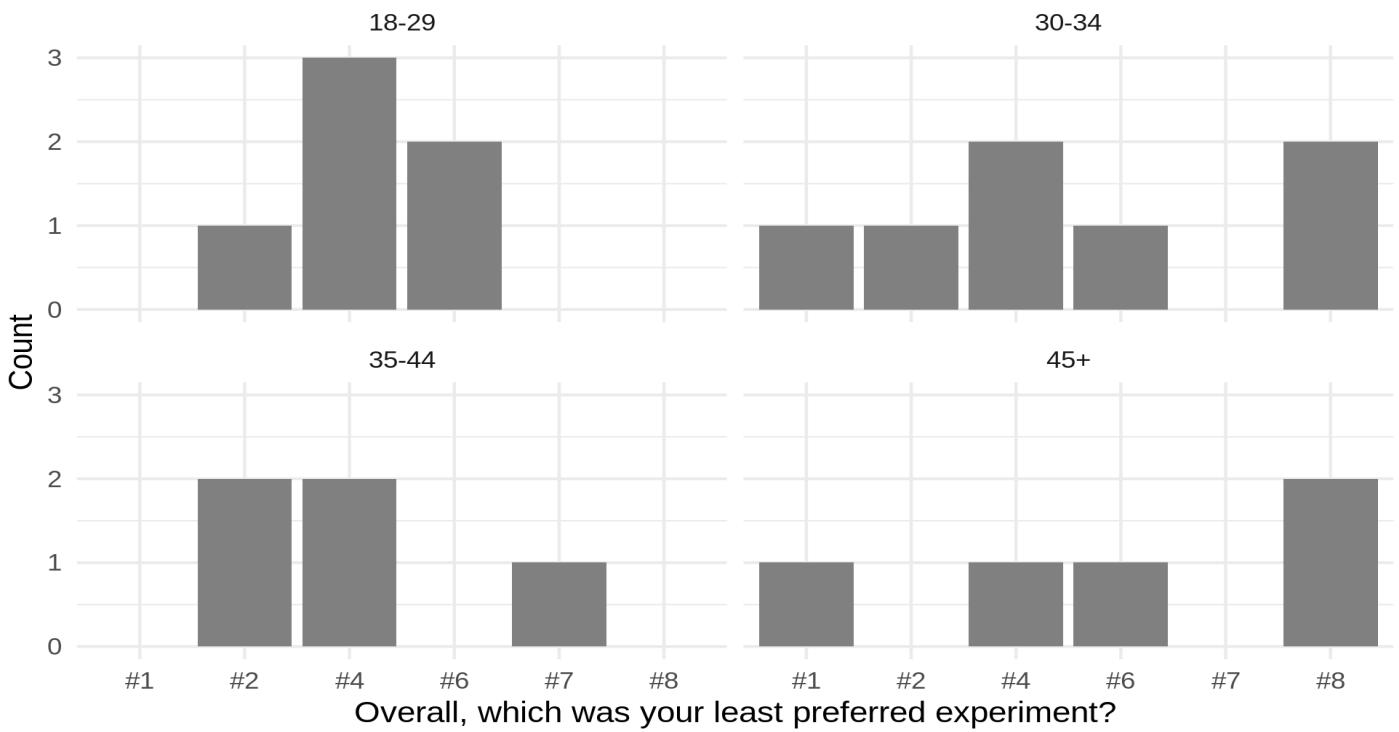
The results for the least preferred experiment experiences is more divergent within age groups than the preferred, with only one age group with more than one participant having a definitive answer for least preferred; in the 50+ demographic, experiment #8 had the highest number of votes for most disliked experiment. It's worth reiterating at this point that experiment #8 is the longest, most involving experience, incorporating all possible elements into the simulated advertising interaction (Loyalty Reward, Augmented Reality, Social Media). Experiment #8 was also joint top for least preferred experiment amongst the 30-34 age group, further suggesting the possibility of some underlying commonality between these two demographics; within the 30-34 age group, the other experiment voted to be least preferred was #4 (Social Media only) which is represented in all age groups bar the 45-49 age group, coming joint top in the remaining age groups.

# Most and Least preferred experiments by age group, adjust for age group sample sizes.

```
ggplot(feedback.adjusted_age_groups, aes(x = `Overall, which was your most preferred experiment?`)) +  
  geom_bar(stat="count", fill=styles.color_grey) +  
  facet_wrap(~`Your age range`) + ylab("Count") +  
  theme_minimal()
```



```
ggplot(feedback.adjusted_age_groups, aes(x = `Overall, which was your least preferred experiment?`)) +  
  geom_bar(stat="count", fill=styles.color_grey) +  
  facet_wrap(~`Your age range`) + ylab("Count") +  
  theme_minimal()
```



With the use of amalgamated age groups with more even sample sizes, the data doesn't present any different results as such, it's just that the findings are easier to read.

## Most and least preferred experiments adjusted for population weighting and aggregated age groups

```
feedback.m_preferred_exp_age <- aggregate(weight ~ `Overall,
  which was your most preferred experiment?` + `Your age range`,
  feedback.adjusted_age_groups, sum)
feedback.m_preferred_exp_age <- feedback.m_preferred_exp_age
%>% group_by(`Your age range`) %>% mutate(weight_pc =
  weight/sum(weight))
kable(feedback.m_preferred_exp_age)
```

---

Overall, which was your most preferred experiment?	Your age range	weight	weight_pc
#1	18-29	0.4038044	0.1105046
#3	18-29	1.4178990	0.3880205
#5	18-29	1.8324828	0.5014749
#1	30-34	0.5834226	0.2504136

---

---

**Overall, which was your most preferred experiment?**

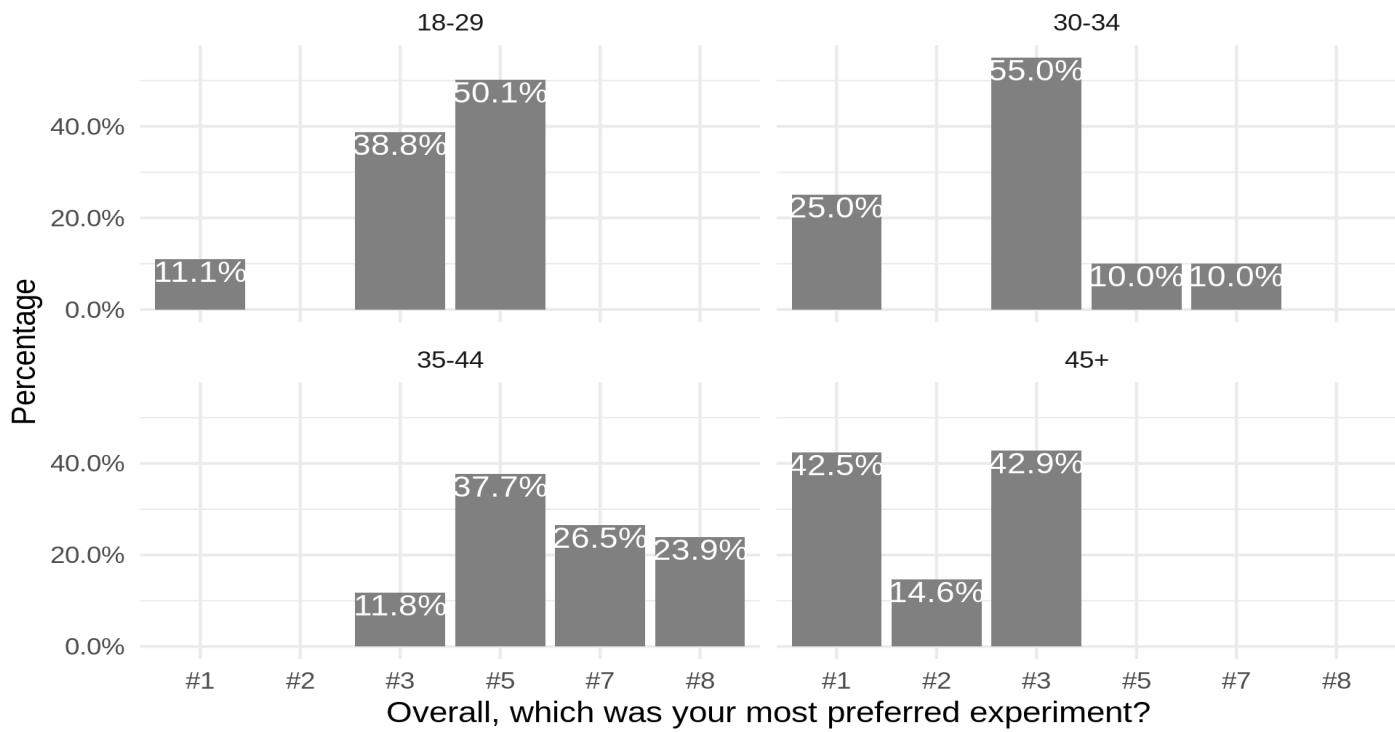
	Your age range	weight	weight_pc
#3	30-34	1.2812170	0.5499173
#5	30-34	0.2325981	0.0998346
#7	30-34	0.2325981	0.0998346
#3	35-44	0.5879894	0.1180433
#5	35-44	1.8778167	0.3769858
#7	35-44	1.3224872	0.2654992
#8	35-44	1.1928405	0.2394717
#1	45+	4.0360299	0.4246970
#2	45+	1.3906661	0.1463348
#3	45+	4.0766207	0.4289682

---

```

ggplot(feedback.m_preferred_exp_age, aes(x = `Overall, which
was your most preferred experiment?`, y = weight_pc, group =
`Your age range`)) +
geom_histogram(stat="identity", fill=styles.color_grey, aes(y =
weight_pc, fill = factor(..x..))) + facet_wrap(~`Your age
range`) +
geom_text(aes( label = scales::percent(weight_pc), y= weight_pc
), stat= "identity", vjust = 1.125, color = "white") +
scale_y_continuous(labels=percent) +
ylab("Percentage") +
theme_minimal()

```



```
feedback.l_preferred_exp_age <- aggregate(weight ~ `Overall,
  which was your least preferred experiment?` + `Your age
  range`, feedback.adjusted_age_groups, sum)
feedback.l_preferred_exp_age <- feedback.l_preferred_exp_age
  %>% group_by(`Your age range`) %>% mutate(weight_pc =
  weight/sum(weight))
kable(feedback.l_preferred_exp_age)
```

---

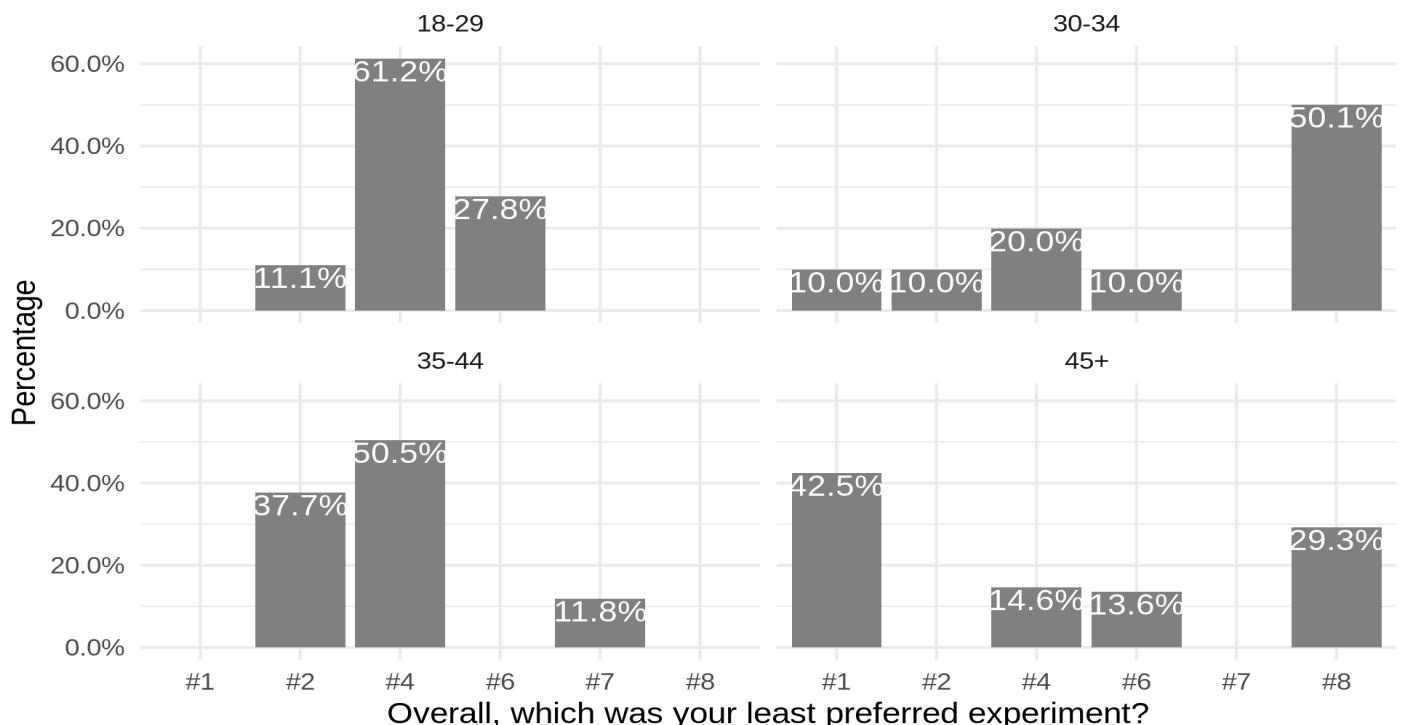
Overall, which was your least preferred experiment?	Your age range	weight	weight_pc
#2	18-29	0.4038044	0.1105046
#4	18-29	2.2362872	0.6119795
#6	18-29	1.0140946	0.2775158
#1	30-34	0.2325981	0.0998346
#2	30-34	0.2325981	0.0998346
#4	30-34	0.4651963	0.1996691
#6	30-34	0.2325981	0.0998346
#8	30-34	1.1668451	0.5008272
#2	35-44	1.8778167	0.3769858

---

## Overall, which was your least preferred experiment?

	Your age range	weight	weight_pc
#4	35-44	2.5153277	0.5049709
#7	35-44	0.5879894	0.1180433
#1	45+	4.0360299	0.4246970
#4	45+	1.3906661	0.1463348
#6	45+	1.2952884	0.1362986
#8	45+	2.7813323	0.2926696

```
ggplot(feedback.l_preferred_exp_age, aes(x = `Overall, which was your least preferred experiment?`, y = weight_pc, group = `Your age range`)) +
  geom_histogram(stat="identity", fill=styles.color_grey, aes(y = weight_pc, fill = factor(..x..))) + facet_wrap(~`Your age range`) +
  geom_text(aes( label = scales::percent(weight_pc), y= weight_pc ), stat= "identity", vjust = 1.125, color = "white") +
  scale_y_continuous(labels=percent) +
  ylab("Percentage") +
  theme_minimal()
```



Once weighting is applied across age groups, with different weightings applied to genders within age groups, some interesting results surface: within the 18-29 and 35-44 age groups that preference for experiment #5 and the dislike for #4 prevail; in juxtaposition to this, the 30-34 and 45+ age groups seem to share traits in as much that experiment #8 is especially unpopular within these age groups and experiment #3 is a leader within the preferred experiments for both groups.

# Most preferred results for age and gender demographics

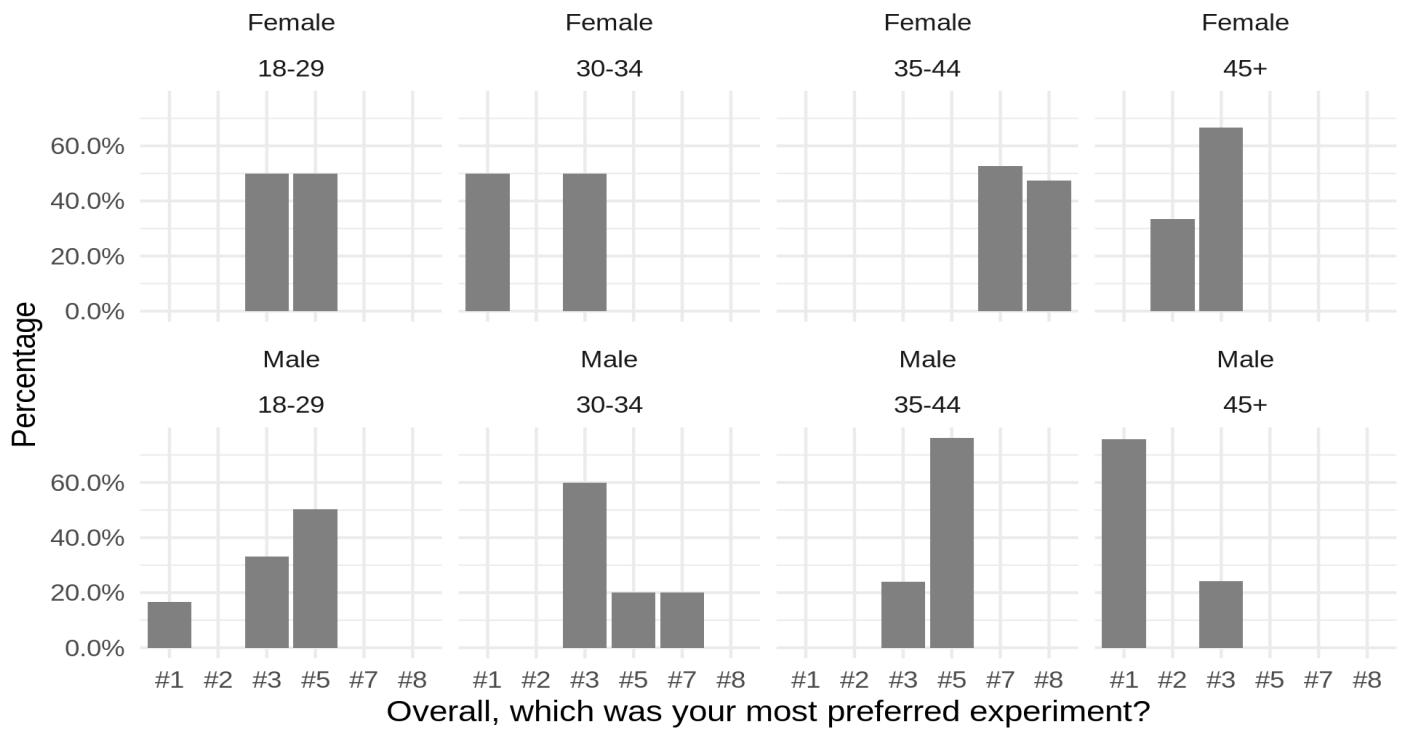
After the previous interrogation into the findings culminating from the feedback, it's worth looking at which experiment experiences are received most positively by the particular demographics recorded in the study. In other words, the following analysis will examine the efficacy of the experiments within the targeted subsets that are the cross sections between age groups and gender.

```
feedback.m_preferred_exp_age_gender <- aggregate(weight ~  
`Overall, which was your most preferred experiment?` + `Your  
age range` + `Your gender`, feedback.adjusted_age_groups, sum)  
feedback.m_preferred_exp_age_gender <-  
feedback.m_preferred_exp_age_gender %>% group_by(`Your  
gender`, `Your age range`) %>% mutate(weight_pc =  
weight/sum(weight))  
kable(feedback.m_preferred_exp_age_gender, format = 'markdown')
```

Overall, which was your most preferred experiment?	Your age range	Your gender	weight	weight_pc
#3	18-29	Female	0.61029 01	0.50000 00
#5	18-29	Female	0.61029 01	0.50000 00
#1	30-34	Female	0.58342 26	0.50000 00
#3	30-34	Female	0.58342 26	0.50000 00
#7	35-44	Female	1.32248 72	0.52577 13
#8	35-44	Female	1.19284 05	0.47422 87
#2	45+	Female	1.39066 61	0.33333 33

Overall, which was your most preferred experiment?	Your age range	Your gender	weight	weight_pc
#3	45+	Female	2.78133	0.66666
			23	67
#1	18-29	Male	0.40380	0.16592
			44	84
#3	18-29	Male	0.80760	0.33185
			89	69
#5	18-29	Male	1.22219	0.50221
			26	47
#3	30-34	Male	0.69779	0.60000
			44	00
#5	30-34	Male	0.23259	0.20000
			81	00
#7	30-34	Male	0.23259	0.20000
			81	00
#3	35-44	Male	0.58798	0.23845
			94	73
#5	35-44	Male	1.87781	0.76154
			67	27
#1	45+	Male	4.03602	0.75704
			99	16
#3	45+	Male	1.29528	0.24295
			84	84

```
ggplot(feedback.m_preferred_exp_age_gender, aes(x = `Overall,
  which was your most preferred experiment?`, y = weight_pc,
  group = `Your age range` + `Your gender`)) +
  geom_histogram(stat="identity", fill=styles.color_grey, aes(y =
  weight_pc, fill = factor(..x..))) +
  facet_wrap(~`Your gender` + ~`Your age range`, ncol = 4) +
  scale_y_continuous(labels=percent) +
  ylab("Percentage") +
  theme_minimal()
```



What these results appear to indicate is that in the 18-29 age group, experiment #5 is most popular followed by #3 which is equally popular for females within this age group; #3 is the clear winner among those in the 30-34 year olds with the baseline #1 in joint place for females; in the 35-44 year group there are distinct differences between male and female groups with #5 being a clear winner with males but #7 just beating #8 for females; lastly, in the 45+ group males generally prefer #1 but #3 is the overall winner for both genders in this demographic.

# Comparing facets of the experiments

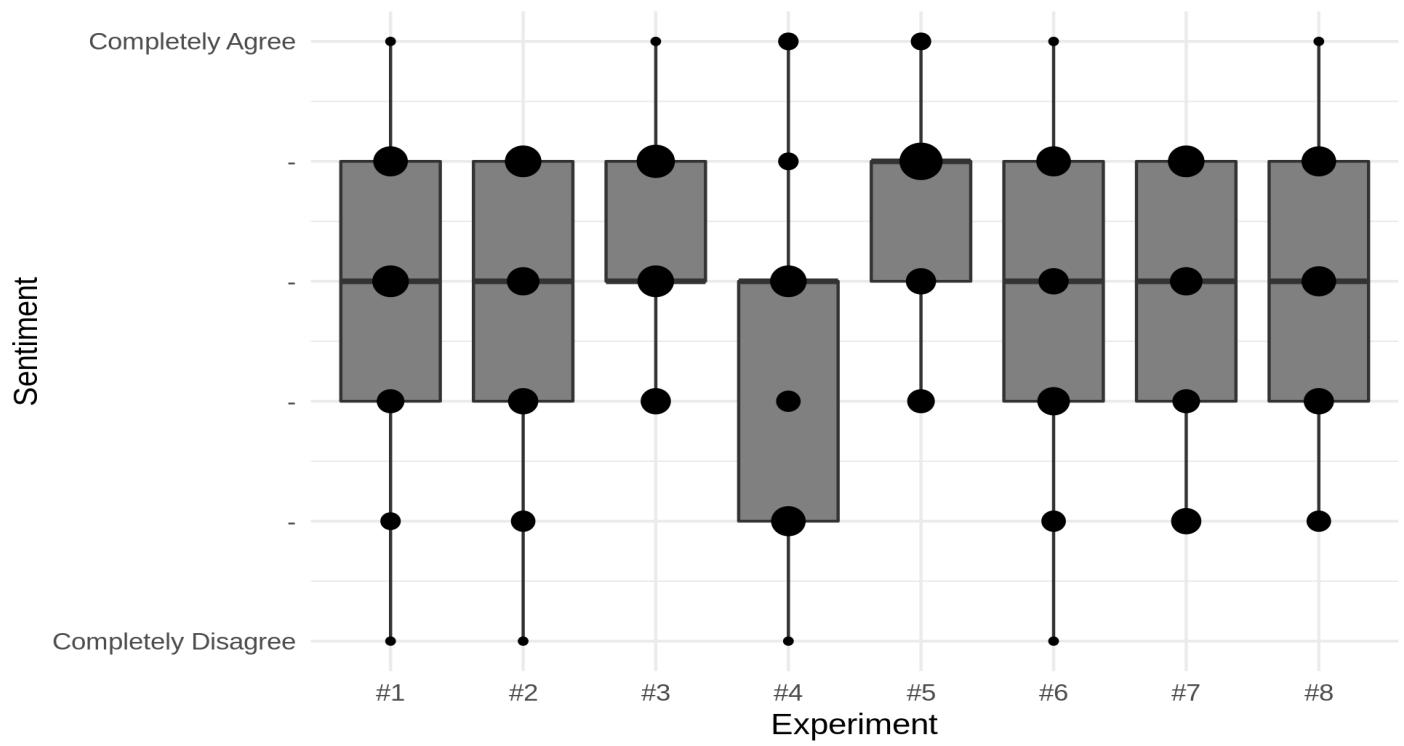
---

Another way that is possible to look at the feedback data from the participants is to assess their answers to individual questions about the qualities of the experiment experiences. Each experiment was subject to the same questions as consequently the experiments can be compared against these questions. This is helpful to get some more granular insight into the characteristics manifested by each experiment composition.

The following data representation uses box plots coupled with point counts to plot the sentiments of the participants. The points indicate individual scoring while the box plot candlesticks help identify the range and median of those scores which is helpful when comparing scores between experiments.

