Using Co-Design to Develop ‘Autshare’, an Online Solution-Sharing Platform for Autistic Individuals

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Abstract

Autistic individuals face a number of challenges on a daily basis. One of these is the fact that while solutions made for, with, and by autistic individuals do exist, users are oftentimes unaware of them. This results in autistic individuals missing out on solutions which could assist them in their daily life. The purpose of this project was to develop “Autshare”, an online platform for autistic individuals to share knowledge and solutions amongst each other. This thesis describes the development process of this platform. The methods used included co-design, as well as, the implementation of 3 iterations of online user testing. Each of these consisted of sharing a version of the platform, alongside a survey asking questions about it. The target group of this project was tech-savvy autistic adults. The key findings of this project were the obtained user requirements specific to tech-savvy autistic individuals, which were divided into three categories: content requirements, technical requirements, and co-design requirements. An evaluation performed at the end of the project indicated that: the website scored well with regards to usability; it implemented a majority of the defined requirements; users liked both the concept behind the platform, as well as, the participation process; and they would like to see the platform develop further in the future. Conclusively, the project succeeded in the creation of a solution-sharing platform for tech-savvy autistic individuals. Therefore, this thesis serves as an addition to the body of literature that supports the use of co-design in the development process of web-platforms.

Acknowledgements

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Introduction
Chapter 1

1.1 Motivation and Background

Online autistic communities are growing in popularity and the internet is proving to be very beneficial for autistic individuals. Simultaneously, technologies, as well as, practical solutions for autistic individuals are being developed and created. Unfortunately, at this point in time, no dedicated platform exists with the purpose of sharing these solutions and technologies for autistic individuals. Furthermore, many of the other existing platforms are either outdated, not focused on autistic individuals, or poorly designed. Due to this, many autistic users migrate to platforms such as Facebook, Tumblr, Reddit, and Twitter. While these serve the purpose of bringing these individuals together well, they are not designed to accommodate their special needs.

What this graduation project aims to accomplish is to create an online, solution-sharing platform for autistic individuals. This will make it possible for such individuals to share technological, practical, social, as well as, do-it-yourself solutions with each other. Throughout the development of this project, 4 key topics were focused upon: (1) understanding the challenges which *autistic individuals* experience, (2) implementing *co-design* into the design process, (3) studying comparative *online platforms* currently available to autistic individuals, and finally, (4) narrowing the target group to focus specifically on *tech-savvy users*, who may have different requirements from other autistic individuals for a web-platform. Each of these will be briefly introduced below.

Autistic Individuals

Autism is a neurological disorder which may lead to difficulties in communication as well as social interaction (Jordan, 2010). According to Geurts, Stek, and Comijs (2016), approximately 1 in a 100 people across the world meet the criteria of being on the autistic spectrum. Furthermore, autisitc individuals encounter other struggles within their day to day lives. These include struggling with new or unexpected situations, processing information, time management, sensory overload, and mental health challenges (Van Hees, Moyson, & Roeyers, 2015). On the other hand, certain positive attributes are also

often times observed with regards to autism. These, for instance, include improved systemizing, engineering and spatial reasoning skills (Jordan, 2010).

Co-design

Co-design is an approach which includes the active involvement of users in the design process (Ehn, 2008; Mattelmäki, 2008). It is growing in popularity, and can be useful in narrowing down user needs and requirements (Sanders & Stappers, 2008). This project aims to implement co-design through including autistic individuals in the design process.

Online Platforms

Currently, autistic individuals use a mixture of both general social media platforms, as well as platforms dedicated for autism-related topics. With regards to social media, Tumblr, Facebook, Twitter and YouTube are often used by autistic individuals (Nguyen, Phung, & Venkatesh, 2013). As for autistic platforms, sites such as WrongPlanet are popular. These platforms are all used to discuss various topics, both related and unrelated to autism.

Tech-savvy Users

This project places focus on tech-savvy autistic individuals. This particular user group is interesting as it can provide specific technical feedback to the project, and may continue the development of the platform in the future, if the project is released to the public.

1.2 Goals and Challenges

Prior to the development of the platform, both the goals and the challenges of the project were considered. They were referred to throughout the development, as to ensure that the goals were met, and that the challenges were tackled.

The primary goal was to create a developed version of a solution-sharing, online platform. This goal incorporated implementing co-design and user feedback to iterate the platform and improve it. Co-design in itself was also a significant aspect of this project, and therefore, successfully implementing it was also one of the key goals. Another goal was to learn from the development about what the specific user group, being tech-savvy adults, as well as the broader autistic audience, desires from a platform such as this. More specifically, the project aimed to narrow down on user specifications for a solution-sharing platform.

Several challenges had to be tackled during the development of this project. One of the key challenges was the technical implementation of the project. Creating a user-interaction oriented platform which allowed for posting, rating and commenting proved to sometimes be difficult. Another challenge stemmed from the fact that autistic individuals have a history of not wanting to use platforms run, or made by, non-autistic individuals. Furthermore, the co-design aspect of the project proved to be difficult. This was for several reasons, the first being that it was hard to obtain enough feedback from users, while the second being the fact that users had to be convinced to participate. Lastly, communication between the team and autistic individuals was a challenge.

1.3 Problem Statement and Research Questions

The primary problem which this project tried to tackle was the lack of a solution and knowledge sharing platform for autistic individuals. Research questions were implemented in order to try and develop a solution to this problem. One primary research question, and several sub-questions were answered. The main research question for this paper was:

> “How can an online, knowledge-sharing platform for autistic individuals be developed through the implementation of web-based co-design.”

The sub-questions for this paper were:

> "What are the factors to be considered when developing an online platform for autistic individuals?"
>
> "How does one implement co-design with autistic individuals, during the development of an online platform?"
>
> "How does co-designing the online platform, with tech-savvy adults, impact the online platform?"

1.4 Thesis Outline

This section describes the various sections of this thesis paper. *Chapter 2* describes the state of the art research done for this project. This involves both a literature review, as well as an analysis of competitors. *Chapter 3* introduces the methods and techniques implemented during the development of this project: a combination of the Creative Technology Design Process, and co-design. *Chapter 4* describes what happened in preparation for the specification and realization part of the project. This includes coming up with a plan for the interaction with users, defining the target group, defining the initial requirements, and planning the process which would be implemented throughout the development of the project. *Chapter 5* describes the co-design iteration process. Each iteration consists of the release of a new version of the platform, alongside a survey asking questions about it, and is described in an individual section. *Chapter 6* explains the various requirements which were obtained from carrying out the project. These are divided into 3 categories, namely: content requirements, technical requirements, and co-design requirements. *Chapter 7* describes the practical aspects of realizing the project. It summarizes the development process from a technical perspective, and shows the final version of the website. *Chapter 8* describes the user evaluation of the final version of the website, as well as the discussion of the project. Furthermore, a shared discussion is included, written by all 3 group members, in which the 3 experiences are compared. *Chapter 9*, the final chapter of the report, includes a conclusion of the project, and presents points for consideration for future work and improvements.

State of the Art
Chapter 2

2.1 Literature Review

A literature review was performed in order to obtain a better understanding of the topic of this graduation project. This was to be based on scientific literature, and provide a foundation for the development process of the platform.

2.1.1 Introduction

Autistic individuals face challenges on a regular basis. Online communities for such individuals have become an integral part of their daily lives. These are places where they can share experiences, questions, thoughts, and communicate with people similar to themselves (Jordan, 2010). At this point in time; however, no dedicated online platforms exist with the purpose of promoting either practical or technological solutions to people with autism, and allowing autistic users to exchange their experiences and thoughts regarding these technologies. The goal of the graduation project was, therefore, to create such a platform. Prior to the development, relevant knowledge about the key topics was needed. This included investigating autism, as well as looking into the way in which these individuals use online technology.

What this literature review aimed to accomplish, was to give an overview of existing literature on the topic of autism and digital online platforms for people with autism. It focused on how autistic people use online technologies at the moment, and in what ways this can be improved. The importance of this research stemmed from the fact that to accommodate these users, their unique characteristics and behaviours had to first be investigated, to ensure that the platform did as much as possible to improve their quality of life. The research question which this section aimed to answer was therefore: “What are the factors to be considered when developing online technology for autistic individuals?” In order to answer this question, information was gathered regarding the definition of autism, the way in which autistic individuals use online technology, and how they wish to use online technology.

2.1.2 Characteristics of Autism

The defining characteristics of autism have developed over time. The original characteristics were described as twofold: a lack of emotional contact with others and a strong insistence on sameness (Baruch, 2001). Nowadays, however, the characteristics of autism are described as a triad (Baruch, 2001; Nguyen, Duong, Venkatesh, & Phung, 2015; Nguyen et al., 2013; Putnam & Chong, 2008). These three attributes include: difficulties in communication, difficulties in social interaction, as well as, repetitive behaviours (Baruch, 2001; Nguyen et al., 2015; Nguyen et al., 2013; Putnam & Chong, 2008). However, when defining autism, researchers sometimes place their focus only on some of the characteristics. For instance, Jordan (2010) focuses only on the lack of communication and social skills. Similarly, Mitchell (2003), solely mentions impaired social skills, as a characteristic of autism. Furthermore, Baruch (2001), Gillberg, Gillberg, Råstam, and Wentz (2001), Nguyen et al. (2015), and Putnam and Chong (2008) add to the list of three, by stating that narrow interests are also a key characteristic of individuals with autism. Having identified the attributes of people with autism, it is also valuable to understand more about the condition itself. Autism is a developmental, neurological disorder which requires a continuous network of support from parents, relatives and friends (Nguyen et al., 2015; Nguyen et al., 2013). Putnam and Chong (2008) expand on this description by stating that it is a disorder which affects everyone differently and is therefore called a spectrum disorder. Based on these characteristics, alongside the additional knowledge obtained about autism, the actual meaning of autism becomes clearer.

Aside from the defining characteristics of autism, autistic individuals may experience a variety of everyday struggles. These may include, but are not limited to, struggling with unexpected or new situations, time management, sensory overload, processing information, and mental health challenges (Van Hees et al., 2015). Ghaziuddin (2005) expands on this, stating that oftentimes the symptoms which present themselves are not necessarily the deficiencies in communication and social interaction, but instead, problems such as depression, hyperactivity, or anger outbursts.

Individuals on the spectrum can show various other qualities, including positive ones. Jordan (2010) states that people with high functioning autism oftentimes show abilities such as systemizing, spatial reasoning, and engineering skills, which relates strongly to working with technology. The relationship between technology as well as technological skills, and characteristics of autism, presents a valid point of consideration when developing the online platform, as this relationship should be utilized to its fullest extent. Furthermore, during development, rather than focusing solely on the impairments associated with autism, it is also important to consider the potential strengths of individuals affected by it.

2.1.3 The Relationship Between Autism and Online Technology

Online technology has proven to be of great value and assistance to autistic individuals. As stated by Jordan (2010), the web may be described as an extension of the autistic brain. Mitchell (2003, p. 3) concurs with this statement, going as far as to say that "the Internet is for many high-functioning autistics what sign language is for the deaf." This is in agreement with statements made by Nguyen et al. (2015), who highlight the importance of the internet for autistic individuals. It is made clear that the relationship between autism and online technology is a significant one.

Online technology is a tool which is fitting for autistic individuals, due to a number of reasons. The internet offers a unique opportunity for them, with regards to both their impairments, as well as unique abilities (Jordan, 2010; Putnam & Chong, 2008). Baruch (2001) and Jordan (2010) expand on these abilities, naming spatial reasoning, engineering and systemizing skills as some of the qualities which are often found in high-functioning autistic individuals, which correlate strongly with computer technology and engineering. This further suggests that the strengths of autistic individuals can be implemented when interacting with online technology. This technology also addresses the potential weaknesses of these individuals. It provides an opportunity for them to interact within a familiar setting, being their computer or mobile device, which further accommodates their unique traits such as that which makes them prefer sameness (Jordan, 2010; Newton, Kramer, & McIntosh, 2009; Putnam & Chong, 2008). Conclusively, it can be said, that online technology does a solid job of accommodating both the strengths and weaknesses of autistic individuals.

Online social platforms play a significant role in the relationship between autistic individuals and online technology. The growing presence of discussion boards, chat rooms and social media has been noted by Abel, Machin, and Brownlow (2019), and Newton et al. (2009). Jordan (2010), Newton et al. (2009), and Nguyen et al. (2013) describe it as a phenomenon which allows autistic individuals to interact with each other, without the anxiety usually associated with face-to-face interaction. Jordan (2010) explores this subject deeper, stating that the usual facial expressions, as well as gestures, tone of voice, and emotion interpretation are some of the elements which are missing in online interaction. Not only do these mediums fit autistic individuals with regard to their characteristics, but also, many of them are also either run or designed by autistic individuals themselves for other, similar people (Jordan, 2010; Mitchell,

2003). Other than the practical aspects of online technology, online platforms provide the opportunity for individuals and small groups scattered around the world to unite, discover and empower themselves (Mitchell, 2003; Nguyen et al., 2013). The importance of social, online platforms for autistic individuals is clear, and brings forth validation for the creation of a new platform.

Other than improving the social lives and skills of autistic individuals, the internet provides other quality of life improvements. An example of this is the fact that, for some autistic individuals, shopping online causes much less stress and anxiety as compared to shopping in a physical store (Mitchell, 2003). Mitchell (2003) states that the same benefits apply with regard to activities such as finding employment. These unique benefits of the internet, amongst others, must be kept in mind during the development of the technology-sharing platform, as they play a significant role in the relationship between people with autism and online technology.

Technologies developed for autistic individuals are in the market; however, many potential users do not know of their existence. Given the previously mentioned strength of the internet in bringing autistic communities together, spreading knowledge about these technological solutions is something which could and should be tackled, online. Goldsmith and Leblanc (2004), as well as, Putnam and Chong (2008) have noted that more and more technological solutions for people with autism have been appearing, with Putnam and Chong (2008) additionally observing a growing interest and enthusiasm in such solutions. Putnam and Chong (2008) point out; however, that little is known with regards to the extent and success of the integration of the technology. In a survey conducted by Putnam and Chong (2008), only 25% of the respondents had any experience with either software or technology developed specifically for people with cognitive disabilities. As for the types of technology which are being developed, these include: virtual reality simulations, assistive technology devices, facial recognition assistors, robots, virtual assistants, language teaching assistants, cooperative games and activity scheduling applications (Putnam & Chong 2008). The existence of such solutions combined with the fact that the integration is currently rather low, suggests a need for an online platform or medium which would encourage the use of the technologies.

While online technology provides many benefits for autistic individuals, it also has several downsides. The primary concern, raised by both Mitchell (2003), and, Putnam and Chong (2008) is that, due to factors such as the tendency for obsessive-compulsive behaviour and enjoying repetitiveness, these individuals may become over-reliant on the internet and stray even further from being able to interact in real life social scenarios. Mitchell (2003) adds to this risk with another potential downside, being the fact

that as the online presence and representation of autistic individuals increases, so does the number of people, possibly wrongly, self-diagnosing themselves with conditions such as autism. Aside from the main risk of people living with a wrong self-diagnosis, this presents a risk in the form of actually autistic individuals interacting with such people and being misinformed or misguided (Mitchell 2003). These risks and dangers associated with online technology are an important factor to consider when evaluating the overall relationship between the internet and autistic individuals.

2.1.4 Potential Developments and Improvements for the Relationship Between Autistic Individuals and Online Technology

The improvements and developments which can be made in the relationship between autistic individuals and online technology should primarily be grounded in the existing functionalities and observations, but taken to a new and improved level. These improvements were considered when developing the platform for this graduation project. As stated previously, the internet offers a unique set of opportunities for such individuals (Abel et al., 2019; Jordan, 2010) and should, therefore, be utilized to the fullest extent. It should be used as a tool to connect these individuals with like-minded people and to spread awareness, while also introducing them to technologies which may assist them.

One of the major areas in which the internet can provide assistance for autistic individuals is in the field of social relations. Jordan (2010) states that many of these people desire social relationships; however, they struggle in engaging in fulfilling interactions. Online technology should, therefore, continue in making it easier for autistic individuals to interact, both with each other, as well as other, non-autistic individuals. It should also; however, work in a way which encourages face-to-face interaction in order to counteract the potential downsides of online interaction, such as further desocialization, as mentioned by Jordan (2010), Mitchell (2003), as well as, Putnam and Chong (2008). Conclusively, social interaction is a field which should continue being addressed in future developments of online technology, as it is currently both a large asset, as well as, a potential risk for autistic individuals.

Overall, the internet, as well as, online technologies should continue being platforms for autistic individuals to express themselves. Jordan (2010) states that, for these people, the internet functions as a medium for self-advocacy. Mitchell (2003) concurs with this, explaining that it the internet provides a

platform for these individuals to represent and develop themselves. With regards to the future, it should continue doing so. A way to accomplish this could be via the creation of new and updated platforms for them to use, as compared to the currently existing, outdated ones. In the past, when online platforms were ran by doctors or parents the actual people affected by autism oftentimes opted out (Jordan, 2010; Mitchell, 2003), therefore, the trend of such platforms being developed or co-designed by autistic individuals should be continued. Co-design is a design technique that is growing in popularity, which places a large emphasis on user input during the development of a product or service (Sanders & Stappers, 2008). The implementation of this could be largely beneficial for the development of the online platform for technology-sharing. It is of paramount importance that the internet continues serving as a tool for people with autism to express and develop themselves.

Online technology should do better in providing autistic individuals with information regarding technologies which may assist them. Moreover, the various ideas as well as needs which this group has, should be made visible to developers. At the moment, little is known about the level of implementation of such solutions (Putnam & Chong, 2008), Therefore, not only should the integration of these technologies be more widespread, but also more information about them should be collected and made available. This can be done through the implementation of forums and reviews which would discuss these technological solutions. Such forums could also allow for these individuals to share suggestions and ideas which they may have about technologies which they would like to have. Putnam and Chong (2008) highlight three primary areas in which autistic individuals would like technological assistance: social skills, academic skills, and organization skills. It is important that these areas become a focus for developers so that the end-user goals align with the technologies, which, according to Putnam and Chong (2008), has not been the case so far. It is also important that these future technologies ensure that the target group's unique traits, such as the difficulty to distinguish between the trivial and the important, as pointed out by Baruch (2001), should be addressed when designing for them. The importance of providing, as well as gathering, information regarding technological solutions for people with autism is an important aspect in future developments of online technology.

Future developments should also focus on addressing some of the existing downsides of online technology for autistic individuals. As noted by both Mitchell (2003), as well as, Putnam and Chong (2008), the primary negative side of online technology for autistic individuals is the risk of them de-socialising even further by following the same repetitive behaviour of interacting with others purely via the internet. Jordan (2010) and Mitchell (2003) add to this, stating that the spread of misinformation such as fake cures as well as misdiagnosis is also a growing issue. Future developments in online

technology should try and address this issue. Another downside which should be addressed stems from the autistic community rather than from the technology. As described by Jordan (2010), a divide is forming between autistic groups which believe that future developments should aim to cure autism, and groups which believe that it should be embraced and supported. This, alongside the other existing downsides, should be addressed in future online technology developments, with the purpose of bringing the community together, rather than separating it.

2.1.5 Conclusion

The research question which this literature review aimed to address was "What are the factors to be considered when developing online technology for autistic individuals?" It defined autism as a developmental, neurological disorder which presents itself in three primary attributes including: difficulties in communication and social interaction, repetitive behaviours, and narrow interests. The people affected by autism require varying levels of support from various networks. The internet has proven to be valuable as one of these networks, as it allowed for the creation and development of communities, allowed for previously unseen levels of social interaction of autistic individuals, and provided these people with many general quality of life improvements. As with all things, online technologies also carry some downsides for people with autism, the primary example of this being the risk of further de-socialization of these individuals if they become too dependent on the internet for all of their social interactions. Through considering these, among other factors, certain suggestions and areas for improvement have been identified for future developments of online technologies targeted at autistic individuals. The internet should continue being a medium which allows for the representation, development and empowerment of the autistic community. Furthermore, technological developments in this area should strive to align with the user goals of these people.

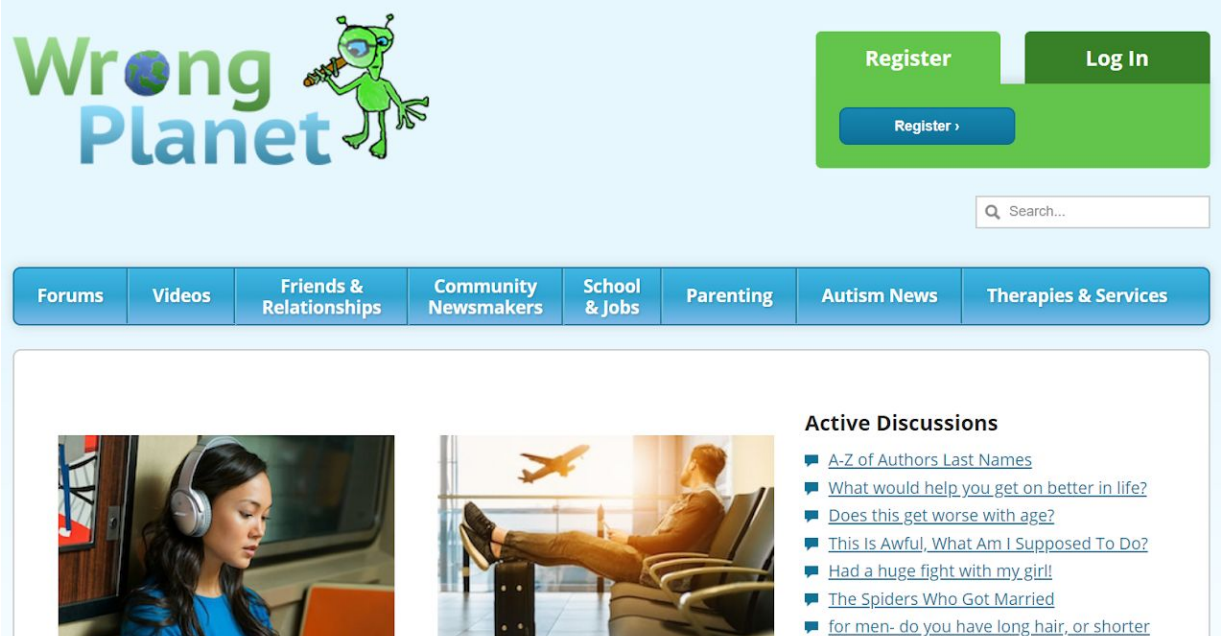
Several aspects should be considered as restrictions of this literature review and the implementation of the knowledge gathered within it. One of these, is the fact that the internet and online technology are both very broad topics, bringing forth countless advantages, disadvantages and points of discussion. What this literature review tried to accomplish, was to provide an overview. However, a limitation of it stems from it purely focusing on academic literature. While the subjects of autism and online technology are explored in detail separately by many researchers, the relationship between the two is not the most covered subject. Thus, further research on specific examples of platforms, combined with the collection of actual feedback from autistic users is advised.

2.2 Competitor Analysis

When developing the online platform, looking into existing platforms and similar technologies was also valuable. Firstly, this was done as to not 'reinvent the wheel' by creating a platform which already exists, but also to learn from the existing alternatives what works, what does not, and what is missing. These alternatives were looked at within this section of the thesis.

2.2.1 Wrong Planet

https://wrongplanet.net/



Description

Wrong Planet is an online community for the discussion of subjects related to autism. It was founded in 2004, and was developed for individuals on the autistic spectrum (Autistic, Asperger's Syndrome, ADHD, PDDs, etc.), other neurologically different individuals, their parents, and professionals who interact with them.

Key Features

As an online platform, WrongPlanet offers many features. These include pages focused on: forums, videos, friends and relationships, community newsmakers, schools and jobs, parenting, autism news, as well as, therapies and services. The forums offer discussions on subjects such as: general discussions, off-topic discussions, coping in life, topical discussions, age/gender related discussions, administration, and foreign languages. Pages such as friends and relationships, schools and jobs, parenting, autism news, as well as, therapies and services, provide access to relevant articles regarding the subjects. The forums appear to be the most active and largest section of the website, while the more article based pages are updated with a new post approximately once a year.

Advantages

The primary advantage of this platform is the fact that it is one of the oldest and most established online autistic communities available. It is also relatively easy to use and covers a broad range of topics.

Disadvantages

While the platform covers a range of topics, many of them are not covered in detail and updated very scarcely. What this means is that if someone wishes to visit the website and find out about a specific subject which is technically covered, they may be disappointed to find outdated articles from several years ago. Furthermore, the platform itself, from a design perspective, is not very aesthetically pleasing.

2.2.2 wikiHow

www.wikihow.com/Main-Page

Description

wikiHow is an online community which grants access to a large database of how-to guides. These cover a wide range of topics from technical guides on how to fix something, to social guides on how to behave in specific situations. However, important to note is the fact that wikiHow, as a platform, is developed for the general public, and not specifically with autistic individuals in mind.

Key Features

This is a very well established platform. It is continuously updated with new guides on more and more subjects. Each guide includes a brief description, explaining to the viewer what will be explained, followed by a step-by-step guide, oftentimes including pictures. For each guide, the platform features a five-star rating system, which allows for users to rate guides which they have followed. This allows for more insight regarding the success of a guide.