## Facet: I found the experience enjoyable

```
feedback.facet_enjoyable <-  
  select(feedback.adjusted_age_groups, starts_with("I found the  
experience enjoyable"))  
  
ggplot(melt(feedback.facet_enjoyable), aes(x = variable, y =  
  value)) +  
  geom_boxplot(fill=styles.color_grey) +  
  geom_count(show.legend=F) +  
  xlab("Experiment") +  
  ylab("Sentiment") +  
  scale_x_discrete(labels = c(paste('#', 1:8, sep = ''))) +  
  scale_y_continuous(labels = c('0' = "Completely Disagree", '1'  
  = "-", '2' = "-", '3' = "-", '4' = "-", '5' = "Completely  
  Agree")) +  
  theme_minimal()
```

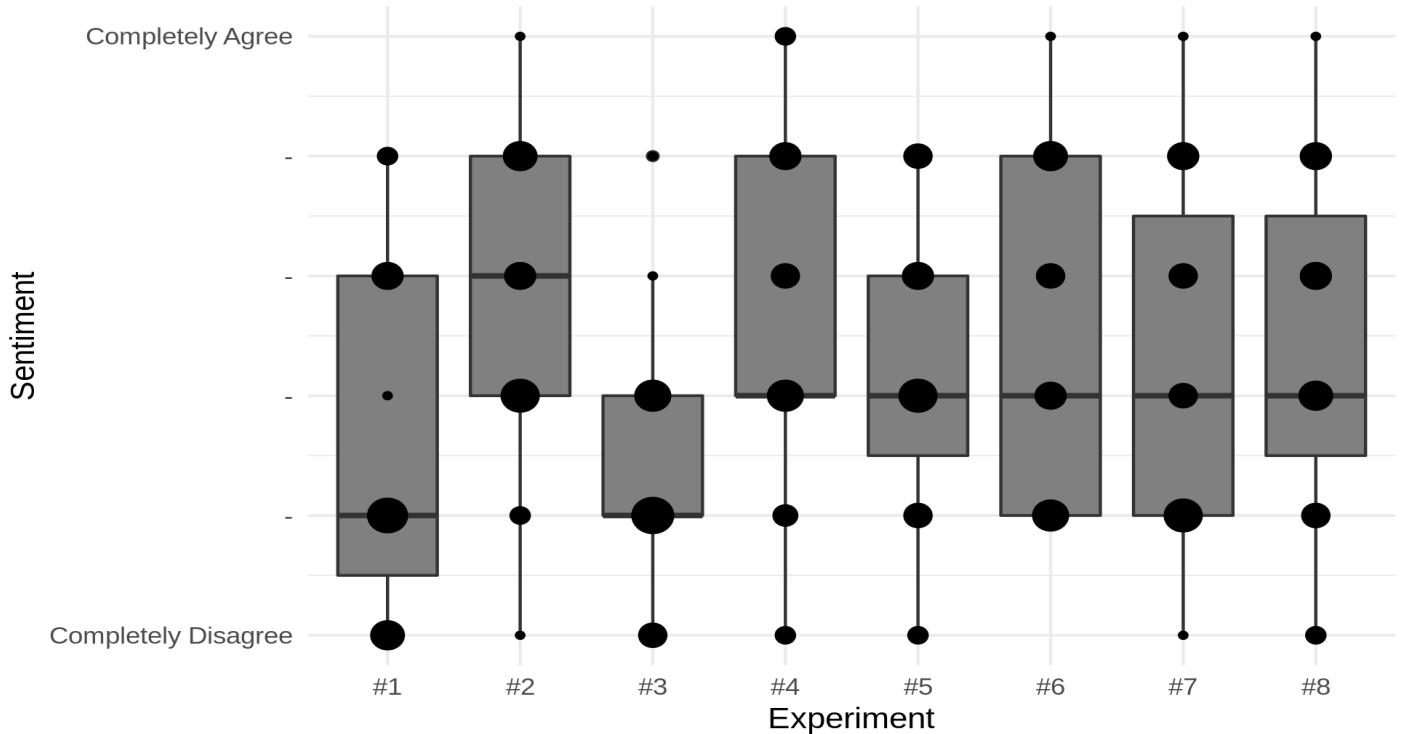


Experiments #1, #2, #6, #7, and #8 all score similarly with regards to the idea of enjoyability. Experiment #4 (Social Media) has a large variation but whilst its median is middling on the scale, the trend is negative. Experiments #3 (Loyalty Reward) and #5 (Loyalty Reward, Augmented Reality) have the most positive results with ranges that are mostly positive and very much skewed to the top end. With greater inspection it appears that #5 is considered most enjoyable because the candlestick median line is the highest of all experiments, just one below the maximum value on the scale.

# Facet: I found the experience annoying

```
feedback.facet_annothing <- select(feedback.adjusted_age_groups,  
  starts_with("I found the experience annoying"))
```

```
ggplot(melt(feedback.facet_annothing), aes(x = variable, y =  
  value)) +  
  geom_boxplot(fill=styles.color_grey) +  
  geom_count(show.legend=F) +  
  xlab("Experiment") +  
  ylab("Sentiment") +  
  scale_x_discrete(labels = c(paste('#', 1:8, sep = ' '))) +  
  scale_y_continuous(labels = c("Completely Disagree", "-",  
    "-", "-", "Completely Agree")) +  
  theme_minimal()
```



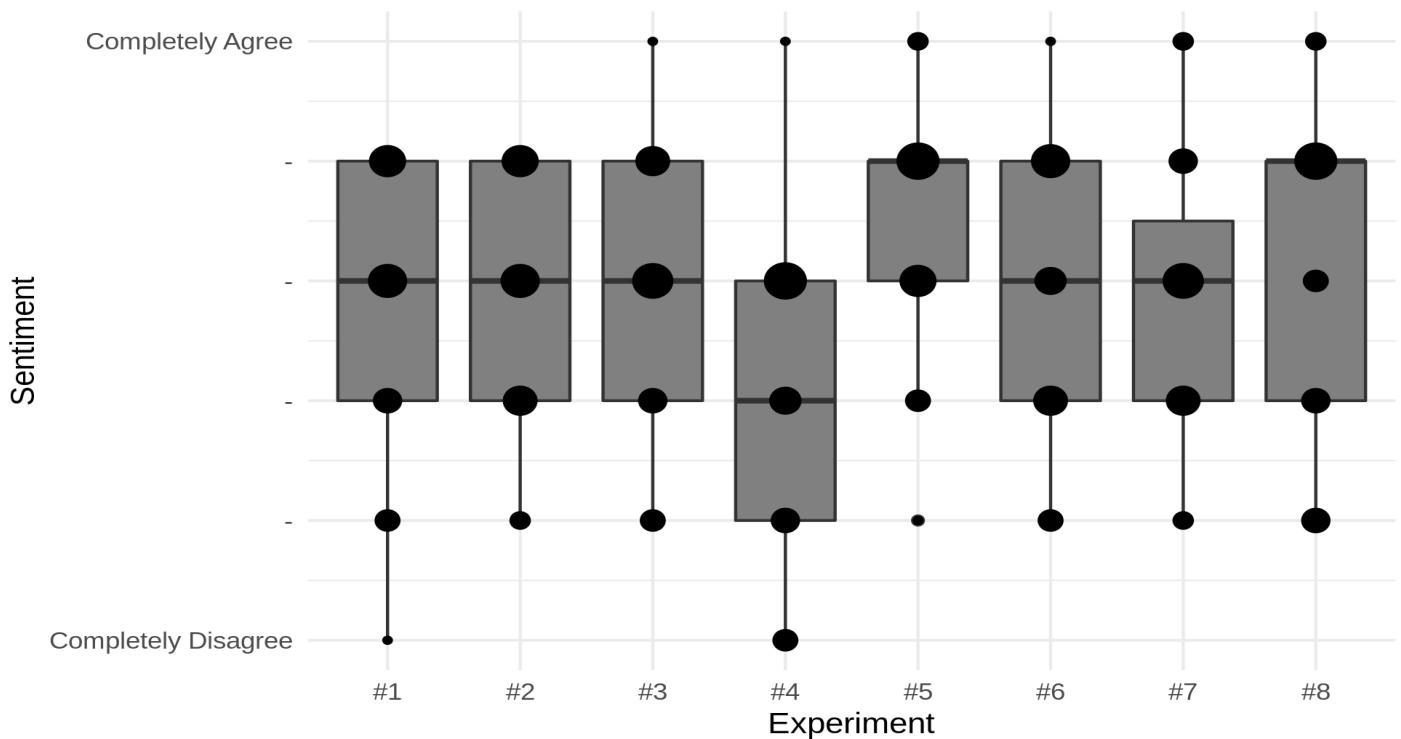
With regards to the characteristic of being annoying, there is quite a lot of variation between experiment as well as a large degree of range displayed by the candlesticks. Looking at the lowest median lines, experiments #1 (baseline) and #3 (Loyalty Reward) were considered least annoying, with median lines drawn at the second lowest position on the scale; experiment #1 has a longer candlestick, indicating more variation in participant scoring for this quality when compared to experiment #3 which is more skewed to the bottom. Occupying the middle ground in this characteristic analysis are experiments #5 (Loyalty Reward, Augmented Reality), #6 (Augmented Reality, Social Media), #7 (Loyalty Reward, Social Media), and #8 (Loyalty Reward, Augmented Reality, Social Media); of these middling results, #5 appears most

concentrated around the centre ground while #8 has quite a normal distribution. Experiment #7 has a similarly broad distribution to #8 while #6 is slightly skewed to the top end, suggesting it is the most annoying of this middle set. The most annoying experiments by participants scores are #4 (Social Media) and #2 (Augmented Reality) which are both skewed to the top end of the scale despite having ranges that reach maximum and minimum values on the spectrum. Experiment #2 has the top most median line, indicating a distribution that is a bit more skewed to the top end than #4 and as such, #2 could be considered the more annoying experiment overall.

# Facet: I found the experience engaging

```
feedback.facet_engaging <- select(feedback.adjusted_age_groups,  
  starts_with("I found the experience engaging"))
```

```
ggplot(melt(feedback.facet_engaging), aes(x = variable, y =  
  value)) +  
  geom_boxplot(fill=styles.color_grey) +  
  geom_count(show.legend=F) +  
  xlab("Experiment") +  
  ylab("Sentiment") +  
  scale_x_discrete(labels = c(paste('#', 1:8, sep = ' '))) +  
  scale_y_continuous(labels = c("Completely Disagree", "-",  
    "-", "-", "Completely Agree")) +  
  theme_minimal()
```

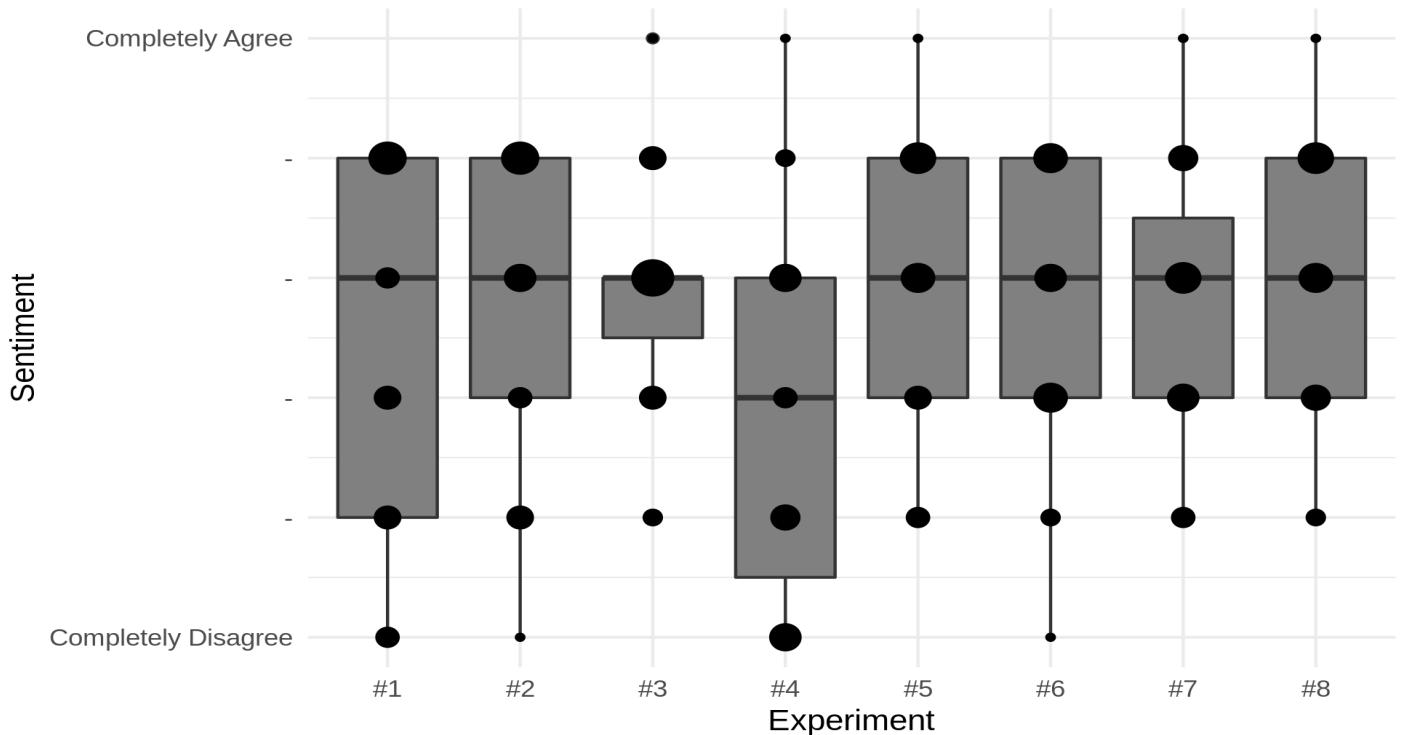


Engagement across experiments are broadly similar and skewed to higher levels of engagement. Only the Social Media only (#4) experiment has a median line in the lower half of the scale, suggesting it was the least engaging. The baseline experiment (#1) is the only experiment aside from #4 to have any participant score it at the very bottom of the scale, suggesting this is the next least engaging experiment experience. The remaining the experiments that have median lines at the lowest position of the top half of the scale are #2 (Augmented Reality), #3 (Loyalty Reward), #6 (Augmented Reality, Social Media), and #7 (Loyalty Reward, Social Media) can be grouped as the average scoring experiments; of these experiments, #2 is the only one to not have any participant give it a maximum top score, so it can be considered the

bottom of the middle set. Experiment #7 seems to be most concentrated around its median so could be seen as the most average while #3 and #6 have a very similar distributions of votes, sitting at the top of the middle set. The most engaging experiments by participant scores both have median lines that at the second highest position on the scale, though they have quite different patterns of distributions; according to the scores, experiment #8 is the second most engaging experiment experience, having more scores towards the lower half than #5, which is almost entirely scored in the top half of the scale, and thus the most engaging.

# Facet: I found the experience interesting

```
feedback.facet_interesting <-  
  select(feedback.adjusted_age_groups, starts_with("I found the  
experience interesting"))  
  
ggplot(melt(feedback.facet_interesting), aes(x = variable, y =  
  value)) +  
  geom_boxplot(fill=styles.color_grey) +  
  geom_count(show.legend=F) +  
  xlab("Experiment") +  
  ylab("Sentiment") +  
  scale_x_discrete(labels = c(paste('#', 1:8, sep = ' '))) +  
  scale_y_continuous(labels = c("Completely Disagree", "-",  
  "-", "-", "Completely Agree")) +  
  theme_minimal()
```



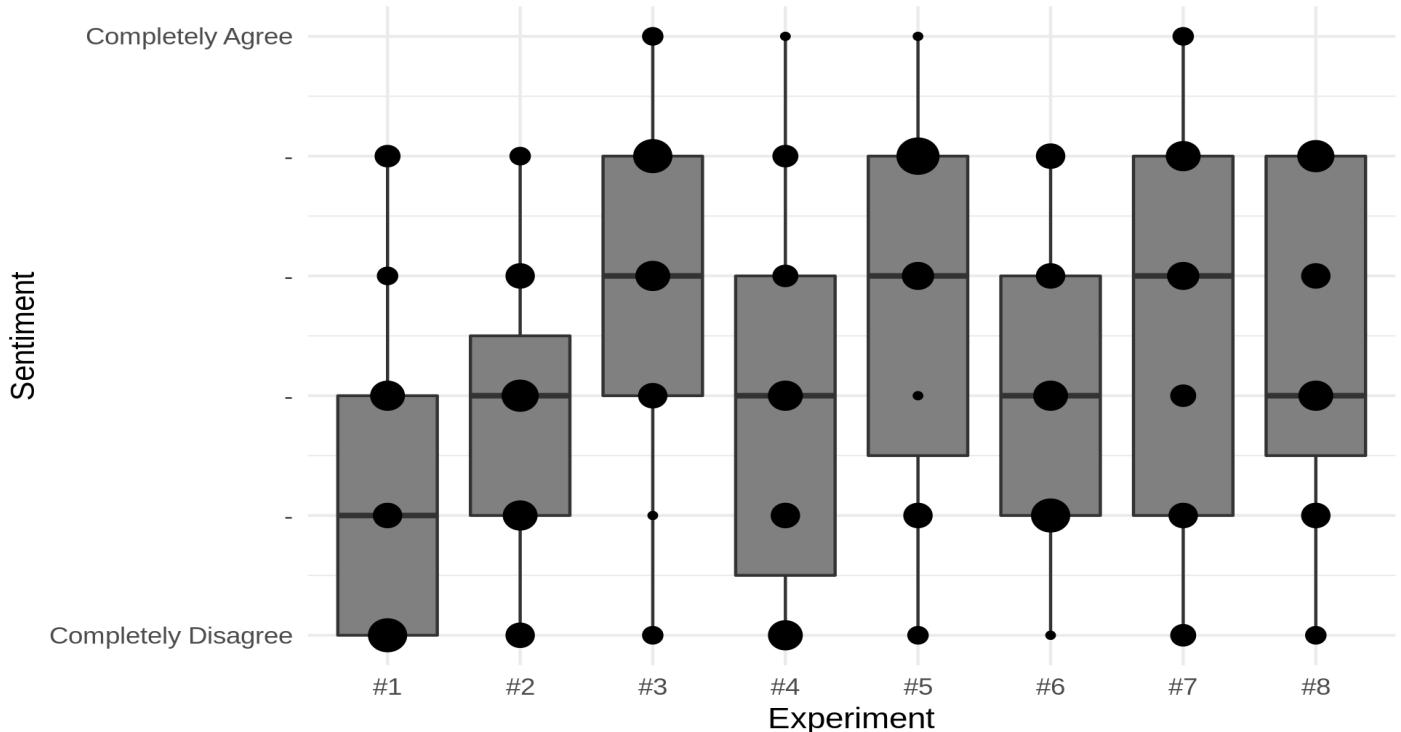
The variation of scoring between experiments for the quality of interestingness is a little more nuanced than other experiment characteristics. At first glance, because all experiments except #4 (Social Media) share the same median line position, it's not clear how most of the experiments compare with one another. Experiment #4 is the exception as it can be considered the worst performer in this category as it is the only experiment with a median line in the lower half of the sentiment axis. The baseline experiment (#1) can be considered the next least interesting thanks to having an overall candlestick skew to the bottom end of the scale. In the lower part of the average performing experiments are #2

(Augmented Reality) and #6 (Augmented Reality, Social Media), which have a similar distribution pattern for scores including the absence of a score at the top most value on the scale. Reading the box plots and points to determine the most interesting experiences is more challenging as the distribution patterns of the remaining experiments are more similar; however when looking at the quartile positions of #3 (Loyalty Reward) and #7 (Loyalty Reward, Social Media) then we can see that these candlesticks skew more to the middle of the scale when compare to #5 (Loyalty Reward, Augmented Reality) and #8 (Loyalty Reward, Augmented Reality, Social Media). Between #5 and #8 the difference is marginal but on this occasion, the experiment composed of every element has perhaps just slightly more votes towards the top end of the scale but they could ostensibly be considered more or less equally interesting.

# Facet: I found the experience to be persuasive

```
feedback.facet_persuasive <-
  select(feedback.adjusted_age_groups, starts_with("I found the
experience to be persuasive"))

ggplot(melt(feedback.facet_persuasive), aes(x = variable, y =
  value)) +
  geom_boxplot(fill=styles.color_grey) +
  geom_count(show.legend=F) +
  xlab("Experiment") +
  ylab("Sentiment") +
  scale_x_discrete(labels = c(paste('#', 1:8, sep = ' '))) +
  scale_y_continuous(labels = c("Completely Disagree", "-",
  "-", "-",
  "-", "Completely Agree")) +
  theme_minimal()
```

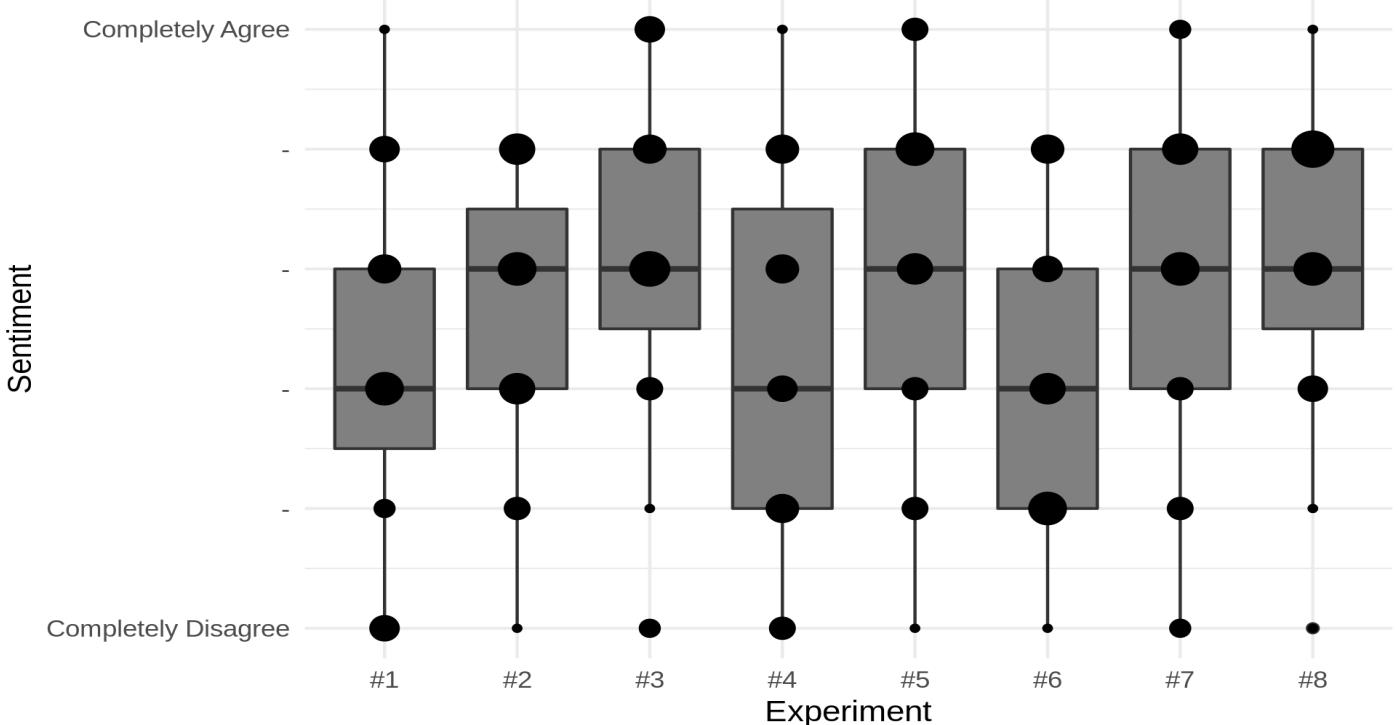


The level of variation of the median line between results for the facet of persuasiveness for each experiment is across three degrees on the sentiment axis; the #1, baseline experiment is the experiment with the lowest median line so classifying this experiment as the least persuasive is straightforward. Experiments #2 (Augmented Reality), #4 (Social Media), and #8 (Loyalty Reward, Augmented Reality, Social Media) all have distribution patterns that include a median

line that is at the top of the lower half of the scale; when taking into account the upper bounds of scores for each of these experiments, coupled with the quartile skew of the boxes, it can be ascertained that their ascending order of persuasiveness is #2, #4, #8. Experiments #3 (Loyalty Reward), #5 (Loyalty Reward, Augmented Reality), and #7 (Loyalty Reward, Social Media) share the same median line position on the scale but with visibly different first and third quartile positions that can aid ranking of these experiments. Of the three top experiments in this category, #7 has the longest candlestick box, and a distribution that comparatively leans towards the lower end of this facet, making it the third most persuasive experience. Between experiments #3 and #5, the candlestick weighting of #5 is lower than #3, making the Loyalty Reward only experiment (#3) supposedly more persuasive than the combined experience of Loyalty Reward and Augmented Reality (#5).

# Facet: The experience connected me with the brand

```
feedback.facet_brand <- select(feedback.adjusted_age_groups,  
  starts_with("The experience connected me with the brand?"))  
  
ggplot(melt(feedback.facet_brand), aes(x = variable, y =  
  value)) +  
geom_boxplot(fill=styles.color_grey) +  
geom_count(show.legend=F) +  
#scale_size_area() +  
xlab("Experiment") +  
ylab("Sentiment") +  
scale_x_discrete(labels = c(paste('#', 1:8, sep = ' '))) +  
scale_y_continuous(labels = c("Completely Disagree", "-",  
  "-", "-", "Completely Agree")) +  
theme_minimal()
```

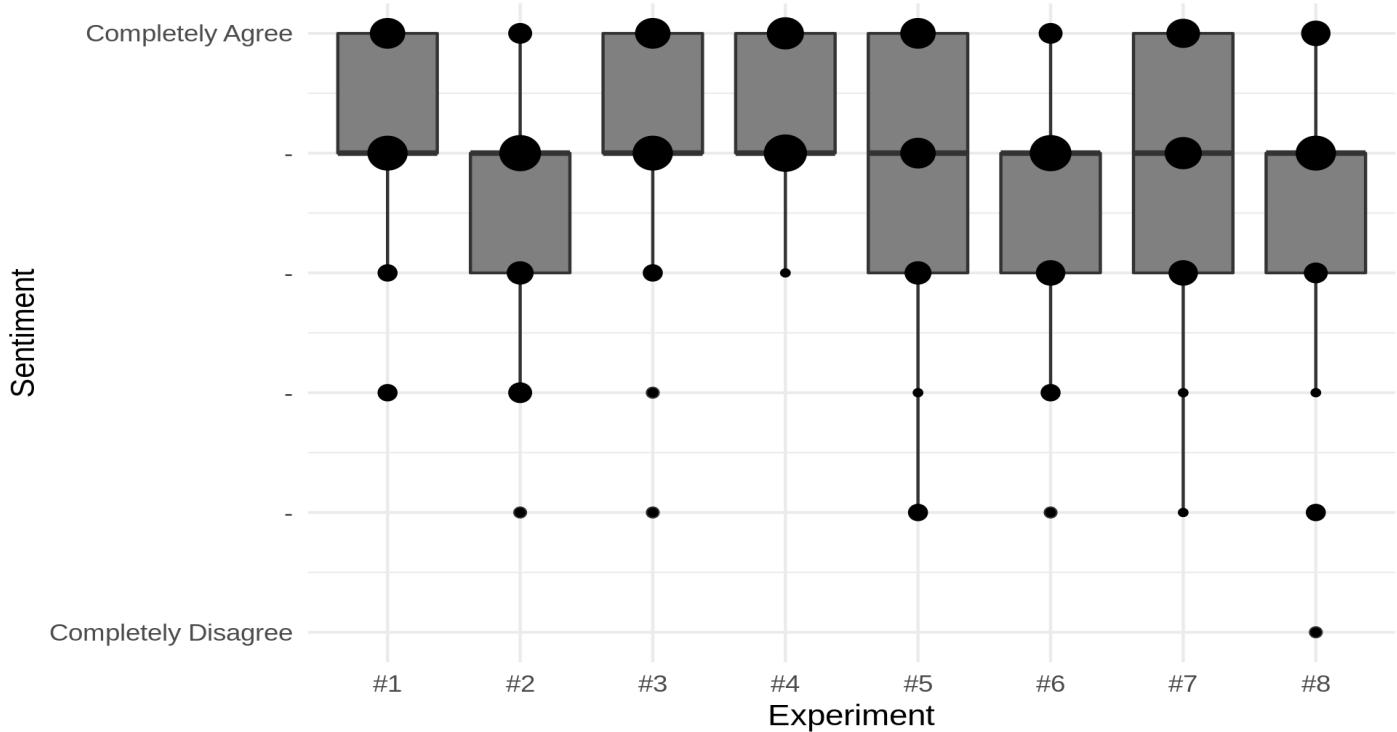


There are only two degrees on the scale of 'brand connectedness' the median line is drawn for any of the experiments; this fact at the least divides the experiments into two, whereby three experiments have a median value at the top end of the lower section of the scale and the other five have median positions at the bottom level of the top end of the scale. The bottom end experiments are arranged in ascending order with the baseline (#1) followed by #4 (Social Media), and

finally #6 (Augmented Reality, Social Media). At the upper end of the spectrum, the experiments can be ordered to ascend accordingly: #2 (Augmented Reality) with no participant providing a maximal score and a skew to the lower end; experiment #7 is next followed #5 which according to the point plots is just slightly more skewed to the upper end of the scale; the top two experiments are #3 and #8 which both have lower quartiles at the halfway mark with most scores in the positive half of the scale. Determining which experiment - #3 or #8 - achieves most brand connection by looking at the candlesticks is not straightforward because #8 is less evenly distributed, with a stronger concentration around the second and third positions on the y axis and far fewer at the extremes; this means that #8 is more consistent but #3 had the potential to deliver stronger sentiment among the participants.

# Facet: I found the experience easy to use

```
feedback.facet_easy <- select(feedback.adjusted_age_groups,  
  starts_with("I found the experience easy to use"))  
  
ggplot(melt(feedback.facet_easy), aes(x = variable, y = value))  
+  
geom_boxplot(fill=styles.color_grey) +  
geom_count(show.legend=F) +  
#scale_size_area() +  
xlab("Experiment") +  
ylab("Sentiment") +  
scale_x_discrete(labels = c(paste(' #' , 1:8, sep = ' '))) +  
scale_y_continuous(labels = c("Completely Disagree", "-", "-",  
  "-", "-", "Completely Agree")) +  
theme_minimal()
```



Ease of use was a characteristic for which all experiments scored fairly highly, with every single experiment sharing the same median line position, one below the maximum score on the scale. Based on the candlestick boxes and the lowest point scores, the worst performing experiment was #8 (Loyalty Reward, Augmented Reality, Social Media) as it has the lowest scores including a few at the very bottom the scale, followed by experiments #2 (Augmented Reality) and #6 (Augmented Reality, Social Media) which have near identical distribution of participant scores and the majority of votes between the bottom and middle quartiles. Experiments #5 (Loyalty Reward, Augmented Reality) and #7 (Loyalty Reward,

Social Media) are the next best performing subset, having similar score distribution patterns with #7 being skewed just slightly more to the positive extreme of the scale. The top three experiment for ease of use in ascending order are #3 (Loyalty Reward), the baseline #1, and #4 (Social Media); all three of these experiment have the majority of participant scores in the top two points on the scale but while #3 and #1 have a distribution that includes scores in the lower half of the y scale, #4 was considered easy to use to greater or lesser degrees by every participant.

# Looking at facets of the experiments as a whole.

---

To get a clearer picture of the perception of the experiments as a whole it's beneficial to look at the facets of each experiment collectively. Using a radar or spider plot it is possible to create a shape the describes the qualities of the experiment. One of the questions asked was on a negative scale of annoyance, so this has been inverted, converting high values to low and vice-versa; the inversion allows for all facets to be considered positive and as such the visual area of the radar plots can be considered indicators of overall performances. That is to say, the larger the area of the plot the better the experiment was perceived.

```
feedback.facets_mean <- data.frame(matrix(nrow = 0, ncol = 3))  
  %>% `colnames<-`(c("variable", "value", "exp"))  
#Creating mean results for the facets  
for (idx in 0:7) {  
  if (idx != 0) {  
    keys = paste(exp_keys, "__", idx, sep = "")  
  } else {  
    keys = exp_keys  
  }  
  
feedback.facets_exp <- select(feedback.adjusted_age_groups,  
  keys)  
  
feedback.facets_mean_exp <-  
  as.data.frame(t(colMeans(feedback.facets_exp)))  
feedback.facets_mean_melt_exp <- melt(feedback.facets_mean_exp)  
feedback.facets_mean_melt_exp$value <-  
  as.numeric(feedback.facets_mean_melt_exp$value)  
feedback.facets_mean_melt_exp$variable <- as.factor(exp_keys)  
feedback.facets_mean_melt_exp[2,2] <- 5 -  
  feedback.facets_mean_melt_exp[2,2]  
feedback.facets_mean_melt_exp$exp <- paste(' #' , idx + 1, sep =  
  '')  
  
feedback.facets_mean <- rbind(feedback.facets_mean,  
  feedback.facets_mean_melt_exp)  
}  
rm(idx, feedback.facets_mean_exp, feedback.facets_exp, keys)
```

```

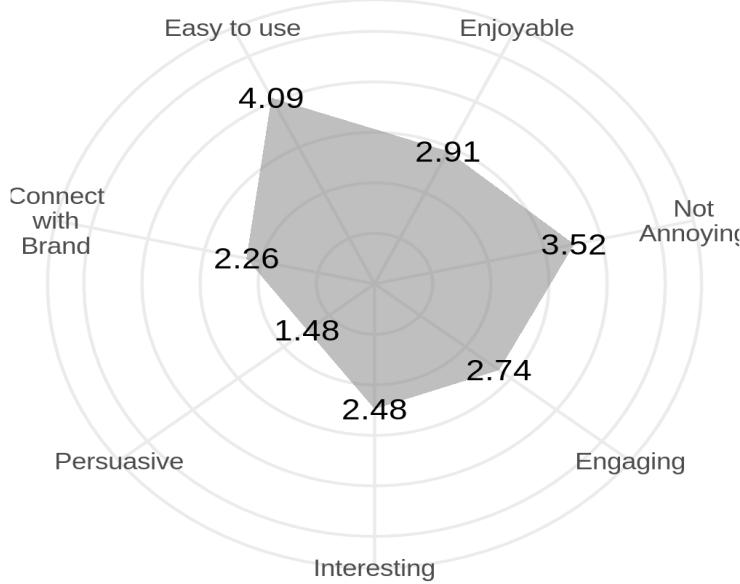
feedback.facets_mean$variable <-
  factor(feedback.facets_mean$variable, exp_keys)
feedback.facets_mean$exp <- factor(feedback.facets_mean$exp,
  factors.exp_num)

do_radar_graph <- function(expVal) {
  return(ggplot(feedback.facets_mean[feedback.facets_mean$exp ==
    expVal, ], aes(variable, value, group = exp)) +
    geom_polygon(aes(group = exp), fill = styles.color_grey_alpha,
    size = 2) +
    ylim(0, 5) +
    scale_x_discrete(labels = c("Enjoyable", "Not\nAnnoying",
      "Engaging", "Interesting", "Persuasive",
      "Connect\nwith\nBrand", "Easy to use")) +
    xlab("") + ylab("") +
    theme_minimal() +
    ggtitle(expVal) +
    theme(axis.text.y=element_blank(),
    axis.ticks.y=element_blank()) +
    geom_text(aes(label = round(value, digits=2), y = value),
      show.legend=F) +
    coord_radar())
}

do_radar_graph('#1')

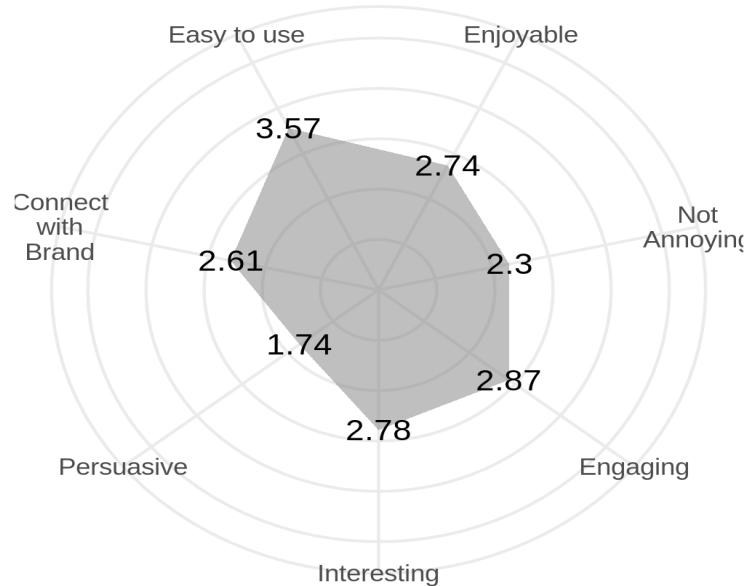
```

#1



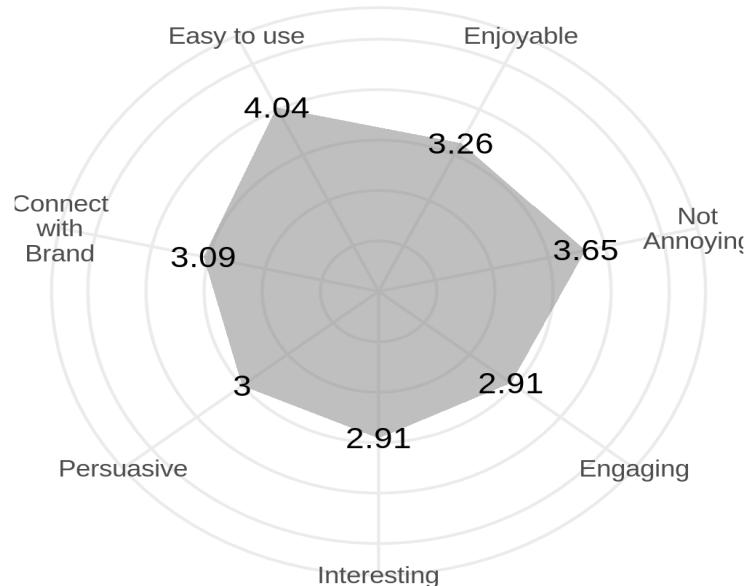
**do\_radar\_graph**('#2')

#2



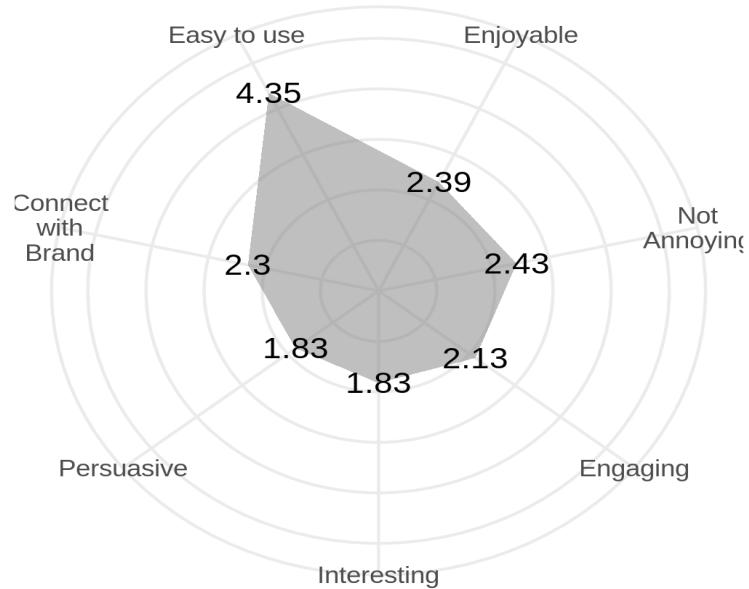
do\_radar\_graph( '#3' )

#3



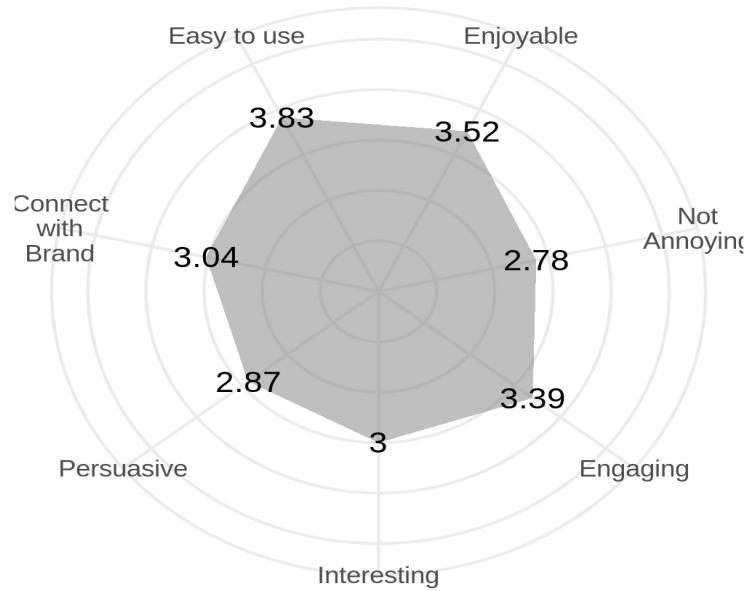
do\_radar\_graph( '#4' )

#4



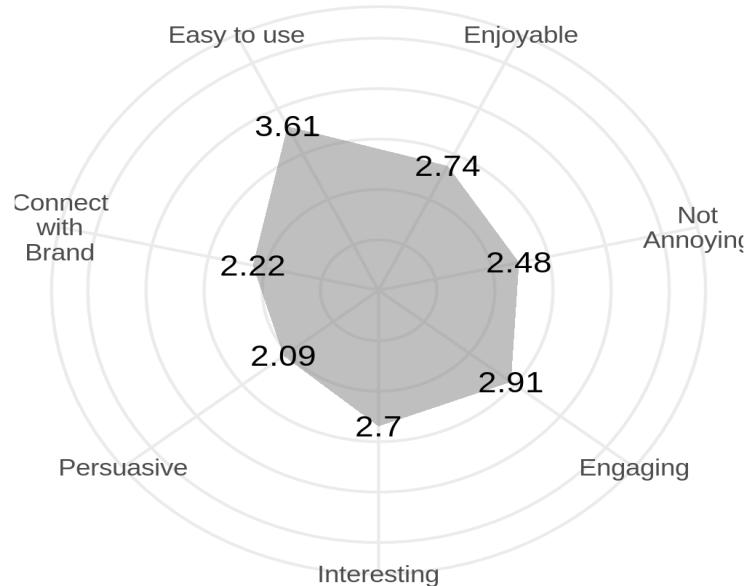
do\_radar\_graph( '#5' )

#5



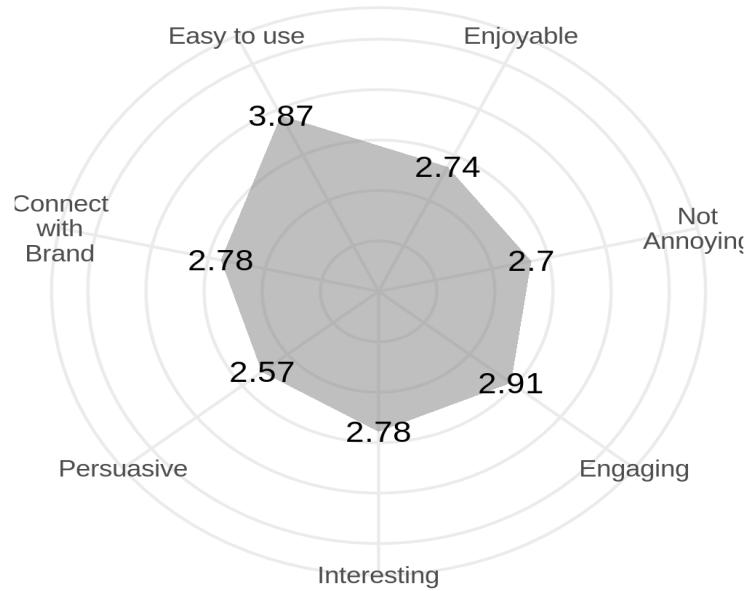
do\_radar\_graph( '#6' )

#6

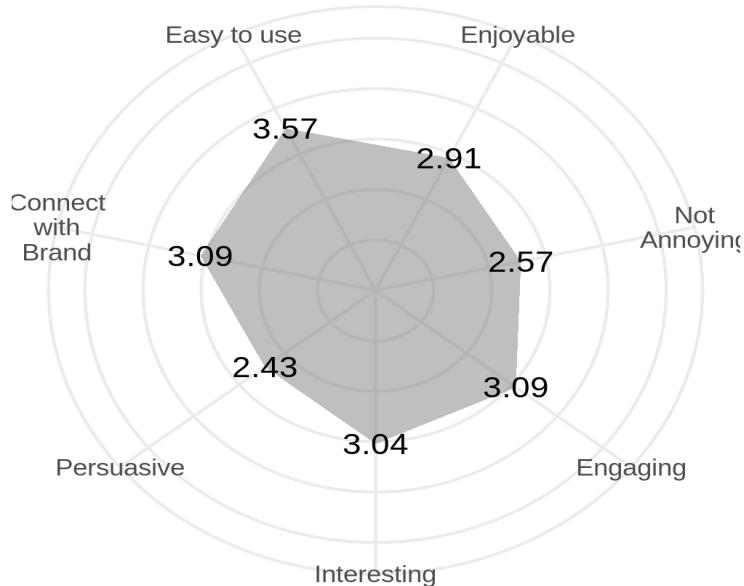


do\_radar\_graph( '#7' )

#7



do\_radar\_graph( '#8' )



## Scaled geometric mean of experiment facets

The mean values of each facet can be converted from a two-dimensional representation to a single number with the use of the geometric mean. Using this form of average helps normalise the values so that no outlying values skew the results disproportionately. In doing so, all facets are folded into one value that can be used to more clearly indicate the overall perception of each experiment.

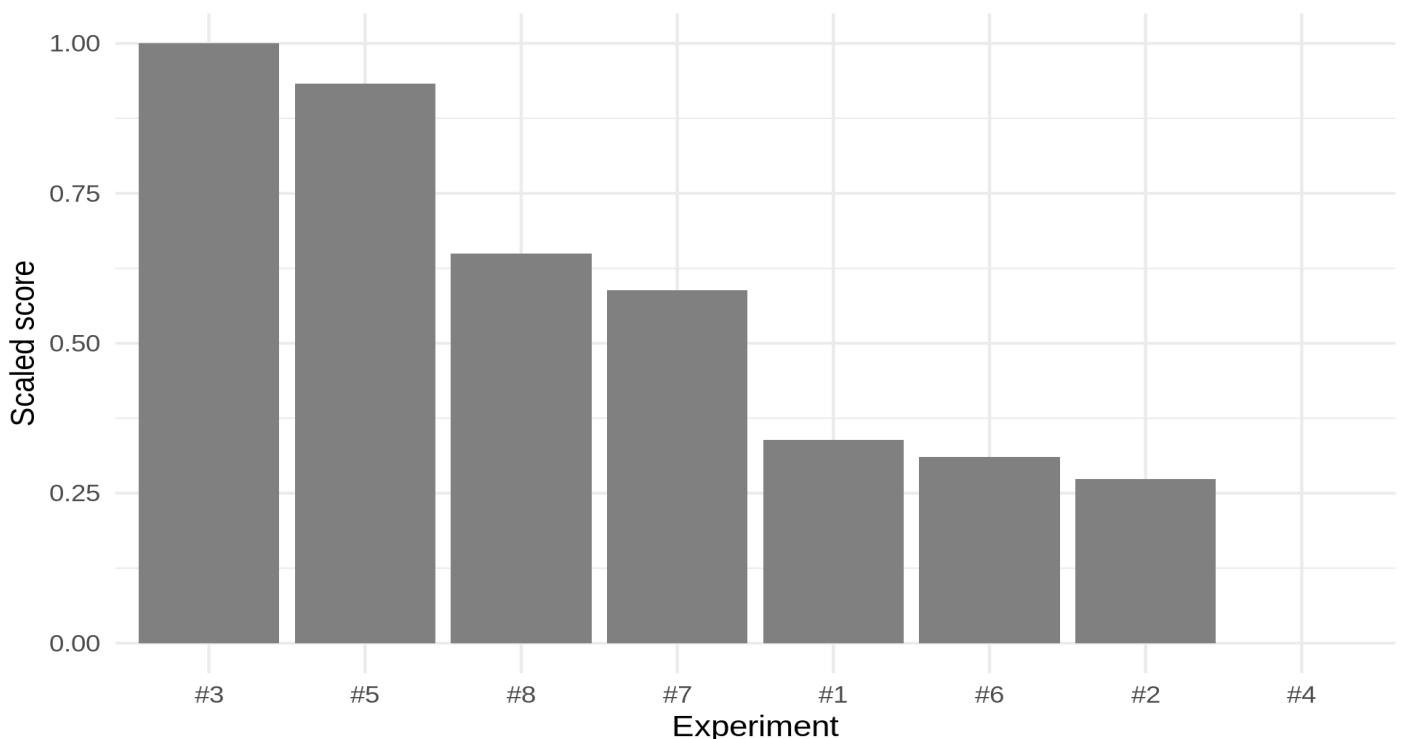
Because the difference between the mean values is relatively subtle, the values have been rescaled between 0 and 1 such that the lowest result is now 0 and the greatest value is now 1; doing this helps with observing the deltas more easily.

```
feedback.facets_mean_mean <- group_by(feedback.facets_mean,
exp) %>% summarise("Facet mean"= geo_mean(value)) %>%
arrange(desc(`Facet mean`))
means <- feedback.facets_mean_mean$`Facet mean`
feedback.facets_mean_mean$`Scaled facet mean` <- rescale(means,
to = c(0, 1), from = c(min(means), max(means)))
rm(means)
colnames(feedback.facets_mean_mean)
[colnames(feedback.facets_mean_mean) == 'exp'] <- 'Exp'
feedback.facets_mean_mean$Exp <-
(factor(feedback.facets_mean_mean$Exp, levels =
feedback.facets_mean_mean$Exp[order(feedback.facets_mean_mean$`mean`,
decreasing = TRUE)]))
```

```
kable(feedback.facets_mean_mean, format = 'markdown')
```

Exp	Facet mean	Scaled facet mean
#3	3.244448	1.0000000
#5	3.185914	0.9334067
#8	2.936151	0.6492537
#7	2.882433	0.5881390
#1	2.663607	0.3391829
#6	2.638480	0.3105967
#2	2.605528	0.2731080
#4	2.365473	0.0000000

```
ggplot(feedback.facets_mean_mean, aes(x = Exp, y = `Scaled facet mean`)) + geom_bar(stat="identity", fill=styles.color_grey) + xlab("Experiment") + ylab("Scaled score") + theme_minimal()
```



As has been previously suggested by the other analyses, experiment #3 (Loyalty Reward only) is the outright leader in terms of people's preferences and perceptions. Having reordered the experiments based on the scaled scoring, it's easy to see that experiment #5 (Loyalty Reward, Augmented Reality) actually comes a close second. It's no surprise that experiment #4 (Social Media only) is in last position but experiment #8 (Loyalty Reward, Augmented Reality, Social Media) stands out in third place because based on earlier angles of analysis, #8 came out less popular than other simpler and quicker interactions. It is also worth noting that the top four experiments on this scale are the only ones to incorporate the Loyalty Reward element into their respective experiences, position 5 is taken by the baseline.