Advantages

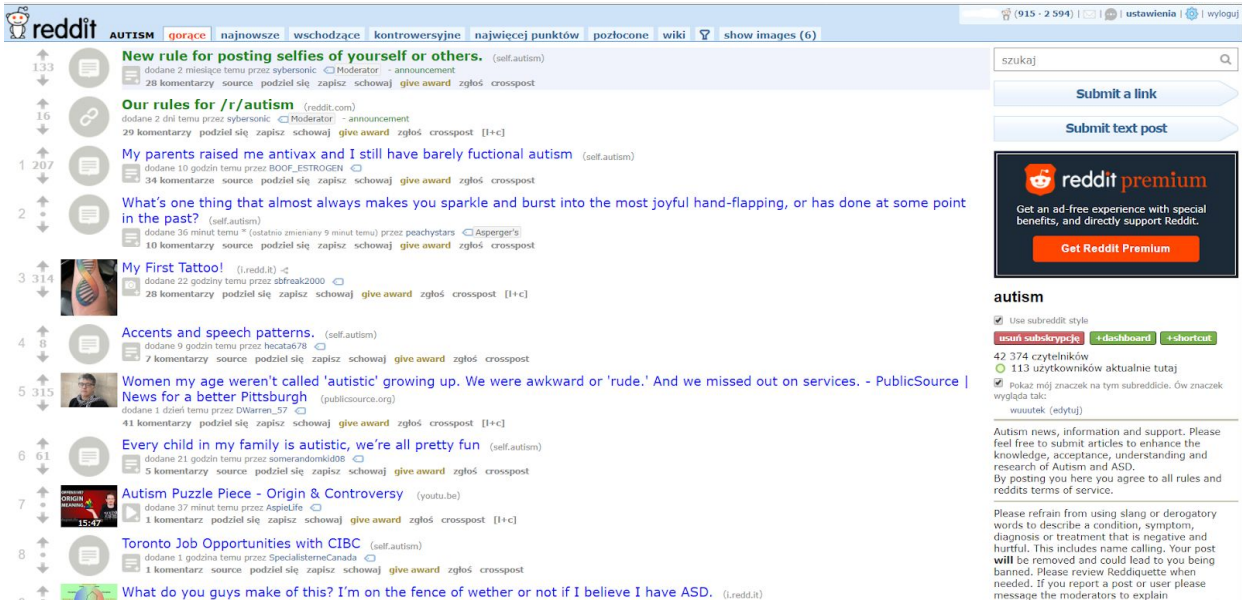
Advantages of this platform include the fact that it is very well established. It is the most popular how-to-guide platform and features a very wide range of topics. The interface is also rather friendly to the users. Furthermore, the platform allows for the guides to be written by co-authors.

Disadvantages

With regards to disadvantages, while the interface is relatively friendly, the website was not developed specifically for autistic individuals but for the general public. This results in quite a lot of information being present on the screen at the same time, which may not be optimal for autistic users. Furthermore, while guides related to autism are present on the platform, they are limited in quantity, and there is no way of knowing if other autistic individuals agree with the guides.

2.2.3 Reddit

https://www.reddit.com/



Description

Reddit is a very unique platform. It features news, content rating, and discussions. Logged-in users can submit content as posts, and comment on the posts of others. The platform is subdivided into subreddits. These are similar to subforums regarding specific subjects. For example, the 'r/autism' subreddit, features the sharing of content and discussions regarding the subject of autism. However, as a platform, it targets the general public, and not specifically autistic individuals.

Key Features

The key feature of Reddit is the 'subreddit' functionality. This allows for users to create sub forums which other users can subscribe to. These subreddits are then moderated by other users. This leads to another key feature of this platform, being the fact that the subreddits operate purely based on the users who are active on them. Without the users, there would be no content, comments or interactions. Another key feature is the rating system. Users can upvote or downvote other posts or comments to express how they feel about them.

Advantages

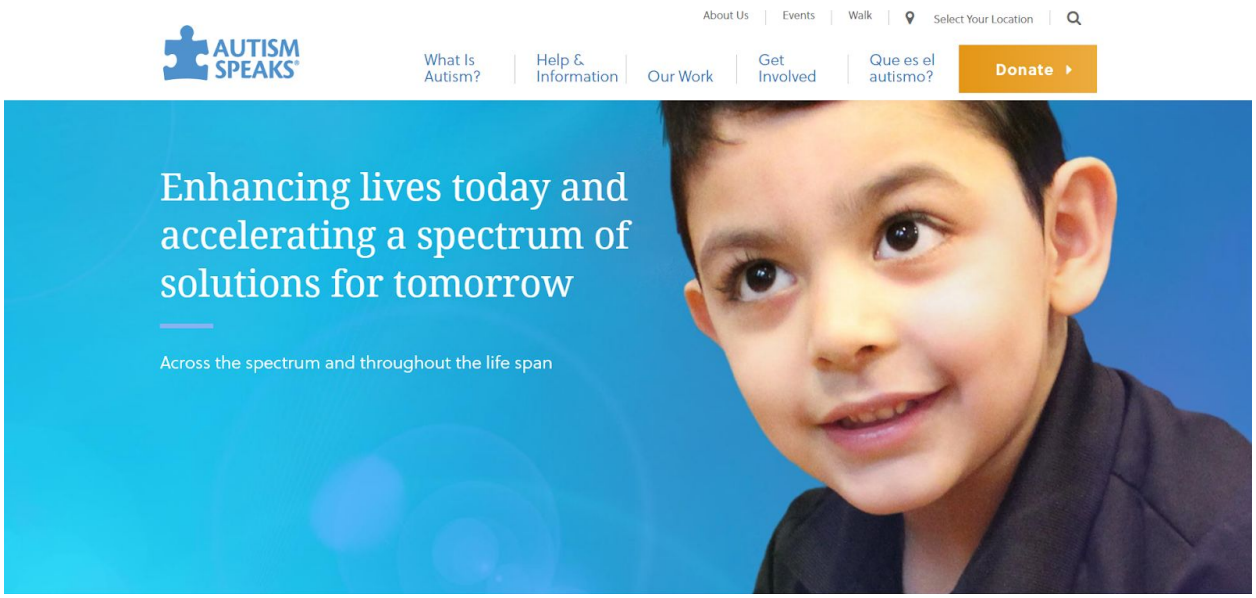
The biggest advantage of Reddit is its sheer size and variety of subjects covered. The fact that users are the driving force behind the platform and can express their opinions via either comments or votes, makes the platform rather democratic. In the specific case of subreddits like the ‘r/autism’ subreddit, an advantage is the fact that the autistic users are able to discuss whatever they wish to discuss with a large community.

Disadvantages

Several disadvantages exist within Reddit. One of these is the fact that unpopular opinions can be downvoted, and thereby, be pushed back from the front pages, meaning that if a potentially sensitive subject is touched on, that discussion will be hard to see. Furthermore, Reddit oftentimes suffers from cases of mob mentality. What this means in practice is that if the majority of a thread forms an opinion, other people visiting those threads may be inclined to share that opinion. Several more practical issues also exist within the platform. One of these, is the rather overwhelming interface of the platform. A lot of information is shown to the user at the same time, and it takes a while for users to become familiar with the interface. This may be especially true for autistic individuals, who may feel overstimulated. Finally, Reddit functions in a very limited time fashion. Due to the fact that it functions based on user posts and votes, every day the highlighted front-page posts change. This brings forth the disadvantage of users having a hard time finding posts which they might find relevant, due to the fact that they may be a few days old. This weakness is strengthened by Reddit’s searching system, which very scarcely provides correct results.

2.2.4 Autism Speaks

https://www.autismspeaks.org/



Description

Autism Speaks is an online platform which works as the hub for the Autism Speaks Inc. organization. It is a website which features a large amount of information about autism. Its primary purpose is to raise awareness, inform visitors, and shine light on important issues. It differs from the previously mentioned platforms as its primary focus is to provide information, and not to share user generated content.

Key Features

Key features of this page include the various information pages which it provides. For instance, it features a “What is autism?” page. Furthermore, the platform provides resources based on who the visitor is. For instance, they offer information for people with autism, their parents, and educators. This feature is highly customizable, as the visitor can pick from a wide range of options in fields such as: audience, age range, level of support and resource type. ‘Resource type’ itself includes elements such as: apps, books, tool kits, podcasts, and more.

Advantages

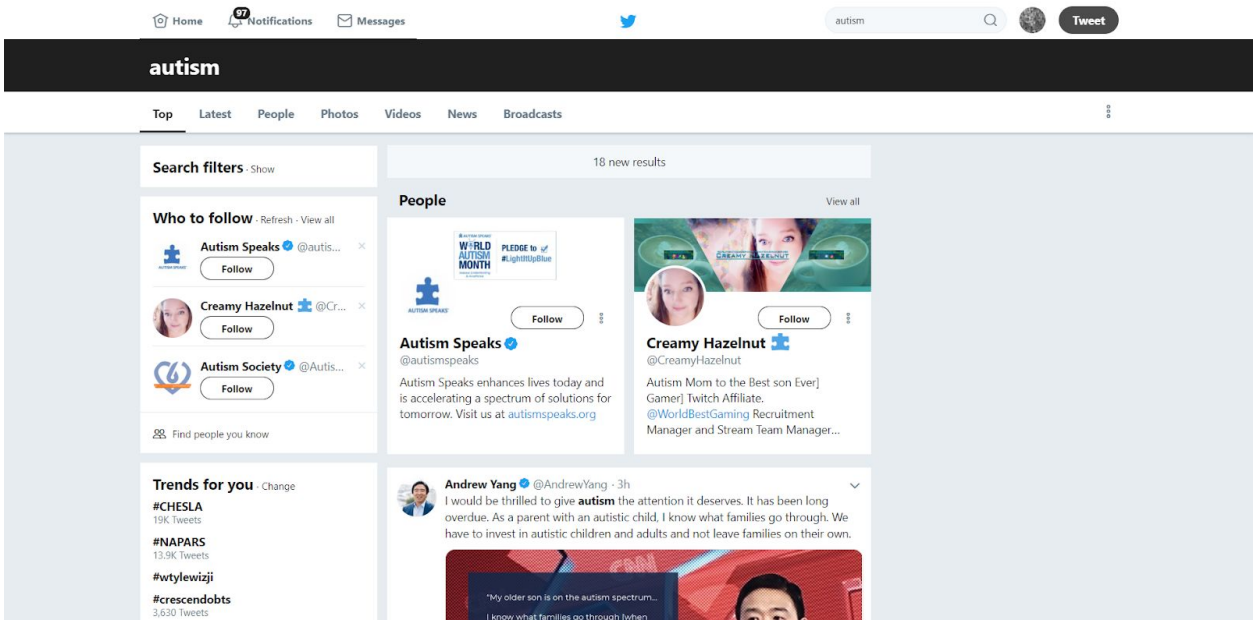
A key advantage of this platform is the fact that it aims to spread awareness about autism. Furthermore, it provides a large amount of high quality information regarding the subject. The resource finding tool is also very customizable and can be helpful for a wide range of audiences.

Disadvantages

One disadvantage of Autism Speaks, in the context of making a platform for autistic individuals is the fact that for the autistic people themselves, this platform may feel quite 'clinical'. What is meant by this is the fact that rather than feeling welcomed and encouraged to use the platform, the users may feel intimidated by the platform, as it talks about things such as symptoms and early detection. Adding to this is the fact that Autism Speaks has a history of being criticised for seeking a cure for autism rather than seeking acceptance. They have shifted from this direction in recent years, however, the somewhat negative history remains.

2.2.5 Twitter

https://twitter.com/



Description

Twitter is an online social media platform. Users interact on this platform using ‘tweets.’ Tweets can be directed at people, they can be used to reply to other tweets, or just be posted on the posters profile. It is one of the most popular social media, and has one of the biggest user bases.

Key Features

The primary key feature of Twitter is the ‘tweet’ functionality. This separates the platform from other ones, as it limits the users to 280 characters per post. Effectively, this leads to content which is easy to digest, and easy to create. Other functionalities include liking, as well as, retweeting, which allows users to repost the tweets of others for their own followers to see.

Advantages

One key advantage of Twitter is the size of its user base. A second advantage is the simplicity of use of the platform. Users can simply type a post up on their device and submit it for the world to see. The platform is also very powerful in bringing people together, as anyone can reply to a public tweet, meaning that unlikely people may interact. In the case of autistic individuals, the platform brings these people together and encourages discussions.

Disadvantages

The unique feature of the platform can also be a disadvantage. Tweets, due to their limited length, may be a limiting factor when users wish to discuss things to a greater extent. Furthermore, it is oftentimes difficult for smaller users to reach audiences as compared to larger ones. What this means is that even if an individual makes a valid point, if they do not have an audience, they will spark no conversation and the subject will end there. Furthermore, it was not specifically developed with autistic individuals in mind.

2.3 Conclusion

Conclusively, the state of the art research has indicated a need for this graduation project by showing the potential of online technology with regards to autistic individuals, and by exploring the existing competitors.

The literature review chapter of this paper, identified key features of the relationship between autistic individuals and online technology. Online technology has been described as an extension of the brain for autistic individuals. It's importance has been highlighted alongside the fact that online technology works well with both the strengths and weaknesses of autistic individuals. The significance of social platforms and other quality of life improvements were described. Several downsides of the relationship were also explored. These include the threat of further desocialization of users, as well as, the risk of the rise in misinformation, regarding autism, being spread online.

Potential developments and improvements for the relationship between autistic individuals and online technology were also discussed within the literature review. It was stated that social relations is an

area in which online technology can develop, further assisting autistic users in this regard. Furthermore, online technology was identified as a tool which should continue being implemented and developed for the self-expression and self-advocacy of autistic individuals. An important factor for consideration, given the context of this project, which the literature review mentions is the fact that online technology should do a better job in providing autistic individuals with information regarding technologies and solutions which are being developed which could assist them.

Looking into competitors and existing products, has shown various platforms which function at the moment, highlighting both their strengths and weaknesses. These competitors included: WrongPlanet, wikiHow, Reddit, Autism Speaks, and Twitter. Although some of these platforms are designed specifically for autistic individuals, many of them are not. Therefore, there is a valid need for the creation of the platform, central to this paper. The following chapters will describe the preparation done prior to working on the project, the actual development process, and the discussion, evaluation, as well as, conclusion.

Methods and Techniques
Chapter 3

This chapter describes the methods and techniques which were implemented during the completion of this graduation project, from a theoretical perspective. The actual implementation of the methods and techniques is described later. The two primary methods implemented within this project were: a variation on the Creative Technology Design Process (Mader & Eggink, 2014), as well as, co-design.

3.1 Creative Technology Design Process

First, the Creative Technology Design Process aspect of the methodology will be discussed. It is a methodology which combines user centered design approaches from fields such as Industrial Design and Interaction Design, with the development of prototypes based on engineering design principles (Mader & Eggink, 2014). It consists of 4 primary stages: Ideation, Specification, Realisation and Evaluation and is illustrated below in Figure 1 (Mader & Eggink, 2014).

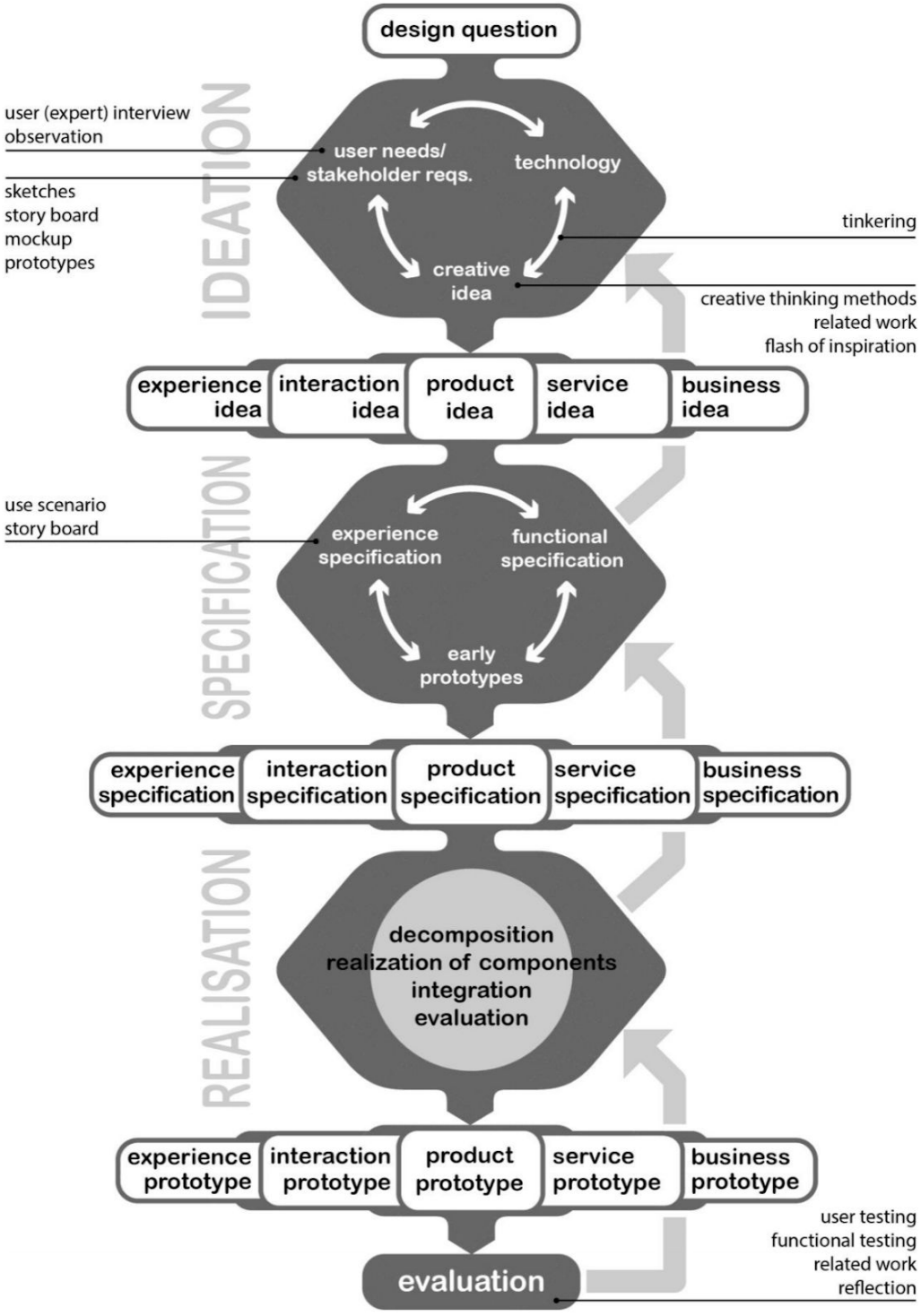


Figure 1. Diagram showing the Creative Technology Design Process.

3.1.1 Ideation Phase

The ideation phase is the starting point of the design process. In the case of this project, the design question was presented in the form of an instruction from the supervisor. This request was: the creation of "a technology evaluation platform for and with autistic adults." The ideation phase includes defining the problem, acquiring relevant information and generating ideas. Looking at the state of the art is also relevant in this phase, as it allows the designer to see what is already available, and what is yet to be made. The end goal of this phase is to have a more elaborated project idea, combined with problem requirements.

3.1.2 Specification Phase

The specification phase describes the process through which the designer aims to obtain the requirements for the project. Oftentimes, prototypes are implemented in order to assist with this, as by showing users a potential version of the final product, they can have a better understanding of the product, but also provide deeper insight with their feedback. The specifications which are to be defined within this phase may include factors such as functionality, as well as experience. The goal of this phase is to establish what the requirements and specifications for the project are.

3.1.3 Realization Phase

The realization phase incorporates the implementation of the specifications, as well as requirements of the project. These are oftentimes approached individually and developed one by one. The goal of this phase is to implement the requirements, and then to evaluate whether the end result meets the specifications.

3.1.4 Evaluation Phase

The final phase is the evaluation phase. It may address a variety of subjects. Testing is oftentimes implemented here in order to test whether the product works with the users. This phase also evaluates whether or not the original requirements from the ideation phase have been met.

3.1.5 Adaptation for this Project

In order to involve the users throughout the design process, adaptations to the Creative Technology Design Process were made. The traditional order would involve first ideating, then specifying requirements, implementing them in the realization, and finally evaluating the results. In the case of this project, requirements were collected and implemented 3 times. This meant that the project shifted between specification and realization several times, rather than first specifying and then realizing. Due to this, the "Ideation" phase was changed into "Preparation." This phase includes both elements from ideation, as well as the methods leading to the obtaining of specifications. Conclusively, it included everything prior to the beginning of the first iteration. Similarly, "Specification" was changed into "Co-design Iterations." It still focused on the obtaining of specifications and requirements, however, it also included the changes implemented in between iterations.

3.2 Co-Design

3.2.1 Description of Co-Design

Given the unique characteristics of autistic individuals, implementing co-design could be a powerful tool to customize the project to their needs and requirements. As a group, they are often excluded from design research (Gaudion, Hall, Myerson, & Pellicano, 2015) and therefore, considering ways in which they can be included, is of great importance. Co-design is a design approach which is growing in popularity (Sanders & Stappers, 2008), and is defined as a form of participatory design, in which users are actively involved in the design process (Ehn, 2008; Mattelmäki, 2008). It's objective is to obtain input from the intended users (Liem & Sanders, 2011), using their expertise, experiences and knowledge, in order to develop or design a product (Mattelmäki, 2008). In recent years, designers have been progressively shifting their focus from the perspectives of experts, towards those of the intended potential users of their products, oftentimes, through the implementation of co-design (Sanders & Stappers, 2008). Steen, Kuijt-Evers, and Klok (2007) suggest the perspective that co-design is a combination of both participatory, as well as, empathic design. Nevertheless, despite the value of including users in the development of the project, there is also still a need for the inclusion of designers. They are needed as

they have skills which become useful in the larger scale of the project, considering various factors, their complexity, and in making decisions (Sanders & Stappers, 2008).

3.2.2 Advantages and Challenges

In many ways, including the intended users in the design process can help better align what the designer wants to make, and what the users want and need. The primary benefit of including users in the design process is obtaining a better understanding of their wants and needs. Through doing so, the end product will be better suited for the users (Sanders & Stappers, 2008). On the other hand, by not including users in the design process, the translation of what the designers want to create, into what users actually want, may fail (Liem & Sanders, 2011). Co-design has the advantage of being able to prevent this.

Challenges of co-design, among others, include the fact that when multiple user opinions are gathered, they may clash. This may lead to a difficulty, for the designers, in processing the various stakeholder inputs (Mattelmäki, 2008). Furthermore, when including users inexperienced in design, several additional risks become present. This includes: the possibility of inefficiency, with users focusing on irrelevant details, users feeling as though they do not have the sufficient level of knowledge necessary to provide input, and users who may feel inadequately creative to provide feedback during development (Sanders & Westerlund, 2011). Additionally, co-design may be especially difficult when involving autistic individuals in the design process as they may not trust non, autistic individuals to design a platform for them.

3.2.3 Web-Based Co-Design

Given the nature of this project (creating a platform for autistic individuals), it was decided that a web-based co-design approach would be taken. Finding participants who represent a user base for any project may be a challenge (Schumacher & Feurstein, 2007), this is even more applicable in the case of this project, as the target group is narrowed down to autistic individuals. Web-based co-design offers the opportunity to reach potential users and involve them in the design process, without physically meeting them. Specifically, co-design through the use of social media tools can be implemented. Social media refers to the various Internet-based applications which provide the opportunity for the creation and exchange of user generated content (Kaplan & Haenlein, 2010). Co-design through the use of social

media is particularly useful in the exploration and ideation phase (Friedrich, 2013), and is very applicable to this project, as it aims to determine what users want and need from an online platform, for solution sharing, thereby exploring the user requirements.

3.2.4 Co-Design with Autistic Individuals

As mentioned before, autistic individuals are oftentimes excluded from design research. Furthermore, when design research regarding autism is performed, the majority of it is done with autistic children in focus (Gaudion, et al., 2015), meaning that autistic adults are even further excluded. There exist significant differences between autistic adults and children which should be addressed through design research. This emphasises the significance of co-designing with autistic adults, as by doing so, their, potentially, unheard design opinions can be noted and implemented.

As described in the literature review in Chapter 2, autistic individuals struggle with social communication and interaction. This may be problematic when co-designing, as the potential users could feel anxious or uncomfortable. Furthermore, the feedback which will be obtained may be limited, due to the participants not being comfortable in expressing their honest thoughts and opinions. This supports the implementation of web-based co-design, as it avoids the social aspect related to co-design, meaning that users can answer questions whenever and however they want to.

Preparation
Chapter 4

The preparation phase of this project involved everything which was done prior to the development of the first iteration of the platform. This included research, defining requirements, but also planning ahead with regards to methodology.

4.1 Plan for Interacting with Users

In the words of Dr. Stephen Shore: “If you’ve met one person with autism, you’ve met one person with autism” (Autism Awareness Month: Interview with Stephen Shore, 2009). What this means is that all autistic individuals are different. With this in mind, when designing for such individuals, it is of great importance to consider the various user groups which may be addressed, alongside their specific wants and needs. Due to this, it became evident that targeting more specific sub-groups within the target population could be of value, as it would ensure that the feedback of individuals belonging to different groups would be heard, and would ultimately allow for a more personalized user experience.

Defining the Target Groups

Given that 3 students were to work on this project, it was decided that 3 user groups would be focused on. The groups were initially narrowed down to younger, school aged users, and adults. Within adults, two primary alternatives were considered. One of these was dividing adults into young adults and older adults, while the other focused on the distinction between tech savvy adults and non-tech savvy adults. The latter was the alternative which was chosen. The primary reasoning behind this was the belief that a bigger difference exists between tech savvy online users and non tech savvy online users, as compared to younger adults and older adults. Furthermore, the tech savvy users may be more vocal online. Due to this, if adults were divided simply by age, the tech savvy users of all ages could potentially dominate the feedback process, possibly leading to non tech savvy users feeling excluded from both the design process, but also the final platform which may no longer be made for them. Thereby, the 3 user groups were chosen.

Having chosen the 3 focus groups, it was also important to consider the groups which were potentially excluded from voicing their opinions during the design process. This included elderly users, but also users who may not be completely independent, such as individuals with disabilities. It is of importance to keep these users in mind for potential future developments of the project, which may attempt to broaden the user group even further.

Interaction with Users

Given the user-centered design focus of this project, it was crucial that the opinions of users were the driving force behind any decision being made. Due to this, the way in which user opinions and feedback would be obtained had to be decided upon. The user base which the project aimed to address, being autistic individuals, meant that the pool from which users could be asked was already rather limited in size. This was an important factor which brought forth the concept of interacting with users online, rather than finding autistic individuals in close physical proximity to the University of Twente. It was therefore decided that for the two adult user groups, online interaction would be the method implemented in order to obtain feedback. In the case of the school aged users, a local high school, which had dedicated classes for autistic individuals, was used.