# Looking at the experiments based on cumulative ranking values

---

Using the feedback from each user when they were asked to contemplate the experiments relative to one another provides another way to judge the experiments and in turn validate the participants other feedback. These results are also scaled to make it easier to compare with the previous rankings based on the facets.

```
feedback.rankings <- select(feedback.adjusted_age_groups,  
  starts_with('Could you please rate the experiments in order of  
  preference? [Experiment '] )  
  
row_count = nrow(feedback.rankings)  
col_count = ncol(feedback.rankings)  
  
feedback.rankings_inverted_numeric <- data.frame(matrix(nrow =  
  row_count, ncol = col_count)) %>% `colnames<-  
  `(colnames(feedback.rankings))  
  
for (ri in 1:row_count) {  
  for (ci in 1:col_count) {  
    cell_val = as.character(feedback.rankings[ri, ci])  
    feedback.rankings_inverted_numeric[ri, ci] = 8 -  
      as.numeric(cell_val)  
  }  
}  
  
feedback.rankings_inverted_numeric_mean <-  
  colMeans(feedback.rankings_inverted_numeric, na.rm = TRUE) %>%  
  t() %>% as.data.frame()  
feedback.rankings_inverted_numeric_mean[2, ] <- paste( '#', 1:8,  
  sep = '') # %>% t() %>% as.data.frame()  
feedback.rankings_inverted_numeric_mean <-  
  t(feedback.rankings_inverted_numeric_mean)  
colnames(feedback.rankings_inverted_numeric_mean) <- c('Mean  
  score', 'Exp')  
rownames(feedback.rankings_inverted_numeric_mean) <- NULL
```

```

feedback.rankings_inverted_numeric_mean <-
  as.data.frame(feedback.rankings_inverted_numeric_mean) %>%
  arrange(desc(`Mean score`))
feedback.rankings_inverted_numeric_mean$Exp <-
  (factor(feedback.rankings_inverted_numeric_mean$Exp, levels =
  feedback.rankings_inverted_numeric_mean$Exp[order(feedback.rank
score`, decreasing = TRUE)]))

means <-
  as.numeric(feedback.rankings_inverted_numeric_mean`Mean
  score`)
feedback.rankings_inverted_numeric_mean`Scaled mean score` <-
  rescale(means, to = c(0, 1), from = c(min(means), max(means)))
rm(means)

kable(feedback.rankings_inverted_numeric_mean, format =
  'markdown')

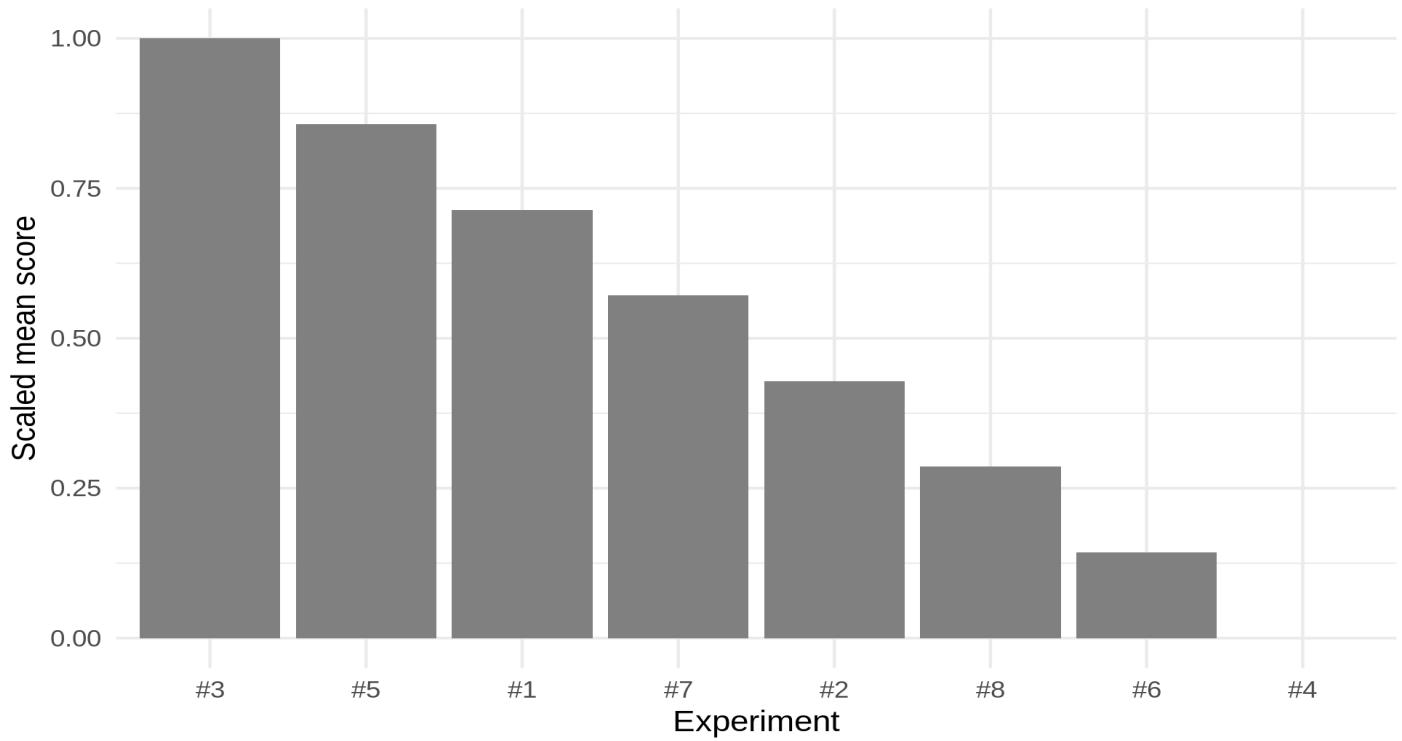
```

Mean score	Exp	Scaled mean score
5.39130434782609	#3	1.0000000
4.78260869565217	#5	0.8571429
4.56521739130435	#1	0.7142857
3.43478260869565	#7	0.5714286
2.82608695652174	#2	0.4285714
2.52173913043478	#8	0.2857143
2.34782608695652	#6	0.1428571
2.1304347826087	#4	0.0000000

```

ggplot(feedback.rankings_inverted_numeric_mean, aes(x = Exp,
  y = `Scaled mean score`)) + geom_bar(stat="identity",
  fill=styles.color_grey) +
  xlab("Experiment") +
  ylab("Scaled mean score") +
  theme_minimal()

```



With the results re-ordered to more easily observe the scale of preference, descending from most popular to least, it is by now, unsurprising to see that experiment #4 (Social Media only) is least popular; it's also predictable by now that #3 (Loyalty Reward only) holds the top spot. The combination of Augmented Reality with a digital Loyalty Reward (#5) comes takes the position of second most popular, while the baseline takes third position. Fourth place is the #7, the combination of Social Media with the Loyalty Reward, the highest position for any experiment that contains the Social Media experiment. All other Social Media experiments occupy the bottom three positions. Augmented Reality on its own (#2) manages to out perform all those Social Media based experiments. This does suggest a definite pattern of preference.

# Multiplying the results of cumulative ranings and facet means

---

Having previously scaled the values so they are between 0 and 1 for both sets of data they can be easily compared and thus can interact with each other in a way that can be considered fair; in this case, by multiplying the values, it is possible to get a result for each experiment that is the product of all of the data from the evaluation of experiment facets as well as the user rankings. By doing this particular operation the result of a new set of rankings will take into account the users different ways of considering the experiments.

```
feedback.facets_and_ranking_scaled_means <-
  merge(feedback.facets_mean_mean,
        feedback.rankings_inverted_numeric_mean) %>%
  select(Exp, `Scaled facet mean`, `Scaled mean score`)
feedback.facets_and_ranking_scaled_means$`Mean product` <-
  with(feedback.facets_and_ranking_scaled_means, `Scaled facet
  mean` * `Scaled mean score`)

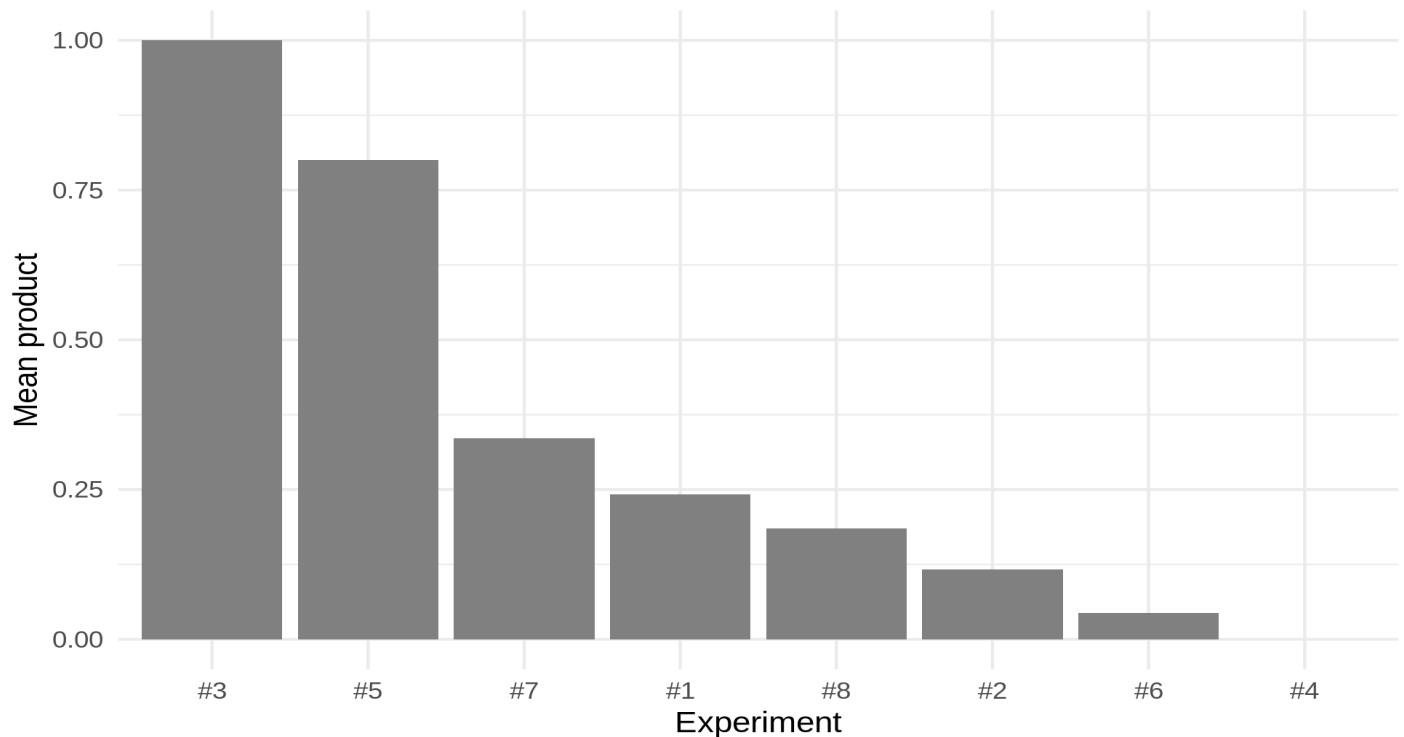
feedback.facets_and_ranking_scaled_means <-
  feedback.facets_and_ranking_scaled_means %>%
  arrange(desc(`Mean product`))
feedback.facets_and_ranking_scaled_means$Exp <-
  (factor(feedback.facets_and_ranking_scaled_means$Exp, levels =
  feedback.facets_and_ranking_scaled_means$Exp[order(feedback.fac
  product`, decreasing = TRUE)]))

kable(feedback.facets_and_ranking_scaled_means, format =
  'markdown')
```

Exp	Scaled facet mean	Scaled mean score	Mean product
#3	1.0000000	1.0000000	1.0000000
#5	0.9334067	0.8571429	0.8000629
#7	0.5881390	0.5714286	0.3360795
#1	0.3391829	0.7142857	0.2422735

Exp	Scaled facet mean	Scaled mean score	Mean product
#8	0.6492537	0.2857143	0.1855011
#2	0.2731080	0.4285714	0.1170463
#6	0.3105967	0.1428571	0.0443710
#4	0.0000000	0.0000000	0.0000000

```
ggplot(feedback.facets_and_ranking_scaled_means, aes(x = Exp, y = `Mean product`)) +
  geom_bar(stat="identity", fill=styles.color_grey) +
  xlab("Experiment") +
  #ylab("Scaled mean score") +
  theme_minimal()
```



When the two sets of mean values are combined the order of popularity is different from either of the previous results, as expected the least and most popular remain the same, as does the case with experiment #5 being the second most popular. The rest of the experiments have undergone a reordering of popularity. In this new order of popularity, the bottom two experiments include a Social Media element with experiment #6 also including Augmented Reality and being slightly more popular; the two experiments next in popularity are Augmented Reality experiments opposite levels of experiment complexity, with Augmented Reality on its own (#2) less popular than experiment #8 which is comprised of all the experiment elements. The fourth position is #1, the baseline, separating the least popular from the top three. Each of the three most popular experiments include the digital Loyalty Reward, with this being the only element atop of the

baseline for #3 in the top spot; again, #5 is second most popular, combining Loyalty Reward with the Augmented Reality game, while the third most popular experiment (#7) is composed of Social Media and the digital reward. It's worth noting that the top two, #3 and #5 are markedly more popular than the rest.

# Examining the demographics of the participants for the three most popular experiments

---

Having looked at the quantitative data for the feedback to the extent such that there can be some confidence as to which experiments are the most popular. More insight can be gained as to which type of experiment is most suitable for a given context by comparing popularity against age and gender.

There are two ways to interpret the data to look at the demographics with regards to the most popular experiment experiences. The first method is to simply count the results the the data subsets that explicitly answered that their most preferred experiments were #3, #5, and #7 respectively; these results are also weighted according to normal distribution of age and gender in the UK. The second method is more involved, making use of the scores per facet of each experiment and plotting the individual geometric mean values per participant in order to create a more nuanced and detailed interpretation of preference and demographic.

```
feedback.favourite_exp3 <- filter(feedback.adjusted_age_groups,
  `Overall, which was your most preferred experiment?` == '#3')
feedback.favourite_exp5 <- filter(feedback.adjusted_age_groups,
  `Overall, which was your most preferred experiment?` == '#5')
feedback.favourite_exp7 <- filter(feedback.adjusted_age_groups,
  `Overall, which was your most preferred experiment?` == '#7')

feedback.adjusted_age_groups_with_facet_means <-
  feedback.adjusted_age_groups

for (idx in c(3,5,7,1,8) -1) {
  facets = exp_keys
  facet_mean_col = paste("Facet mean exp", idx + 1)
  facet_annoying_col = exp_key.annoying

  if (idx != 0) {
    facets = paste(exp_keys, idx, sep = '__')
    facet_annoying_col = paste(facet_annoying_col, idx, sep = '__')
  }

#Create collection of facet means
facet_means = c()
```

```

facet_vals =
  select(feedback.adjusted_age_groups_with_facet_means, facets)

facet_vals[facet_annothing_col] <- 5 -
  facet_vals[facet_annothing_col]

for (r in 1:row_count) {
  facet_means[r] = geo_mean(unlist(facet_vals[r,]))
}

feedback.adjusted_age_groups_with_facet_means[facet_mean_col]
<- facet_means

}

```

## Demographics for participants preferring Experiment #3

Experiment #3 is the experiment that only involves the Loyalty Reward element atop of the baseline of email capture.

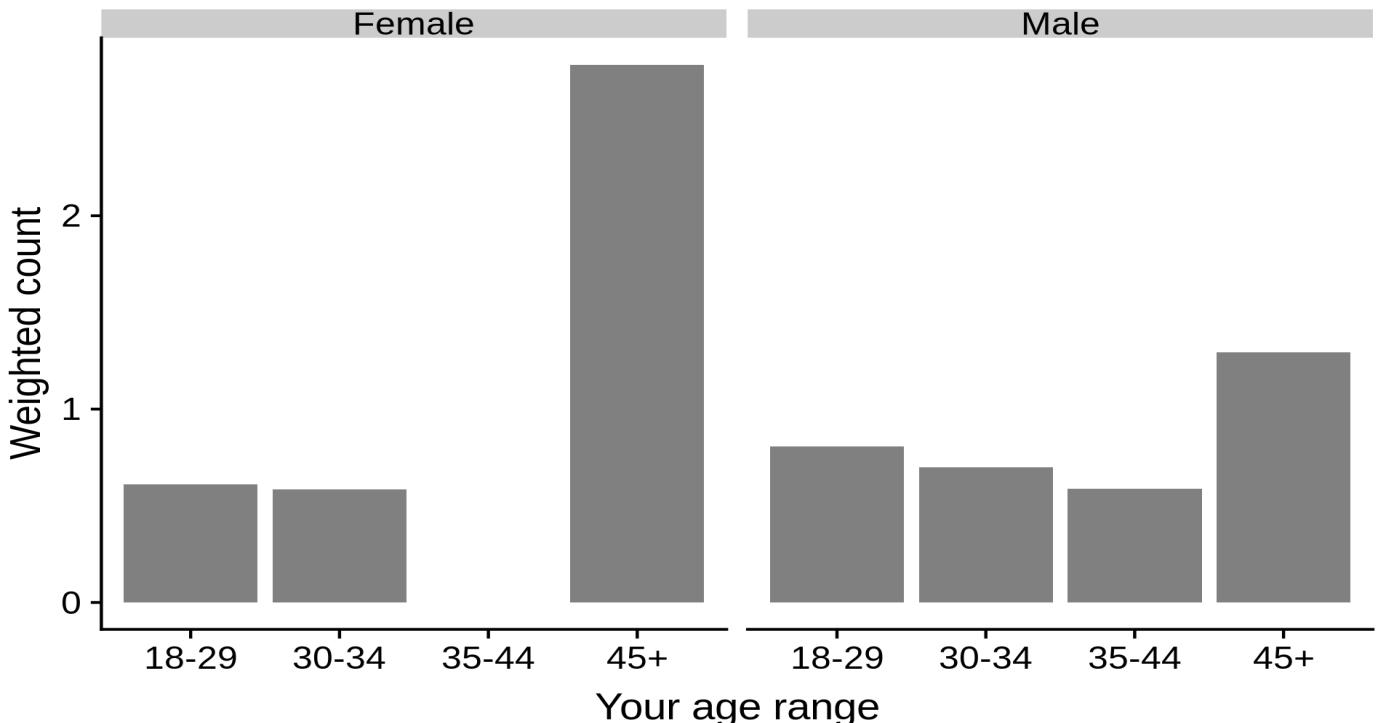
```

feedback.favourite_exp3_demo <- count(feedback.favourite_exp3,
  `Your age range`, `Your gender`, wt = weight, sort = TRUE);
kable(feedback.favourite_exp3_demo, col.names = c("Your age
range", "Your gender", "Count"), format = 'markdown')

```

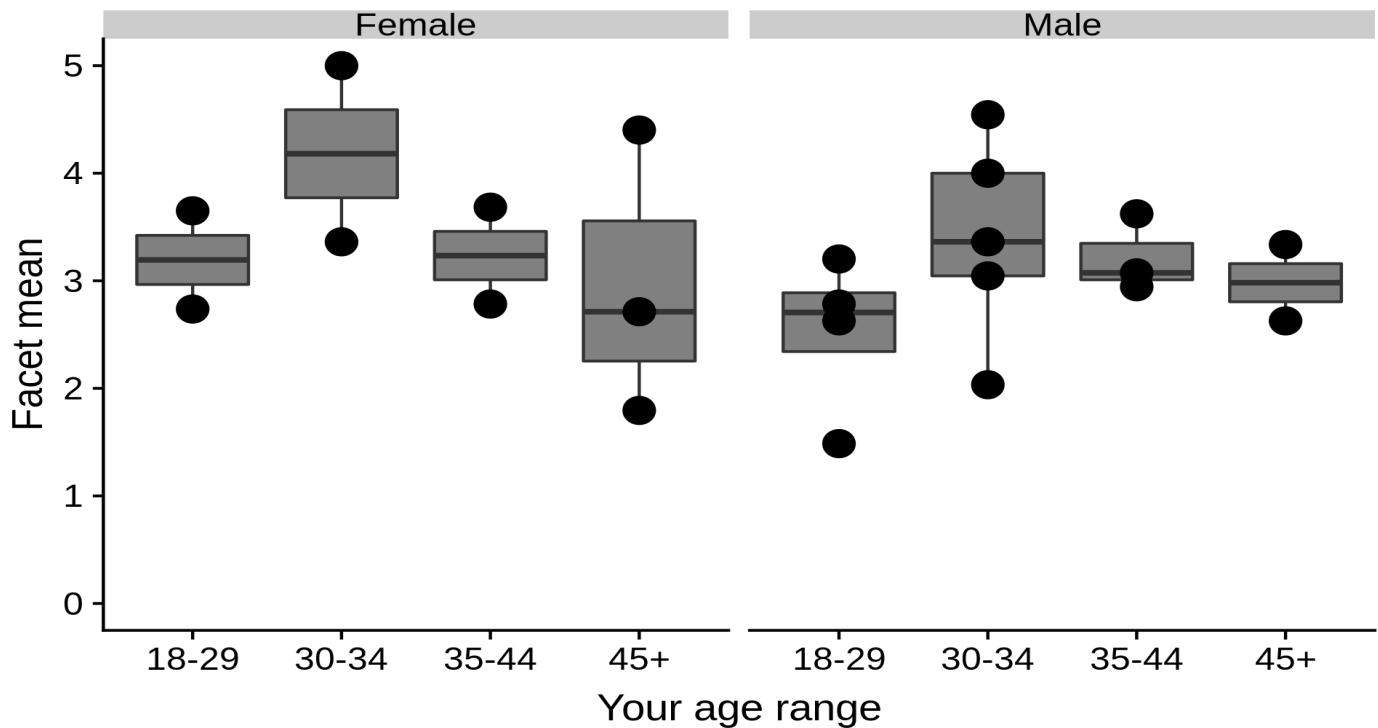
Your age range	Your gender	Count
45+	Female	2.7813323
45+	Male	1.2952884
18-29	Male	0.8076089
30-34	Male	0.6977944
18-29	Female	0.6102901
35-44	Male	0.5879894
30-34	Female	0.5834226

```
ggplot(feedback.favourite_exp3_demo, aes(x = `Your age range`,
y = n)) +
geom_bar(stat="identity", fill=styles.color_grey) +
facet_wrap(~`Your gender`) +
ylab("Weighted count")
```



When looking at the answer to which was the most preferred experiment, the results suggest that there is a clear target demographic for experiment #3, that is the same age group of over 45s for both genders. In addition, this experiment appears to also be somewhat popular with both genders of the youngest demographic (18-25).

```
ggplot(feedback.adjusted_age_groups_with_facet_means, aes(x =
`Your age range`, y = `Facet mean exp 3`)) +
geom_boxplot(fill=styles.color_grey) +
geom_count(show.legend=F) +
ylab("Facet mean") +
scale_y_continuous(limits = c(0, 5)) +
facet_wrap(~`Your gender`)
```



When the mean values for all the facets are used to determine the reception of this experiment across demographic groups, the 30-34 age group is most positive about experiment #3. The 45+ female demographic actually scores the experiment least favourably among the female subset and second least positive among the males. Within the male age-groups, the 18-29 demographic scored this experiment the least.

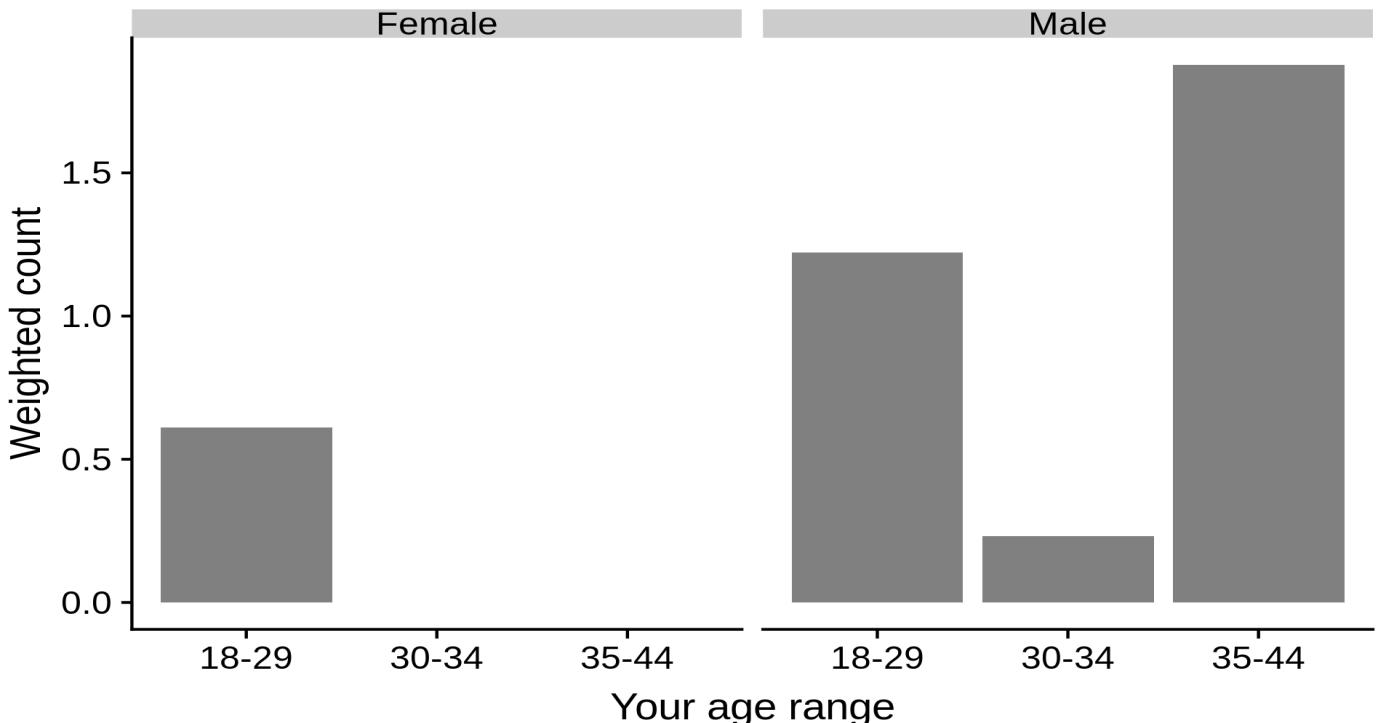
## Demographics for participants preferring Experiment #5

Experiment #5 is the experiment that combines the Loyalty Reward and Augmented Reality elements over the baseline email capture.

```
feedback.favourite_exp5_demo <- count(feedback.favourite_exp5,
  `Your age range`, `Your gender`, wt = weight, sort = TRUE);
kable(feedback.favourite_exp5_demo, col.names = c("Your age
range", "Your gender", "Count"), format = 'markdown')
```

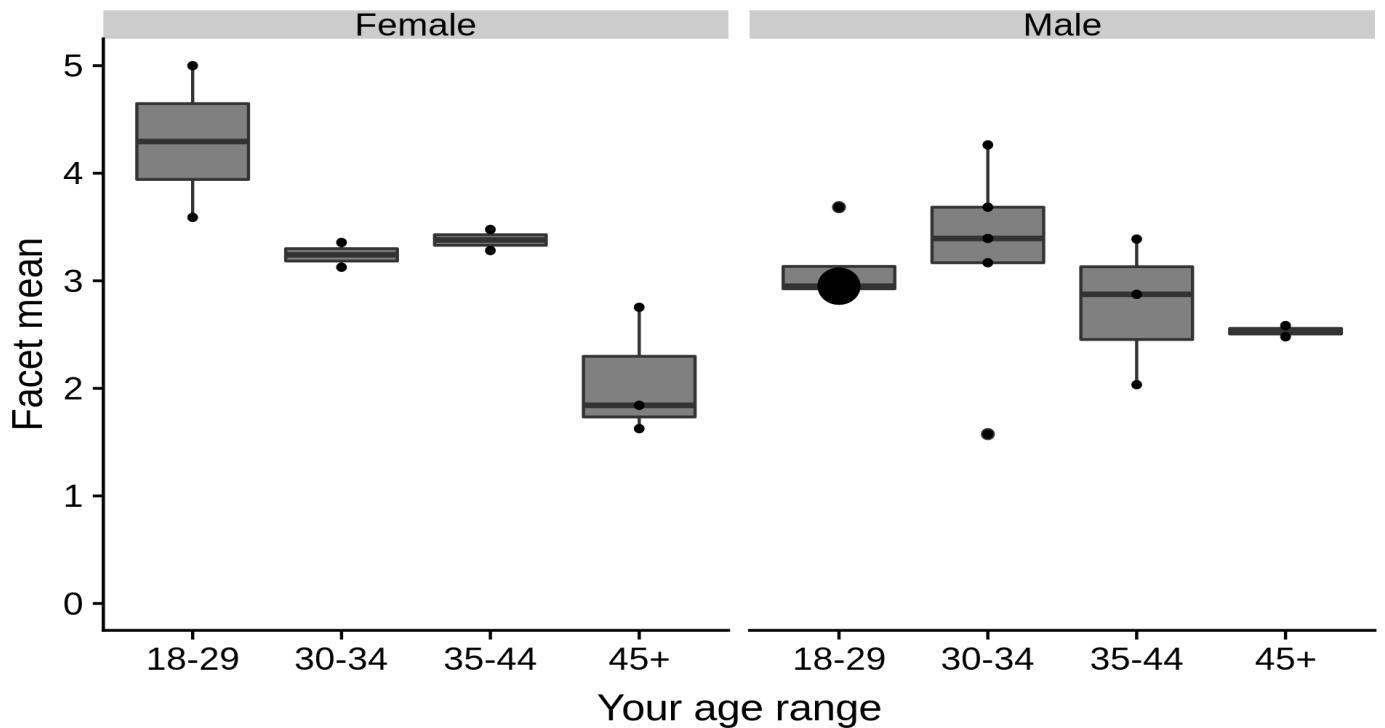
Your age range	Your gender	Count
35-44	Male	1.8778167
18-29	Male	1.2221926
18-29	Female	0.6102901
30-34	Male	0.2325981

```
ggplot(feedback.favourite_exp5_demo, aes(x = `Your age range`,
y = n)) +
geom_bar(stat="identity", fill=styles.color_grey) +
facet_wrap(~`Your gender`) +
ylab("Weighted count")
```



When the question of most preferred experiment is looked at with regard to experiment #5, there is some division in the results; it would appear that among males, the Augmented Reality and Loyalty Reward combination fares best amongst the 35-44 male group and the 18-29 demographic across both genders.

```
ggplot(feedback.adjusted_age_groups_with_facet_means, aes(x =
`Your age range`, y = `Facet mean exp 5`)) +
geom_boxplot(fill=styles.color_grey) +
geom_count(show.legend=F) +
ylab("Facet mean") +
scale_y_continuous(limits = c(0, 5)) +
facet_wrap(~`Your gender`) #+
```



After facet data has been assessed, the participant perception of experiment #5 is not so polarised among the males but remains so for females. Among females the variation in scores between age groups is high, with the 18-29 age group scoring towards the top end of the scale and the 45+ group scoring close to the bottom. In fact, the 18-29 females were most positive across all groups and the 45+ females least positive across the groups. The middle age groups among the females scored similarly, around the middle of the scale. For males, the age group most receptive to the experience of #5 were there 30-34 group followed by the 18-29 group. Based on median lines the 45+ males were least receptive among the males, though they did score the experiment more highly than females of same age.

## Demographics for participants preferring Experiment #7

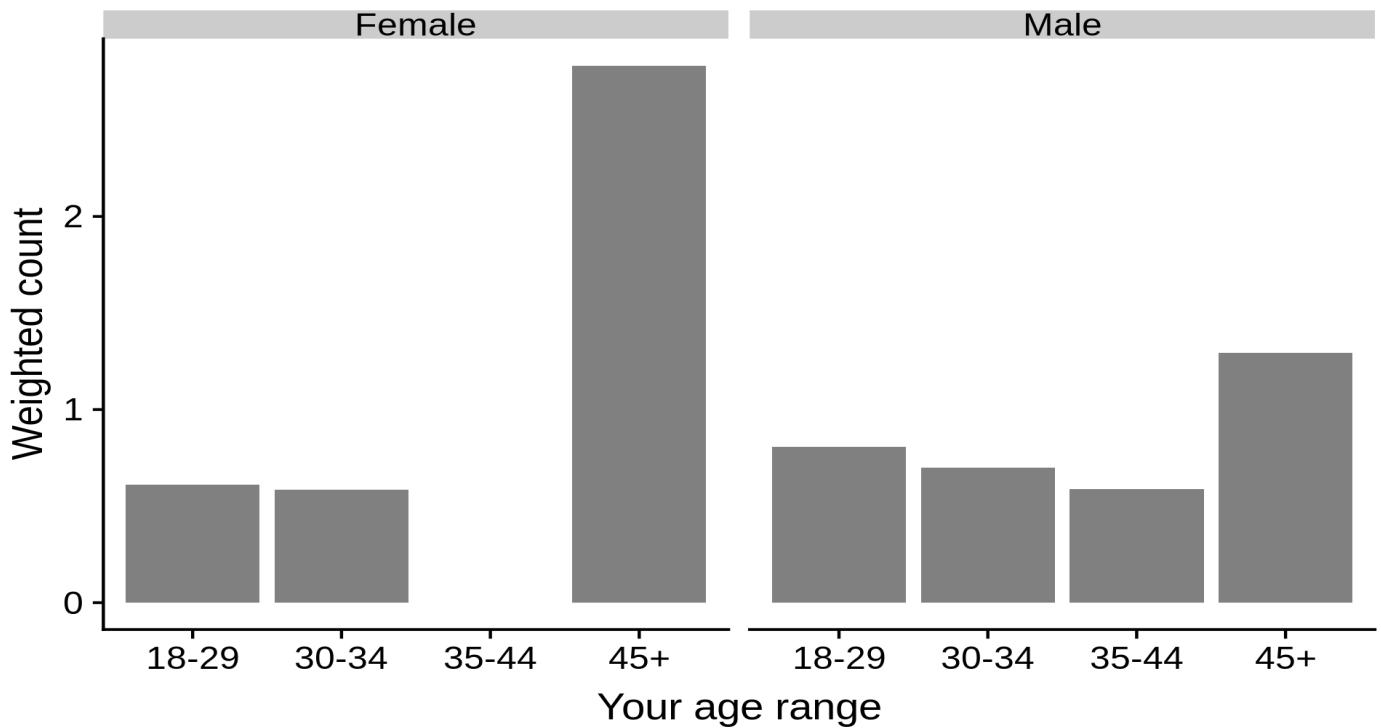
Experiment #7 is the experiment combining the Loyalty Reward Social Media elements over the baseline email capture.

```
feedback.favourite_exp7_demo <- count(feedback.favourite_exp3,
  `Your age range`, `Your gender`, wt = weight, sort = TRUE);
kable(feedback.favourite_exp7_demo, col.names = c("Your age
range", "Your gender", "Count"), format = 'markdown')
```

Your age range	Your gender	Count
45+	Female	2.7813323
45+	Male	1.2952884

Your age range	Your gender	Count
18-29	Male	0.8076089
30-34	Male	0.6977944
18-29	Female	0.6102901
35-44	Male	0.5879894
30-34	Female	0.5834226

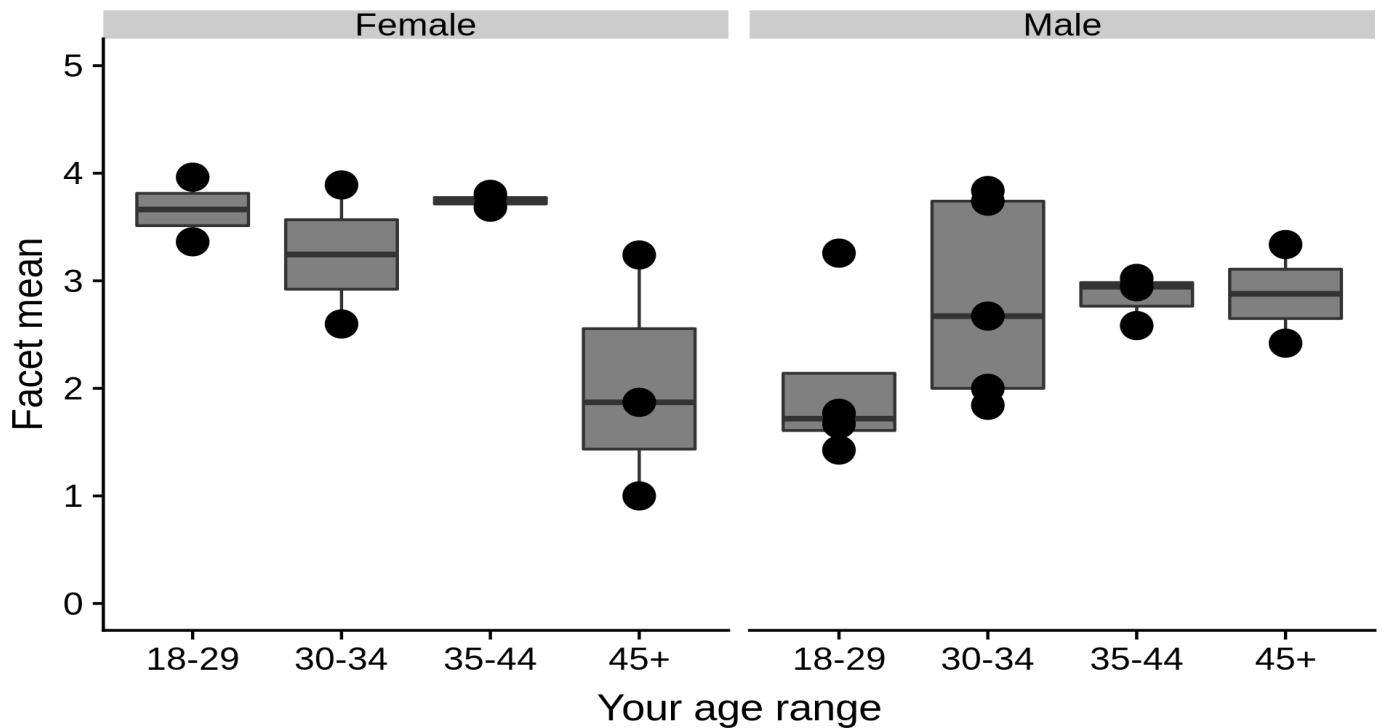
```
ggplot(feedback.favourite_exp7_demo, aes(x = `Your age range`,
y = n)) +
geom_bar(stat="identity", fill=styles.color_grey) +
facet_wrap(~`Your gender`) +
ylab("Weighted count")
```



Based on the question of the most preferred experiment, this experiment was most popular with the over 45s and least popular with those in the 35-44 age group. The 18-29 age group appears to be slightly more receptive to this experiment than those in the 30-34 age group.

```
ggplot(feedback.adjusted_age_groups_with_facet_means, aes(x =
`Your age range`, y = `Facet mean exp 7`)) +
geom_boxplot(fill=styles.color_grey) +
geom_count(show.legend=F) +
ylab("Facet mean") +
```

```
scale_y_continuous(limits = c(0, 5)) +
facet_wrap(~`Your gender`) #+
```



When the facet means are analysed, the 35-44 age group is more positive about the experiment than the previous graph would suggest, scoring the experiment the highest among both female and male demographics by median line position. Among males this experiment scores mostly around the middle of the scale while apart from the 45+ females, most females score this experience most positively than their male counterparts.

# Examining the demographics of the participants with preferences for the most extreme experiments

---

Having looked at the results for the highest scoring experiment, it's worth comparing these results with the baseline as every other experiment is derived from this one. Looking at the results for this experiment may reveal more insight into the participant scoring behaviour. It's also worth looking at experiment #8 as this is the only experiment to incorporate all possible elements into one experience.

```
feedback.favourite_exp1 <- filter(feedback.adjusted_age_groups,  
  `Overall, which was your most preferred experiment?` == '#1')  
feedback.favourite_exp8 <- filter(feedback.adjusted_age_groups,  
  `Overall, which was your most preferred experiment?` == '#8')
```

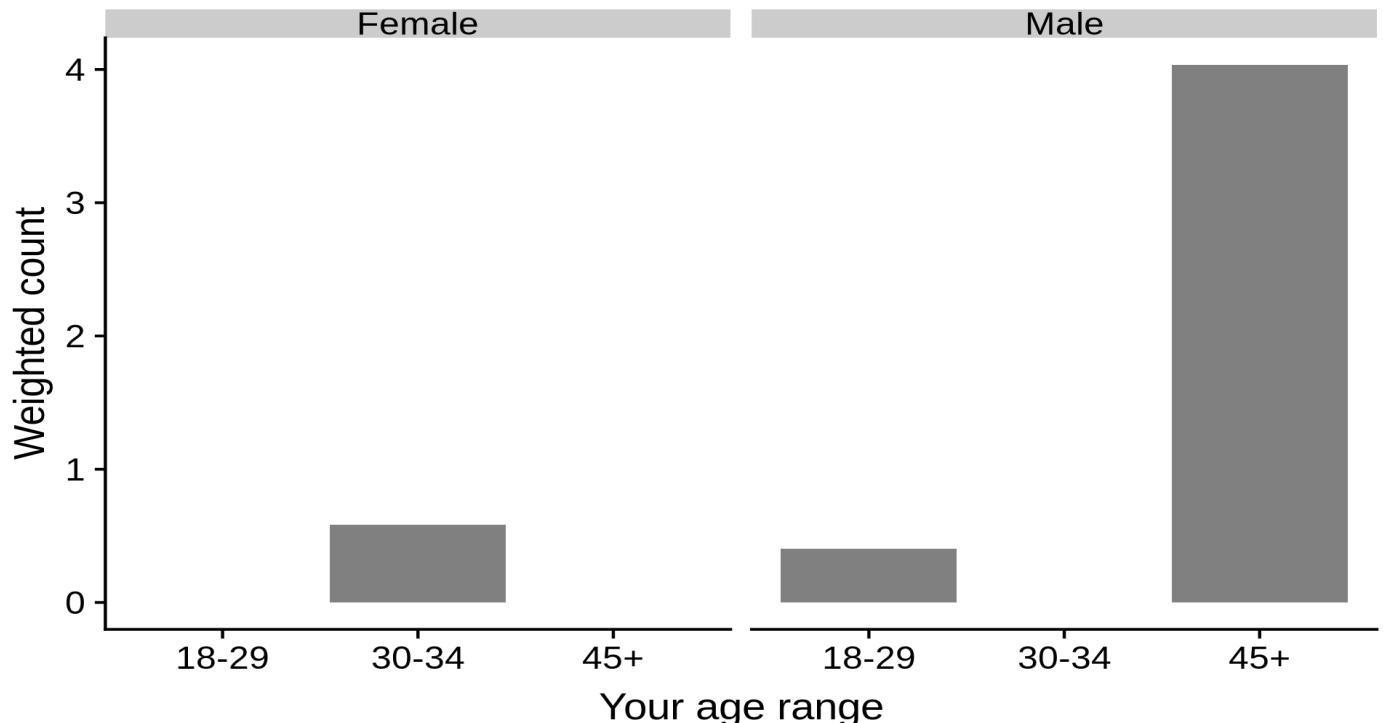
## Demographics for participants preferring Experiment #1

Experiment #1 was the baseline, which involved a simple form to capture the participants email.

```
feedback.favourite_exp1_demo <- count(feedback.favourite_exp1,  
  `Your age range`, `Your gender`, wt = weight, sort = TRUE);  
kable(feedback.favourite_exp1_demo, col.names = c("Your age  
range", "Your gender", "Count"), format = 'markdown')
```

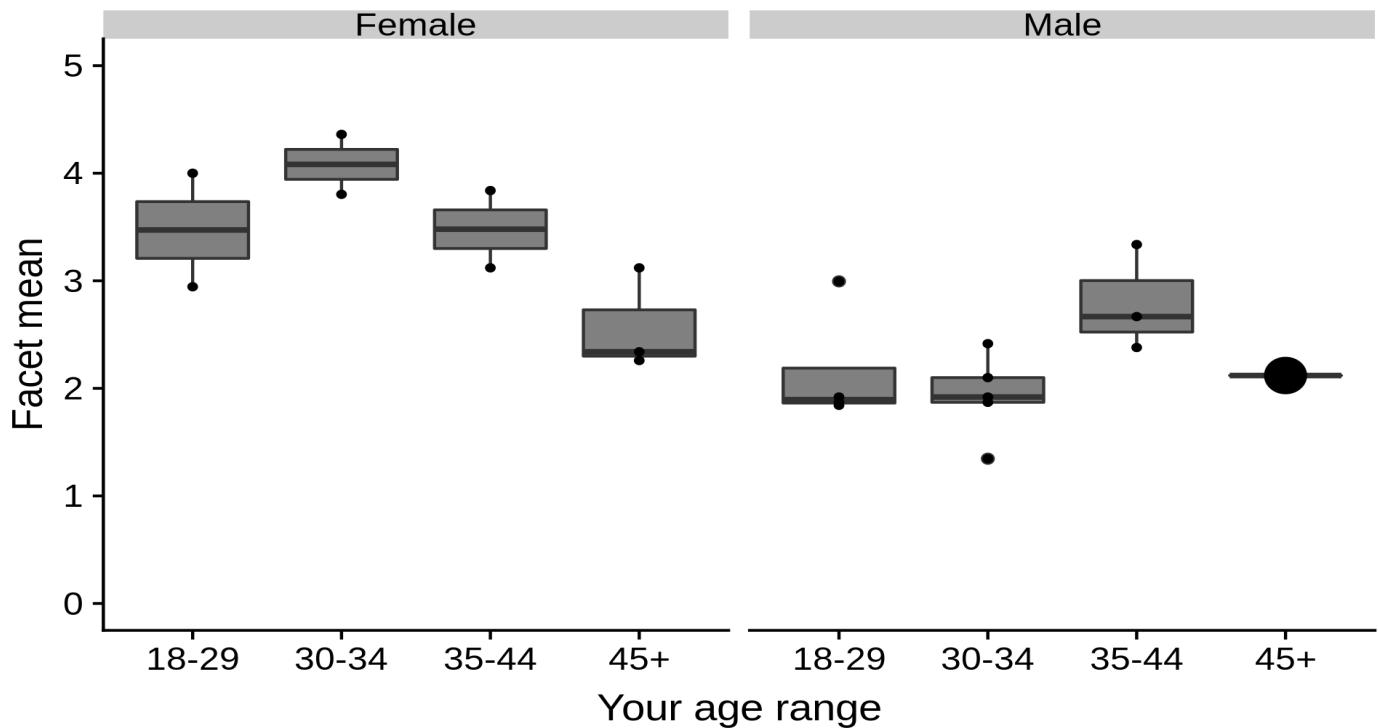
Your age range	Your gender	Count
45+	Male	4.0360299
30-34	Female	0.5834226
18-29	Male	0.4038044

```
ggplot(feedback.favourite_exp1_demo, aes(x = `Your age range`,
y = n)) +
geom_bar(stat="identity", fill=styles.color_grey) +
facet_wrap(~`Your gender`) +
ylab("Weighted count")
```



According to the question regarding preference, the baseline experiment was most popular among the 30-34 female and 45+ male groups.

```
ggplot(feedback.adjusted_age_groups_with_facet_means, aes(x =
`Your age range`, y = `Facet mean exp 1`)) +
geom_boxplot(fill=styles.color_grey) +
geom_count(show.legend=F) +
ylab("Facet mean") +
scale_y_continuous(limits = c(0, 5)) +
facet_wrap(~`Your gender`) #+
```



When looking at the mean scores for the baseline facets, there is a similar pattern of scoring variation among the gender groups; less variation is found among the male age groups then compared to the females; the males tend to score this experience less positively with most score clustering around 2 whereas for female age groups, only the 45+ group frequently scores below 3. The most positive scoring group among males.

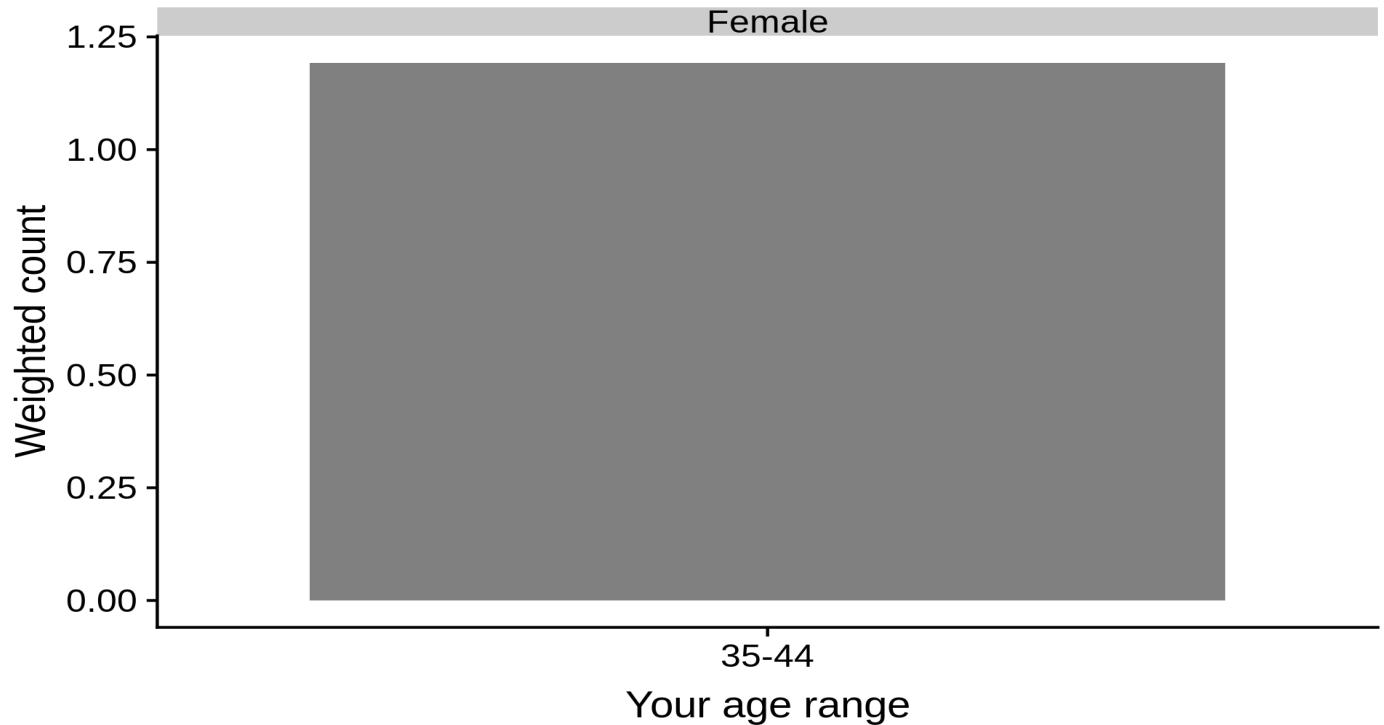
## Demographics for participants regarding Experiment #8

Experiment #8 only experiment to use the Loyalty Reward, Augmented Reality, and Social Media element together.

```
feedback.favourite_exp8_demo <- count(feedback.favourite_exp8,
  `Your age range`, `Your gender`, wt = weight, sort = TRUE);
kable(feedback.favourite_exp8_demo, col.names = c("Your age
range", "Your gender", "Count"), format = 'markdown')
```

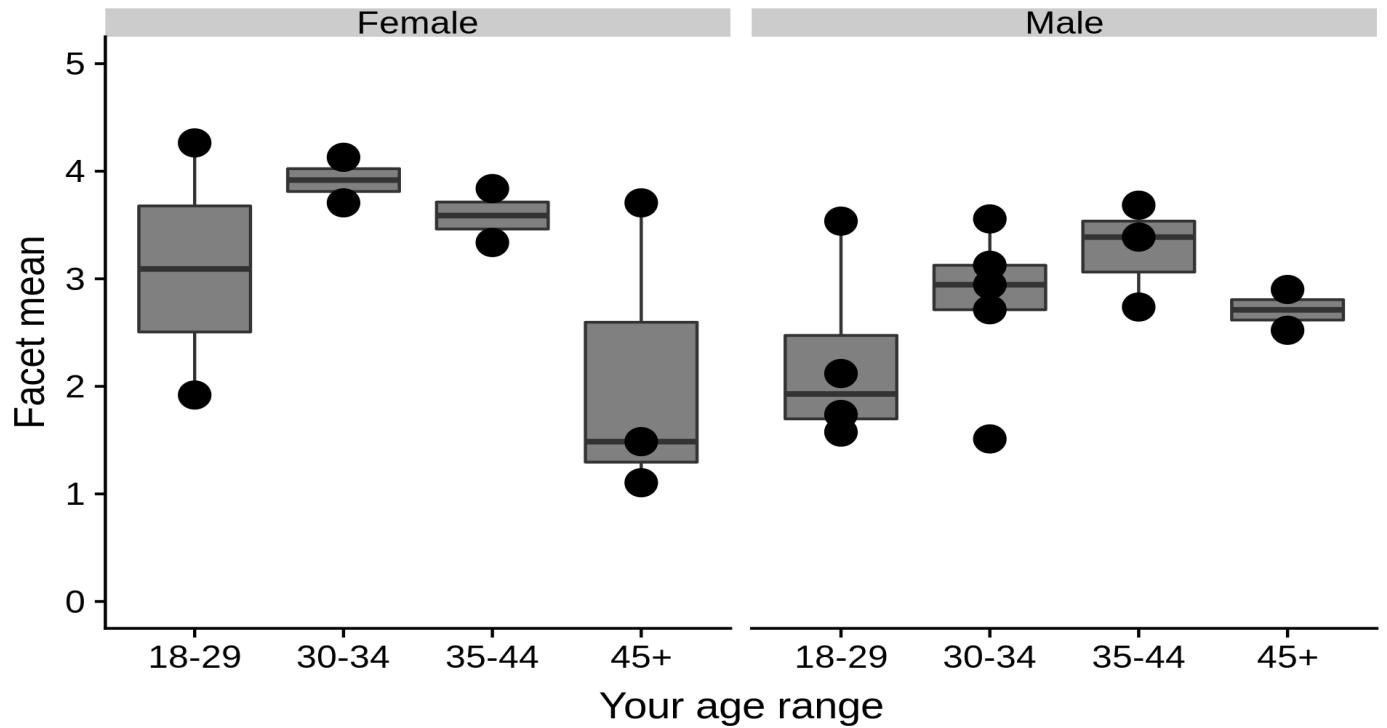
Your age range	Your gender	Count
35-44	Female	1.19284

```
ggplot(feedback.favourite_exp8_demo, aes(x = `Your age range`,
  y = n)) +
  geom_bar(stat="identity", fill=styles.color_grey) +
  facet_wrap(~`Your gender`) +
  ylab("Weighted count")
```