Following the decision making behind the reaching of users, the way in which feedback would be obtained from tech-savvy adults was decided. Several options were considered, however, the final decision was made that users would be reached out to via social media platforms including: Twitter and Reddit. On Twitter this would be done by creating a ‘tweet’ and adding the appropriate hashtags to ensure a proper outreach. Meanwhile, on Reddit, a post could be made in the appropriate, autism related, subreddits.

As for the obtaining of feedback, it was decided that online surveys would be used to ask questions and collect feedback. This was initially pitched by the team working on the project, and was later confirmed by the contacted autistic individuals as the best way to obtain feedback. Users stated that surveys with specific questions regarding specific topics would be the best way for them to provide feedback. These surveys were shared using the previously mentioned social platforms, with the hope of reaching as many users as possible. A detailed description of how users were actually contacted for the development of the project is described in Chapter 5.

4.2 Initial Requirements

Based on the research done, several core requirements and specifications were determined. A list of these original requirements can be found in Table 1.

Table 1.

List of initial requirements

Requirements
● Posting functionality
● Commenting functionality
● Rating functionality
● Sign-in functionality
● User friendly design, that is simple and easy to use
● Clarify that it is for autistic individuals, made with autsitic individuals
● Implement co-design in the development

4.3 Plan for the Project

The next aspect which had to be addressed was a timeline and structure which was to be followed throughout the development of the project. It was decided that 3 iterations would be implemented in order to develop the platform. Each iteration was to include sending out a version of the prototype, alongside a survey asking questions about it. The reasoning behind implementing 3 iterations was that 3 feedback sessions were decided to be an appropriate amount, but also due to the time limitations present. It was important that users were given enough time to respond, and that the team had enough time to implement changes. Combined with the limited time to complete the project, this meant that only a limited number of such iterations could take place. Each iteration was to focus on a different feedback area, and will be discussed in its respective sub section of Chapter 5. The planned process, including the focus of each iteration, is shown in Figure 2, below.

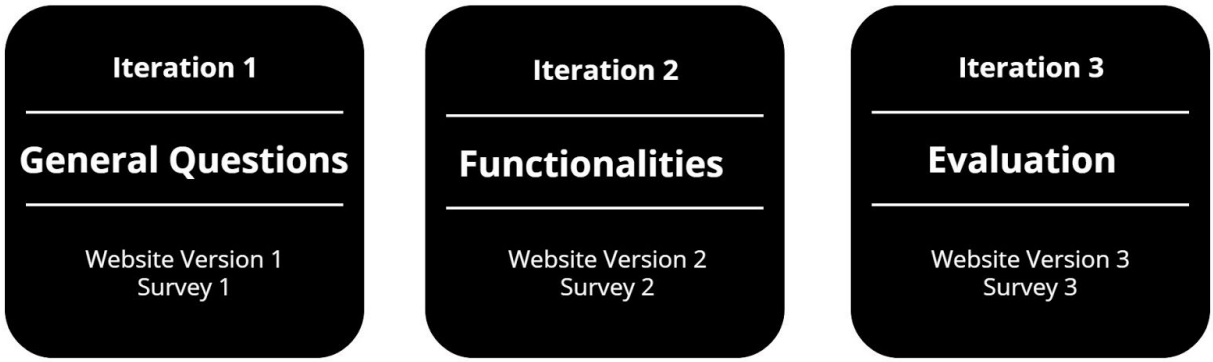


Figure 2. Diagram showing the 3 iterations.

It was decided that towards the end of the project, the 3 group members would come together and discuss their findings; more specifically, in what ways they were similar, and in what ways they differed. Furthermore, the key observations from each prototype would then be summarized and combined, creating specifications to be followed when developing the project in the future. Aside from this, the observations made regarding the co-design process with autistic individuals would also be compared, also creating a list of pointers for future, related projects. This comparison and discussion can be found in Chapter 8.5.

Co-Design Iterations
Chapter 5

This phase of the development process is a variation on the specification phase mentioned in Chapter 3. It describes each iteration, including the corresponding version of the website and survey.

5.1 Iteration 1: General Feedback

5.1.1 Website Version 1

Iteration 1 involved the releasing of the first version of the platform, and releasing the first survey, to obtain feedback. The first version of the platform, as stated in Chapter 4 was created by all 3 of the team members working on the project. This version was based on the core requirements which were extracted both from the project requirements, but also from research. The website therefore included: an explanatory landing page, a forum page, a members page, an about page, and a rules page. The key element was the forum page on which two different categories for posts were located. These included "Technology" and "How-to." Screenshots showing the first version of the platform can be found in Appendix C.

5.1.2 Questionnaire 1

Alongside the first version of the website, a survey was created. This survey aimed to ask some general questions regarding the platform, hoping to receive some broader feedback about the platform. This survey was shared between myself and Alan Deuvletian, seeing as it addressed a common, shared version of the website. However, the users were divided into tech-savvy and non-tech-savvy, based on the question: "Would you identify as being proficient and interested in technology? (This question is here simply to let us better understand the users, not as a qualification)." Wojtek would then only use answers from users who indicated that they were tech-savvy, while Alan would use the feedback from the remaining users. A total of 6 users answered this survey, 5 of which were tech-savvy. The survey can be found in Appendix F.

First Release

Having both the first version of the platform and the survey, the two elements were ready to be shared with users. It was decided that the team would start by creating a Twitter account, and sharing it there. This was decided based on the outreach which Twitter provides, and the ability to target a specific audience using hashtags. A Reddit account was also created with the purpose of posting in the 'r/autism' and 'r/aspergers' subreddits. Before publishing the posts, a draft of the tweet and Reddit post were sent to several autistic individuals,to ensure that the message was clear and appropriate. Based on the feedback, some minor changes were made. Next, the Reddit post was shared, followed by the tweet, which was posted using the hashtags: "#askingautistics," "#autism," "#asd," and "#autismlife." These were chosen, as they are some of the most popular autism related hashtags to use for such inquiries.

The tweet was retweeted 11 times, was liked by 19 users and had 5 comment threads. Furthermore, the supervisor for our project retweeted the tweet, with his tweet being retweeted 35 times, receiving 45 likes, and sparking 5 comment threads. Despite these numbers, only 2 users filled in the survey. Furthermore, one user was quick to point out that the text on the landing page of the website was offensive to him, as it used "people with autism spectrum disorders" when referring to autistic individuals. This was immediately changed, however, the number of total survey replies remained at 2. The tweet in question can be found in Appendix A.

As for the Reddit post, it was posted on 2 subreddits. However, the bigger, "r/aspergers," subreddit removed the post as it violated their rules. Having contacted the moderators it was explained that they do not allow the sharing of surveys if they are not approved by an ethics committee.. The post made in the other subreddit, namely "r/autism," did not receive any attention, receiving only 1 upvote and no comments. The post can be found in Appendix A.

Changing Strategy to Tackle Low Response Rates

Given the low number of responses for the first questionnaire, a new strategy was considered. This involved messaging users who showed interest in the original tweet directly, which lead to a total of 9 individuals showing interest in participating. Since this point, reaching out to users directly via private messages was chosen as the main approach of contacting users. The messages which were sent out to users are shown in Appendix B.

Results

Having waited an appropriate amount of time, of approximately a week, the various requirements and changes suggested by the users were combined, categorized and listed. These are shown in Table 2. The table also indicates whether the suggestion was implemented or not within version 2 of the website. The details of the implementation of these changes are described in Chapter 5.2.

Table 2.

Table showing the requirements and suggestions made by users in Iteration 1.

	Feedback		
	Content	**Technical**	**Survey**
1.	Present site rules in one column as compared to two	Ensure that the platform is screen reader friendly	Ask more generally about online communities
2.	Make the rules more specific	Add a function which allows the categorizing or sorting of posts	Ask if users use any other online platforms for similar or other purposes
3.	Add category to the Forum page for “Communication”	Fix black scroll down menus	Collect input from non-verbal autistic individuals
4.	Make the purpose of the platform clearer		Add a ‘maybe’ option to the “Would you return to this website?” question
5.	Add videos or a different form of multimedia to the about page		
6.	Enable multimodal feedback		
7.	Explain the members page and why people should sign up		

8.	Add who will be moderating		
9.	Include examples for the rules		
10.	Give examples of things people may want to give feedback on		
11.	Move FAQ		

Note. Green indicates that the suggestion was implemented, while red indicates that it was not.

Furthermore some feedback regarding the survey itself was also received. One user in particular, said that she found the wording of the survey to be confusing. For instance, the title of a page in the survey, namely “Forum Page,” lead to some confusion. This was due to the fact the the questions on that page asked questions regarding the Forum page on the platform, while the user interpreted it as the questions asking about the Forum page in the survey. Based on this feedback, this was quickly changed, and the title pages in the survey were renamed. Inspired by this feedback, an additional section was added to the survey, asking several questions about the survey itself.

5.2 Iteration 2: Functionalities

5.2.1 Website Version 2

Iteration 2 focused on implementing the suggestions and requirements obtained from users during iteration 1 (see Table 2). Screenshots showing the second version of the platform can be found in Appendix D.

Improved Website Rules

The site rules received a significant amount of feedback, primarily regarding the content. It was emphasised by several users that the rules should be made more specific, as compared to what they were, to avoid confusion. Furthermore, certain users highlighted the need for examples of what the rules are referring to, as to avoid the risk of potential misunderstandings. These changes were implemented and the change is shown in Figure 3**.** The new rules expanded on the rules from the first version of the website, but also took inspiration from similar websites, such as WrongPlanet.

Figure 3. Diagram showing the comparison between the old website rules (on the left) and the new website rules (on the right).

Screen Reader Compatibility

Another change which was implemented involved ensuring that the website was compatible with screen readers, which certain autistic individuals use when using their devices. These read the text present on the screen out loud, making it easier for certain individuals to use. This suggestion was implemented, and further accessibility-related steps were taken to make the website as accessible as possible. This process is described in more detail in Chapter 7.

Improved Forum

Feedback was also provided regarding the forum, with one user pointing out that an additional category could be beneficial. Given that autistic individuals oftentimes have difficulties with social interaction and communication, a dedicated 'Communication' category was added. Furthermore, it was suggested that a way to categorize and search through the posts would be beneficial once more posts are present. A sidebar categorizing feature was added, linking users to the most popular tags used. Additionally, the layout of the sub-forum pages was changed to fit more posts on a single page. This new layout is shown in Figure 4**.**

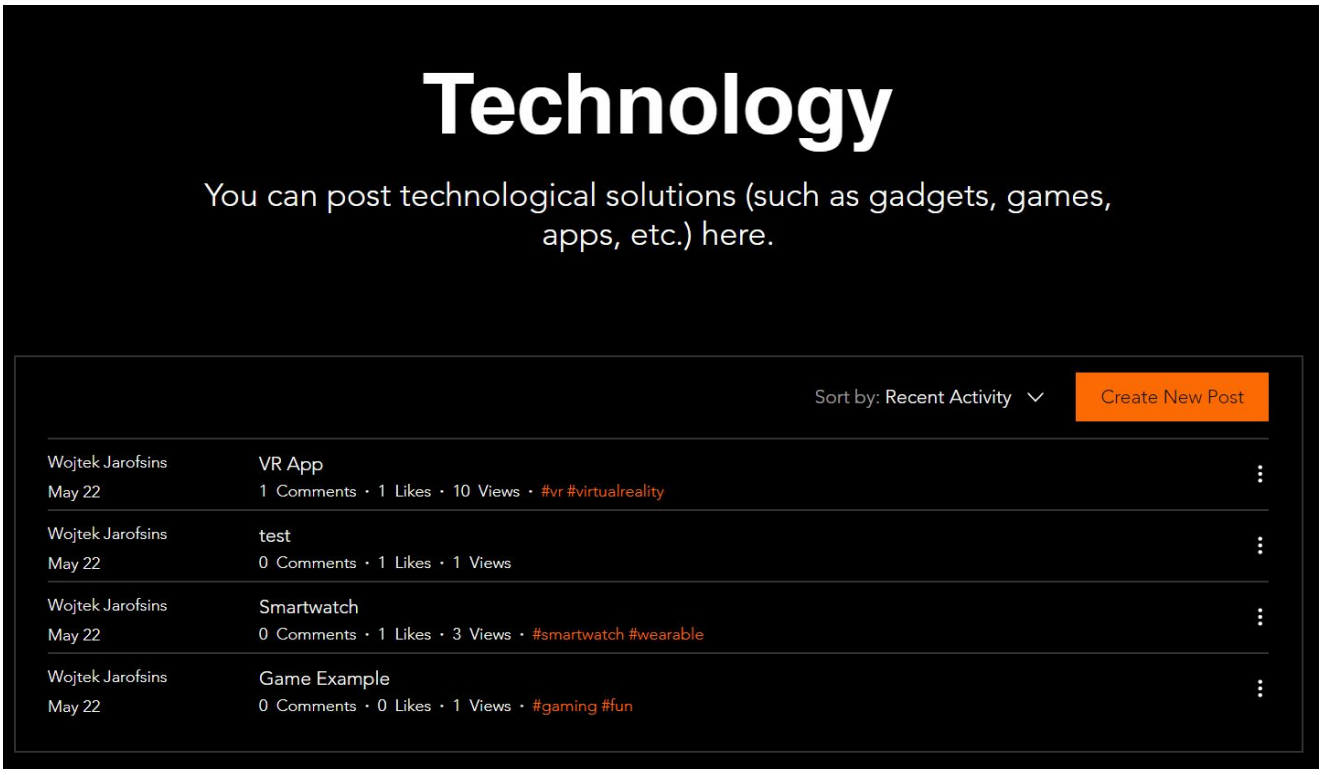


Figure 4. Screenshot showing the new format of the forum, 'Technology,' page.

While multiple changes were implemented based on user feedback, certain suggestions were not. For instance, the addition of multimedia to the about page was not completed. This was due to the fact that, while an explanatory video or image would be beneficial, this should be done properly, and can therefore be an element to be implemented in the future.

5.2.2 Questionnaire 2

The second questionnaire was focused on functionality and usability, and had a total of 4 participants. It aimed to determine what users thought about the features available on the platform, such as 'liking' using hearts, the tagging system, and how posts are viewed. Alongside this, the survey asked some general questions, e.g. to find out what other social online platforms they use. The full survey can be found in Appendix G. Furthermore, the second questionnaire implemented feedback from the first one, improving the clarity and the overall quality of the survey. These improvements included:

- Reviewing the formulation of the questions to ensure they were phrased appropriately.
- Including pictures to make it easier for users to answer questions, as they would no longer need to go back and forth between the website and the survey.

Results

Similarly to the first iteration, the different requirements and suggestions brought up by users were combined, categorized and listed. This is shown in Table 3 on the next page.

Table 3.

Table showing the requirements and suggestions made by users in Iteration 2.

	Feedback	
	Content	**Technical**
1.	Change the name	Change the color of the post from black background and white text, to white background and black text
2.	Add “Legal Help” as a new category in the forum	Make the menu smaller so it does not obstruct the view as much
3.	Explain “Communication” as a category better	Make the menu disappear when users scroll down
4.	Add subcategories to the categories of the Forum.	Different rating system

Note. Green indicates that the suggestion was implemented, while red indicates that it was not.

5.3 Iteration 3: Design and Evaluation

5.3.1 Website Version 3

The third iteration of the website implemented improvements indicated by users, through the use of the survey, alongside other developments made to the platform.

Changing Name from ‘Shaut’ to ‘Autshare’

One of the primary changes made in this iteration was a change of the name. Within the survey, users rated the previous name, “Shaut”, with an average of 2.5 on a five-point scale. This suggested that users found the name to be suboptimal, due to a variety of reasons. These included the fact that the name left some room for mispronunciation, and that the name was not very clear in indicating what it stood for. Keeping this feedback in mind, a new name was chosen. This new name was “Autshare.”

Improved Forum

A second area which was changed was within the forum section of the website. A user suggested the addition of a “Legal Help” category to discuss matters such as filling in paper work or working through

certain official procedures, this was added. However, a factor to consider regarding this is to what extent legal help can be provided through the website. Another change which was implemented in the forum was the improvement of the description of the "Communication" category. A user pointed out that this section seemed slightly vague and therefore, the description was edited. Additionally, a category was added to the forum without the feedback of users. This was "Future Product Ideas." Within this category, users are to post ideas which they would like to see developed in the future as products or services. These can then be used by businesses for inspiration. The remaining categories within the Forum were kept without any changes being made, as users indicated that they found them relevant. Although a user suggested further sub-categorization of the existing categories in the forum, this was not implemented, as the website did not have enough posts for it to be suitable. A prior design decision which was supported by user feedback, was the implementation of hashtags as a way to categorize and tag posts. The average response to this feature was 4.75 out of 5, meaning that users strongly agreed with the functionality

Technical Improvements to Design

One suggestion which was made regarding the general design elements of the website was changing the colors within the posting functionality (see Figure 5). The changes were made due to the fact that users pointed out that the old format may be challenging for users with impaired vision to view. Aside from this, the users liked the feature for making new posts. Another technical improvement which was suggested was the tweaking of the menu bar at the top of the page. Although the users liked the top menu overall (average score of 4.75), it was suggested that the menu bar could be made smaller, as to obstruct less of the actual website view, and to make it disappear when users scroll down, reappearing when users scroll back up. These changes were implemented.

A change which was suggested by users, which was not implemented, was the changing of the rating system for posts on the website. Currently, the platform implemented likes, in the form of hearts. Certain users indicated that they would prefer a different rating system, however, the overall opinions were rather divided, making it impossible to come to a conclusion based on the user feedback. This is an area for consideration for future improvements of the website. Lastly, the feature of being able to view the profiles of others was well received by the users.

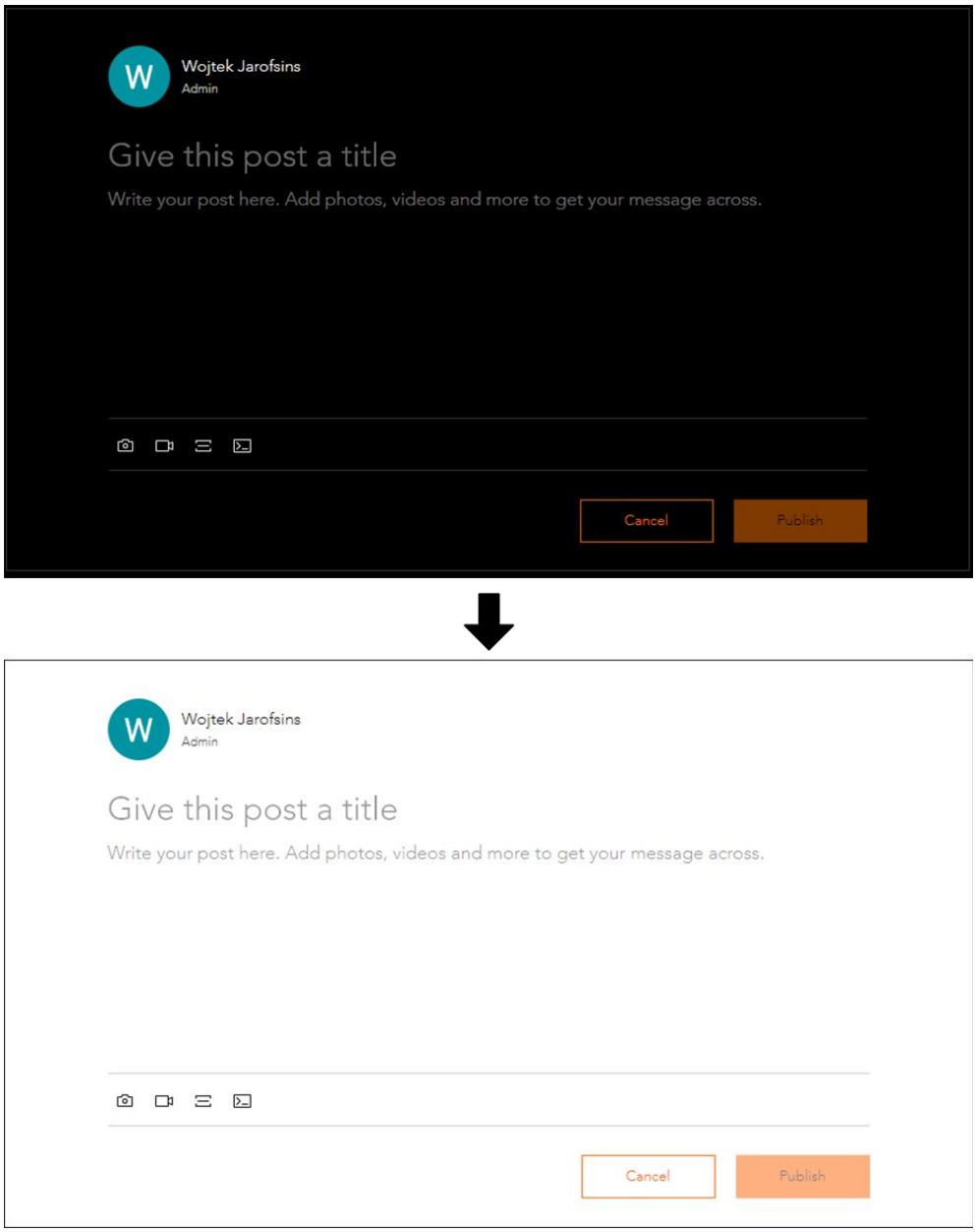


Figure 5. Screenshot showing the design changes made to the posting functionality of the website. The old version is shown on top, while the new one is shown on the bottom.

Update to Front Page: Featured Posts

An addition was made to the website during this iteration, based on factors other than the opinions of users. This new feature was the addition of the "Featured Posts" on bottom of the front page of the website, which includes 3 recommended posts to the visitor (see Figure 6). This feature was added in order to improve the user experience and usability of the front page, without overstimulating the visitors.

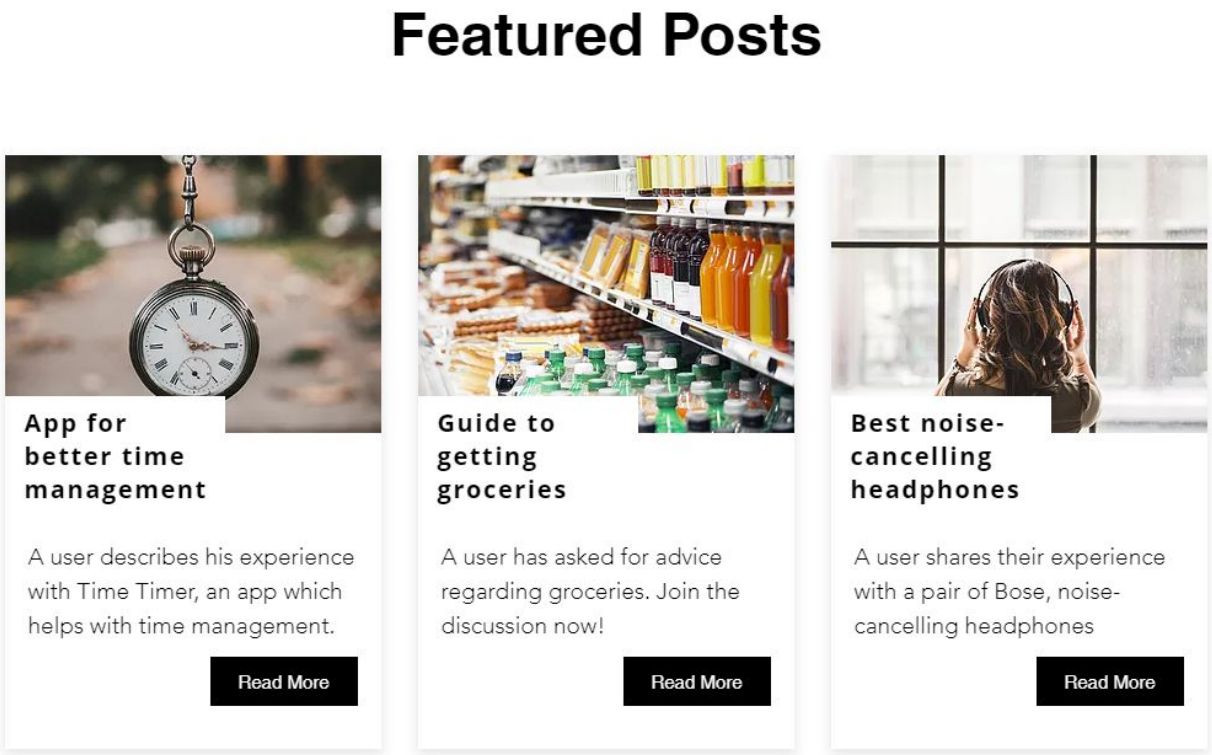


Figure 6. Screenshot showing the "Featured Posts" feature.

5.3.2 Questionnaire 3

The third questionnaire had three primary purposes: (1) to ask questions regarding the new features (e.g. name, featured posts on landing page, new forum categories), (2) to ask questions regarding the design of the website (e.g. color scheme, text, quantity of images), and (3) to ask evaluative questions regarding the platform (e.g. System Usability Score, evaluation if user requirements were met). A total of 4 users answered this survey. The survey can be found in Appendix H, while the findings from this questionnaire are further discussed in Chapter 8.

Requirements
Chapter 6

A large focus of this project was to, through the implementation of co-design and research, obtain requirements regarding the development of an online, solution-sharing platform for autistic individuals. Once obtained, these requirements were divided into 3 categories: content requirements, technical requirements, and co-design requirements. Each of these will be discussed individually.

6.1 Content Requirements

Content requirements referred to requirements regarding the website, which were not technical. This included the things which were to be on the website, such as the text, images, but also the characteristics of the website, such as it being free to use.

Table 4.
Table showing the content requirements for a solution-sharing platform, as observed during the development of this project.

Content Requirements
● Use of clear and specific language.
● Use appropriate terminology when referring to autism related subjects.
● Free to use.
● Clearly provide information about the platform and the development behind it.
● Include examples when appropriate to illustrate how things are to be done.
● Include a variety of forum pages, covering a range of topics.
● Moderated by autistic individuals.
● Simple and user friendly user experience.

6.2 Technical Requirements

The technical requirements of the website referred to the technical features and functionalities which were found to be crucial in the development of an online, solution-sharing platform for autistic individuals.

Table 5.

Table showing the technical requirements for a solution-sharing platform, as observed during the development of this project.

Technical Requirements
● A posting functionality.
● A commenting functionality.
● A rating functionality.
● A sign-in functionality.
● Clutter free.
● Categorization.
● Accessibility.

6.3 Co-design Requirements

The co-design requirements referred to the requirements regarding, not the platform, but instead the process of co-designing with autistic individuals.

Table 6.

Table showing the co-design requirements for the development of a solution-sharing platform, as observed during the development of this project.

Co-design Requirements
● Obtain feedback from users which will be the basis for improvements of the platform.
● Specific questions.
● Specific instructions.
● Include images in surveys.
● Incorporating user technical knowledge.

Realization
Chapter 7

This chapter will explain the realization and practical development of the project. This includes factors such as creating the online platform via a website development tool, and implementing the requirements and specifications.

7.1 Wix

7.1.1 Choosing Web Building Tool

Several options were considered for the creation of the website. These ranged from the implementation of manual tools, such as programming the website from scratch, to using online website-development tools. Due to the nature of this project, it was quickly decided that making the website from scratch was not the best option. This was based on several factors including the fact that the planned process included the creation of a quick first draft, and the sharing of it as soon as possible. If this was to be done from scratch, either the quality of the website would suffer, or the time it would take to create such a website would take far too long. Furthermore, several iterations were to be created during this project, in a limited time frame. The manual implementation of these could be time consuming and present too many challenges, taking the focus away from determining what users want, to trying to create a functioning platform by programming it.

Having decided this, the next step was to determine how the platform was to be created through the implementation of a website creation tool. This included deciding which tool would be best suited for this. Several options were considered. These included: Squarespace, Wix, and Wordpress. Wix[1] was ultimately chosen as the tool which was to be implemented in order to create the online platform. Wix is an online tool which gives users the ability to quickly create professional and functional websites ("The Leader in Website Creation," 2019). It offered all of the functionalities which were required to create a prototype of the platform. Specifically, referring back to the technical requirements of the project, it allowed for: posting, commenting, rating, signing in, accessibility features and, to an extent, the

[1] https://www.wix.com/

categorization of posts. Furthermore, the tool was deemed to be good for quick iterations, customization and allowed multiple users to work on a website together. This feature was useful during the creation of the first version of the website which was done together. An additional benefit of using Wix was the feature of transferable site ownerships. This was a valuable feature due to the fact that after the completion of the project, the ownership of the website could then be passed on to individuals who may be interested in continuing the project.

The way in which one uses Wix to develop a platform is either by creating a website from scratch by drag and dropping features, or by basing it on a template. The way in which this was done with regards to autshare is described in the next section.

7.1.2 Making Website Using Wix

Given the fact that a quick first draft of the platform had to be made, it was decided that the website would be based on a template offered by Wix. In order to make a website based on a template the "My Sites" page on Wix was visited. Following this, the "Create New Site" button was pressed. This then loaded a new page in which a website category was to be chosen. Due to the fact that none of the highlighted categories included "Forum," the button "Other" was pressed. The next step was to choose how the website was to be created. The choice was between letting Wix create a website based on answers to questions, or creating a website using the Wix editor based on a template. The latter option was chosen as customization was of significance. In the page which then appeared the term "Forum" was searched for and the template: "Social Forum," was chosen. This template already included a skeleton of most of the pages which were to be used in the platform, and therefore, was deemed as appropriate. The template also featured several elements which had to be removed such as animated GIFs, slide shows, and text animations. It was decided that these elements were potentially detrimental when dealing with autistic individuals as the target group, as too many on-screen stimuli could lead to a sensory overload.

Having established a foundation, the next step was to fill the website with content. A welcoming image and title were added to the homepage, alongside a description explaining what the platform is about. Adding these elements was done using the "Add" button within the Wix editing mode. This allowed for the addition of various features. Next, the forum section was looked into and the appropriate categories for discussion were created. The forum was integrated thanks to the Forum[2] add-on for Wix.

[2] https://support.wix.com/en/article/adding-wix-forum

The forum was customized by navigating to the forum page, opening the “Forum Settings” window, going to “Categories” and pressing the “Add New Category” button. Following this, the new categories could be edited. Here it was possible to add a name, header title, description, and tweak design elements, such as the header image. Furthermore, the forum settings allowed for the changing of the layout of the forum. For the main page of the forum, the “Cards” layout was chosen. This was done to make the page easier to look at and provide a clear indication of the different categories through the use of pictures. For the individual category pages however, the “Compact” layout was chosen as to ensure that many posts could be present on the page at the same time, without making users scroll down the page. The way in which these layouts were chosen was by going to the “Layout” page within the Forum settings and navigating either to the “Main Page” for the main page of the forum, or navigating to the “Posts Page” for the sub-category pages of the forum.

In the case of this platform the following forum structure was chosen:

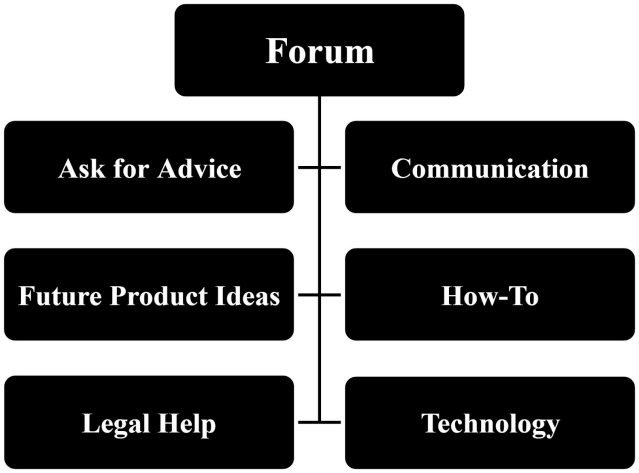


Figure 7. Diagram showing the structure chosen for the forum of the website.

7.2 User Experience and User Interface Design

It was of great importance to ensure that the user experience and web design was developed optimally for autistic individuals. The core aspect that was derived from research and user testing was to provide a clear and simplistic user experience, reducing the amount of distractions for the user that could cause cognitive overload. This requirement guided the design throughout the website, and lead to several subsequent design decisions. By making the website minimalistic, hopefully, the user would be less likely to feel overwhelmed by too much content on the screen. In alignment with this requirement, it was therefore decided that no moving content would be included for now, as to avoid overstimulating certain users. The web designs of other platforms for autistic individuals were used as inspiration when developing this platform.

One example of how the user experience was improved based on the feedback from the target group was the addition of a post categorization system. This was done using Wix forum's inbuilt hashtag system. Within each post, a user is able to add a hashtag, thereby tagging the post with what it is about. For example, a user can write a post about headphones and then use '#headphones' in order to tag the post. These hashtags can then be searched for within the inbuilt search bar. However, at this point in time, Wix does not offer a category viewing utility. This had to therefore, be implemented manually. The way in which this was done was through the addition of a text box on the side of the forum page. This text box then had several hashtags added to it, highlighting how this functionality could work. Each hashtag was then highlighted, and a link was attached to each word individually. The links which were attached lead to the search result page of that word. Therefore, when clicking '#headphones,' the user would be taken to the search results of someone searching for headphones in the search bar.

As for the aesthetic design of the platform, it was developed with clarity and ease of use in mind. Given the, previously mentioned, risk of sensory overload of autistic individuals (Van Hees et al., 2015), it was important that using the platform would not be a problem. Three primary colors were used within the website. This included black, white, and orange. It was of importance to ensure an appropriate contrast between the colors, to make sure that visually impaired users would not have issues with viewing the platform.

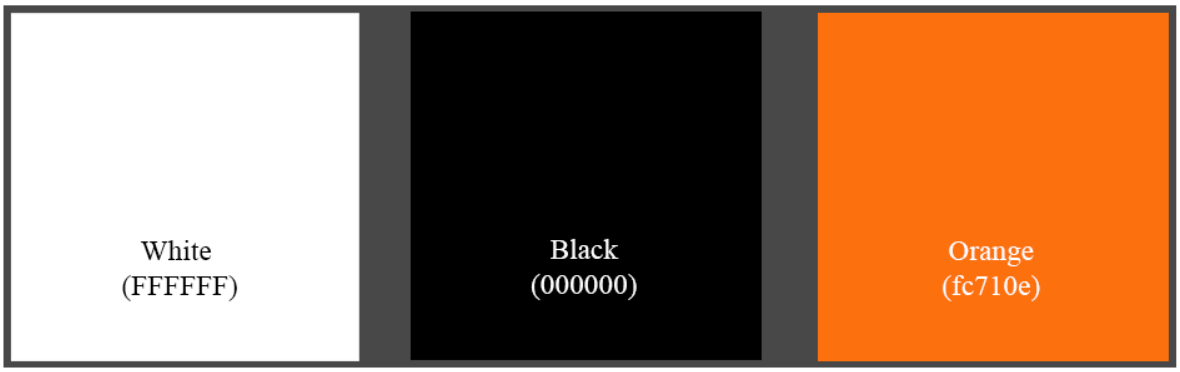


Figure 8. Diagram showing samples of the colors used within the platform.

It was decided that while images would be included in the design of the website, there would not be an overwhelming amount of them. This also served the purpose of not over stimulating users. It was, on the other hand, also important to include some images, as to make the platform viewing process more interesting, engaging and encouraging. Due to this, the welcoming page has one large image, welcoming the users. Each category within the forum also has its respective image, to assist users in identifying which category they are looking at. Despite the growing popularity of GIF animations (Miltner & Highfield, 2017), it was decided that these would not be included within the website as to avoid overstimulation.

As for the text on the website, clarity was once again a focus. Due to this, when possible, large and readable text was implemented, with large contrast between the text and the background. Furthermore, a rather neutral font was chosen, as to make reading text user friendly. The chosen font is called "Helvetica" and an example of it can be seen in Figure 9.

A quick brown fox jumps over the lazy dog

Figure 9. Screenshot showing an example sentence written using "Helvetica."

7.3 Accessibility

Accessibility, in the context of web development, refers to the practice of ensuring that anyone, regardless of their ability, can both use and visit the website ("Improving Your Site's Accessibility," 2019). User feedback from one of the co-design participants stated that in the development, it should be ensured that the platform worked well with text-to-speech readers which some autistic users implement in their computer usage. This is an example of an accessibility feature. The way in which this was implemented was by following a guideline[3] shared on the Wix forums. This guideline described not only how to ensure that such readers cooperate with the platform, but also other ways in which the website can be made more accessible.

7.3.1 Optimization for Screen Readers

The way in which the website was optimised for screen readers was through ensuring that on each page, each piece of text was labeled correctly with the heading tag. These are tags used in web development which differentiate between different types of text. For instance, headers include the main header, referred to as 'h1,' or a sub header, which is referred to as 'h2.' Paragraphs, on the other hand, are referred to as 'p.' These tags are then used by readers in order to read the text in the correct order and following the correct structure. Following this, the settings of the website were checked to make sure that the language of the site was set correctly. This then ensures that the reader would use the appropriate accent, speaking rate and pitch ("Improving Your Site's Accessibility," 2019). Finally, each image on the website was given a description so that in the case of a user using a screen reader, they can have an idea of what is shown in the picture. These descriptions were added under the 'alt text' function.

7.3.2 Additional Optimizations

The guideline also suggested making sure that the website uses the appropriate color contrasts as to be usable for users with vision related disabilities. This was done. Secondly, visual indicators were enabled to assist users who may be using a keyboard instead of a mouse, meaning that they can press 'Tab' on their keyboard and shift through the various buttons on screen, with a visual indicator showing them where they are. Furthermore, it was ensured that all default animations were removed from the website.

[3] https://support.wix.com/en/article/improving-your-sites-accessibility

These animations trigger, for example. when a user opens a new page, for instance, fading in a piece of text. This functionality was disabled as to work towards the requirement of simplicity of the user experience.

7.4 Final Website

This section contains several screenshots showcasing the final version of the platform. The complete collection of screenshots can be found in Appendix E.

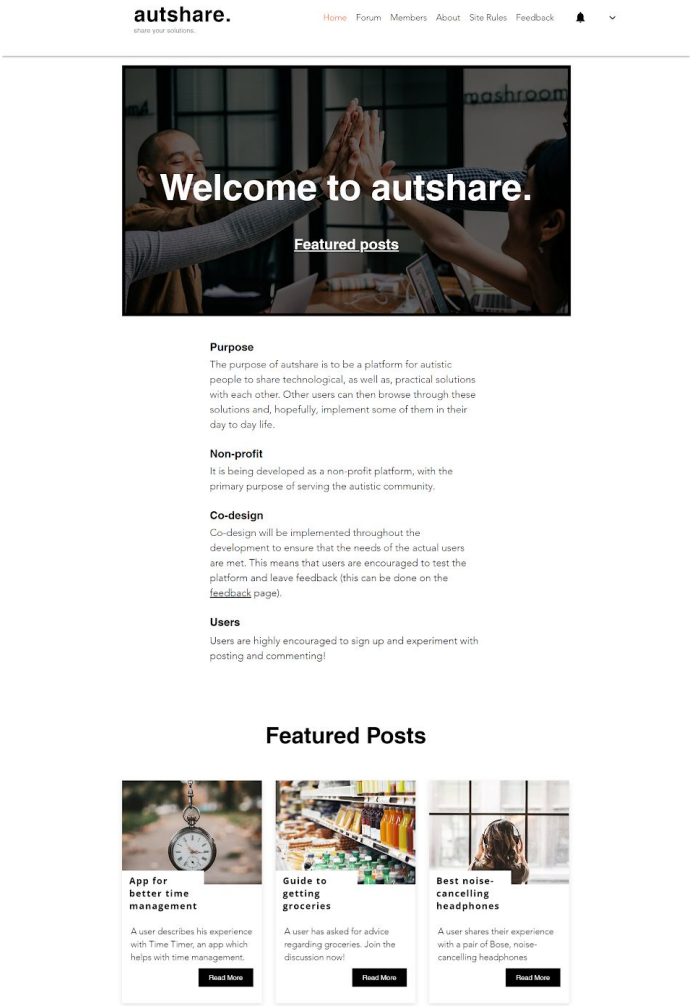


Figure 10. Screenshot showing the landing page of the final version of the platform.

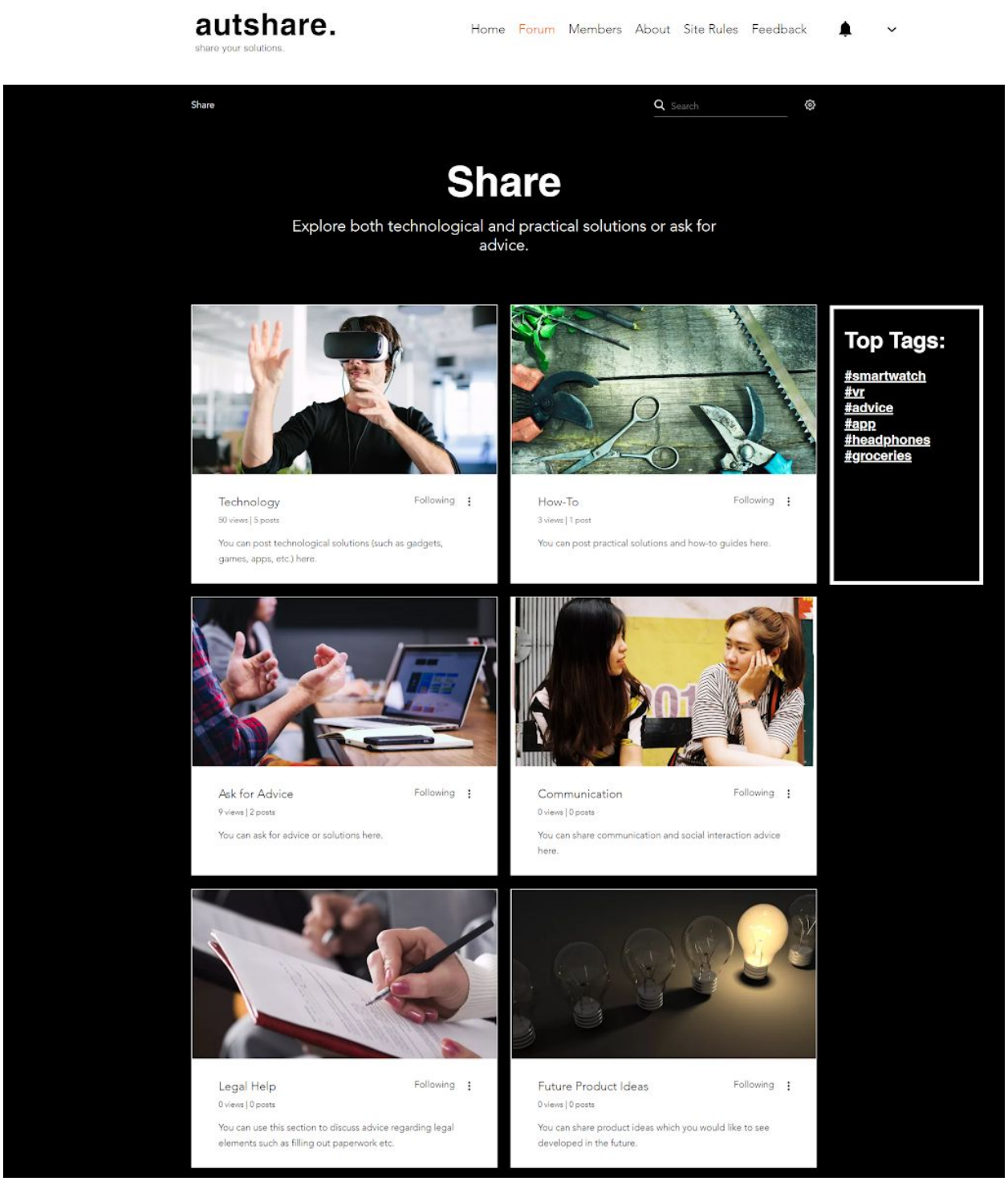


Figure 11. Screenshot showing the forum page of the final version of the platform.

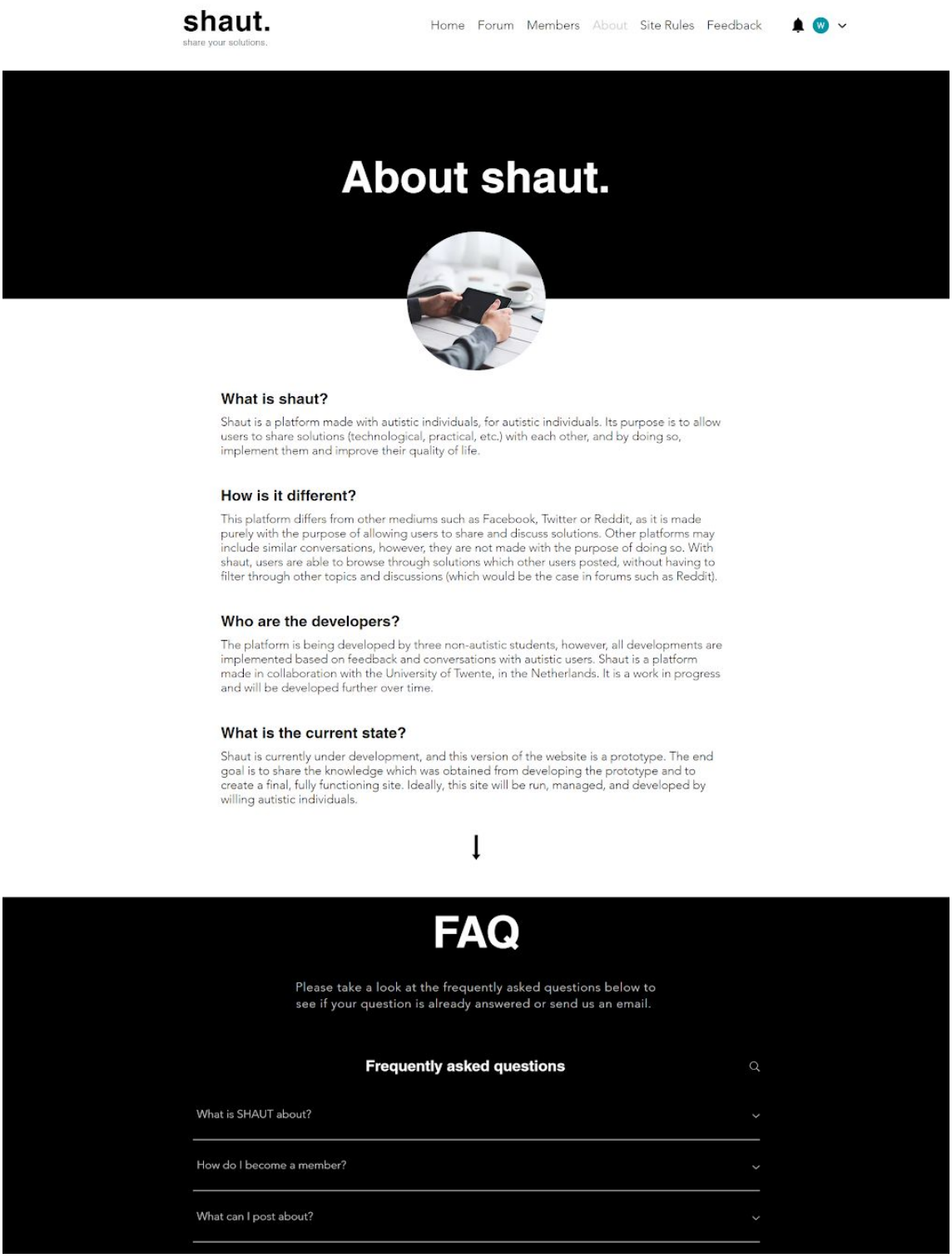


Figure 12. Screenshot showing the about page of the final version of the platform.

Evaluation and Discussion
Chapter 8

Having developed a prototype of the platform, the latest version was then evaluated. This was done to determine what users thought about the platform, and to what extent the requirements were met.

8.1 Results from User Test 3: Evaluation

User Test Details

The evaluation was carried out in user test 3. The evaluation was performed primarily using the System Usability Scoring (SUS) scale (Brooke, 1996), alongside other evaluative questions asked within the survey. The SUS scale is a usability scale, which aims to determine the level of usability of a system, in this case, a platform, based on the answers of users. It consists of ten statements, to which users respond by indicating the extent to which they agree or disagree (Brooke, 1996). It has been found to be reliable across a wide range of sample sizes, including small ones (Bangor, Kortum, & Miller, 2009). Given the small sample size of this evaluation (4 individuals), this was an important factor to consider. For the purposes of this evaluation the questions from the SUS were adapted slightly, changing "system" to "platform," as to ensure that users understand what the questions are referring to.

A total of 4 individuals responded to the survey. 3 of these individuals were males, while 1 was female. All of the users were contacted via Twitter, and answered the survey remotely. The users were instructed to first visit the platform and see the various pages, and then to answer questions within the survey which was sent to them. This survey included 5 evaluative questions, alongside 10 SUS scale questions. Within the evaluative questions, 1 used the Likert scale, while the remaining 4 provided users with multiple choice answers. These included: yes, no, maybe. The questions from the SUS scale all used the Likert scale to obtain answers. The possible answers ranged from "Strongly Disagree" (1), to "Strongly Agree" (5).

System Usability Score

The end goal of implementing the SUS scale is to obtain a final score. This then determines the usability of a system. In order to obtain the score, a specific calculation has to be performed. First the average result for each question has to be found (see Table 7). For questions 1, 3, 5, 7, and 9, the score contribution of each question is equal to the average, minus 1. This is due to the fact that these are 'positive' questions, meaning that they are phrased in a way in which a "Strongly Agree" statement would be positive. As for questions 2, 4, 6, 8, and 10, for each question, the score contribution is equal to 5 minus the average. This is due to the fact that these are 'negative' questions, where a "Strongly Agree" is negative.

Table 7.

Table showing the average results for each individual question, on a scale from 1-5

Statement Number	SUS Statement	Average Answer
1	I think that I would like to use the website frequently.	3.75
2	I found the website unnecessarily complex.	1.5
3	I thought the website was easy to use.	4.5
4	I think that I would need the support of a technical person to be able to use the website.	1
5	I found the various functions in the website were well integrated.	4
6	I thought there was too much inconsistency in the website.	1.5
7	I would imagine that most people would learn to use the website very quickly.	4
8	I found the website very difficult to use.	1
9	I felt very confident using the website.	4.25
10	I needed to learn a lot of things before I could get going with this website.	1

Having obtained the score contribution for each individual statement, these were then summed and multiplied by 2.5. The result of this calculation was the final SUS scale score (Brooke, 1996). These range from 0 to 100. The calculation, performed using results from this evaluation, is shown below.

*((3.75-1) + (5-1.5) + (4.5-1) + (5-1) +(4-1) + (5-1.5) + (4-1) + (5-1) + (4.25-1) + (5-1)) * 2.5 =* ***86.25***

Thus, the SUS-score is 86.25. According to the rating diagram by Bangor et al. (2009) shown in Figure 13, this score is in between 'good' and 'excellent,' implying that the website scores high with regards to its usability. For websites, the average usability score is 68.2 (Bangor et al., 2009). Given that this platform scored well above that, the usability of the platform can be concluded as successfully implemented.

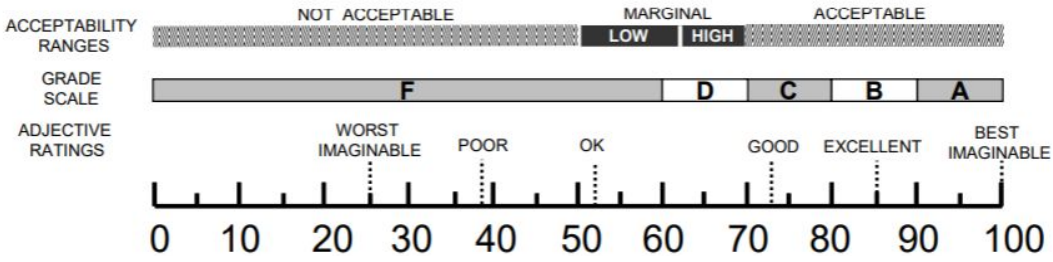


Figure 13. Diagram showing the range of scores of the SUS scale (Bangor et al., 2009).