The graph indicates that only one person in the entire study preferred this experiment and they were female and within the 35-44 age group.

```
ggplot(feedback.adjusted_age_groups_with_facet_means, aes(x = `Your age range`, y = `Facet mean exp 8`)) +  
  geom_boxplot(fill=styles.color_grey) +  
  geom_count(show.legend=F) +  
  ylab("Facet mean") +  
  scale_y_continuous(limits = c(0, 5)) +  
  facet_wrap(~`Your gender`)
```



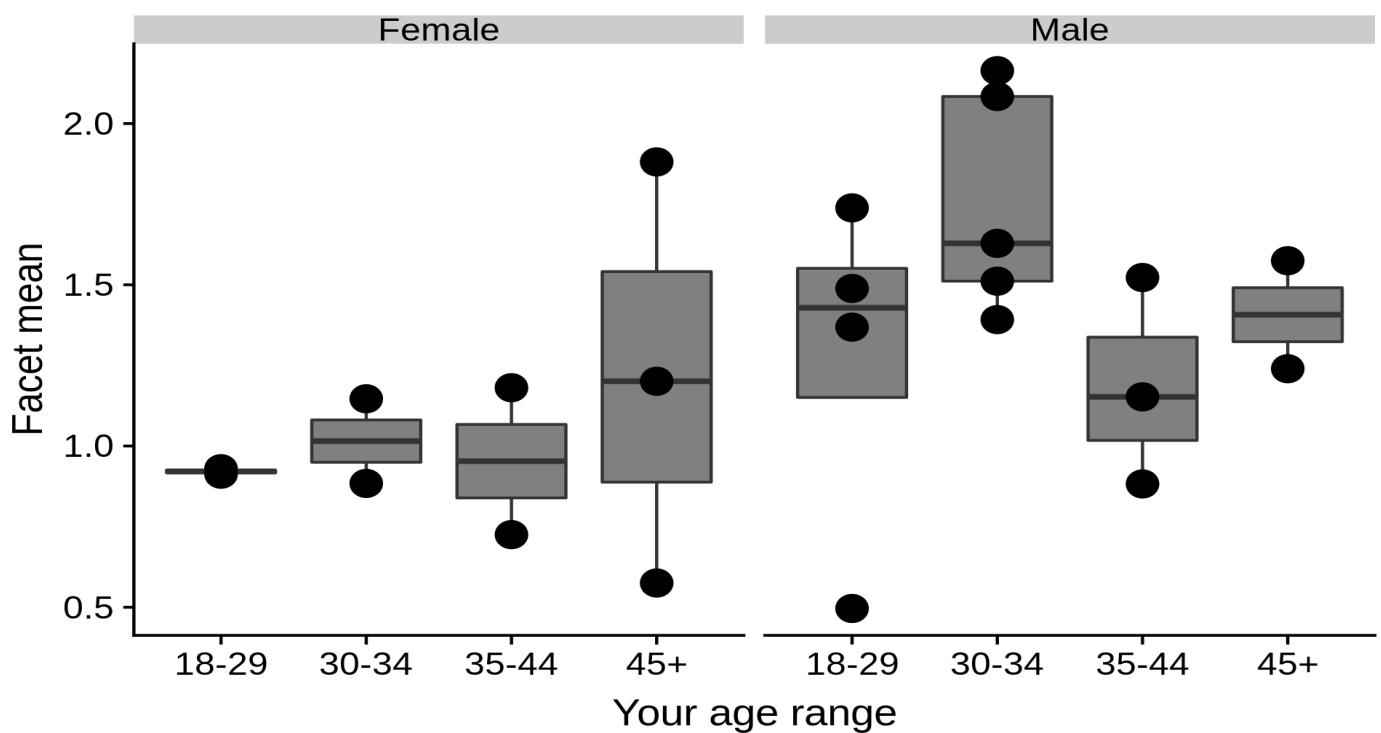
When facet mean scores are taken into account, the 35-44 age group rank the most positive towards this experiment amongst males and second amongst female; the 30-34 age group scores this experiment highest for females, and second highest for males. Overall female participants scored this experiment higher than males. The demographic groups that scored this experiment the lowest are the 45+ females and 18-29 males.

# Dividing experiment scores over the baseline

Given that the baseline was designed as control, using the participant scores for this experiment as the unit for which their other scores can be compared it is possible to mitigate the individual differences in scoring with more positive or negative biases. In other words, if a participant has a tendency to score highly or lower than others, using the baseline allows participants to be more fairly compared with relative scores. A score of 1 suggests an experience no better or worse than the baseline, scores below 1 suggest the experiment was less well received than the baseline and those over 1 are seen as better by a factor based on the individual baseline score.

## Experiment #3 scores over the baseline

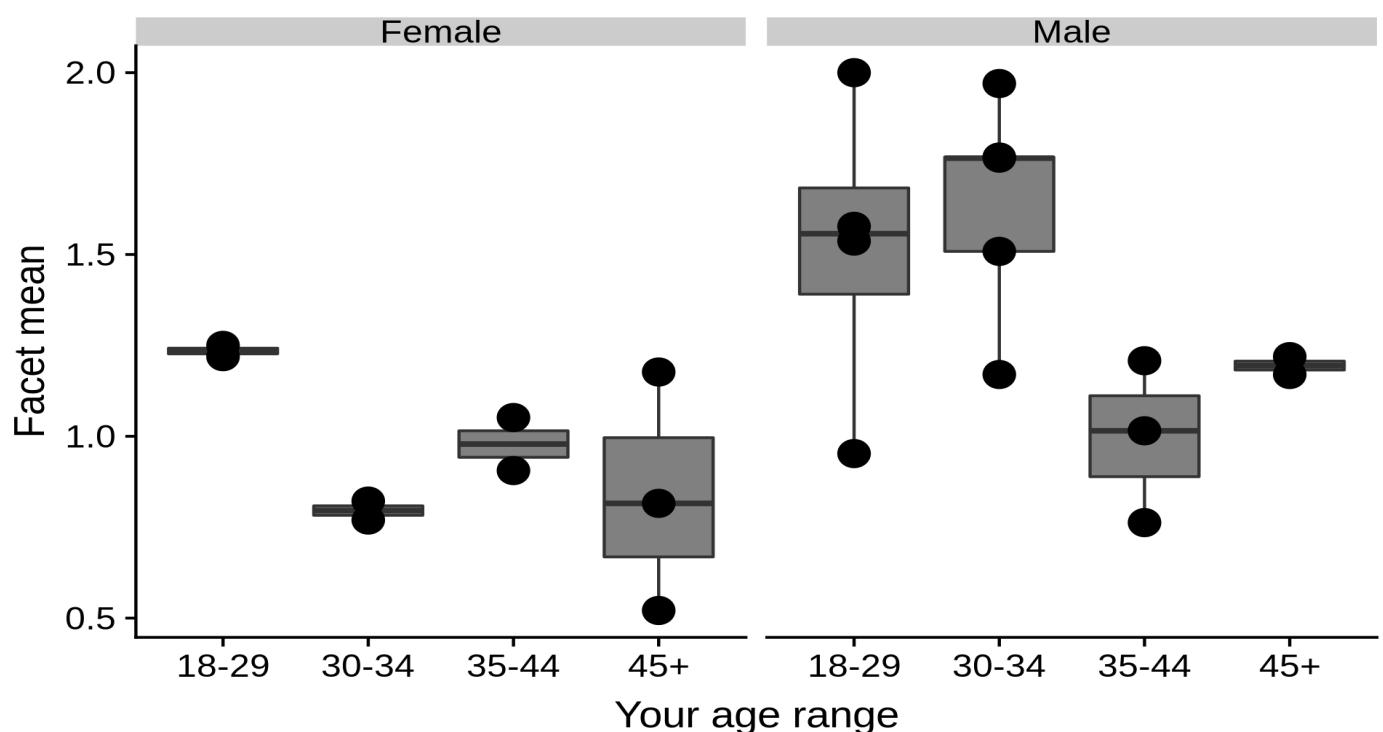
```
ggplot(feedback.adjusted_age_groups_with_facet_means, aes(x = `Your age range`, y = `Facet mean exp 3` / `Facet mean exp 1`)) +  
  geom_boxplot(fill=styles.color_grey) +  
  geom_count(show.legend=F) +  
  ylab("Facet mean") +  
  #scale_y_continuous(limits = c(0, 5)) +  
  facet_wrap(~`Your gender`)
```



For experiment #3 when compared against the baseline, almost all the males actually rated this more positively, whereas for females the experience was not significantly better or worse, with the exception of the 45+ group that had a median line around 1.25. Males in the 30-34 age group were most positive overall with nearly all participants in this demographic scoring this experiment fifty percent higher than the baseline.

# Experiment #5 scores over the baseline

```
ggplot(feedback.adjusted_age_groups_with_facet_means, aes(x = `Your age range`, y = `Facet mean exp 5` / `Facet mean exp 1`)) +  
  geom_boxplot(fill=styles.color_grey) +  
  geom_count(show.legend=F) +  
  ylab("Facet mean") +  
  #scale_y_continuous(limits = c(0, 5)) +  
  facet_wrap(~`Your gender`)
```

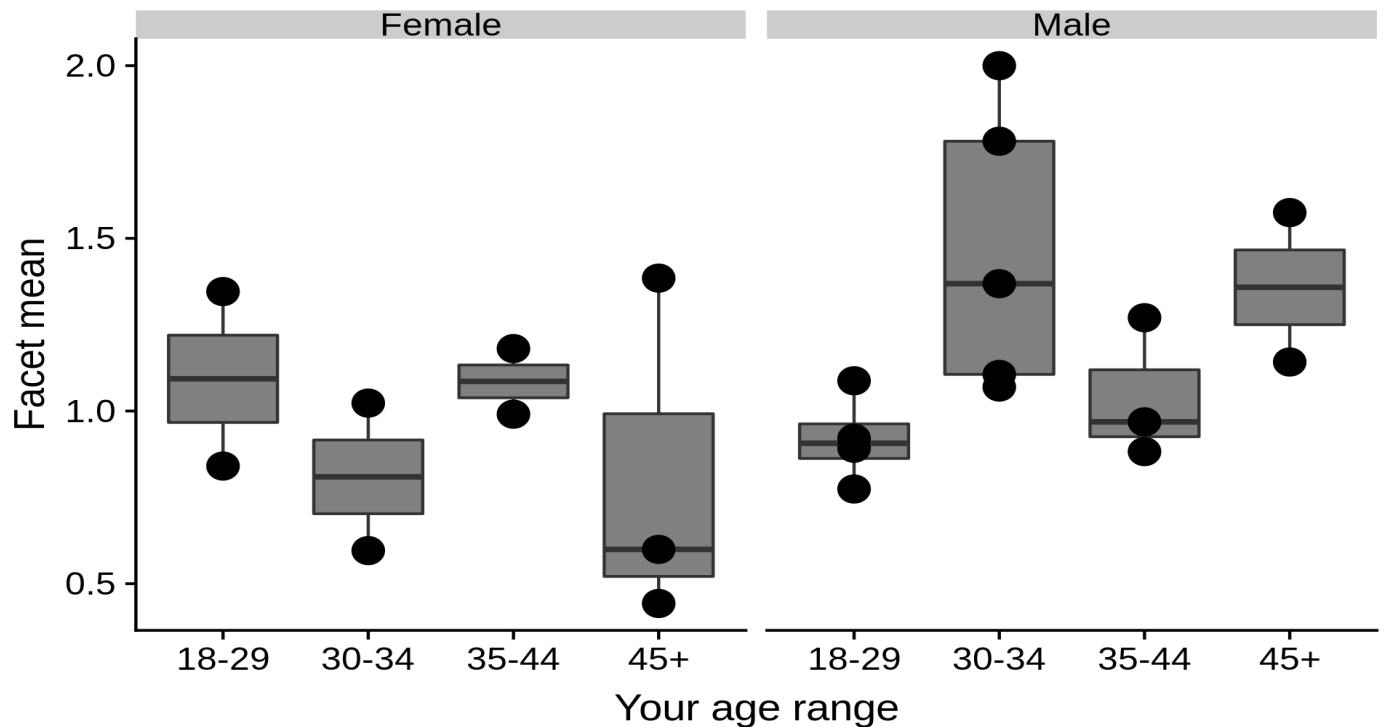


Experiment #5 was most successful relative to the baseline for the males in the 30-34 and 18-29 groups having median lines over 1.5. The only female demographic to receive this experiment positively over the baseline is the 18-29 age group.

# Experiment #7 scores over the baseline

```
ggplot(feedback.adjusted_age_groups_with_facet_means, aes(x = `Your age range`, y = `Facet mean exp 7` / `Facet mean exp 1`)) +  
  geom_boxplot(fill=styles.color_grey) +  
  geom_count(show.legend=F) +  
  ylab("Facet mean") +
```

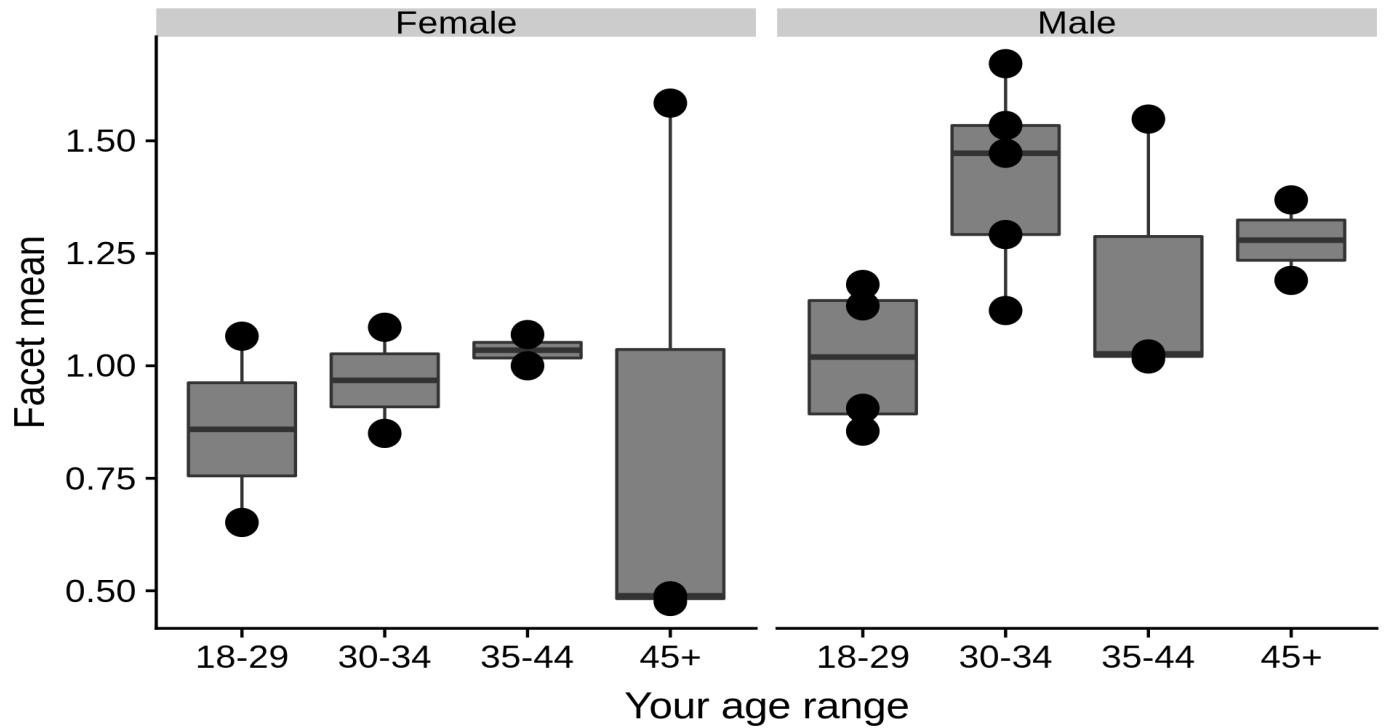
```
#scale_y_continuous(limits = c(0, 5)) +
facet_wrap(~`Your gender`)
```



Experiment #7 scored most positively against the baseline for the males in the 30-34 and 45+ age groups, followed by females in the 18-29 and 35-44 demographics. The 35-44 males had a neutral experience relative to the baseline, while all other age groups had less positive experiences.

## Experiment #8 scores over the baseline

```
ggplot(feedback.adjusted_age_groups_with_facet_means, aes(x =
`Your age range`, y = `Facet mean exp 8` / `Facet mean exp
1`)) +
geom_boxplot(fill=styles.color_grey) +
geom_count(show.legend=F) +
ylab("Facet mean") +
facet_wrap(~`Your gender`)
```



Experiment #8 appears to be overwhelmingly less positive for females across all age groups. For the males, the 18-29 age group had a neutral experience compared to the baseline, while the 35-44 subset has a marginally more positive experience. The highest scores for this experiment came from the 30-34 and 45+ males.

# Qualitative feedback

---

```
feedback.qualitative_cols = c("If you enjoyed any part(s) in particular, please describe what you enjoyed:", "If you were annoyed by any part(s) in particular, please describe what annoyed you:", "If you found any particular part(s) engaging, please describe what:", "If you found any particular part(s) interesting, please describe what:", "If you found any particular part(s) persuasive, please describe what:", "If you found any part(s) in particular, connected you with the brand, please describe what:", "If you found any part(s) in particular, difficult to use, please describe what:", "What was the best part of the experience?", "What was the worst part of the experience?", "Do you have any suggestions for improvement?")
```

## Experiment #1

```
feedback.qualitatives = c()
idx = 1

for (q in feedback.qualitative_cols) {
  feedback.qualitative <- as.data.frame(feedback.formatted[q]
  [!is.na(feedback.formatted[q])])
  feedback.qualitatives[idx] <- feedback.qualitative
  idx = idx + 1
}

#Removing odd http link
feedback.qualitatives[[1]] <- feedback.qualitatives[[1]][-4]

kable(feedback.qualitatives[1], col.names =
  feedback.qualitative_cols[1])
```

---

**If you enjoyed any part(s) in particular, please describe what you enjoyed:**

---

trying it out for the first time

---

the experience was simple.

---

it was simple

---

I enjoyed paying via Bluetooth

---

nice and easy. didn't need to get cash out

---

Was quite quick and simple and easy to follow the onscreen instructions.

---

It's a very normal process as I pay with my phone usually

---

Fun idea that as I pay I effectively get thanked in a personal-ish way

---

it was cute

---

feels unnecessary in this scenario to give email as left feeling as though I will be spammed by company

---

Easy and quick

---

---

```
kable(feedback.qualitatives[2], col.names =  
feedback.qualitative_cols[2])
```

---

**If you were annoyed by any part(s) in particular, please describe what annoyed you:**

---

Not knowing what I had to do beforehand

---

being asked for email address

---

i dont generally sign up for things unless i use the product/website a lot

---

Starting with Thank you made me think that the session had just ended rather than just starting

---

Intrusive

---

I guess it could have been even fewer clicks and swipes than it was

---

It was quite quick but would felt like a bit of an invasion of privacy giving email

---

Having to provide an email address - too personal.

---

It's a very normal process as I pay with my phone usually

---

Generally do not like giving out my email address (fear of spam)

---

without autofill would find it more annoying

---

```
kable(feedback.qualitatives[3], col.names =  
feedback.qualitative_cols[3])
```

---

**If you found any particular part(s) engaging, please describe what:**

---

The idea of a new experience

---

the technology was responsive

---

I am not sure as yet what this experience is

---

visuals - bright colours, positive feedback

---

It was neither engaging nor unengaging

---

It was pretty quick so at no point was i distracted

---

Again - it's a very normal experience

---

The simplicity

---

Colourful advert

---

---

```
kable(feedback.qualitatives[4], col.names =  
feedback.qualitative_cols[4])
```

---

**If you found any particular part(s) interesting, please describe what:**

---

il found it interesting in context of participating in a research project

---

I enjoyed using the bluetooth to pay for my drink

---

It was novel simply because I hadn't done it before. But I wouldn't find it particularly interesting after doing it a few time.

---

It was not interesting

---

interesting that my email was already filled in. Even on my own phone, this is rare.

---

regular for companies to ask for email for receipts and promotions

---

---

```
kable(feedback.qualitatives[5], col.names =  
feedback.qualitative_cols[5])
```

---

**If you found any particular part(s) persuasive, please describe what:**

---

What would happen afterwards

---

I didn't feel persuaded in any way

---

it was simple, i think there persuasion in ease and simplicity

---

I enjoyed the animated thank you after payment was received

---

It didn't persuade me about anything

---

Persuasive simple language

---

---

```
kable(feedback.qualitatives[6], col.names =  
       feedback.qualitative_cols[6])
```

---

**If you found any part(s) in particular, connected you with the brand, please describe what:**

---

there was an attempt to connect by capturing email

---

without looking i cant remember the brand name

---

powerful imagery and I liked being thanked by the company - made it more personal

---

big bold wording

---

A tiny bit. The colours on the 'Amazing' screen etc echoed the label and branding

---

Giving email address made it a bit more brand orientated

---

if there was a link to the website with promotional offers available would feel more connected

---

The image was bold

---

---

```
kable(feedback.qualitatives[7], col.names =  
       feedback.qualitative_cols[7])
```

---

**If you found any part(s) in particular, difficult to use, please describe what:**

---

Having to input my email address

---

I am not really sure why I would be using this in real life. Reward points are not that beguiling  
very simple and effective

---

was very clear

---

easy with autofill for details on phone

---

Guided through experience by onscreen prompts ok

---

---

```
kable(feedback.qualitatives[8], col.names =  
feedback.qualitative_cols[8])
```

---

**What was the best part of the experience?**

---

The idea of something new

---

simple payment and getting the desired drink

---

the fact that it was easy to use

---

simplicity

---

bluetooth payment

---

short and easy to use

---

Reasonably quick/limited engagement and input required (particularly if autofill were set)

---

Haven't experienced anything similar before

---

logo at the end and the thankyou

---

automatic association with personal details. Email was already known.

---

ease of payment using phone

---

Simple and colourful

---

---

```
kable(feedback.qualitatives[9], col.names =  
feedback.qualitative_cols[9])
```

---

---

## **What was the worst part of the experience?**

---

Not knowing exactly what I had to do

---

Asking for email

---

Getting it to work

---

Bluetooth is not always available so could lead to difficulties when paying in future

---

perhaps it could involve something a bit more engaging to make it memorable

---

The request to provide personal info such as an email address.

---

Having to give email address

---

fear of future spam from company/third parties

---

---

```
kable(feedback.qualitatives[10], col.names =  
       feedback.qualitative_cols[10])
```

---

## **Do you have any suggestions for improvement?**

---

A fuller explanation of the process

---

no

---

Don't start with thank you but something more intuitive such as - Welcome - or whatever

---

perhaps wifi connection might work better?

---

More explanation of why email is being captured.

---

Clear Skip option or obvious clarification that you can continue without inputting one (if possible)

---

immediate option to not participate or to prevent use of email for promotional offers

---

More text explaining the whys?

---

# Experiment #2

```
feedback.qualitative_cols_2 <- paste(feedback.qualitative_cols,  
1, sep = '___')  
  
feedback.qualitatives = c()  
idx = 1  
  
for (q in feedback.qualitative_cols_2) {  
  feedback.qualitative <- as.data.frame(feedback.formatted[q]  
  [!is.na(feedback.formatted[q]),])  
  feedback.qualitatives[idx] <- feedback.qualitative  
  idx = idx + 1  
}  
  
kable(feedback.qualitatives[1], col.names =  
  feedback.qualitative_cols[1])
```

---

## If you enjoyed any part(s) in particular, please describe what you enjoyed:

---

Knowing what I was doing

---

feeling more confident that I understand the technology now

---

the game was easy to use

---

More fun than a standard signup link

---

playing music game

---

the augmented reality bottles were good

---

if the game was better i.e. had more playable content would be more enjoyable. similarly if it had a reward at the end of it would be more inclined to participate

---

```
kable(feedback.qualitatives[2], col.names =  
  feedback.qualitative_cols[2])
```

---

---

**If you were annoyed by any part(s) in particular, please describe what annoyed you:**

---

Having to input my email again

a bit annoying that the bottles took a while to appear

it was a bit slow

this was the same game as before as far as i could see except no coin reward

I didnt understand why I needed to play a game after paying

Having to type in the notes of the tune

Novelty wearing off.