Evaluative Questions

The second part of the questionnaire included the remaining questions which aimed to determine what users thought about the platform as a whole, as well as what they thought about the design of the platform. Each of the questions, and respective results, will be discussed below. The survey which contained these questions, alongside the results, can be found in Appendix H.

Question: *What do you think of the new name: "Autshare"?*

Answer: *4.5 (average score)*

The name change received a positive response from users. Users rated the new name with an average of 4.5, meanwhile the previous name averaged at 2.5. This indicated a clear improvement in user opinions regarding the name.

Question: *What do you think about the overall design of the website?*
Answer: *4.75 (average score)*

The overall design of the website scored 4.75. This is a very good result, indicating that users liked the design of the website. Nevertheless, due to the small sample of users for this evaluation, this question should be explored further in the future.

Question: *Do you like the color scheme of the website?*
Answer: *3 Yes / 0 No / 1 Neutral*

In general, users responded to the color scheme of the website well. An additional remark regarding this, left by a user, was that changing the colors to ones with less contrast could be considered.

Question: *Do you like the way that text is presented on the website?*
Answer: *4 Yes / 0 No / 0 Neutral*

Users indicated that they liked the way in which text was presented on the website.

Question: *Would you like to see more media on the website?*
Answer: *1 Yes / 0 No / 3 Neutral*

Users seemed unsure whether or not they would like to see more media on the website, and therefore, new media was not added for now. This can be considered in future improvements of the platform.

Question: *Do you like the idea behind the website?*
Answer: *5 (average score)*

The purpose behind asking this question was to determine if users fundamentally agreed with the concept behind the platform. Given the average answer of 5, it can be said that they did.

Question: *Do you think there is a need for this type of website in the online autistic community?*
Answer: *4 Yes / 0 No / 0 Neutral*

This question aimed to see whether or not users believed that there is a need for a platform such as this one, in the online autistic community. Given that all the answers say yes, this indicates that there is a need for such a platform.

Question: *Does the website make you want to discuss solutions with other autistic individuals (in the forum)?*
Answer: *2 Yes / 0 No / 2 Neutral*

The goal of this question was to determine if users found that the platform encouraged them to discuss solutions with other autistic individuals. While overall, the answers were positive, 2 neutral responses imply that this is an area for improvement.

Question: *Did you like being a part of the development of this website?*
Answer: *4 Yes / 0 No / 0 Neutral*

This question aimed to determine how users felt about participating in the development process of the platform. All of the replies said yes, implying that all users enjoyed it.

Question: *Would you like to see this website develop further (into an actual platform which is released)?*
Answer: *4 Yes / 0 No / 0 Neutral*

This final evaluative question asked users whether or not they would like to see the platform develop into an actual website in the future. All users replied yes, suggesting that, in fact, they would like for that to happen.

8.2 Evaluation of User Requirements

Most requirements were successfully implemented into the final website. The only requirement which was not met was for the platform to be 'moderated by autistic individuals' (see Table 8). The technical requirements of creating a 'clutter free' website with a clear and efficient 'categorization' were met to an extent (see Table 9), however, they showed room for improvement. Finally, the co-design requirement of 'incorporating user technical knowledge' was also only met to an extent, since there could be a possibility to incorporate some tech savvy individuals as co-developers of the platform, which was not done in this prototype.

Table 8.

Table showing the extent to which each of the content requirements were met

Content Requirements	**Implemented: (**Yes/No/To an Extent)	**Explanation**
Use of clear and specific language.	Yes	This requirement was implemented throughout the platform (e.g. site rules, about page, and more).
Use appropriate terminology when referring to autism related subjects.	Yes	Following user feedback, changes were made within texts on the platform as to refer to autistic individuals in a way which they find appropriate.
Free to use.	Yes	The platform is, and will continue being, free to use.
Clearly provide information about the platform and the development behind it.	Yes	Information is provided about the website both on the landing page, as well as the about page.
Include examples when appropriate to illustrate how things are to be done.	Yes	Examples were included within the site rules, as well as in the feedback page.
Include a variety of forum pages.	Yes	A total of 6 different forum categories were implemented within the platform, all covering different topics.
Moderated by autistic individuals.	No	At this point in time, the platform is functional, however, it has no active user base other than the co-design participants. There is therefore no need for moderators.
Simple and user friendly user experience.	Yes	This was accomplished both through easy to use features, combined with a user friendly design of the website.

Table 9.

Table showing the extent to which each of the technical requirements were met

Technical Requirements	**Implemented:** (Yes/No/To an Extent)	**Explanation**
A posting functionality.	Yes	A posting functionality was implemented thanks to the Wix Forum functionalities.
A commenting functionality.	Yes	A commenting functionality was implemented thanks to the Wix Forum functionalities.
A rating functionality.	Yes	A rating functionality was implemented thanks to the Wix Forum functionalities.
A sign-in functionality	Yes	A sign-in functionality was implemented thanks to the Wix Forum functionalities.
Clutter free.	To an Extent	This requirement is rather subjective, and therefore it cannot be stated whether or not the design is clutter free. It can be stated however, that efforts were taken to try and accomplish this goal.
Categorization.	To an Extent	This feature was implemented to an extent, however, improvements could be made to make this feature more sophisticated.
Accessibility	Yes	This requirement was implemented through the following of an accessibility guideline.

Table 10.

Table showing the extent to which each of the co-design requirements were met

Co-design Requirements	**Implemented:** (Yes/No/To an Extent)	**Explanation**
Obtain feedback from users which will be the basis for improvements of the platform.	Yes	Feedback was obtained from users. The knowledge obtained from this feedback was then used to improve the platform.
Specific questions.	Yes	Specific questions were asked within the surveys.
Specific Instructions.	Yes	The instructions, both within the survey, as well as direct messages, were written clearly.
Incorporating user technical knowledge.	To an extent	The technical knowledge of users was incorporated to a certain extent, however, certain users expressed their interest in actively developing this platform. This was not implemented.

8.3 Discussion

The primary research question of this paper was: “How can an online, knowledge-sharing platform for autistic individuals be developed through the implementation of web-based co-design.” This thesis paper attempted to answer this question, by describing the process of developing Autshare, an online platform for autistic individuals to share practical and technological solutions amongst each other, in collaboration with tech-savvy autistic individuals. Based on their feedback, continuous improvements were made to a prototype of the platform, built using the website development tool ‘Wix.com’. Users were interacted with through the use of Twitter direct messages, and their feedback was gathered through the implementation of online surveys. Through evaluative user testing, it was found that the target group thought that the website had high usability Based on the evaluations from the users, it can be concluded that both the platform’s usability, and the concept and design of the website were rated positively, and the target group would like to see the platform being developed further.

Through iterations of co-design, factors to be considered when developing a platform for tech-savvy autistic individuals were derived. These factors were the requirements which were defined and

categorized as: content requirements, technical requirements, as well as, co-design requirements. The most significant requirements were: the platform being ‘free to use’; the use of ‘clear and specific language’; a ‘clean, user friendly design’; ‘transparency’; the implementation of various ‘forum functionalities’; the inclusion of different ‘forum categories’; the implementation of ‘user feedback in the design process’; the inclusion of ‘accessibility features’; and the use of ‘specific questions and instructions when obtaining feedback’. These findings correlate with contemporary scientific literature on the topic of autism, discussed in Chapter 2. For instance, the threat of sensory overload, as described by Van Hees et al. (2015), correlates to the requirement for a clean design of the platform, as well as the clarity of feedback surveys.

The process of implementing co-design with tech-savvy autistic individuals was done through the implementation of web-based co-design, and online communication using the social networking site Twitter. Direct messages on Twitter were then used in order to form relationships with individuals, and share links to the platform and surveys with them. These surveys were then answered by users and their input was used in order to make improvements to the platform. This approach was successful in terms of finding and interacting with a specific target group, however, had its limitations. For instance, reliable communication could be difficult to establish, as oftentimes users did not reply to messages, or did not check their inboxes. Furthermore, misunderstandings, such as users not understanding instructions, occurred, leading to certain difficulties. Nevertheless, the approach is recommended for similar projects, with the following suggestions for improvements. Firstly, a longer scouting period should be implemented to try and find participants who would be willing to commit to the project and participate throughout the entire process. This could solve the issue of individuals losing motivation and not replying past a certain point. Secondly, a different feedback-obtaining method could be implemented, as compared to the use of online surveys. This could for example include a method such as video-calls.

A part of the project was studying how the implementation of co-design with tech-savvy adults impacted the development of the platform. Throughout the design process, the importance of involving autistic individuals became evident, as their thoughts and opinions were unpredictable to the developer. Furthermore, the impact that co-design had on the resulting platform also became clear when compared with the other 2 platforms developed by the other team members. This highlighted the similarities and differences between developing the platform with autistic tech-savvy adults, older adults, and adolescents. These differences were present in the obtaining of participants, communication with participants, in the quality of feedback, and finally in the actual platforms which were developed. This comparison is described in Chapter 8.

One limitation of this project was the fact that the developed platform was based on a narrow target group, namely, tech-savvy individuals. Developing a platform including opinions of all user groups would present certain obvious benefits, and therefore, the findings from this platform, as well as those from the platforms developed targeting adolescents, and adults over 30 could be used as inspiration for a future platform. Another limitation of the project was due to the nature of online communication, which can be infrequent and unreliable. It is therefore worth considering using a variety of mediums when contacting users, or performing co-design offline, by interacting with users face-to-face.

Another factor worth debating is the fact that the co-design process begun with showing users an already created first version of the platform. This was done to kickstart the project and development process, already giving users something to provide feedback on, however, it also meant that user opinions were oriented around the design created by the team working on the project. For future developments, it may be worth considering involving the users at an earlier stage, and seeing what would happen if the project was truly co-designed with autistic individuals from scratch.

8.4 Shared Discussion

Due to the fact that this project was carried out by 3 team members, it is also worth looking into the findings, and comparing them amongst each other. This may be useful when drawing conclusions or planning steps for the future. This section of the discussion is co-written by me (Wojtek), Alan Deuvletian (Alan) and Marise van Noordenne (Marise).

8.6.1 Introduction of Shared Discussion

Three students were assigned to this graduation project and therefore, it was decided to focus on 3 different user groups: adolescents, tech-savvy adults, and older adults. Alan and Wojtek chose to conduct co-design via the internet (web-based), while Marise conducted the co-design with a small group of participants in person. Furthermore, Alan and Wojtek decided to begin the project with an already functioning prototype of the platform, while Marise chose to start designing from scratch.

8.6.2 Differences in Co-Design

Various different approaches were undertaken in order to tackle the method of co-design with autistic individuals. Hence, each member of the group observed differences in regards to obtaining participants, communication and interaction, as well as the overall quality of feedback acquired. These differences will be discussed further in terms of each individual project group member's findings for a particular subtopic.

8.6.3 Obtaining Participants

In order to acquire voluntary participants, Wojtek primarily relied on Twitter's social network. At first, the approach taken was to post public tweets in order to reach the widest audience possible. Unfortunately, it was quickly noted that following the tweet, not many survey responses were received. Thus, a new approach was attempted in which Wojtek directly reached out to individuals who had liked, or shared, the original public tweet, as well as prominent members of the autistic Twitter community through private, direct messages. There was a substantial improvement in peoples' willingness to participate. Nonetheless, it was occasionally the case that individuals initially showed interest in participating in the co-design process, however they were difficult to keep engaged in the long run.

Alan undertook a similar approach in which he used Reddit as a platform for sourcing participants. Similarly to Wojtek's case, it was quickly observed that public posts received no replies or interest. Cumulatively, in the case of the findings of this graduation project group, this indicated that public broadcasting is not a practical or useful method of sourcing autistic individuals. This could potentially be attributed to the lack of intimacy of public broadcasting, being that it is perceived as a more corporate and less personal approach. Therefore, Alan decided to reach out to people directly through private messages as well. In spite of that, it became evident that even direct messages were not an effective method of sourcing participants, especially ones fitting the target group of older autistic adults. For that reason, Alan decided to reach out to people in his personal network that could put him in touch with autistic individuals. This method worked significantly better, although it did not provide a very large influx of participants.

Marise assumed a more direct method of sourcing participants which did not involve finding people online. This was done by collaborating with a high school for special education. Even in this case, the rate of willingness to participate was quite low, since only 3 of 90 possible students signed up for the

co-design collaboration. Overall, the observations demonstrated that there is a high reluctance and skepticism on behalf of autistic individuals to participate in such a co-design process. This could very well be due to the fact that the developers themselves were not autistic. It is hypothesized that the inclusion of autistic individuals in the development team would improve peoples' willingness to participate, which could be useful to note for future development of such a project.

8.6.4 Communication

Throughout the sequence of the co-design process, various similarities and differences were witnessed in terms of communication and interaction. In Wojtek's case, it was observed that once communication was established via direct messages on Twitter, communication went relatively smoothly with little to no hindrances. It was also noted that explicit language and wording were often needed to clarify certain tasks in order to be clear of what was asked of the individuals in question. This was especially true as vagueness can lead to confusion and as a result have a detrimental effect on the evolution of the project and participants' willingness to partake in the co-design process.

In Alan's case, communication was partially mediated by the mutual personal connections who put both parties in touch, especially initially. Later on, communication took place through email correspondences. Within these interactions, it was important to keep the participants highly motivated and engaged by making sure they felt valued and heard. Comparatively to Wojtek's observations of communication and interaction, it became apparent that thorough instructions were needed to properly explain and elaborate on what was required of the participants. Once this was done, communication was relatively straightforward and successful.

Marise found that it was difficult to get participants to open up at first, but that, once a bond was established, interaction was fairly natural. Instances arose in which participants had difficulties properly communicating their ideas and thoughts, however their fields of interest were used to appease the situation. This indicated that once a familiar rapport was established, the interaction could flourish and communication became easier with time.

8.6.5 Quality of Feedback

Throughout the sequence of the co-design process, various similarities and differences were witnessed in terms of the quality of feedback obtained. In Wojtek's case, the feedback acquired was very good in general. Participants were not hesitant to share their opinions extensively since they answered all questions well, especially open-ended questions with rather high levels of detail. Contrastingly, in Alan's case, the feedback offered in open-ended questions was not as extensive, although the quality of feedback was not sacrificed. This was especially true in terms of the creativity offered when asked for additional features and aspects of the website that the participants would enjoy. The participants did not hold back with their desires, no matter how ambitious they were. Nonetheless, it must be taken into consideration that since the participants were sourced through personal connections, the feedback offered could be slightly biased and influenced due to a mutual connection in the relationship. By this it is meant that the participants could have been afraid or hesitant to give their unfiltered feedback for fear of being offensive or overtly critical. In Marise's case, the quality of feedback obtained was very high. This is most likely due to the fact that the small pool of participants allowed for a greater investment of attention and focus in a hands-on approach. When occasions occurred in which the participants had difficulties with visualization and imagination, it was possible to draft quick sketches and drawings to help support explanations and evoke thought processes. This method was drastically different to Wojtek and Alan's approach, as this method of supportive sketches was not possible online given the technological and time constraints. Regardless, Marise's predicament was quite similar to Alan's in the sense that dealing with participants in-person could have influenced the feedback granted. This is because the pressure of being on the spot and expecting an instant answer can result in skewed feedback. This is especially true since dealing with people virtually by means of online interaction means people pay less attention to political correctness and more on their true feelings and emotions.

8.6.6 Advantages and Disadvantages of Co-design

The various advantages and disadvantages of both web-based and in-person co-design, as observed by the project team, will now be discussed.

With regards to web-based co-design, one of the primary advantages was the fact that it gave access to a broader range of participants. This included both a larger potential quantity of participants, as

well as an increased diversity. Furthermore, several advantageous practical aspects came into play when dealing with online co-design. One of these was the avoidance of complications associated with setting up face-to-face feedback sessions. These include sending out and receiving consent forms, but also scheduling conflicts which may arise when attempting to plan meetings. As for the users, benefits include the fact that they were free to provide user feedback in their own time, and in a space which they found to be comfortable. This was of additional importance given the target user base of this project, being autistic individuals.

On the other hand, several disadvantages were also noted when implementing web-based co-design. The primary challenge was capturing the interest of users and encouraging them to participate in the user tests. Public posts, such as Tweets and Facebook posts, were found to be ineffective in obtaining replies to the surveys. While they received attention in the form of likes and shares, they lead to a very limited quantity of feedback. Therefore, users were contacted directly via private messages. This was more effective, however; it brought forth even more challenges. One of these was simply the fact that users saw the messages and did not reply, while other users showed interest, stating their willingness to participate, only to not reply when the survey was sent out. Furthermore, another disadvantage which was observed, was the lack of an opportunity to properly explain the project to the potential users, without sending them excessively long messages. This, in turn, resulted in a higher level of skepticism from users, as they were unsure of the motivations and purpose behind the project, and the threat of users misunderstanding what the project is about, thereby, potentially, providing inaccurate feedback. Due to the nature of online interaction, challenges such as users becoming distracted with other things while messaging or providing feedback were observed. It was therefore of great importance to ensure that feedback sessions were as short as possible, in fear of users losing motivation, becoming distracted or becoming bored. Lastly, a disadvantage of web-based co-design was the fact that the verification of users was rather difficult. Due to the anonymity of online activity, hypothetically anyone can pretend to be anyone, including non-autistic individuals pretending to be autisitc. This in turn could potentially lead to misinformation being taken as user feedback, leading to inaccurate developments of the project.

As for in-person co-design, similarly, both advantages and disadvantages were noted. The primary benefit of this technique was the fact that the bonds and relationships formed with the participants were much deeper than those formed with online participants. Furthermore, in-person interaction allowed for additional explanation in case users misunderstand an element of the project. This is not always the case when interacting with users online. Additionally, the feedback obtained from users may be more in-depth when interacting face-to-face. This is due to the fact that these sessions may be

longer, as compared to online surveys (which have to be kept short to maintain user interest), meaning that users may provide more feedback. It may also be considered to be a more reliable form of co-design, as users cannot ignore the person asking for feedback once they have met, and they may feel more of an obligation and responsibility to carry out their part until the end.

Disadvantages of this in-person co-design include the fact that finding participants can be very difficult. Furthermore, once potential participants are found, the process leading to a feedback session can oftentimes be challenging, as consent forms have to be sent out and received. In general, this form of co-design can be described as more time consuming, as not only do the feedback sessions have to be prepared, they also have to be carried out. In the case of this project, Marise obtained feedback from each user individually, making the process even more time consuming. Additionally, the process of getting to know users and making them feel comfortable enough to open up can also be time consuming. This factor can potentially be enhanced when working with autistic individuals.

8.6.7 Differences in Platform Outcomes

This section of the discussion will describe some of the key differences which were observed amongst the different user groups with regard to the platform itself.

One area that illustrates the differences amongst the users is that of technical aspects of the platforms. Prior to the development of the project, it was assumed that Wojtek's target group of tech-savvy adults would have the most to say in this regard. However, the technical comments made by users were rather limited. The primary feedback regarding this subject was the fact that a scroll down menu appeared to be blank when users clicked on it. In the case of Alan's user group, being older autistic adults, similarly, not many technical details and improvements were identified. On the other hand, Marise's group of adolescents placed a large focus on certain technical features not working or being buggy. The information obtained in this regard is too limited to draw concrete conclusions, especially given the fact that both Wojtek's and Alan's platforms were functioning websites from the beginning of the iteration process, as compared to Marise, who developed the platform during the iterations.

The functionalities of the website were another area where both similarities and differences amongst user groups could be identified. Both older adults, as well as adolescents, noted that they would like to see a chat function implemented within the platform. This was not observed with the tech-savvy

adults. On the other hand, all user groups highlighted the fact that they would like a better way to categorize and filter posts, potentially based on the different topics of discussion.

With regards to design, all 3 target groups seemed to lean towards a clean and functional design. Tech-savvy users made an interesting observation regarding this subject, as they wanted to ensure that the color scheme of the website was suitable for visually imparied users. This improvement was not identified by the other user groups. Another noticeable observation, was the fact that the group of older adults asked for more pictures and illustrations, while the adolescents put an emphasis on the preferred absence of those and a very clean and minimal look. This showed in the general comments regarding design and aesthetics as well.

The content of the website is the area in which the differences between user groups were most present. The two adult user groups emphasised the need for clear and specific site rules, while the adolescent group did not identify this need, stating only that they would like a blocking functionality. The user groups differed in their preferences for categories within the forum functionality of the website. Tech-savvy users wanted to see: ‘Ask for Advice’, ‘Communication’, ‘Future Product Ideas’, ‘How-To’, ‘Legal Help’, and ‘Technology.’ Older adults, on the other hand wanted: ‘Advice’, ‘How-To’, ‘Communication Support’, ‘Technology’, ‘Success Stories’, ‘Community Blog’, and ‘Feature Requests’. Meanwhile, adolescents wanted: “General” and “Technologies.” Tech-savvy adults also wanted to ensure that the “About” section of the website was clarified, making sure that the platform is as transparent as possible.

Furthermore, both the adolescents and the older adults had a lot of concerns about privacy. The adolescents highlighted that they preferred the forum to be completely inaccessible for people who are not logged into the website. This was also the case for the ‘Members’ page.

8.6.8 Conclusion of Shared Discussion

Conclusively, each group member, through the process of this project, managed to develop a varying version of the solution-sharing platform. While the methods implemented differed in several ways, all of them successfully managed to obtain user feedback and incorporate it within the design of the platforms. This accumulated knowledge, summarized within this section, may be of use for future advancements regarding this project, but also for other individuals who may pursue similar projects.

Conclusion and Future Work
Chapter 9

9.1 Conclusion

This thesis describes the development of Autshare, a solution-sharing platform made for, and with, autistic individuals. More specifically, tech-savvy autistic adults were chosen as the user group for this project and participated actively in the development process. They were contacted via Twitter, a social media platform, and their opinions and feedback was collected via online surveys. The platform itself was developed using an online website development tool called Wix. The importance of this project is the fact that the information may be implemented by future projects working either with the development of this specific platform, similar platforms, projects involving co-design with autistic individuals, and projects focused around the development of products or services for any user group with special needs.

The key findings of this project were the requirements which were obtained and implemented throughout the development. These were divided into three categories: content requirements, technical requirements, and co-design requirements. Content requirements included: the use of clear and specific language; the use of appropriate, autism-related, terminology; the platform being free to use; clear information about the platform and the developers being presented; the inclusion of examples when appropriate; the platform being moderated by autistic individuals; the inclusion of a variety of forum pages; and a simple and user friendly user experience. The technical requirements included: posting, commenting, rating, sign-in, and categorization functionalities; the platform to be clutter free; and for the platform to implement accessibility features. As for the co-design requirements, these included: the obtaining of feedback from users; the feedback being used as a basis for improvements of the platform; the inclusion of specific questions and instructions; the inclusion of images in surveys; and the incorporation of user technical knowledge within the development of the project. All of these requirements helped shape the user experience of the platform, customizing it to tech-savvy autistic individuals. Through iterative user testing and evaluation, it was found that the target group thought that the website had high usability, that the concept behind the platform was good, and that they would like to see the platform develop further in the future.

9.2 Future Work

This section will discuss future work which could be done with this project. This includes continuing work on the platform developed throughout this project, but also using knowledge obtained from this project when developing a new, but similar, platform in the future. Due to this, the future work section is divided into an exploration of future work regarding the platform, and future work regarding the co-design process.

9.2.1 Platform

With regards to the platform itself, while many features were integrated, some areas for improvement still exist. One of these is the categorization feature. At the moment, users can use hashtags in order to tag their posts. Other users can then search for hashtags, finding relevant posts. Furthermore, a dedicated feature highlighting the top tags has been added to the forum page. While this does allow users to categorize posts to a degree, a better implementation of this system could be added in future developments. While top tags should still be included, as they may inspire users to look into areas which they otherwise would ignore, a filter feature could be added, through which users can search for a specific type of post.

Another improvement which could be made regarding the platform could be the customization of the posting feature. At the moment, users can post using a rather neutral text window. This allows for the addition of a title, tags, main text, pictures and videos. While this does include the necessary components, a customized posting feature could be useful for certain topics or categories of discussion. For instance, the “How-to” category within the forum could benefit from enforcing a specific template for posts. Due to the ‘how-to’ naure of the posts, this could, for example, ensure that users implement steps within their descriptions, with sub-headers for each step. This could ultimately lead to a more standardized and unified experience for users viewing such posts.

A third improvement which could be made with regard to the posts on the platform, is to study which rating system which users wish to see implemented. The replies found in this project were rather divided, not leading to a conclusive decision pointing at a specific rating system. Due to this, the original ‘liking’ system was kept.

A factor to consider in the future, is contacting existing autistic platforms. This could be done in order to see if they would be willing to collaborate or contribute to this project. This could either mean that they would back the development, either financially or technically, or potentially incorporate the discussion forum within their existing websites, as an additional feature. This could, for instance, lead to the platform being used by a higher number of users.

9.2.2 Co-design

The co-design process was very beneficial for the development of this project. Without it, user needs and requirements would not be known, and the platform would not be as well suited to the target group. Despite it providing much needed information however, there are certain areas for improvement.

One factor to consider with regard to co-design, is the implementation of face-to-face co-design. This could lead to obtaining a better understanding of what users want and need. On the other hand, it is also important to consider the advantages of web-based co-design, as mentioned within the "Discussion." A second area for potential improvement is the inclusion of more social media platforms in the obtaining of feedback. The way in which this project developed lead to Twitter becoming the primary medium for interaction with users, however, including other social media such as Facebook, Reddit, and Tumblr, could be of great value. Another consideration for future work is beginning the design from scratch, rather than starting with a quick draft version. This could lead to the project being even more customized to what users want. Expanding on this, a point which was brought up by several users was the suggestion to perform more in-depth user research prior to the beginning of the project. The goal of this would be to obtain a well defined and user supported foundation prior to starting the project.

An aspect of co-design which should be considered is also the more active participation of users in the development process. In the case of this project, 2 individuals expressed their potential interest in actively assisting with the web development, due to their interest and experience in web-design. Due to the technological and practical limitations of this project this was not utilised to the fullest extent possible, however, it should be considered in future works.

With regards to advice for others taking on similar projects, certain areas should be focused upon. Based on the experiences from this project, it could be concluded that the communication and development of relationships with the individuals is of great importance. Establishing said relationship

can be of great use and may lead to much better interactions and feedback. As for how to develop these relationships, due to the fact that every autistic individual is different, there is no guaranteed method. However, a good place to start is being honest and clear from the start. These individuals may be wary at first, as they are unsure of the intentions of the person reaching out to them. They may not know whether or not one is trying to help them or use them for their own gain. Therefore, the focus should be placed on, from the start, being transparent with one's goals and ambitions. Furthermore, when contacting users online, both patience and persistence should be employed. It may sometimes take multiple messages over a prolonged period of time to finally catch the attention of a potential participant, and therefore, it is of importance to not give up if at first someone does not respond. Instead, one should respectfully remind the individuals, asking them if they would like to participate. As for the actual information collection, if one is implementing surveys, clear questions and instructions are key. Not doing so may result in users feeling confused and providing inaccurate feedback. Furthermore, when designing surveys for autistic individuals it is important to consider the way in which these are presented. Having too much information and stimuli on-screen at once should be avoided, similarly to a long and daunting list of questions. Instead, one can implement page breakers to give viewers room to breathe, and separate various sections to different pages. In order to encourage the continued participation of users, a method which was found to be successful within this project, was informing users how their previous feedback was used in order to make changes to the platform. Many users thanked for this, and indicated that this encouraged future cooperation.

References

Abel, S., Machin, T., & Brownlow, C. (2019). Support, socialise and advocate: An exploration of the stated purposes of Facebook autism groups. *Research in Autism Spectrum Disorders, 61*, 10-21. doi:10.1016/j.rasd.2019.01.009

Autism Awareness Month: Interview with Stephen Shore. (2009, April 19). Retrieved from https://www.healthcentral.com/article/autism-awareness-month-interview-with-stephen-shore

Bangor, A., Kortum, P., & Miller, J. (2009). Determining what individual SUS scores mean: Adding an adjective rating scale. *Journal of usability studies, 4*(3), 114-123.

Baruch, Y. (2001). The autistic society. *Information & Management, 38*(3), 129-136. doi:10.1016/S0378-7206(00)00067-7

Brooke, J. (1996). SUS-A quick and dirty usability scale. *Usability evaluation in industry, 189*(194), 4-7.

Ehn, P. (2008, October). Participation in design things. In *Proceedings of the tenth anniversary conference on participatory design 2008* (pp. 92-101). Indiana University. doi:10.1145/1795234.1795248

Friedrich, P. (2013). Web-based co-design: Social media tools to enhance user-centred design and innovation processes.

Gaudion, K., Hall, A., Myerson, J., & Pellicano, L. (2015). A designer's approach: how can autistic adults with learning disabilities be involved in the design process?. *CoDesign, 11*(1), 49-69. doi:10.1080/15710882.2014.997829

Geurts, H. M., Stek, M., & Comijs, H. (2016). Autism characteristics in older adults with depressive disorders. *The American Journal of Geriatric Psychiatry, 24*(2), 161-169. doi:10.1016/j.jagp.2015.08.003

Ghaziuddin, M. (2005). *Mental health aspects of autism and Asperger syndrome.* Jessica Kingsley Publishers.

Gillberg, C., Gillberg, C., Råstam, M., & Wentz, E. (2001). The Asperger syndrome (and high-functioning autism) diagnostic interview (ASDI): a preliminary study of a new structured clinical interview. *Autism, 5*(1), 57-66. doi:10.1177/1362361301005001006

Goldsmith, T. R., & LeBlanc, L. A. (2004). Use of technology in interventions for children with autism. *Journal of Early and Intensive Behavior Intervention, 1*(2), 166. doi:10.1037/h0100287

Improving Your Site's Accessibility. (2019). Retrieved from https://support.wix.com/en/article/improving-your-sites-accessibility

Jordan, C. J. (2010). Evolution of autism support and understanding via the World Wide Web. *Intellectual and Developmental Disabilities*, *48*(3), 220-227. doi:10.1352/1934-9556-48.3.220

Kaplan, A. M., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of Social Media. *Business horizons, 53*(1), 59-68. doi:10.1016/j.bushor.2009.09.003

Liem, A., & Sanders, E. B. N. (2011, July). The impact of human-centred design workshops in strategic design projects. In *International Conference on Human Centered Design* (pp. 110-119). Springer, Berlin, Heidelberg. doi:10.1007/978-3-642-21753-1_13

Mader, A., & Eggink, W. (2014). A design process for creative technology. In *DS 78: Proceedings of the 16th International Conference on Engineering and Product Design Education (E&PDE14), Design Education and Human Technology Relations, University of Twente, The Netherlands, 04-05.09. 2014*.

Mattelmäki, T. (2008). Probing for co-exploring. *Co-Design, 4*(1), 65-78. doi:10.1080/15710880701875027

Miltner, K. M., & Highfield, T. (2017). Never gonna GIF you up: Analyzing the cultural significance of the animated GIF. *Social Media+ Society, 3*(3), 2056305117725223. doi:10.1177/2056305117725223

Mitchell, C. (2003). Autism e-mailing lists. *He@lth Information on the Internet*, *33*(1), 3-4.

Newton, A. T., Kramer, A. D., & McIntosh, D. N. (2009, April). Autism online: A comparison of word usage in bloggers with and without autism spectrum disorders. In *Proceedings of the SIGCHI conference on human factors in computing systems* (pp. 463-466). ACM. doi:10.1145/1518701.1518775

Nguyen, T., Duong, T., Venkatesh, S., & Phung, D. (2015). Autism blogs: Expressed emotion, language styles and concerns in personal and community settings. *IEEE Transactions on Affective Computing, 6*(3), 312-323. doi:10.1109/TAFFC.2015.2400912

Nguyen, T., Phung, D., & Venkatesh, S. (2013, July). Analysis of psycholinguistic processes and topics in online autism communities. In *2013 IEEE International Conference on Multimedia and Expo (ICME)* (pp. 1-6). IEEE. doi:10.1109/ICME.2013.6607615

Putnam, C., & Chong, L. (2008, October). Software and technologies designed for people with autism: What do users want? In *Proceedings of the 10th international ACM SIGACCESS conference on Computers and accessibility* (pp. 3-10). ACM. doi:10.1145/1414471.1414475

Sanders, E. B. N., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. *Co-design*, *4*(1), 5-18. doi:10.1080/15710880701875068

Sanders, E. B. N., & Westerlund, B. (2011). Experiencing, exploring and experimenting in and with co-design spaces. *Nordes*, (4).

Schumacher, J., & Feurstein, K. (2007, June). Living Labs-the user as co-creator. In *2007 IEEE International Technology Management Conference (ICE)* (pp. 1-6). IEEE.

Steen, M., Kuijt-Evers, L., & Klok, J. (2007, July). Early user involvement in research and design projects–A review of methods and practices. In *23rd EGOS Colloquium* (Vol. 5, No. 7, pp. 1-21).

The Leader in Website Creation. (2019). Retrieved from https://www.wix.com/about/us

Van Hees, V., Moyson, T., & Roeyers, H. (2015). Higher education experiences of students with autism spectrum disorder: Challenges, benefits and support needs. *Journal of autism and developmental disorders, 45*(6), 1673-1688. doi:10.1007/s10803-014-2324-2

Appendices

Appendix A: Initial Posts

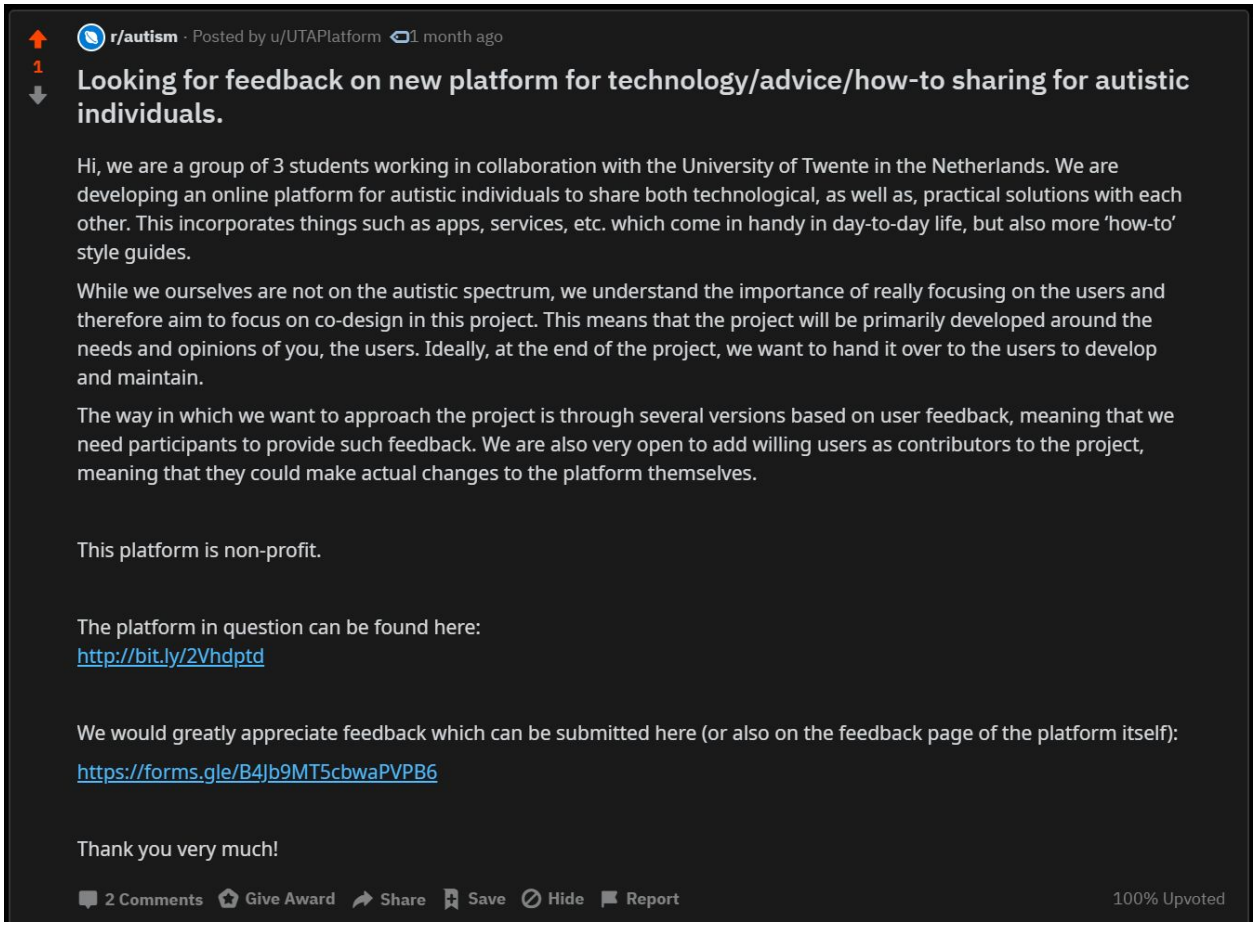


Figure A1. Screenshot showing the initial Reddit post which was shared during the first iteration.

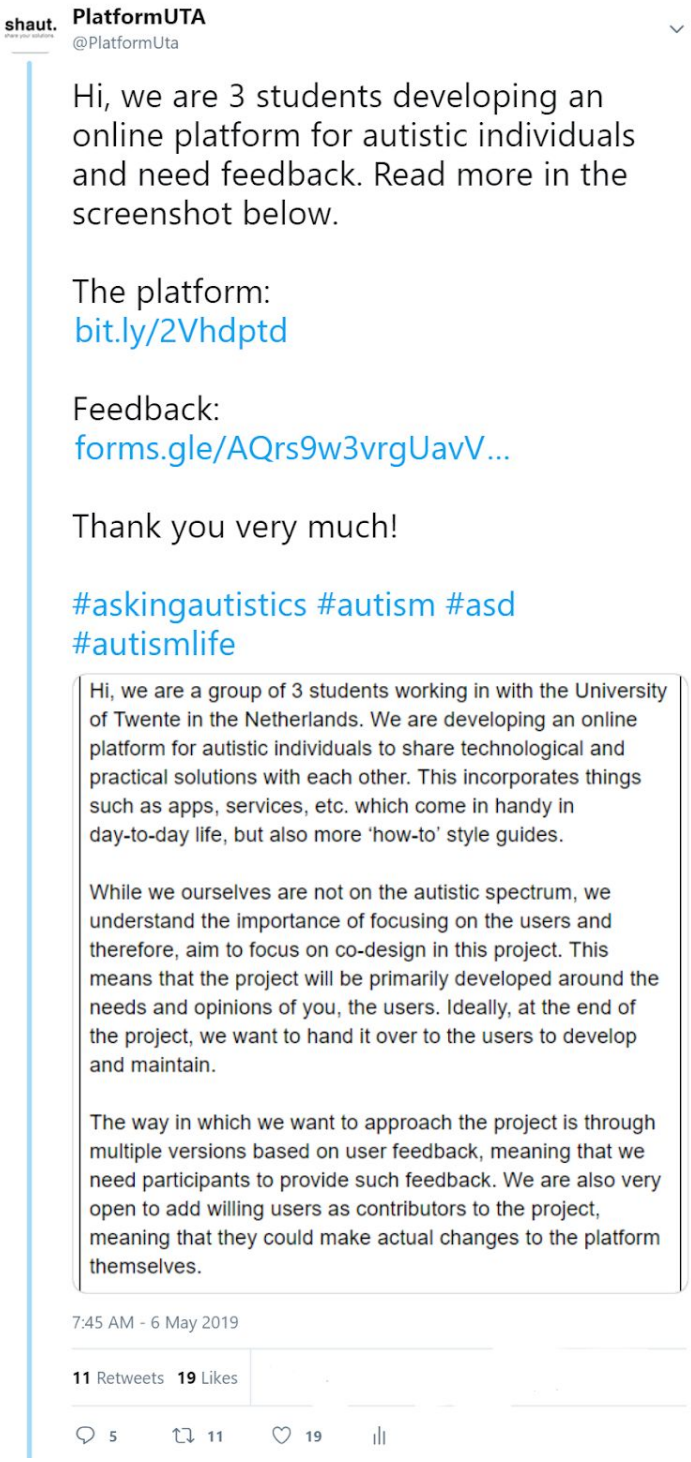


Figure A2. Screenshot showing the initial Twitter post which was shared during the first iteration.

Appendix B: Twitter Messages

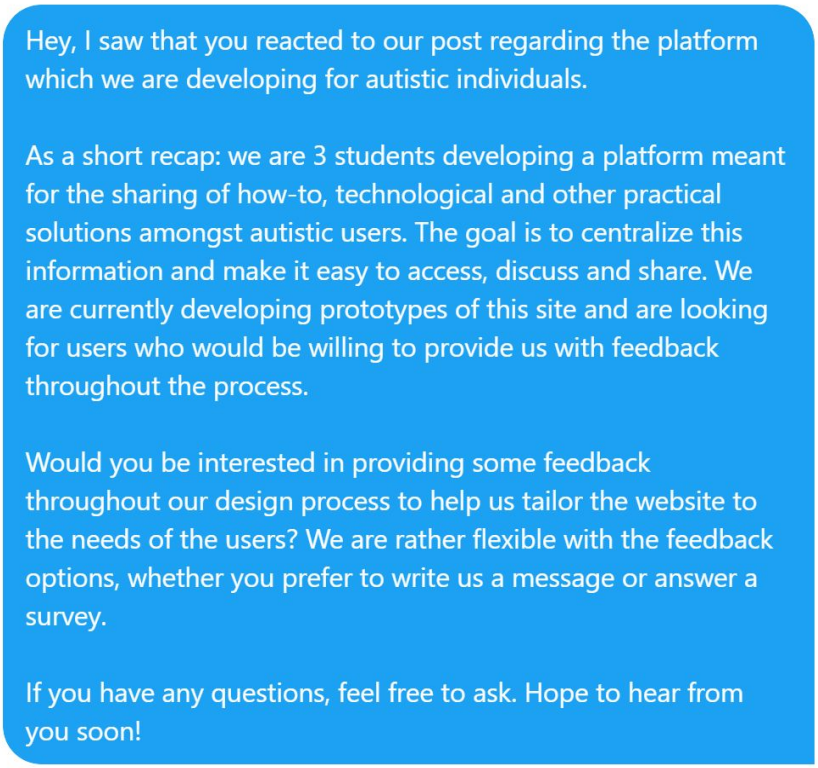


Figure B1. Screenshot showing the message which was sent out to Twitter users, during Iteration 1, asking if they are interested in participating in the design process.

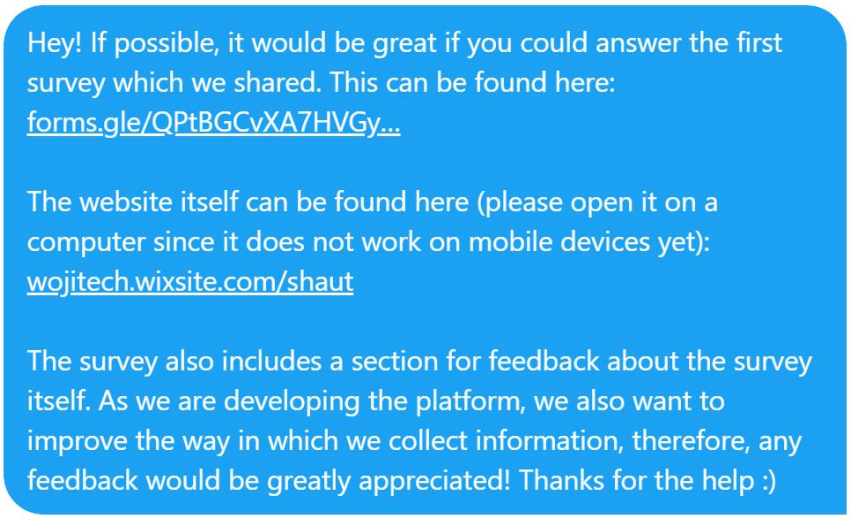


Figure B2. Screenshot showing a message which was sent out to Twitter users, during Iteration 1, providing them with instructions on how to provide feedback.

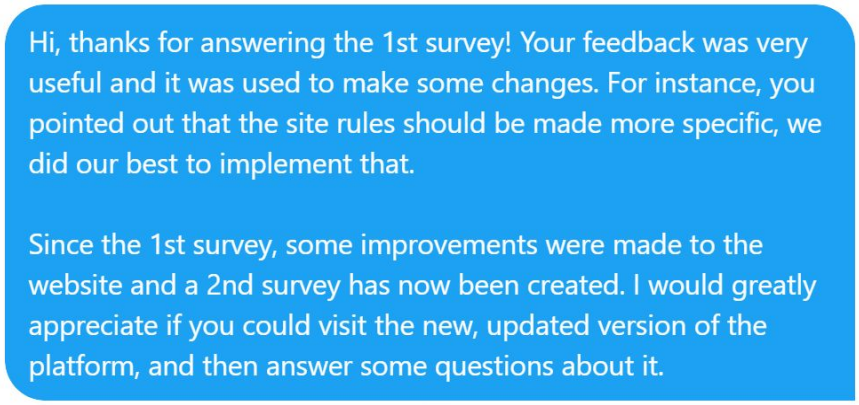


Figure B3. Screenshot showing one of the messages which was sent out to Twitter users, during Iteration 2.

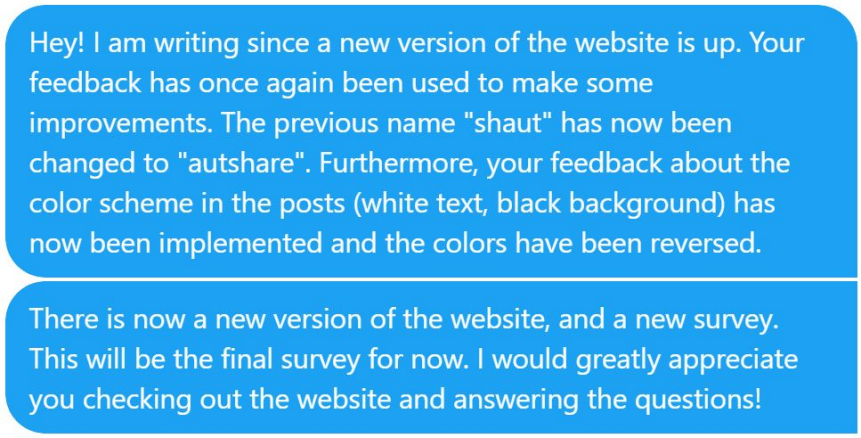


Figure B4. Screenshot showing one of the messages which was sent out to Twitter users, during Iteration 3.

Appendix C: Website - Version 1

The images showing the various pages of the website were cropped in order to better fit within the document.

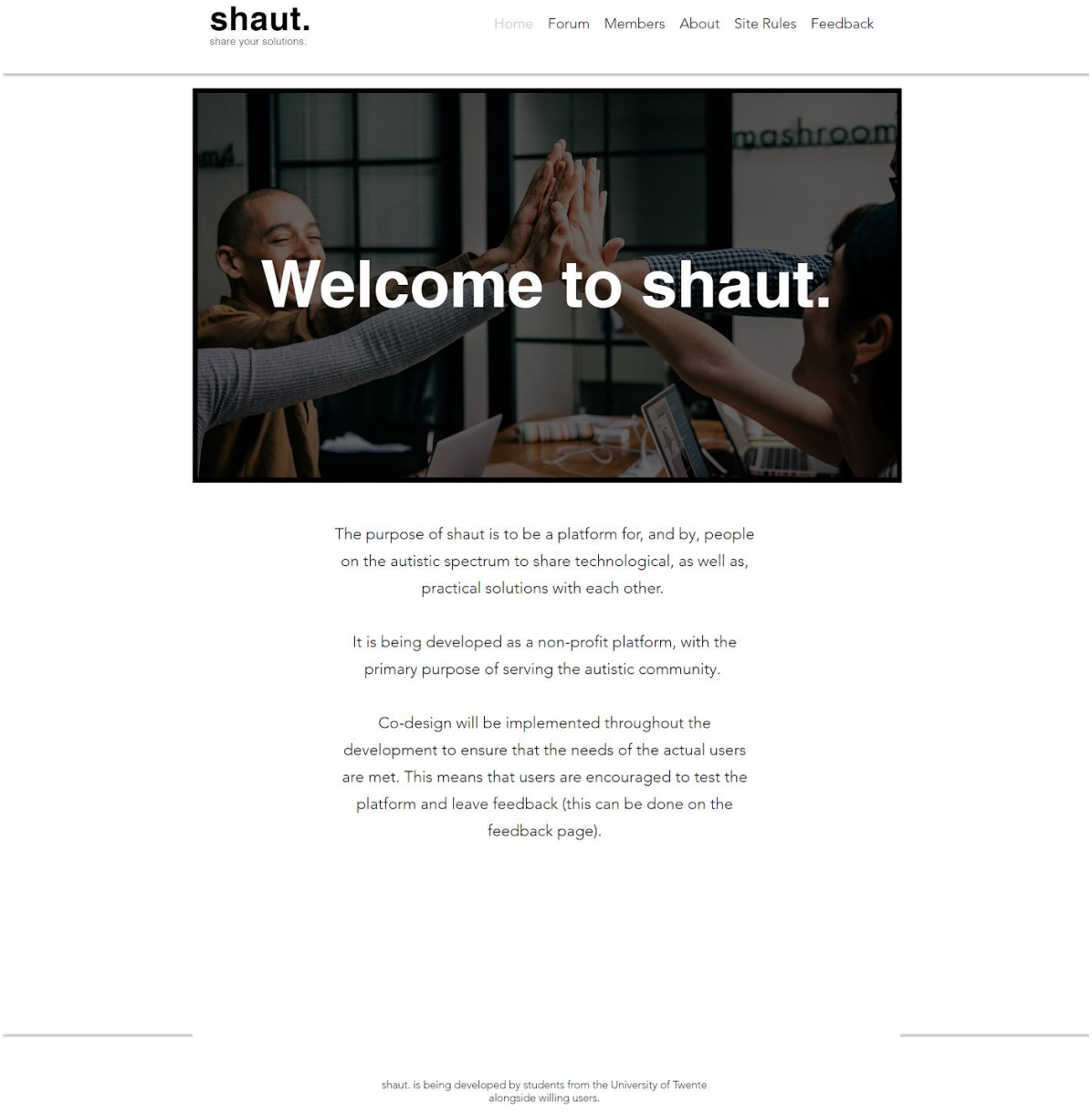


Figure C1. Screenshot showing the landing page of the first version of the platform.