Playing a game with sound

AR is difficult to read/understand - without reward just seems like unnecessary promo gag

It didn't tell me why I was playing the game? Not sure I would bother if i was in a rush

---

**kable(feedback.qualitatives[3], col.names = feedback.qualitative\_cols[3])**

---

**If you found any particular part(s) engaging, please describe what:**

---

slightly more engaging now I feel more confident re the technology

in order to get the rewards you have to engage

Interactive game

engaging but not through consumer choice

The augmented bit was cool

---

**kable(feedback.qualitatives[4], col.names = feedback.qualitative\_cols[4])**

---

**If you found any particular part(s) interesting, please describe what:**

---

That I felt more used to the app already

AR relatively new introduction to point of sale but seen as more inconvenience and only for promotion if it does not result in customer reward

---

```
kable(feedback.qualitatives[5], col.names =  
feedback.qualitative_cols[5])
```

---

**If you found any particular part(s) persuasive, please describe what:**

---

Still not quite as catchy as it could be

---

rewards

---

I dont like when companys make me play games without my own choosing

---

interactivity can help persuasiveness but is limited to its novelty as a new addition to a normal activity

---

Instructions to turn phone made me curious to see what would happen

---

```
kable(feedback.qualitatives[6], col.names =  
feedback.qualitative_cols[6])
```

---

**If you found any part(s) in particular, connected you with the brand, please describe what:**

---

rewards

---

```
kable(feedback.qualitatives[7], col.names =  
feedback.qualitative_cols[7])
```

---

**If you found any part(s) in particular, difficult to use, please describe what:**

---

it was a bit slow

---

the phone - samsung - has a return button that i had forgotten about

---

I not very good when it come to using technolgy so I didn't quite understand what needed to do

---

It was okay - but you do need to know where the 'marker' is

---

The sizing and pace of this iteration seemed easier to grasp game, but familiarity also playing a part.

---

the directions to augmented reality need signposting more

---

The AR game

---

AR writing difficult to read, AR relies on distance created between object in the background and the phone to project image - purchasing from vending machine requires proximity to the machine making image and interaction blurry disorienting

---

```
kable(feedback.qualitatives[8], col.names =  
feedback.qualitative_cols[8])
```

---

### **What was the best part of the experience?**

---

having help to hand in case i can't work the technology

---

the game

---

the graphics

---

doing the task

---

the graphics are nice

---

The game is fun but would rather just get the drink as no rewards offered

---

THe game and the coins

---

simple to use

---

The AR game

---

The notification.

---

game itself was fun and classic for its type but needs a reward after

---

---

```
kable(feedback.qualitatives[9], col.names =  
feedback.qualitative_cols[9])
```

---

## **What was the worst part of the experience?**

---

inputting my email again

---

the speed

---

same old same old

---

I didnt understand what to do

---

it just takes up time

---

no worst part

---

Game controls not obvious

---

not engaging enough

---

That the minigame was the same. Tune plays loudly not sure I want the attention of any needless noise as I am going about whatever I am doing.

---

The game put me off wanting to sign up at the end

---

The AR game. I felt like it was for a purpose.

---

does not allow for speed and convenience - also no reward offered

---

The noise

---

---

```
kable(feedback.qualitatives[10], col.names =
feedback.qualitative_cols[10])
```

---

## **Do you have any suggestions for improvement?**

---

I presume one would sign up and register to join the app

---

more than three notes on the tune? Use rhythm on the phone and get users to drum out that rythm with their bottle purchase

---

good idea for those that don;t mind playing games on phone - just not for me

---

not sure what rewards I can earn in terms of purchasing the drinks

---

different optional games

---

Explanation of coins

---

Skip option or obvious that the diversion of the game can be ignored.

---

More of a marketing improvement but a game that is related to the brand would be more immersive and relate-able

---

Perhaps a random lottery. Winner plays the AR game to win a token/loyalty prize?

---

game needs a reward/prize to attract custom otherwise will be seen as unnecessary interactive promotion

---

---

## **Experiment #3**

```
feedback.qualitative_cols_2 <- paste(feedback.qualitative_cols,
  2, sep = '___')

feedback.qualitatives = c()
idx = 1

for (q in feedback.qualitative_cols_2) {
  feedback.qualitative <- as.data.frame(feedback.formatted[q]
    [!is.na(feedback.formatted[q])],)
  feedback.qualitatives[idx] <- feedback.qualitative
  idx = idx + 1
}

kable(feedback.qualitatives[1], col.names =
  feedback.qualitative_cols[1])
```

---

---

**If you enjoyed any part(s) in particular, please describe what you enjoyed:**

---

it's quite enjoyable to get a coin towards some free tea!

---

it was quick

---

I liked being rewarded with coins

---

quick to use/getting coins

---

This was nice and quick to get through

---

Getting coins for rewards

---

Curiosity temporarily piqued by novelty of coin reward (at least on the first presentation)

---

It was relatively quick and gave me a reason to keep buying

---

less disruption to purchasing experience - allows for speed

---

It was more clear what was going on

---

---

```
kable(feedback.qualitatives[2], col.names =  
       feedback.qualitative_cols[2])
```

---

**If you were annoyed by any part(s) in particular, please describe what annoyed you:**

---

Simply because I didn't have to enter my email address

---

Not annoying if you recognise that you are getting a coin for this

---

It was nice and short - didn't annoy me

---

Slightly attention drawing/consuming. Only an issue because I wouldn't engage or use with reward feature going forward.

---

not being able to see coin balance immediately is fairly annoying

---

I would be unlikely to click on my email to read more info if I'm trying to buy a drink

---

---

```
kable(feedback.qualitatives[3], col.names =  
       feedback.qualitative_cols[3])
```

---

---

**If you found any particular part(s) engaging, please describe what:**

---

difficult to engage in a process that you have to go through to get a coin.

---

it was simple and the rewards scheme were engaging

---

The promise of a reward

---

again liked being thanked - good graphics, fast paced, rewarding and i felt like i got something in return for my custom

---

Wouldn't make me rush out and buy more Fave than I would have done anyway

---

would be more engaging if it had an app for the collection and spending of coins

---

More explanation/better instructions - or maybe just noticed them more?

---

```
kable(feedback.qualitatives[4], col.names =  
feedback.qualitative_cols[4])
```

---

**If you found any particular part(s) interesting, please describe what:**

---

more interesting that the focus of this experience is completely on getting a coin

---

Yes I got coins but no social media button this time

---

I enjoyed the reward system

---

It was okay but not particularly interesting

---

Reward feedback direct from buying product

---

loyalty coins not new but delivery method through phone payment is and so to be automatically given coins for small purchases will likely intrigue.

---

```
kable(feedback.qualitatives[5], col.names =  
feedback.qualitative_cols[5])
```

---

**If you found any particular part(s) persuasive, please describe what:**

---

possibly persuasive because it's relatively easy to get a coin towards a free drink

---

simplicity and rewarding

---

I'm sorry but there is not anything persuasive about this. I don't care about the coins as they are worth 1000th of a penny or whatever and when I look in my email I will find emails telling me that I have earnt very little so this could be a source of annoyance each time I use a vending machine

---

More likely to repeat my purchase

---

It didn't really persuade me to buy Fave

---

Being able to get something back for my purchase is persuasive

---

having rewards instantly given which can be used for future purposes encourages customer to return in order to accrue coins. more persuasive if customer could see balance and spend either online instantly (through universal app) or spend at the same machine pre purchase.

---

**kable(feedback.qualitatives[6], col.names = feedback.qualitative\_cols[6])**

---

**If you found any part(s) in particular, connected you with the brand, please describe what:**

---

I guess there is some connection to the brand by default if you are getting involved in collecting coins.

---

rewards

---

key colours and repeated - good theme

---

It gave me a reason to repeat purchases

---

coins specific to the brand which can only be used through their own promotions means spending more time using the brands interactive services and more opportunity to buy into promotions.

---

**kable(feedback.qualitatives[7], col.names = feedback.qualitative\_cols[7])**

---

---

**If you found any part(s) in particular, difficult to use, please describe what:**

---

very user friendly - anyone can use it

Mildly put out by the request to provide personal email address

autofill essential for email - would be better to see coin balance upfront

It was easy until directed away from app to my email

---

```
kable(feedback.qualitatives[8], col.names =  
feedback.qualitative_cols[8])
```

---

**What was the best part of the experience?**

---

reward

getting the coin!

it was easy

reward system

quick/getting coins

The graphics are nice

The offer of coins was good however im not sure how good the prizes will be

the simplicity, the speed

Not overly long to process and move on and forget

Getting something back for my purchase

coins for nothing! if the coins feel to easy to get, they feel kinda worthless.

The reward element with the coins is a nice idea for brand engagement

The reward screen. Gave me a positive feedback.

getting reward - financial/ coin based essential - prizes traded for coins must also be worthwhile

Easy to understand process

---

```
kable(feedback.qualitatives[9], col.names =  
feedback.qualitative_cols[9])
```

---

## **What was the worst part of the experience?**

---

friends would get fed with me keep sending them adverts for drinks.

---

N/A

---

not a worst part

---

not sure if the coins are persuasive enough for me to become loyal to the brand

---

Request for personal data - email address

---

coins for nothing! if i already know and value fave coins, then getting them for just buying a drink and tapping on my phone aint bad at all

---

having to confirm my email address again. Personal details should already be known? On my phone, im not likely to share the reward with other people.

---

not seeing or being able to spend coins immediately but instead being emailed a balance and inevitably promotional offers to suit

---

---

```
kable(feedback.qualitatives[10], col.names =
feedback.qualitative_cols[10])
```

---

## **Do you have any suggestions for improvement?**

---

The language used for the delivery of the prize

---

I'm assuming that the meaning of the coin is explained elsewhere and you don't think it needs any further explanation during the experience which is focused on getting a coin?

---

maybe saying what some of the prizes are instead of having to check inbox

---

Could provide notification before purchase with special offers or let you pay with reward coins.

---

Slight delay registered before promotion proceeded through to final email request screen.

---

Speed up the process, it seemed a bit slow, and could have done with info on what the coins are for before submitting my email address

---

As stated. A one-time registration, then keep the experience personal.

---

see balance immediately, spend coins immediately at machine before/after purchase, use universal app e.g. nectar to see points balance and promo offers side by side therefore able to set targets for points accrual - less likely to receive all promotions via email

---

keep it all in the app

---

When you have the coin, it doesn't tell you to click to finish. Sounds could help?!

---

# Experiment #4

```
feedback.qualitative_cols_2 <- paste(feedback.qualitative_cols,  
 3, sep = '___')  
  
feedback.qualitatives = c()  
idx = 1  
  
for (q in feedback.qualitative_cols_2) {  
  feedback.qualitative <- as.data.frame(feedback.formatted[q]  
  [!is.na(feedback.formatted[q]),])  
  feedback.qualitatives[idx] <- feedback.qualitative  
  idx = idx + 1  
}  
  
kable(feedback.qualitatives[1], col.names =  
  feedback.qualitative_cols[1])
```

---

## If you enjoyed any part(s) in particular, please describe what you enjoyed:

It was simple and direct

it was easy but I don't use social media so the invitation to share wasn't relevant for me,

i feel like enjoyable is perhaps the wrong word

getting more used to the app

speed

It was quick and unfussy

Quick and easy

In comparison to other minigame experiences a lot quicker.

Being thanked for my purchase and opportunity to give something good to friends

no enjoyment in sharing personal information

---

```
kable(feedback.qualitatives[2], col.names =  
  feedback.qualitative_cols[2])
```

---

---

**If you were annoyed by any part(s) in particular, please describe what annoyed you:**

---

Sharing with friends as before

slightly annoying re the assumption that social media is used.

I don't like the bookend tag lines

forced to share on social media

I dont like having to share content on social media without my own choosing

Request for personal info and promotion on personal media together.

Having to post on my social media channels

A little apprehensive sharing something trivial like a drink preference to my social media feed

felt invasive to be asked to post to social media just because i bought a drink

Having to keep confirming email details.

strongly dislike sharing on social media and emails especially for no reward and if to be used only for marketing purposes

It seemed pretty pointless - no reason to be clicking on anything, just asked for my email with no explanation

---

**kable(feedback.qualitatives[3], col.names = feedback.qualitative\_cols[3])**

---

**If you found any particular part(s) engaging, please describe what:**

---

only engaging because of the context of research

it was good that it wasn't too engaging

As I only had the option to fb or tweet then I felt a bit hamstrung - I need an option to say no

the graphics were quite jolly

no engagement except sharing on social media

---

**kable(feedback.qualitatives[4], col.names = feedback.qualitative\_cols[4])**

---

**If you found any particular part(s) interesting, please describe what:**

---

only interesting because of research factor

---

We all see so much of this stuff these days

---

inconvenient

---

---

```
kable(feedback.qualitatives[5], col.names =  
       feedback.qualitative_cols[5])
```

---

**If you found any particular part(s) persuasive, please describe what:**

---

I am not persuaded and have no interest in buying drinks from a vending machine

---

I found I was stuck having to do something but maybe in real life I wouldn't open the app. My enthusiasm for the product - a bottle of water is not that great that I want to share it

---

not as much as previous times

---

It doesn't make me want to buy more of the product than I would otherwise

---

Giving friends a deal on something encouraged me to share

---

dislike posting on social media and sharing email means less likely to return

---

Seemed a bit spammy

---

---

```
kable(feedback.qualitatives[6], col.names =  
       feedback.qualitative_cols[6])
```

---

**If you found any part(s) in particular, connected you with the brand, please describe what:**

---

I am rarely persuaded by brand but I accept that a brand can build trust so to this extent I think that the fact that the technology is easy to use, helps build trust.

---

Yes I suppose so in that the brand came up on my phone

---

Tiny bit.

---

Felt like I would be shouting out my love for the brand by sharing

---

forced to promote brand

---

```
kable(feedback.qualitatives[7], col.names =  
feedback.qualitative_cols[7])
```

---

**If you found any part(s) in particular, difficult to use, please describe what:**

---

Getting used to it

---

No clear close/ignore/skip, which I feel inclined to do once I realise what is happening.

---

auto fill necessary

---

```
kable(feedback.qualitatives[8], col.names =  
feedback.qualitative_cols[8])
```

---

**What was the best part of the experience?**

---

quick and easy

---

easy

---

it was simple, easy and quick

---

the jolly graphics

---

Its easy to use and relatively quick

---

Quick. Understood what the experience wanted of me, quick for me to dismiss.

---

receiving the drink

---

It was very simple to follow

---

```
kable(feedback.qualitatives[9], col.names =  
feedback.qualitative_cols[9])
```

---

## **What was the worst part of the experience?**

---

advertising in general as well as signing up for things, nothing specific to the singular experience just advertising generally

---

Expectancy to share on social media without any reward

---

not having a choice if i wanted to share content or not

---

Being forced to share on socials

---

Confronted by the request for personal info and promotion

---

Feel uncomfortable sharing things on social media

---

lack of anything in return for social media post.

---

posting on social media and sharing email for likely spam

---

Didn't give me any incentive to engage

---

---

```
kable(feedback.qualitatives[10], col.names =
feedback.qualitative_cols[10])
```

---

**Do you have any suggestions for improvement?**

---

Yes have a Not now button

---

give option to share content or not

---

Make sharing optional or be able to send to specific contact?

---

Add more social media channels, pics on instagram maybe

---

I didn't really get anything out of the experience, not memorable, i simply shared my purchase on facebook, im not sure if people would really be interested in this if they get nothing in the return such as the coins.

---

Skip option/obvious ignore and move on with day

---

Give more detail on the type of promo to make it more persuasive to share on social media

---

the social media message wording maybe. But really i think the user needs something in exchange for the post.

---

There needs to be a reward if customers are being compelled to share marketing

---

My chosen drink was not indicated. It would be good to show me my usual flavour in some way and tailor the acknowledgement to my taste.

---

no social media or good reward system

---

More instructions and feedback

---

# Experiment #5

```
feedback.qualitative_cols_2 <- paste(feedback.qualitative_cols,  
4, sep = '___')  
  
feedback.qualitatives = c()  
idx = 1  
  
for (q in feedback.qualitative_cols_2) {  
  feedback.qualitative <- as.data.frame(feedback.formatted[q]  
  [!is.na(feedback.formatted[q]),])  
  feedback.qualitatives[idx] <- feedback.qualitative  
  idx = idx + 1  
}  
  
kable(feedback.qualitatives[1], col.names =  
  feedback.qualitative_cols[1])
```

---

## If you enjoyed any part(s) in particular, please describe what you enjoyed:

more enjoyable because I managed to use the technology without help

it was the first time i think id properly understood the game

playing the bottles was okay but getting the instructions / distance from the fave logo and understanding what i needed to do was a problem and I needed prompting

Game is more interesting, especially with the prospect of a reward

easy to use game

Like the way the 3 notes are in different order each time

Novelty caught attention

Fun to interact with the advertising in a new kind of way

enjoyed winning the game and getting some sweet coins

AR simple game gives reward - writing difficult to read/understand

---

```
kable(feedback.qualitatives[2], col.names =  
  feedback.qualitative_cols[2])
```

---

**If you were annoyed by any part(s) in particular, please describe what annoyed you:**

---

Same experience each time

less annoying because i was more familiar with the technology

im a ludite, generally if im using technology, i want it to be fast, the game didnt work quickly

only the part where it patronised me with well done for playing three nortes

It all just takes precious time - for a tiny reward

It caught my attention. In addition to needing me to get close to the marker to load game it requires me to backtrack to vending machine. Breaks flow as I was heading away from the machine.

Playing a game with sound in public is not appealing

AR difficult to understand, does not lend to convenience/speed. also could do without having to rotate to landscape on phone use.

---

**kable(feedback.qualitatives[3], col.names = feedback.qualitative\_cols[3])**

---

**If you found any particular part(s) engaging, please describe what:**

---

more engaged because I was motivated to work out the technology

fun to work it out

enjoyable game and rewards

I do like the graphics

Being able to earn coins

AR game interactive and relatively new tech therefore more engaging for point of sale, use of coin system means engagement with brand more likely as they can be used for further prizes etc

---

**kable(feedback.qualitatives[4], col.names = feedback.qualitative\_cols[4])**

---

**If you found any particular part(s) interesting, please describe what:**

---

due to the reward scenario

---

I don't find this experience interesting except in context of the research contribution

---

game element

---

I would find this quite boring after the first couple of times

---

Caught attention

---

both AR and loyalty points in this setting are relatively new and therefore will always trigger intrigue so long as novelty is retained or new interactions created.

---

**kable(feedback.qualitatives[5], col.names = feedback.qualitative\_cols[5])**

---

**If you found any particular part(s) persuasive, please describe what:**

---

more persuasive depending on better understanding of reward/coin

---

rewards are persuasuve

---

more engaging than the previous options

---

rewards and fun game leads to a good brand

---

success with task/positive feedback

---

It won't make me more likely to buy more of a particular product

---

Being able to earn coins from my purchase would make me more likely to purchase from this brand from this vending machine again

---

winning coins

---

game and reward is best combo

---

AR new concept for this type of purchase - novelty factor may encourage repeat purchase, coin rewards also encourages repeat purchase to possibly unlimited levels based on prize in exchange for coins

---

Email address entering after game was better

---

**kable(feedback.qualitatives[6], col.names = feedback.qualitative\_cols[6])**

---

---

**If you found any part(s) in particular, connected you with the brand, please describe what:**

---

rewards

---

no not really

---

Not really

---

Earning coins and the potential to earn more through more purchases

---

tapping directly onto the product as part of the game

---

coin reward system means customer is tied to brand but for the customer it feels more like a choice as there is the potential to gain a return in exchange for repeat custom

---

**kable(feedback.qualitatives[7], col.names = feedback.qualitative\_cols[7])**

---

**If you found any part(s) in particular, difficult to use, please describe what:**

---

much easier to use the 2nd time round!

---

changing orientation was difficult holding the drink

---

only with help / prompting

---

Rotating the screen seemed a bit buggy, could have been smoother

---

the game wasn't easy to see as the vending machine is in the background and the drinks on the screen dont stand out against it

---

Minigame gameplay rule not immediatley clear. Missed first note cues before I grasped what I needed to do.

---

AR difficult to understand - would be more convenient with immediate access to coins and coin balance

---

**kable(feedback.qualitatives[8], col.names = feedback.qualitative\_cols[8])**

---

## **What was the best part of the experience?**

---

being able to use the technology

---

rewards

---

rewards

---

It was quite a slick little app

---

The game is fun and a surprise but on a second play was a bit less interesting. After first play the game gets a bit boring quite quickly

---

the interactive element / augmented reality experience

---

The interactive nature of the advertising

---

the AR game

---

The feeling of winning a prize.

---

coin in return for AR

---

Instructions were better and took you through journey more.

---

Liked how you had to play the game, was interactive, sounds, engaging and then winning a coin - also had more text saying what you had won and how to get access to coins etc

---

---

```
kable(feedback.qualitatives[9], col.names =  
       feedback.qualitative_cols[9])
```

---

---

## **What was the worst part of the experience?**

---

Language "YOU HAVE COIN"

---

changing orientation

---

working out what I was meant to do

---

Not really a worst part

---

the game wasn't clear or easy to understand

---

Time out of my activity to ask me for personal info (email address) at the end.

---

The fact that it played sound on the phone

---

sharing email address

---

```
kable(feedback.qualitatives[10], col.names =  
feedback.qualitative_cols[10])
```

---

## Do you have any suggestions for improvement?

---

Change the language to something more exciting

---

maybe think about whether more helpful to get the technology easy to use first time round!

---

simplify the language, orientation isn't a game that would appeal to anyone who struggles with english language

---

yes a bit more info on the screen and don't say 'well done' maybe 'room for improvement'

---

Make the game a bit smoother and maybe different games??

---

Ability to login to app

---

the game could work better if the vending machine was a lighter colour in order to see the drinks in the screen. I felt i had to move the phone around in order to read the game instructions

---

Skip option or option to ignore not obvious

---

Give more detail on what I can use the coins for before I submit my email address so I can decided if it is really worth it

---

Knowing how many Fave Coins i won and what they can be exchanged for could have made more excited about entering the experience and more likely to check the follow up email immediately.

---

There was no quantity of coin specified. It would be a good idea to specify difficulty levels, which would in turn have varying levels of rewards.

---

more coins, better AR game, no email sharing (probably necessary for coin collection) maybe use app instead.  
best version yet

---

Have more info before you play game about what you can do with coins and how to use

---

# Experiment #6

```
feedback.qualitative_cols_2 <- paste(feedback.qualitative_cols,  
5, sep = '__')
```

```
feedback.qualitatives = c()  
idx = 1
```

```
for (q in feedback.qualitative_cols_2) {  
  feedback.qualitative <- as.data.frame(feedback.formatted[q]  
  [!is.na(feedback.formatted[q]),])  
  feedback.qualitatives[idx] <- feedback.qualitative  
  idx = idx + 1  
}  
  
kable(feedback.qualitatives[1], col.names =  
  feedback.qualitative_cols[1])
```

---

**If you enjoyed any part(s) in particular, please describe what you enjoyed:**

---

finally worked out that if I point the phone at Fave then the bottles appear!

---

i enjoyed making music - interactive

---

The game

---

As a novelty it caught my interest.

---

no reward only asking for email and posting gives impression of likely promo spamming and pointless sharing of promos using my own channels - nothing given back only taken - I AM THE CUSTOMER not marketing mule

---

```
kable(feedback.qualitatives[2], col.names =  
  feedback.qualitative_cols[2])
```

---

**If you were annoyed by any part(s) in particular, please describe what annoyed you:**

---

Not enough practice

---

just wanted drink

---

there was a lot to do, changing orientation of the phone whilst holding the product was irritating

---

playing bottles software was too slow

---

Social media sharing

---

Its good to have use to share on social media but I don't always like sharing that sort of content on the net

---

It all takes time. And do social media friends really want to be tweeted about this?

---

Required a moment to get what the game expected of me. Despite understanding the objective from the description, what I had to do wasn't jump straight in obvious or why (afterwards).

---

Having a game that plays sound out loud without knowing in advance is annoying, and don't like sharing things on social media

---

being asked for email AND social media post back to back felt over the top. I was kinda happy to give the email, but as soon as the social media screen appeared, it annoyed me and even made me question why my email had been requested at all.

---

Assuming this was a regular purchase, I wouldn't want to play the AR game every time.

---

ibid Q1

---

the noise of the game, and also didn't explain the incentive before you play

---

---

```
kable(feedback.qualitatives[3], col.names =  
       feedback.qualitative_cols[3])
```

---

**If you found any particular part(s) engaging, please describe what:**

---

The idea of taking part in something new

---

more engaging once I got my head around playing the game!

---

it was engaging in the sense that i had a lot to do, the engagement was a bad point rather than a good one in this instance

---

fun to play/music game interesting element

---

It was a tiny bit fun to play the notes back - I am not musical and don't get to do things like that often

---

Caught attention and required input - that wasn't personal which would have put me off straight away.

---

forced to engage - game engaging but offers no reward

---

```
kable(feedback.qualitatives[4], col.names =  
       feedback.qualitative_cols[4])
```

---

**If you found any particular part(s) interesting, please describe what:**

---

What the advertiser is looking for

---

the game was interesting

---

nice graphics

---

As a novelty interaction it caught interest.

---

simply using customers as marketing agents not interesting more annoying

---

```
kable(feedback.qualitatives[5], col.names =  
       feedback.qualitative_cols[5])
```

---

**If you found any particular part(s) persuasive, please describe what:**

---

i dont know what i was supposed to be persuaded by, i already had the drink in my hand

---

Good way to share info on a brand you liked

---

Wouldn't make me choose this item over another

---

Being able to share promos with friends is nice

---

The social media sharing was a good tool. Not sure I want my friends knowing my drink preferences though!