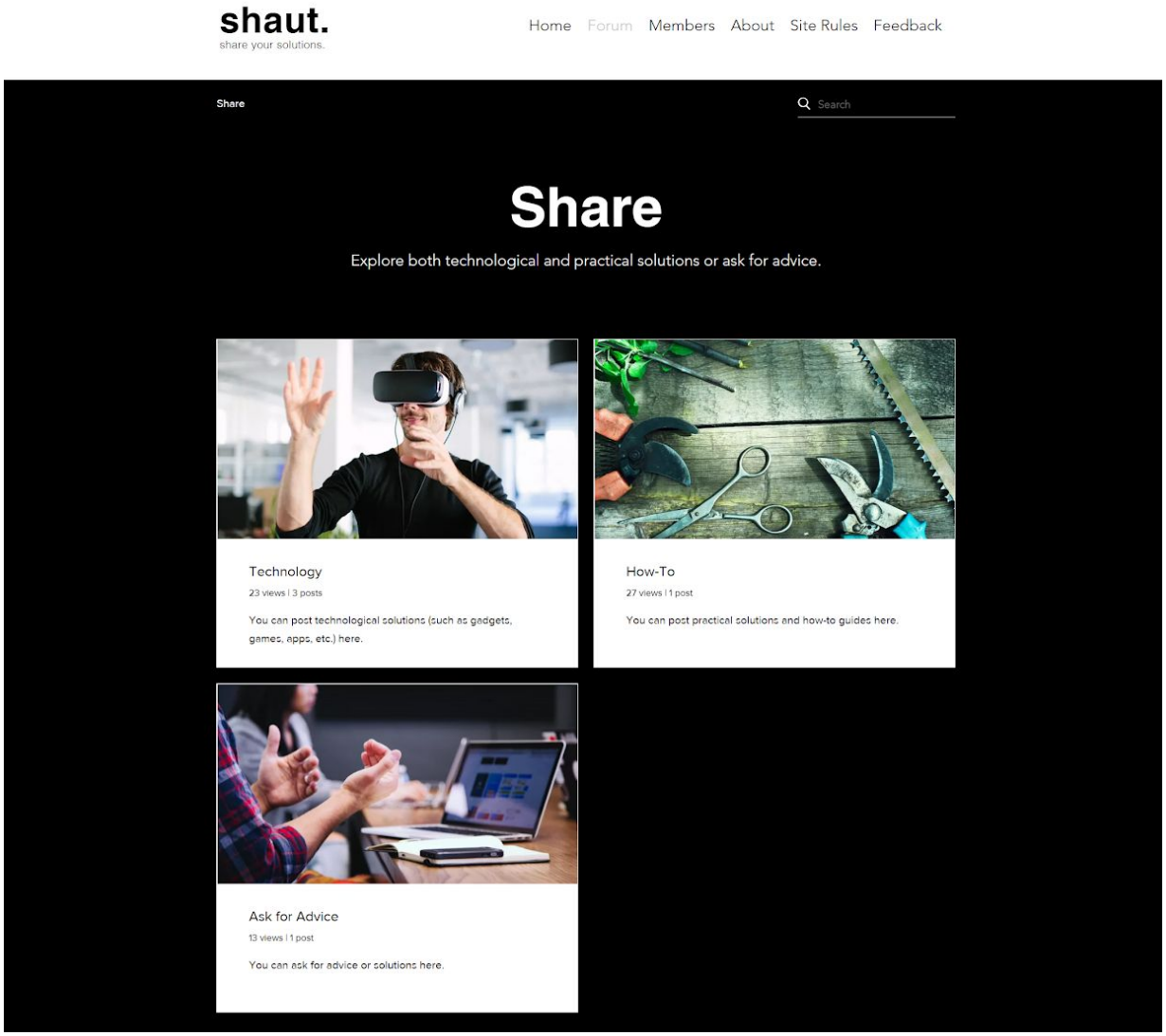


Figure C2. Screenshot showing the forum page of the first version of the platform.

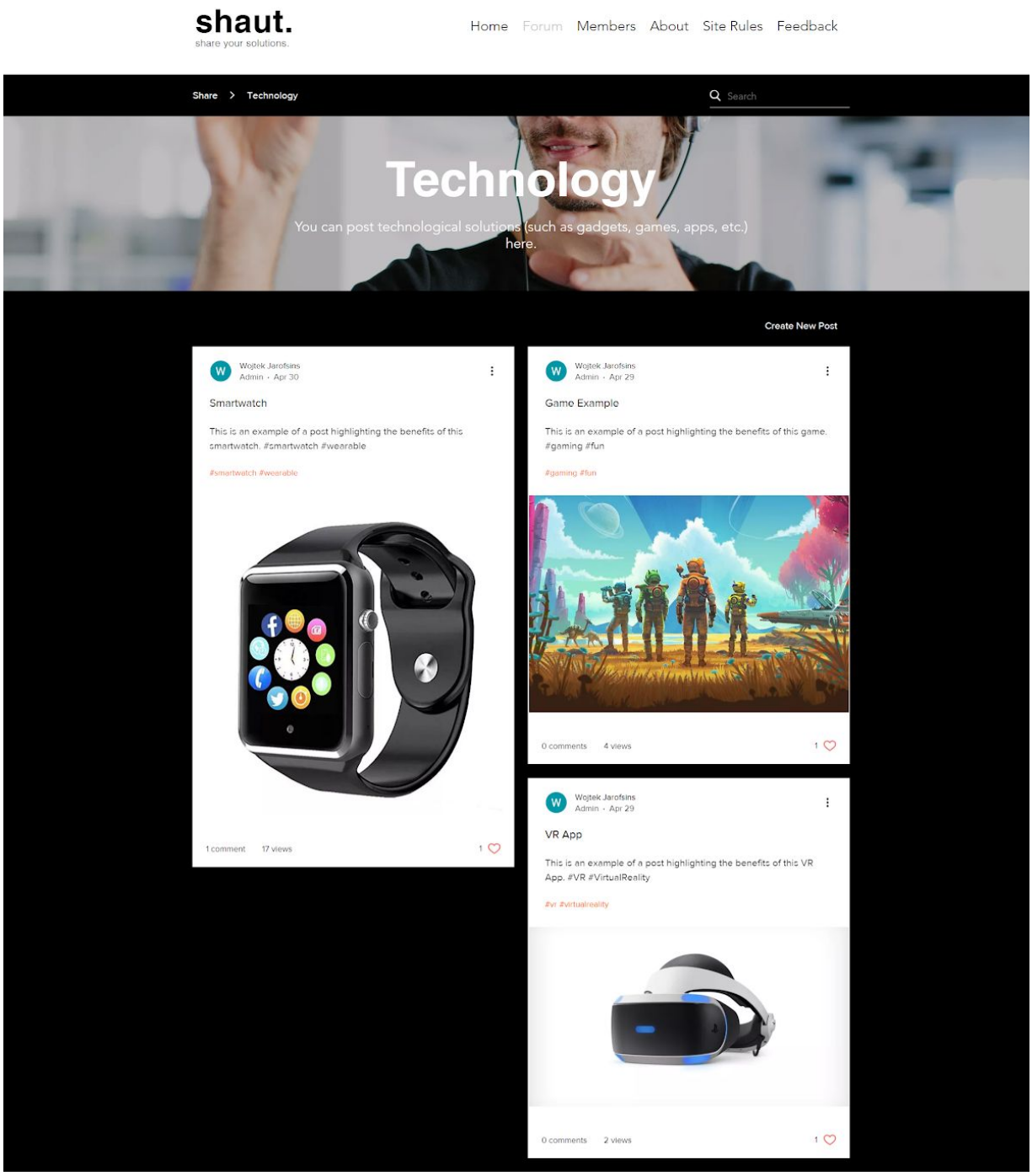


Figure C3. Screenshot showing the Technology page of the forum, of the first version of the platform.

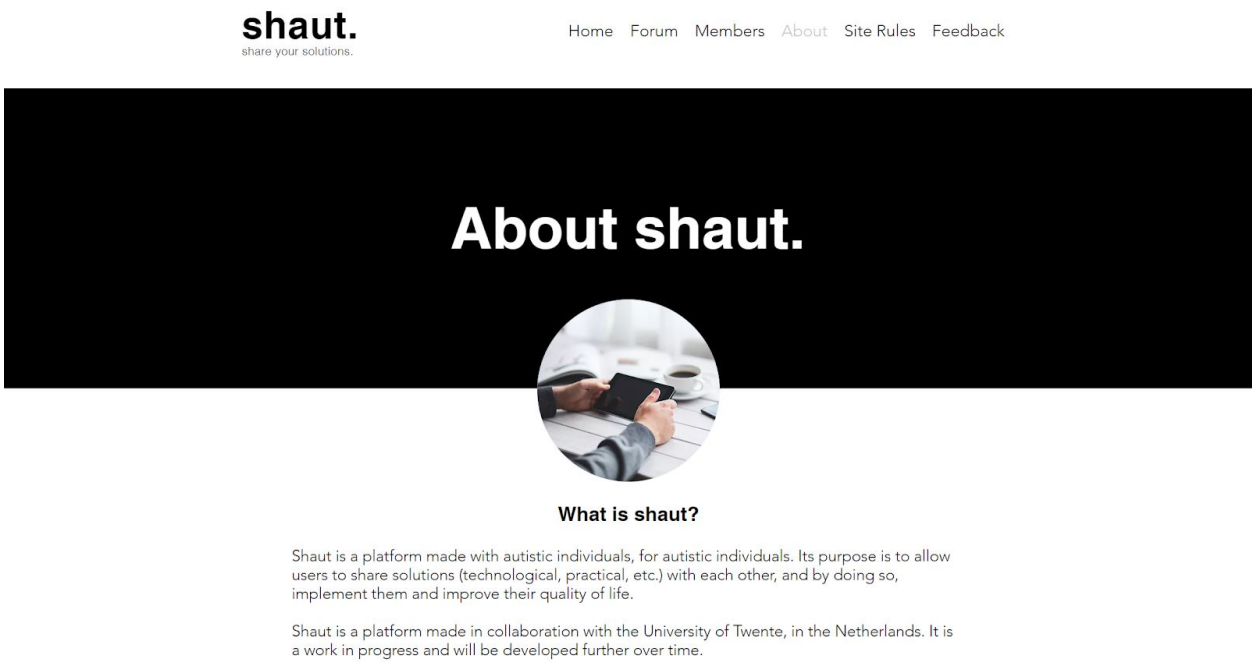


Figure C4. Screenshot showing the about page of the first version of the platform.

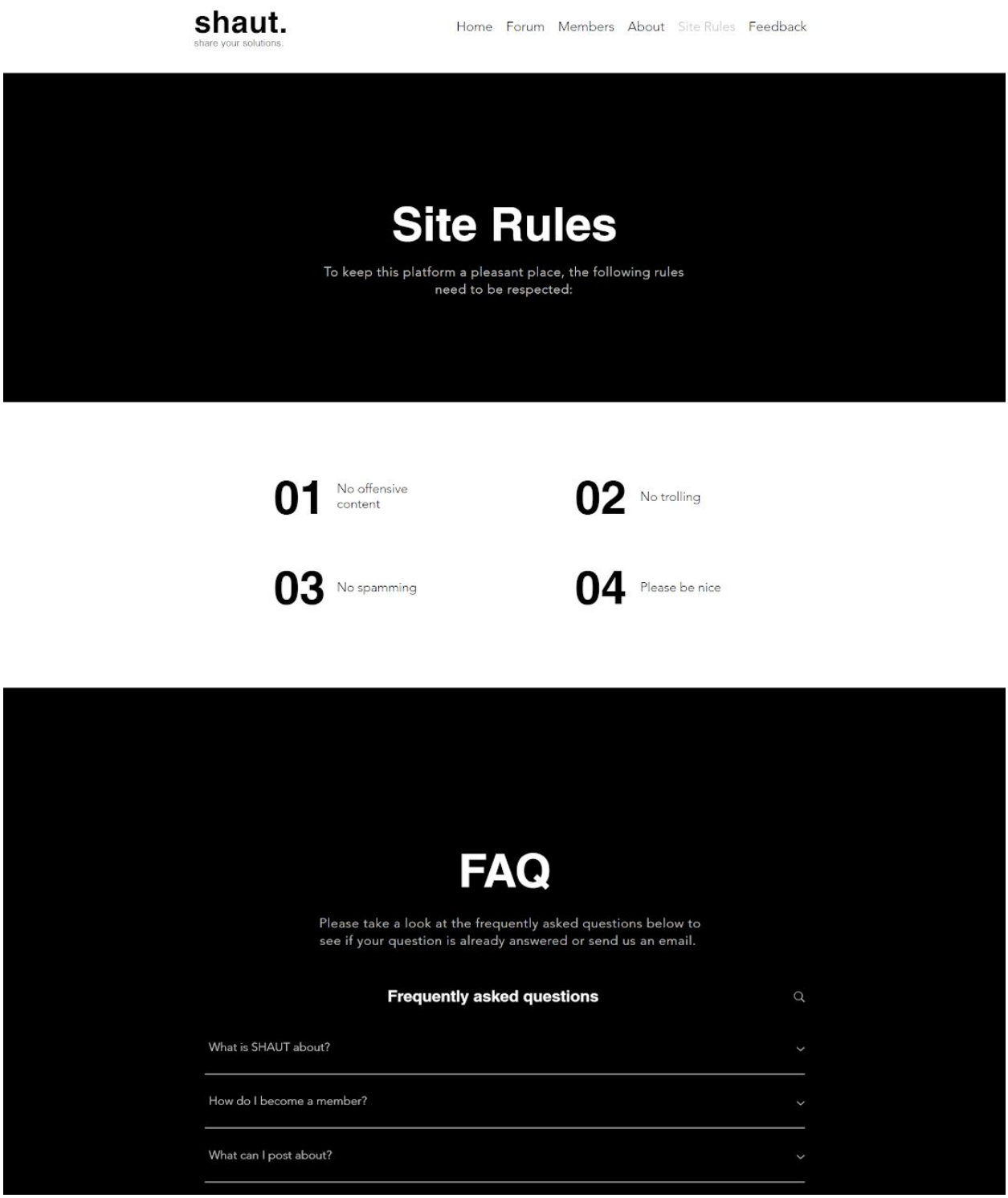


Figure C5. Screenshot showing the site rules page of the first version of the platform.

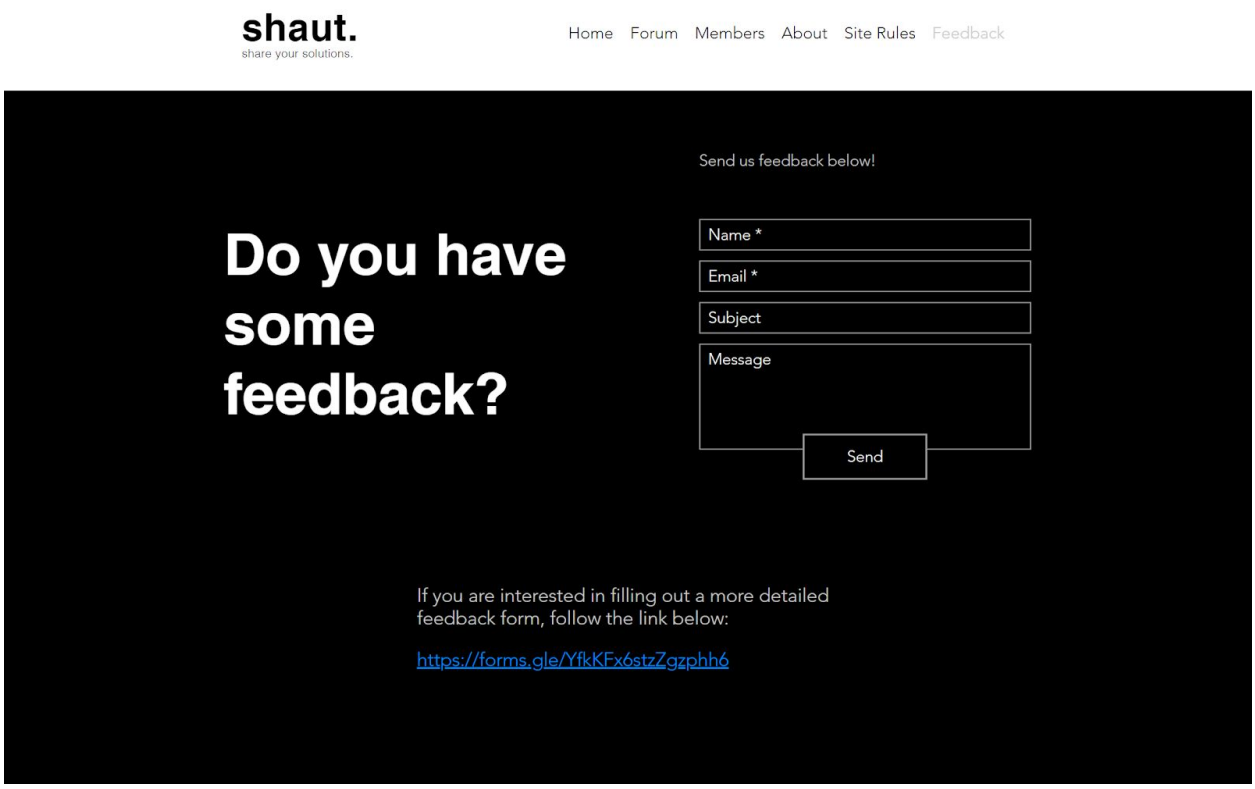


Figure C6. Screenshot showing the feedback page of the first version of the platform.

Appendix D: Website - Version 2

The images showing the various pages of the website were cropped in order to better fit within the document.

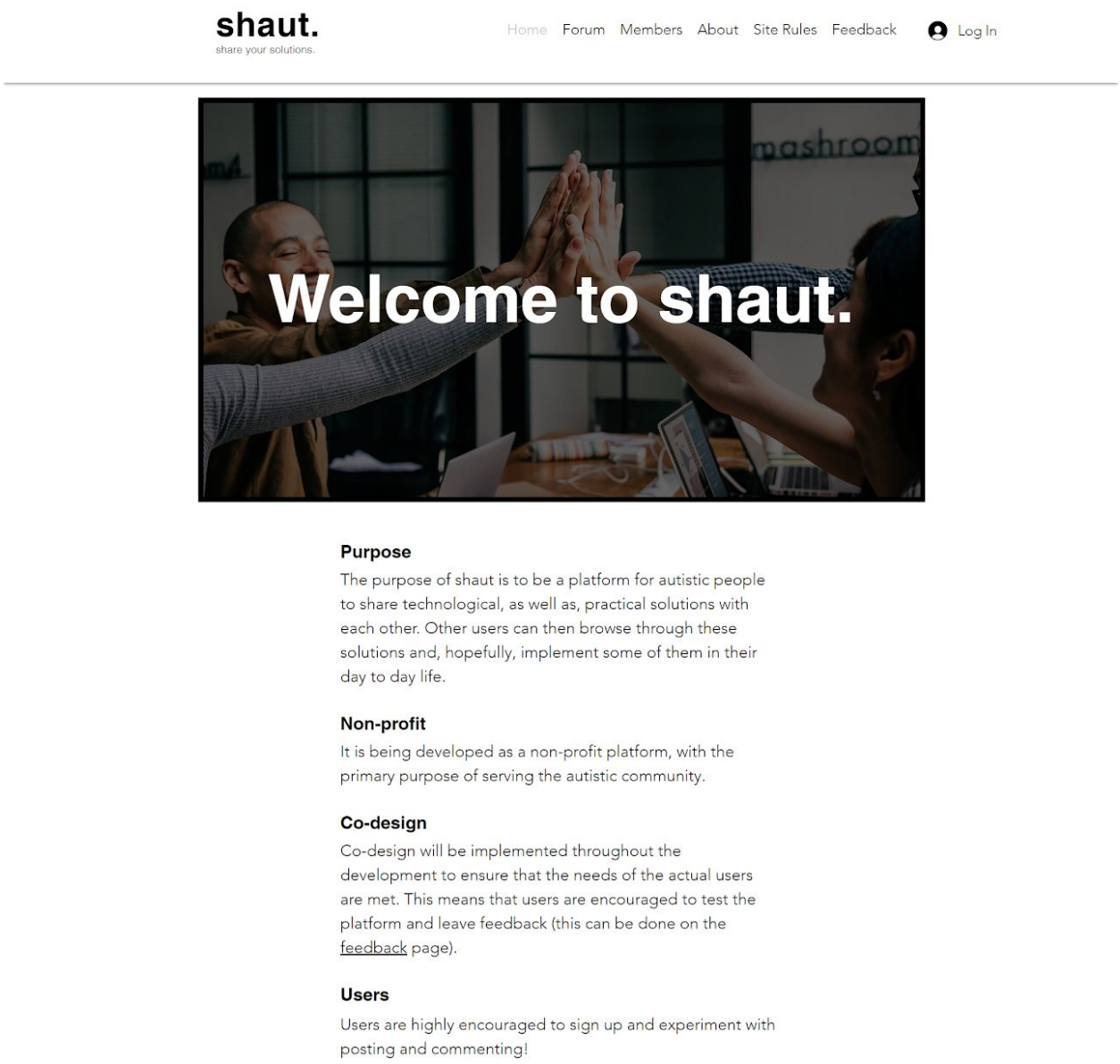


Figure D1. Screenshot showing the landing page of the second version of the platform.

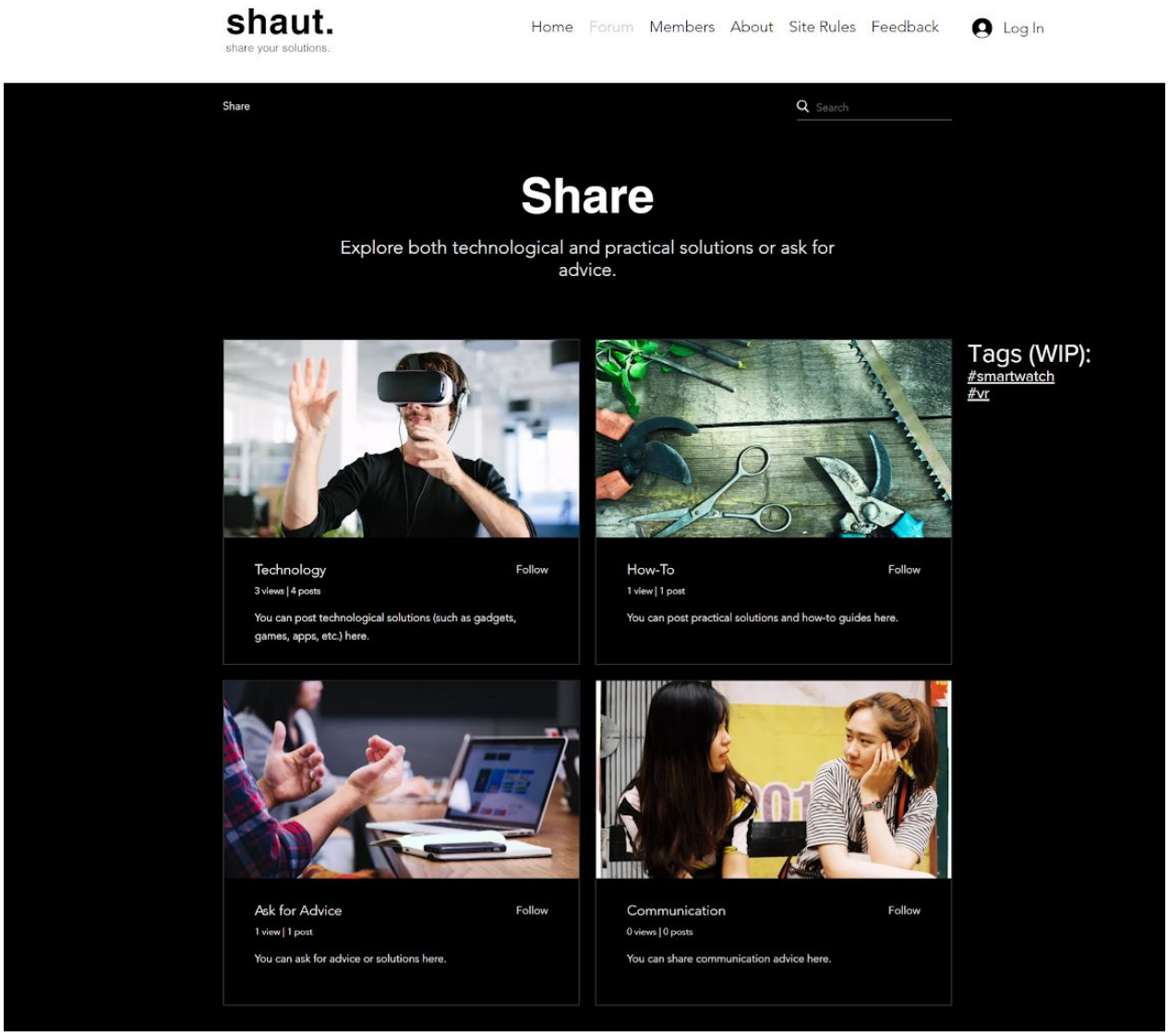


Figure D2. Screenshot showing the forum page of the second version of the platform.

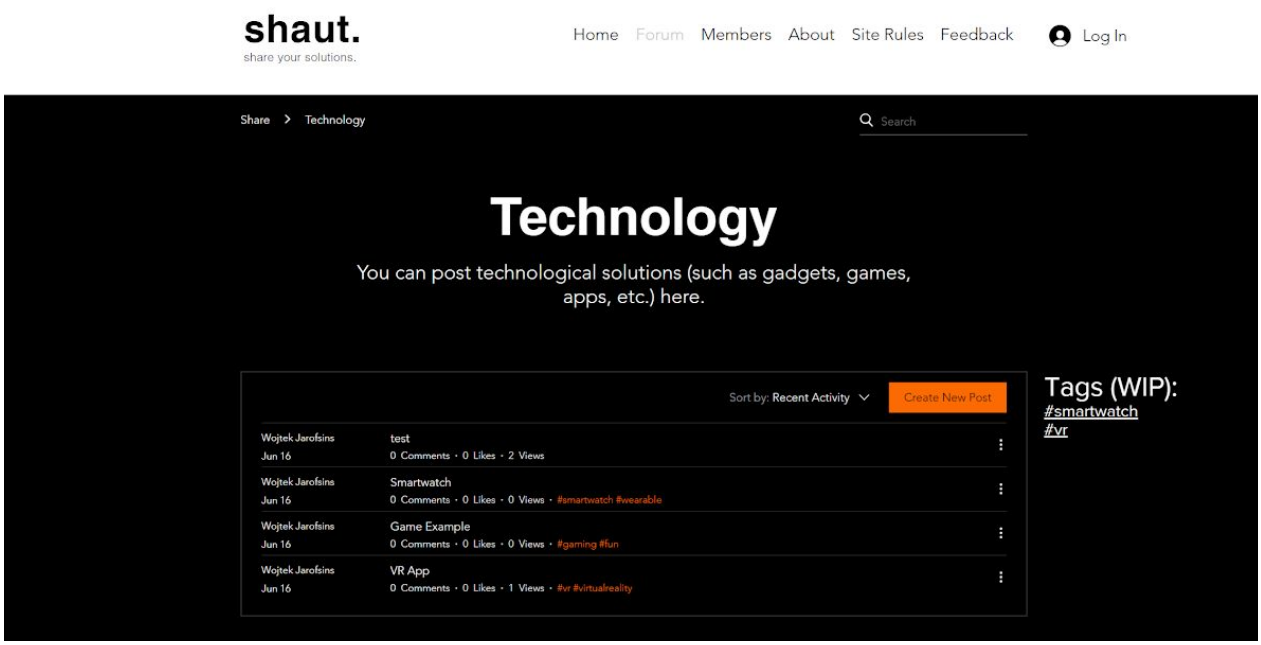


Figure D3. Screenshot showing the Technology page of the forum, of the second version of the platform.