---

asking me to post and share email discourages repeat purchase

---

---

```
kable(feedback.qualitatives[6], col.names =  
       feedback.qualitative_cols[6])
```

---

**If you found any part(s) in particular, connected you with the brand, please describe what:**

---

The bottle video game made me remember the brand

---

game connected to brand

---

not necessarily

---

If it did connect me with the brand, it was on a level which I am not conscious of

---

The request for promotion on personal media connect me but triggered a mildly negative response

---

shackled to brand through posting and sharing email for inevitable marketing mail

---

---

```
kable(feedback.qualitatives[7], col.names =  
       feedback.qualitative_cols[7])
```

---

**If you found any part(s) in particular, difficult to use, please describe what:**

---

The first time of using any new app has to make one think more than the following attempts. But it was pretty easy

---

much easier now I understand how to use the technology

---

changing orientation and the game wasnt easy, theres also no objective to the game that i could understand

---

i copy the tune / order of the bottles playing but the phone is slow to react so I have finished the tune before the bottles play - there is a time lapse

---

found it easier due to doing a similar experience

---

The more i use the app the easier it is to use but even after a couple of tries it isn't clear on the screen,

---

Rules/how to play minigame not particularly clear

---

AR difficult to understand

---

Took a while to realise what I had to point phone towards - (the fave in the box) rather than the white marker

---

```
kable(feedback.qualitatives[8], col.names =  
       feedback.qualitative_cols[8])
```

---

**What was the best part of the experience?**

---

Being involved

---

it's the last experience!

---

it was fairly quick

---

the music

---

incentives

---

the jumping bottles were nice

---

The game is quite fun but better with coin rewards

---

interesting idea to be able to share something you've just purchased with your friends online immediately

---

Thanking me for my purchase

---

receiving the drink

---

```
kable(feedback.qualitatives[9], col.names =  
feedback.qualitative_cols[9])
```

---

### **What was the worst part of the experience?**

---

Not knowing what to do beforehand

---

more social media

---

it wasn't quick enough

---

repeat experience so a bit boring - why would i bother doing this more than a couple fo times to find out all the patterns.

---

having to share on social media

---

Having to share to socials

---

reading the screen whist the bottles are on the screen

---

After the attention grab the realisation of advertising demand on my personal media.

---

Having a game with sound

---

not knowing why my email address was asked for.

---

posting on social media and sharing email - no reward given

---

Trying to find the thing to point the phone at

---

---

```
kable(feedback.qualitatives[10], col.names =  
feedback.qualitative_cols[10])
```

---

## **Do you have any suggestions for improvement?**

---

A short summary of how the app works beforehand

---

speed up the bottle playing and make the tunes more demanding. Put in a race game or a super mario type character each time and involve the product in the game

---

give option to share or not to share

---

have option to not share

---

Could share scores in SM posts. Also, game should be played away from machine to prevent queuing.

---

make the bottles /augmented reality screen easier to read, then i think the whole experience becomes more engaging and memorable. This experience didn't seem different enough from the previous ones.

---

Skip option to get on with my day

---

Use an AR game with no sound

---

Perhaps, if the game had a top score, It would make a better use of the social media. Gamifying the interaction will draw me back and be competitive with my peers.

---

give a reward or don't ask to post on social media - sharing email for further interactivity expected but not if it would only be used for promo emails.

---

There was no reason to share on social media - maybe more points?

---

Clearer instructions for user?!

---

# Experiment #7

```
feedback.qualitative_cols_2 <- paste(feedback.qualitative_cols,  
6, sep = '___')  
  
feedback.qualitatives = c()  
idx = 1  
  
for (q in feedback.qualitative_cols_2) {  
  feedback.qualitative <- as.data.frame(feedback.formatted[q]  
  [!is.na(feedback.formatted[q]),])  
  feedback.qualitatives[idx] <- feedback.qualitative  
  idx = idx + 1  
}  
  
kable(feedback.qualitatives[1], col.names =  
  feedback.qualitative_cols[1])
```

---

## If you enjoyed any part(s) in particular, please describe what you enjoyed:

---

I was more familiar with the process

---

This time I got some coins - though I don't know how much they were worth

---

good reward system

---

the speed, ease of use, neat (no wallets/cards/money)

---

Relief to just be able to end the purchase process quickly

---

Getting a free reward coin but nnoying having to share on socials

---

Quicker to present coin reward.

---

Earning something back for my purchase

---

Dislike posting to social media

---

```
kable(feedback.qualitatives[2], col.names =  
  feedback.qualitative_cols[2])
```

---

---

**If you were annoyed by any part(s) in particular, please describe what annoyed you:**

---

The app asks to share with friends every time it is used?

I was annoyed to have to choose from social media which I don't actually use.

advertising annoys me

Prompted to share on social media before completion

didn't like having to share my email address with another brand

not sure how much i want to share with people on social media yet

This wasn't too bad - no time-consuming bottlenecks game

Less annoying as email address is taken in return for a reward but being forced to share on socials is not good

Request for personal information or promotion feel invasive

Having to share on social media

sharing email and posting to social media annoying, 1 coin not good enough.

---

**kable(feedback.qualitatives[3], col.names = feedback.qualitative\_cols[3])**

---

**If you found any particular part(s) engaging, please describe what:**

---

I don't find the experience engaging other than the fact that I have achieved what I wanted ie buying a drink.

having to literally do the thing engaged me, i liked the addition of the coins though i don't know what they're for

Not addictive nor engaging

again, simple but effective design - visually engaging

rewarding to get coins/positive feedback

Was very clear and the reward was good incentive but again annoying to have to share

coin gives engagement but less likely to engage because of social media and email share

---

**kable(feedback.qualitatives[4], col.names = feedback.qualitative\_cols[4])**

---

---

**If you found any particular part(s) interesting, please describe what:**

---

What peoples reactions would be to be sent a share each time the app is used

Yes as this was the first time that I got coins

It would be interesting if it was the first time I'd used this app

Reward can be used for multiple things so is quite interesting

coin reward in this setting is interesting but sharing info is not

---

```
kable(feedback.qualitatives[5], col.names =  
       feedback.qualitative_cols[5])
```

---

**If you found any particular part(s) persuasive, please describe what:**

---

I believe that younger people would engage with the app far better than the older generations of smartphone users

I don't know what would be persuasive about it

rewarding - good way to get repeat custom

Wouldn't make me buy more of this product or favour it over a rival

Would make me want to buy the drink but forced to share really annoying

Being able to earn coins

posting to social media, sharing email and receiving promotional content as a result more likely to drive me away.

Told me why i should use the app right at the start - exchanging coin

the simplicity of being rewarded just for buying the drink

---

```
kable(feedback.qualitatives[6], col.names =  
       feedback.qualitative_cols[6])
```

---

---

**If you found any part(s) in particular, connected you with the brand, please describe what:**

---

The continuity of brand name being shown

---

the coins seemed to connect me

---

Fave came up on the screen

---

repeated use of brand logo

---

It didn't really connect me to brand

---

Would want the drink more because of reward but not like the brand because of being forced to share

---

There felt a forced connection to the brand in the request to promote on personal media.

---

Being able to earn coins would make me more loyal to the brand

---

coins help connection, posting and sharing does not

---

---

```
kable(feedback.qualitatives[7], col.names =
feedback.qualitative_cols[7])
```

---

**If you found any part(s) in particular, difficult to use, please describe what:**

---

n/a

---

this was very easy

---

was very simple to follow

---

easy to share and submit, would be easier if I had access to my coins and coin balance - difficult to understand why I have to post and share.

---

V clear instructions/prompts

---

the fact that it was simply sent to your email

---

---

```
kable(feedback.qualitatives[8], col.names =
feedback.qualitative_cols[8])
```

---

---

## **What was the best part of the experience?**

---

the addition of the coins

---

reward system, easy to use

---

receipt of drink/speed

---

that the brand is attempting to connect with the customer on not just a sales level, perhaps this makes the brand more relevant.

---

Gaining coins but not having to partake in the game

---

Earning coins

---

coin

---

---

```
kable(feedback.qualitatives[9], col.names =
feedback.qualitative_cols[9])
```

---

## **What was the worst part of the experience?**

---

the promotion for social media. I particularly dislike Facebook.

---

social media sharing

---

having to give email address and having to share on social media - i like to be in control of who im sharing content with

---

being asked to share

---

Felt a longer than desirable process with multiple opening pages/content to be parsed.

---

Sharing on social media

---

Sharing with friends. Not really wanted, but was very prominently displayed.

---

posting to social media and sharing email

---

Social media sharing - no reason to share with friends?

---

Not as fun without a game

---

---

```
kable(feedback.qualitatives[10], col.names =
feedback.qualitative_cols[10])
```

---

---

## **Do you have any suggestions for improvement?**

---

Scrap Facebook

---

a brief explanation of the coins, are they reward points?

---

As before a no thank you or not now button on social media page

---

Promise of more coins if you share on social media

---

It could be clearer what you're getting for your coins and where your interaction with the brand will lead.

---

No skip option to ignore and move on.

---

The pre-filled social media post could be linked to the coins rather than just sharing deals, or maybe I should get extra coins for sharing on social media

---

maybe the social media post could be incentivized. "Double your fave coins for sharing"

---

Perhaps an option to share with your favourite social media as a setting, then kept away from you, or some notification when done, but not always prompted.

---

no social media - AT ALL. easier access to coins

---

---

## **Experiment #8**

```
feedback.qualitative_cols_2 <- paste(feedback.qualitative_cols,
  7, sep = '___')

feedback.qualitatives = c()
idx = 1

for (q in feedback.qualitative_cols_2) {
  feedback.qualitative <- as.data.frame(feedback.formatted[q]
    [!is.na(feedback.formatted[q])],)
  feedback.qualitatives[idx] <- feedback.qualitative
  idx = idx + 1
}

kable(feedback.qualitatives[1], col.names =
  feedback.qualitative_cols[1])
```

---

---

**If you enjoyed any part(s) in particular, please describe what you enjoyed:**

---

i like the game

---

a repeat of the bottle playing

---

liked the music game and being rewarded

---

THe game

---

I enjoyed the tune

---

too many interactions but game gives reward

---

Interactive game, image and music

---

the interactive element

---

---

```
kable(feedback.qualitatives[2], col.names =  
       feedback.qualitative_cols[2])
```

---

**If you were annoyed by any part(s) in particular, please describe what annoyed you:**

---

As before resubmitting my email

---

I found this experience more annoying because it was less easy to use and I needed help with the process.

---

the game doesnt entirely work and doesnt seem to work

---

not annoying but wonder if anybody will bother - alright for 5 year olds doing the tune

---

didnt like that i had to share info on soical media

---

Request for personal info and my promotion of the brand on social media after my attention and time used.

---

Having to post on my social media chanel

---

Both sound on game and sharing on social media

---

The social media section, particularly the pre-filled message isnt something i would share with friends.

---

too many interactions, AR difficult to read/ understand. DESPISE the idea of sharing on social media - if doing so reward must be much greater or at least proportionate to the level of marketing carried out by the individual posting i.e if customer has 700 followers and 7 people then purchase products poster should be given reward proportionate to the custom received by marketing - £5/10 off voucher, 100-250 coins per person

---

I would want to be warned if sound was about to come out of my phone in public

---

```
kable(feedback.qualitatives[3], col.names =  
feedback.qualitative_cols[3])
```

---

**If you found any particular part(s) engaging, please describe what:**

---

Interesting that the app will probably engage younger people very quickly

---

not engaging because not easy for me to use

---

engaging in this experiment but I wouldn't play the game ordinarily

---

Not particularly engaging after the same minigame. Possibility of some coins/rewards being useful is slightly engaging.

---

The inclusion of the AR game

---

The coins gave me a reason to play the game

---

the game

---

too engaging - too many interactions with email, AR game, Coins, email

---

---

```
kable(feedback.qualitatives[4], col.names =  
feedback.qualitative_cols[4])
```

---

**If you found any particular part(s) interesting, please describe what:**

---

Interesting in that it will pull younger users into playing the game

---

a little interesting because it was significantly more difficult for me to use.

---

the coins and rewards

---

felt more like a game/interesting visuals

---

THe AR

---

The AR game

---

AR interesting as concept for point of sale

---

---

```
kable(feedback.qualitatives[5], col.names =  
feedback.qualitative_cols[5])
```

---

**If you found any particular part(s) persuasive, please describe what:**

---

the coins would persuade me to continue and do it again, rewards in exchange for time and effort is persuading

---

If I had this app I probably would not use it so I am not persuaded

---

reward system is good to encourage repeat custom

---

directed to play

---

Earning coins

---

felt less trusting of the brand after the social media section

---

anything that asks me to post on social media has immediately lost its persuasion as it feels as though I am doing their marketing for them. also without significant reward that makes the potential embarrassment of posting an advert for a likely unhealthy product it will simply discourage me from re-buying.

---

Winning a coin - share to win!

---

**kable(feedback.qualitatives[6], col.names = feedback.qualitative\_cols[6])**

---

**If you found any part(s) in particular, connected you with the brand, please describe what:**

---

The constant picture of the bottles

---

I didn't feel connected with the brand during the experience.

---

rewards will keep me coming back

---

graphics

---

seeing the Fave bottles jumping about reinforced the brand

---

Not in a positive way - overall slightly negative in that I didn't want to connect with the brand and the request to associate me with it isn't appealing even for reward. Especially if unknown what I would receive.

---

Earning coins would make me want to be loyal, however sharing on social media kind of ruined it

---

maybe overly connected due to social media part

---

coins make connection, Social media is shackling customer to brand, AR game engages but can be seen as inconvenience

---

The game was related to the product

---

Again, colours and font stick in the brain

---

---

```
kable(feedback.qualitatives[7], col.names =  
       feedback.qualitative_cols[7])
```

---

**If you found any part(s) in particular, difficult to use, please describe what:**

---

I didn't find the bottles to tap without more help and I held the phone the wrong way to rotate to portrait.

---

the game wasn't particularly easy, changing orientation whilst holding the product was difficult

---

now i have done it a couple of times yes

---

Couldn't find marker straight away

---

Slightly confused by the game

---

AR difficult to understand

---

There were quite a lot of clicks between screens and wasn't really sure what was going on

---

---

```
kable(feedback.qualitatives[8], col.names =  
       feedback.qualitative_cols[8])
```

---

---

## **What was the best part of the experience?**

---

Being more aware of what to do

---

knowing I would get the help I need!

---

rewards

---

mini game

---

rewarding

---

Getting the reward

---

The game was really cool and surprisingly fun

---

the concept that you receive coins as loyalty is good idea, the process is easy to use and also pretty quick

---

Earning coins

---

Ar game

---

receiving coin reward

---

Interactive game, playing with music

---

the fact that it involved you in an interactive way

---

---

```
kable(feedback.qualitatives[9], col.names =  
       feedback.qualitative_cols[9])
```

---

## **What was the worst part of the experience?**

---

Expecting the user to share with friends

---

the game is a bit boring.

---

not being able to do it independently

---

the game

---

havign to share content on social media

---

being asked to share again

---

It was just a bit of a hassle

---

Being forced to share on socials makes it feel like you are being controlled and would make me not buy the drink

---

A lot of screen transitions requireng user input to progress.

---

The sound on the game, however as I was earning coins I would probably still play again if the reward was good enough

---

Social media

---

The AR game, again. Wasn't optional.

---

having to post on social media - very little will make me post on social media - usually have to be in return for a free product or service. only example of when I have been persuaded to post on behalf of company is at nightclub in return for free entry/drinks

---

---

```
kable(feedback.qualitatives[10], col.names =  
       feedback.qualitative_cols[10])
```

---

## **Do you have any suggestions for improvement?**

---

Yes a additional option of sharing that can be by private messaging or email

---

I think this experience needs looking at in terms of how easy it is to use.

---

whats the point in the game?

---

as before maybe more instruction like hold the camera around a metre from the fave logo

---

The game was fine, it's just that we are bombarded with this stuff now and it all takes up so much time

---

have option not to share

---

Could the marker be on the drink instead of the vending machine, then you can grab your drink and scan whilst you're on the go rather than standing by the machine.

---

Skip option/obvious 'ignorability' once engaging with promotional app

---

Make the pre-filled social media post contain a link to the game so anyone can earn a few initial coins without having to make a purchase

---

adapt the message so that its more specifically tied to the game experience or rewards

---

Remove social media posting or increase reward - combination of AR for reward where AR is very simple as in experiment works well provided reward and reward spending system is made worthwhile and easy to use.

---

More information about why I should be taking part

---

Bottles appeared slightly off the screen to left (might be because i wasn't pointing at the marker properly though!)

---

---

## **Summary feedback**

```
feedback.qualitative_cols_summary <- c("Do you have any
thoughts on the the wireless IoT device triggering the
interaction?", "Do you have any thoughts on the the smartphone element of the
interaction?")
```

```
feedback.qualitatives = c()
idx = 1
```

```
for (q in feedback.qualitative_cols_summary) {
  feedback.qualitative <- as.data.frame(feedback.formatted[q]
  [!is.na(feedback.formatted[q]),])}
```

```
feedback.qualitatives[idx] <- feedback.qualitative
idx = idx + 1
}

kable(feedback.qualitatives[1], col.names =
feedback.qualitative_cols_summary[1])
```

---

## **Do you have any thoughts on the the wireless IoT device triggering the interaction?**

---

No its just part of the experiment

---

important for me to have choice to not be engaged at all

---

I think there needs to be an option for people to take their drink and go rather than engage in the technology. The technology might be welcomed by some people but not everyone wants to go through this especially giving their email address.

---

it didn't completely work

---

A bit slow as in the bottles I didn't like the tag lines 'Thank you' and 'Amazing' I wasn't amazing and you started off saying goodbye (Thank you ) at the beginning. I guess it is thank you for purchasing the fave drink but taht doesn't really connect

---

Clever, but intrusive

---

Good idea - if people dont want to use it then turn bluetooth off

---

easy to use/immediate feedback

---

thought it was clever

---

Good idea, should trigger on point of payment or drink collection? Notification if you don't take drink?

---

device works well, so easy to use

---

Breaks up your activity of purchasing a drink to get on with quenching thirst by causing you to have to stop and turn/return to marker.

---

It was a process that I would deem to be second nature.

---

some people may find it invasive.. but others will be delighted by the surprise!

---

It could at times be quite intrusive.

---

worrying trend increasing of contactless fraud and phone hacking- would need to see better use of phone payment as simply being in the same room sets it off

---

I think it's quite cool that it pops up and you can use your phone to discover stuff

---

it was easier than clicking loads of things and entering text - instant

---

```
kable(feedback.qualitatives[2], col.names =  
feedback.qualitative_cols_summary[2])
```

---

## **Do you have any thoughts on the the smartphone element of the interaction?**

---

Bit basic

---

I am personally uncomfortable that my email gets captured every time.

---

It wasn't intuitive and was rather slow - by the time phone event had got going I would have moved on

---

sometimes you don't want to be bothered with games, sharing content etc when you just want to buy something

---

Dont like having to download apps as they use up precious memory and screen space on my smartphone. Find it a bit of a nuisance to be asked to do it

---

seemed like a natural experience to have on your phone

---

Not comfortable with the seamless communication of social media platforms to each other and with the payment system/process. I would not permit access of various apps to features such as camera.

---

I was, apart from the processing of entering my e-mail address and posting to social media.

---

use phone for many contactless payments already - AR could be better without the need for portrait rotation - added inconvenience

---

```
feedback.qualitative <- select(feedback.formatted, c("Overall,  
which was your most preferred experiment?", "Why was this your  
most preferred experiment?")) %>%  
filter(!is.na(`Why was this your most preferred experiment?`))
```

```
kable(feedback.qualitative)
```

---

**Overall, which was your most preferred experiment?**

#2

**Why was this your most preferred experiment?**

I had more of an idea of what was expected but enjoyed them all

#3

5

#7

i liked playing the games to win coins.

#3

opportunity to get a free drink

#1

it was the quickest and required the least effort

---

**Overall, which was your most preferred experiment?****Why was this your most preferred experiment?**

---

- #1 They all seemed too similar to remember which was best This is a required answer so I had to put something so this is random choice
- #3 Simplest, with reward
- #3 you got thanked for being a customer and rewarded but didnt have to share content
- #8 3 - first music task
- #3 Quick and easy to get through
- #3 Because it was good to get a reward without the game
- #7 Coin and SM sharing, plus quick so I can get down to drinking!
- #3 i like the idea of being rewarded with a fave coin, but not having to use social media as its not something i'd be interest to share online.Also there is no augmented reality element in this experience. I felt the augmented elememt didnt really add to the experience.
- #3 In retrospect; quick and not many screens, coin/point reward clear, option to engage to receive it by submiting email address (ecxhange is more explicit and more agreeable in that I get opt to get/continue)
- #3 Because it featured the AR game but didn't ask me to enter my social media information
- #3 I felt like I was getting something back for my purchase which would encourage me to be too loyal. The experiment was short and didn't ask me for too much information or expect me to share anything on social media, which I generally do not like to do.
- #5 i like the game idea with the email sign up justified by the reward and no social media request.
- #5 best combination
-

<b>Overall, which was your most preferred experiment?</b>	<b>Why was this your most preferred experiment?</b>
#5	I had the feeling of purpose in the engagement in the game. Plus the reward.
#5	AR game for coin is simplest, least sharing of info - AR could be better
#3	Explained what was going on from start (incentive), didn't push me to share on social media, which can be annoying, esp if also giving out email address -
#5	Because you got to play a game, it had sounds and was interactive and then you won a coin. You also don't have to share with friends - which I find annoying
#1	it had the least amount of clicks to sign up for, the simplicity worked best as you didnt have to do anything before entering email

```
feedback.qualitative <- select(feedback.formatted, c("Overall,
which was your least preferred experiment?", "Why was this
your least preferred experiment?")) %>%
filter(!is.na(`Why was this your least preferred experiment?`))

kable(feedback.qualitative)
```

<b>Overall, which was your least preferred experiment?</b>	<b>Why was this your least preferred experiment?</b>
#8	My reaction to sharing with friends
#6	most time consuming with smallest reward
#4	having to send adverts to friends.
#4	Because i don't like social media, especially Facebook
#6	i didnt completely understand the game for a couple of turns, this affects my answers for a few experiments
#1	They all seemed too similar to remember which was worst This is a required answer so I had to put something so this is random choice

---

**Overall, which was your least preferred experiment?****Why was this your least preferred experiment?**

---

#4	Sign up with social media share with no reward
#8	too many steps and needing too much info and sharing of personal information
#4	no coins and no game
#8	Found it all took too long - too many clicks
#2	Because you are forced to share it without getting a reward or a game
#1	No explanation, just email capture.
#2	It seemed to be purely a game. I 'signed up', but not sure for what?
#6	Too much input required, many screen transitions and decisions/options presented
#4	It asked for all my information without any real interactions
#2	I didn't like the game, mainly because of the sound, and in this version there was no real incentive to play it (like earning coins). To then have to share my email address after that seemed more negative than in other experiments.
#4	asking for email without reason and social media interaction felt lazy and invasive on their own. Together it was really annoying and kinda suspicious
#7	Not sure about sharing drink preferences with my friends on social media. Didn't see the point in it.
#4	No AR game, no reward, only used as marketing mule - hate posting on social media

---

---

**Overall, which was your least preferred experiment?**

#6

**Why was this your least preferred experiment?**

Didn't tell me why i should play game, no incentive, then didn;t tell me why i ahed played - just says 'well done'. Also lots of 'asks' at the end - give email address, share with friends, etc - what's in it for me? Also felt like there were more screens even though there actually weren;t

---

#4

You have to sign up and share on social media however you don't get anything in return

---

#8

as there were several steps to go through, although i enjoyed the interactive element, when you are in a rush and on the go you might not have time to play the game

---

**kable(as.data.frame(feedback.formatted\$`Lastly, do you have any other feedback regarding the experiments?**

`[!is.na(feedback.formatted\$`Lastly, do you have any other feedback regarding the experiments?`)]), col.names = 'Lastly, do you have any other feedback regarding the experiments?' )

---

**Lastly, do you have any other feedback regarding the experiments?**

I do believe that there would be added value if the app were to have a login that offered a loyalty card and was added as a smartphone wallet so that one could chose there favourite drink and just automatically wave their phone at the vending machine pick up their drink and leave.

---

I believe we live in a Corporatocracy and this whole process of feedback, loyalty and reward is only there to truly benefit the corporations and move us further away from conscious awareness by creating mechanical type behaviours.

---

I think there should be different types of adverts as they could become boring seeing the same ones.

---

Firstly thank you for being welcoming and supportive. My experience of these experiments has been to recognise how much technology intrudes into purchasing experiences and my view is that the more our purchasing is tracked by technology the more our freedoms and autonomy are threatened. I am very ambivalent now about loyalty incentives because they track my life and I find this intrusive. Most people are involved with social media and this technology re-inforces the power of social media. This is of concern to me, especially as I am aware of the risks to mental health that social media presents and especially to young people who I believe are mainly targetted by this technology.

---

---

## **Lastly, do you have any other feedback regarding the experiments?**

---

the language isn't simple enough for children or people who don't speak English, the changing orientation is annoying

---

This is a required answer so I had to put something so this is random choice. Needs some work All the best  
Stephen

---

Massively disliked the social media aspect, especially if there's no reward

---

could see it becoming repetitive so less engaging over time. don't like being asked to share all the time!

---

Hate typing using my smartphone QWERTY keyboard to give info like email address as keys are so small. I would probably, realistically, not bother with this

---

I'd imagine this would be interesting for a young demographic who like interact with social media, but personally I don't think I'd like to share with social media or use the augmented reality element. Using your phone to collect coins seems a good idea though.

---

Took a few goes before I got what to expect from each run. Maybe 2 trial runs (extreme examples not useful for the actual experiments) would be helpful as at first I didn't grasp what the differences I was looking out for were. Minigame took a moment to get to grips with.

---

They are all very similar - if the games could be differentiated that would make the process easier to compare and more enjoyable overall

---

Ordering all the tests was quite confusing even with the sheets!

---

I like the game idea, especially if it's fun and quick. Making the game result tied to the amount of fave coins awarded could make the game more engaging and make me look forward to buying my next can of sweet sweet Fave!

---

The AR element is fun for being new(ish) and different, but forcing the customer to stay near the vending machine to play might put me off. I could feel awkward standing in front of the machine or I might have places to be. It would be good to reward for things like - coins go to your favorite charity / rewards for using provided bins - maybe using QR codes to register disposal etc and reward. No social media, make rewards better or make prizes traded for rewards amazing, AR game better or not at all, email okay (to be expected) but only in return for coins or not at all - all other aspects good |  
The social media element needs more incentive, and there should be more explanation on why I am getting the notification and how it benefits me before I am asked to do anything, the gaming thing is fun - but if you're in a rush it would be good to be able to have an option to 'play later' | Game with coin was best - however also shorter versions of this advert |