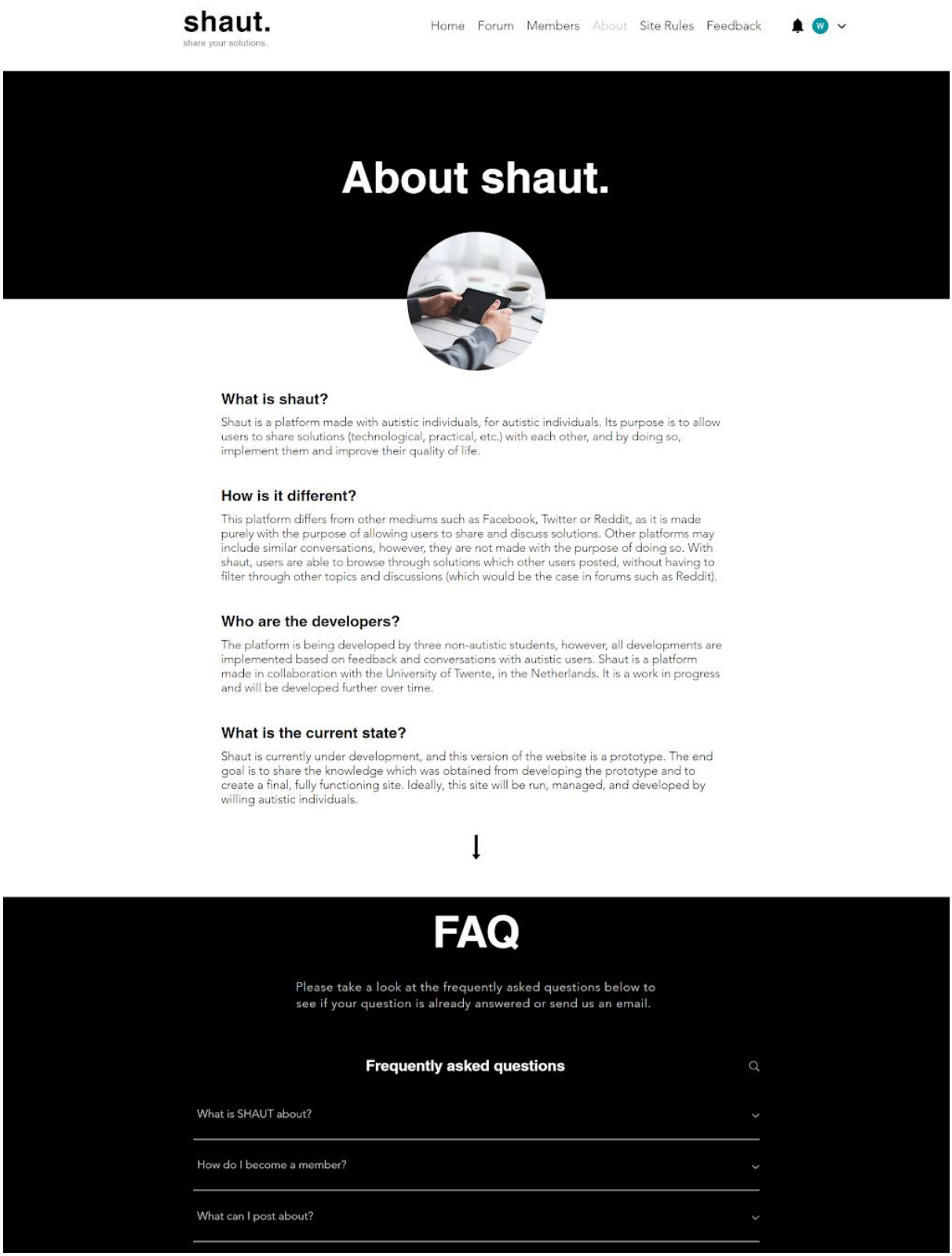


Figure D4. Screenshot showing the about page of the second version of the platform.

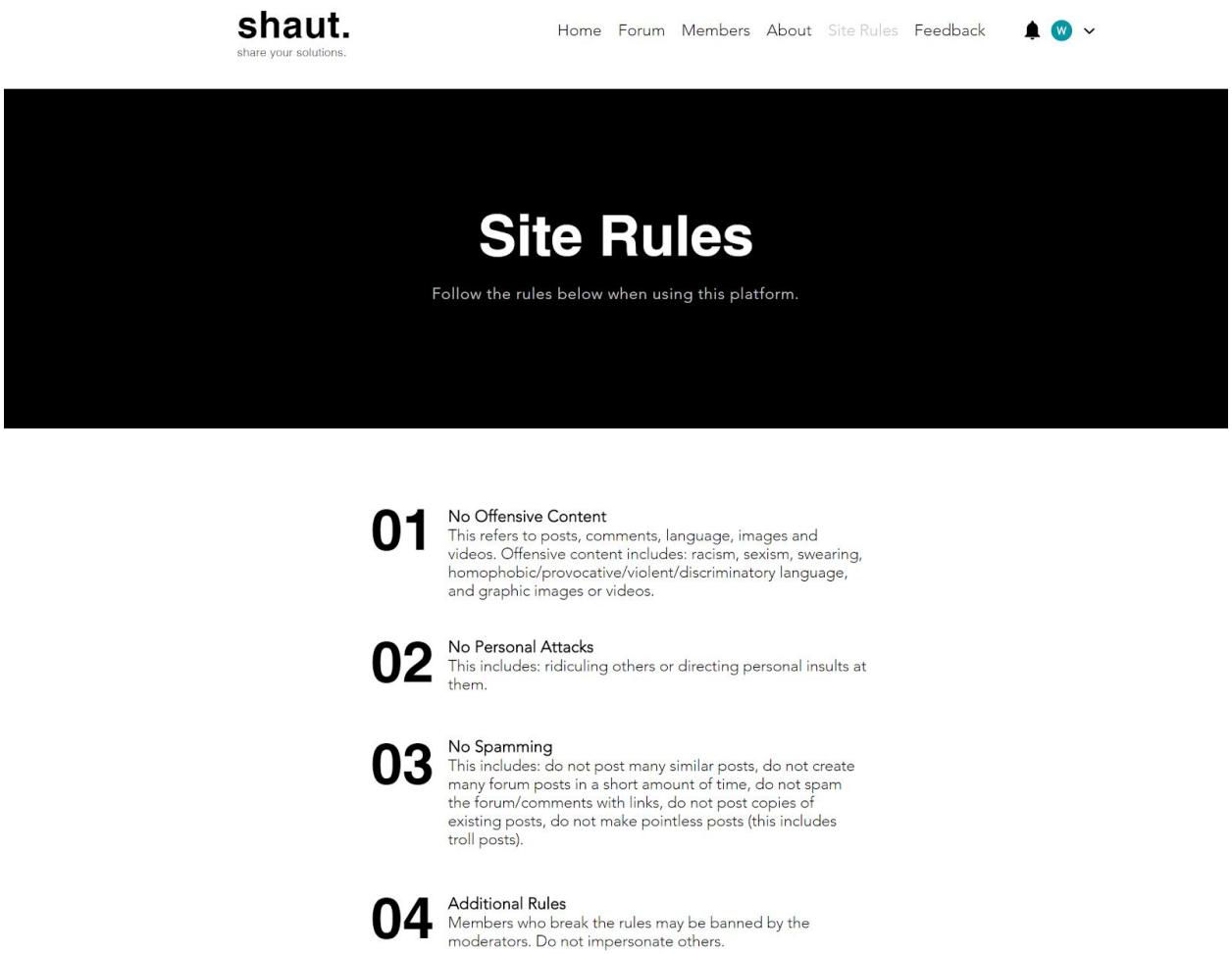


Figure D5. Screenshot showing the site rules page of the second version of the platform.

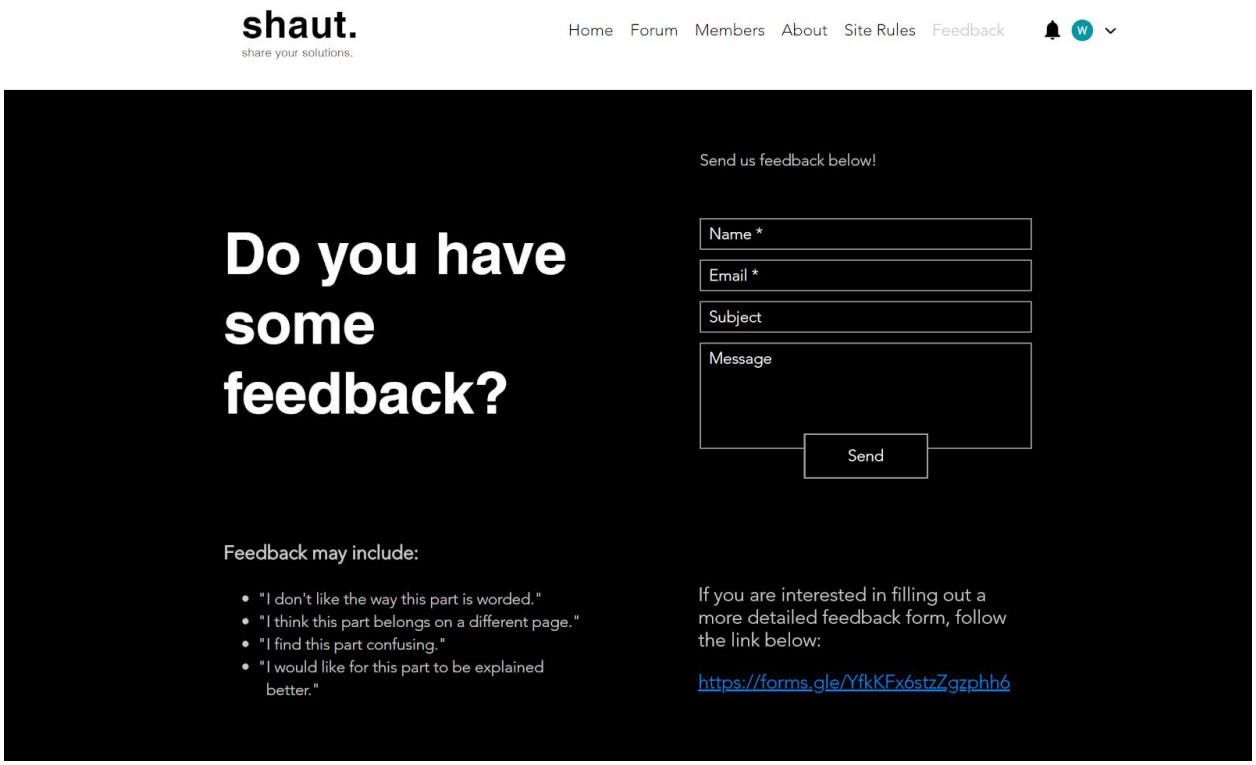


Figure D6. Screenshot showing the feedback page of the second version of the platform.

Appendix E: Website - Final

The images showing the various pages of the website were cropped in order to better fit within the document.

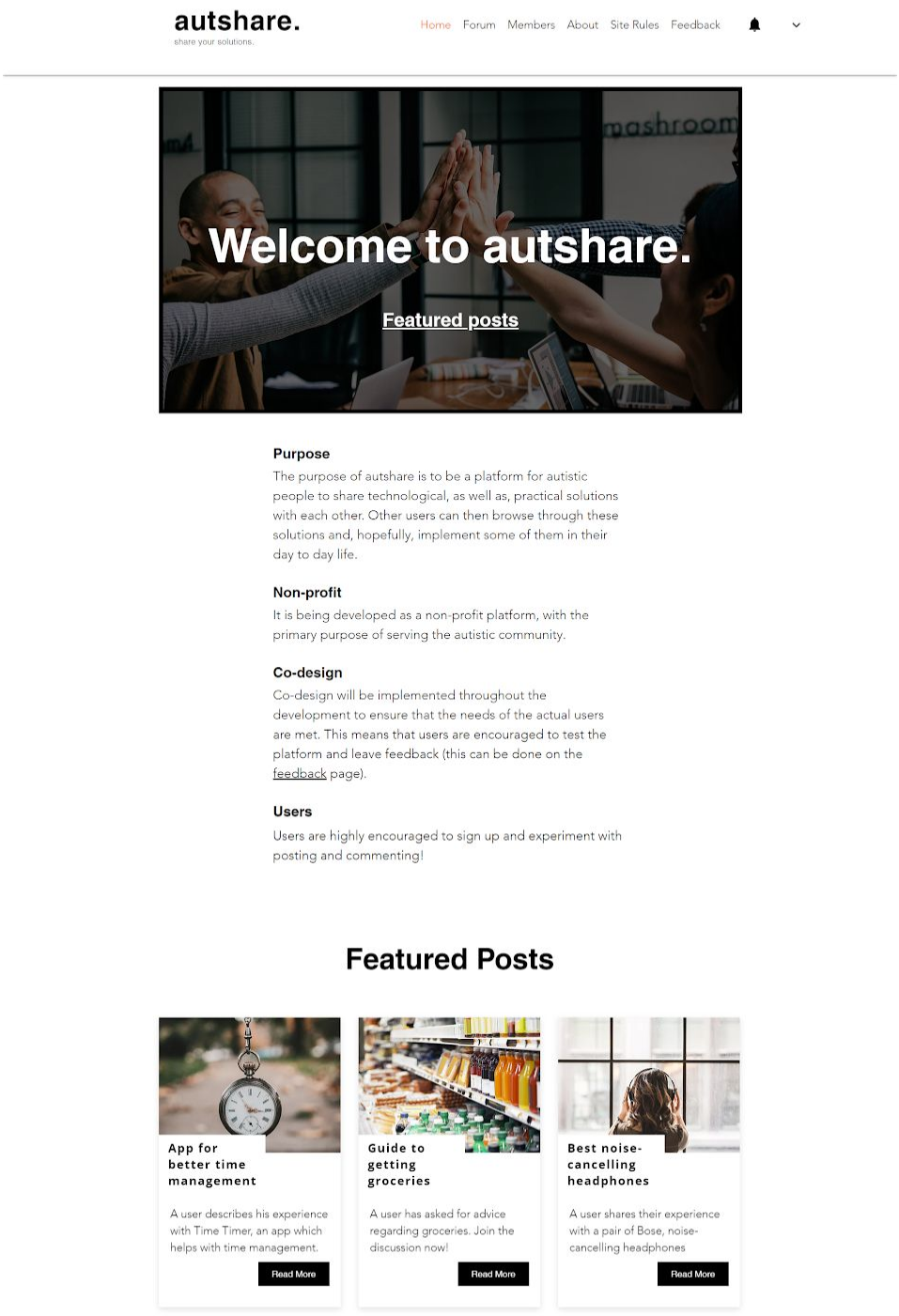


Figure E1. Screenshot showing the landing page of the final version of the platform.

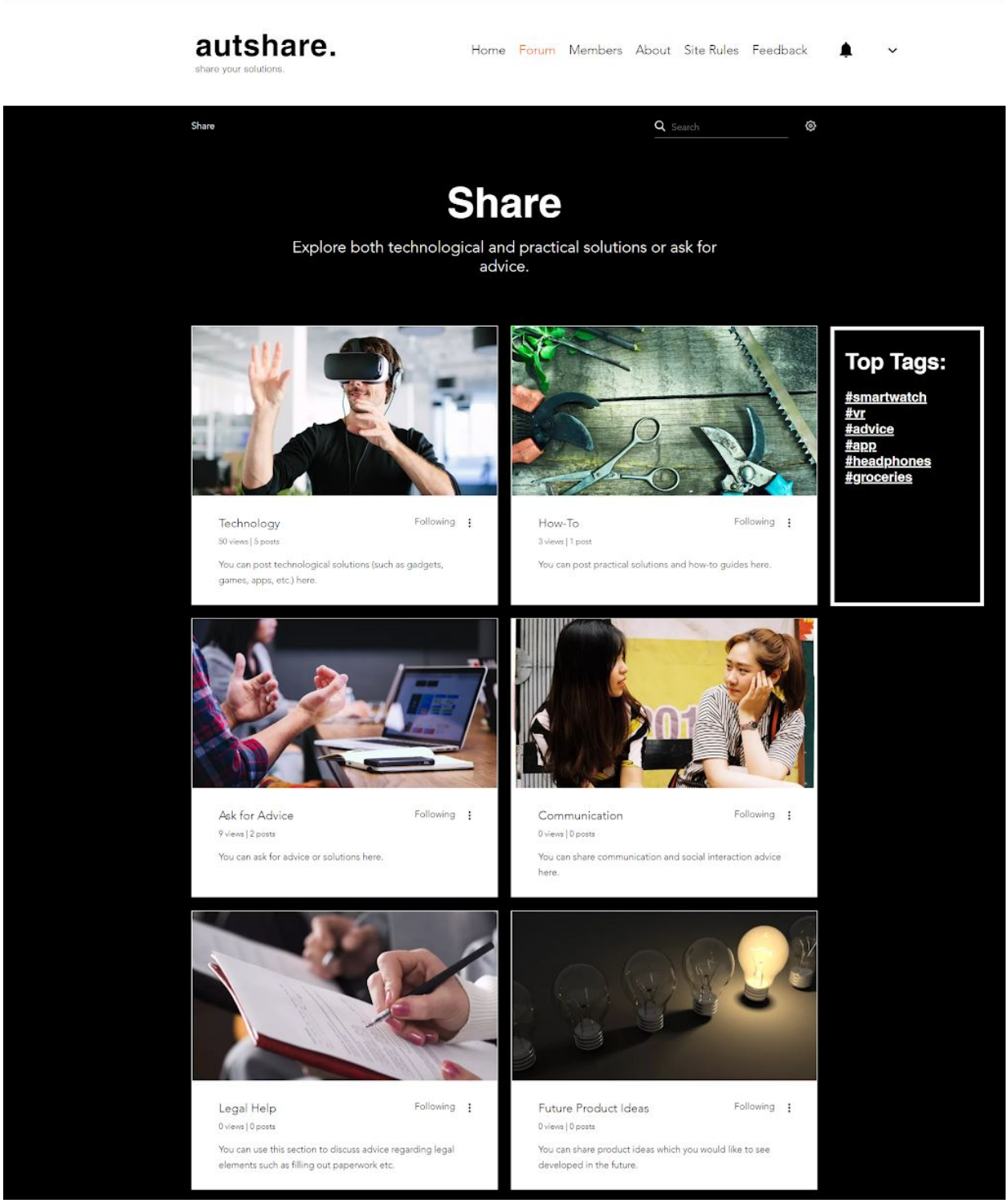


Figure E2. Screenshot showing the forum page of the final version of the platform.

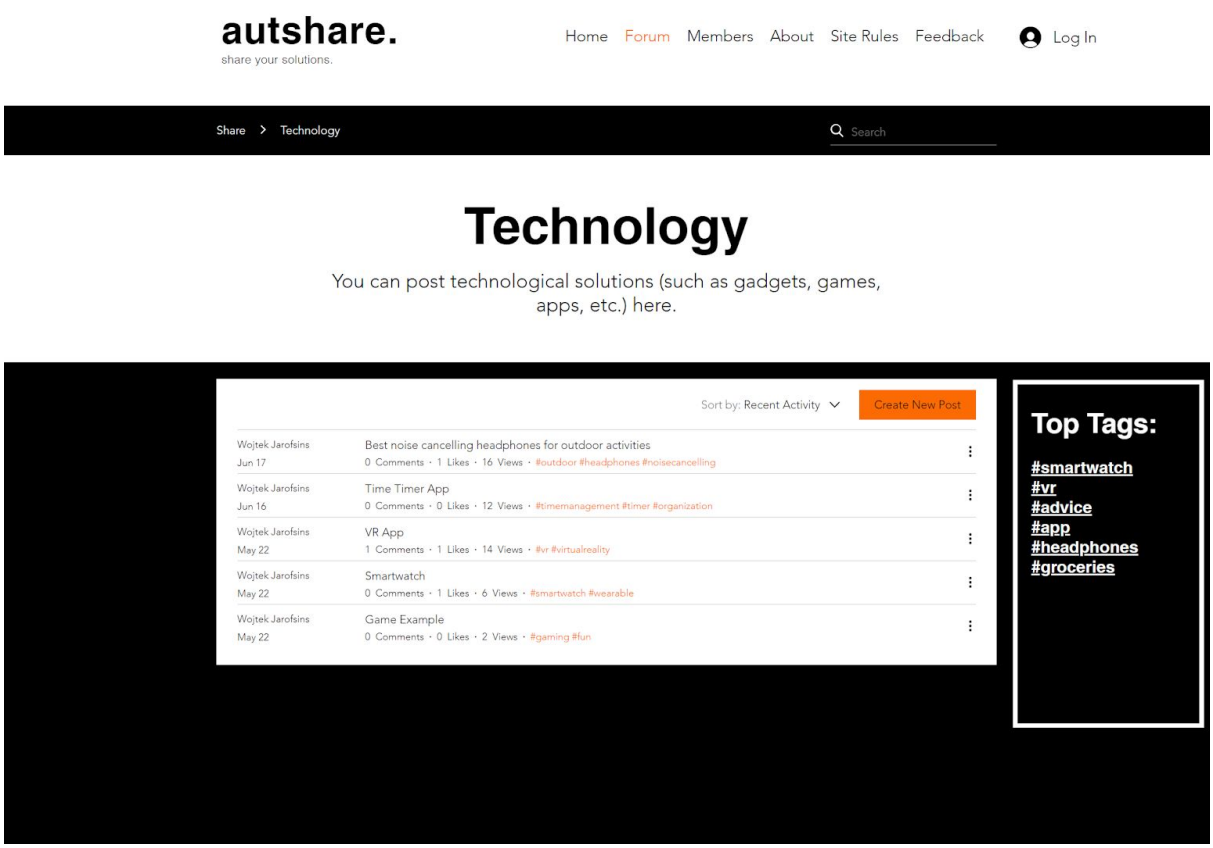


Figure E3. Screenshot showing the Technology page of the forum, of the final version of the platform.

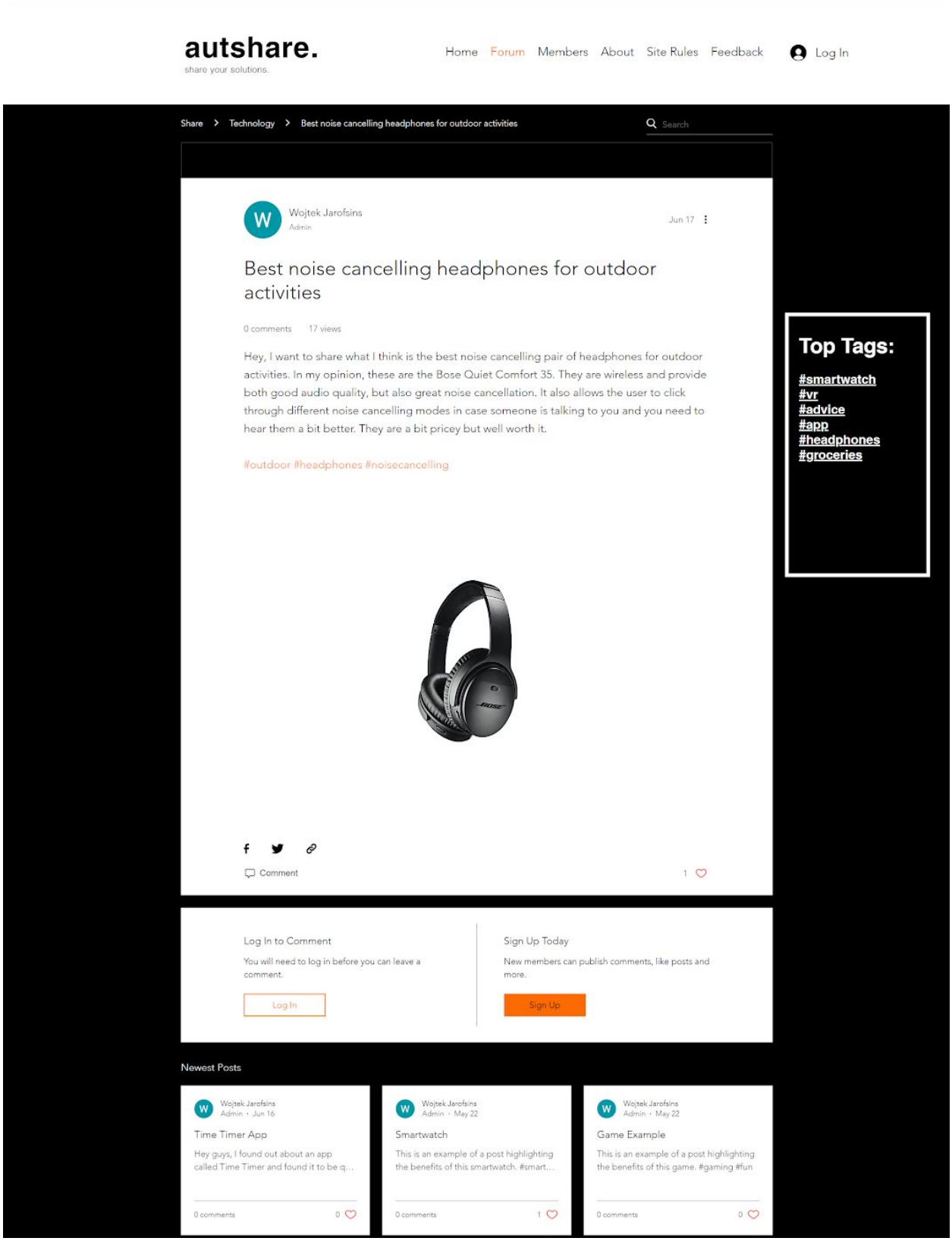


Figure E4. Screenshot showing one of the posts within the forum, of the final version of the platform.

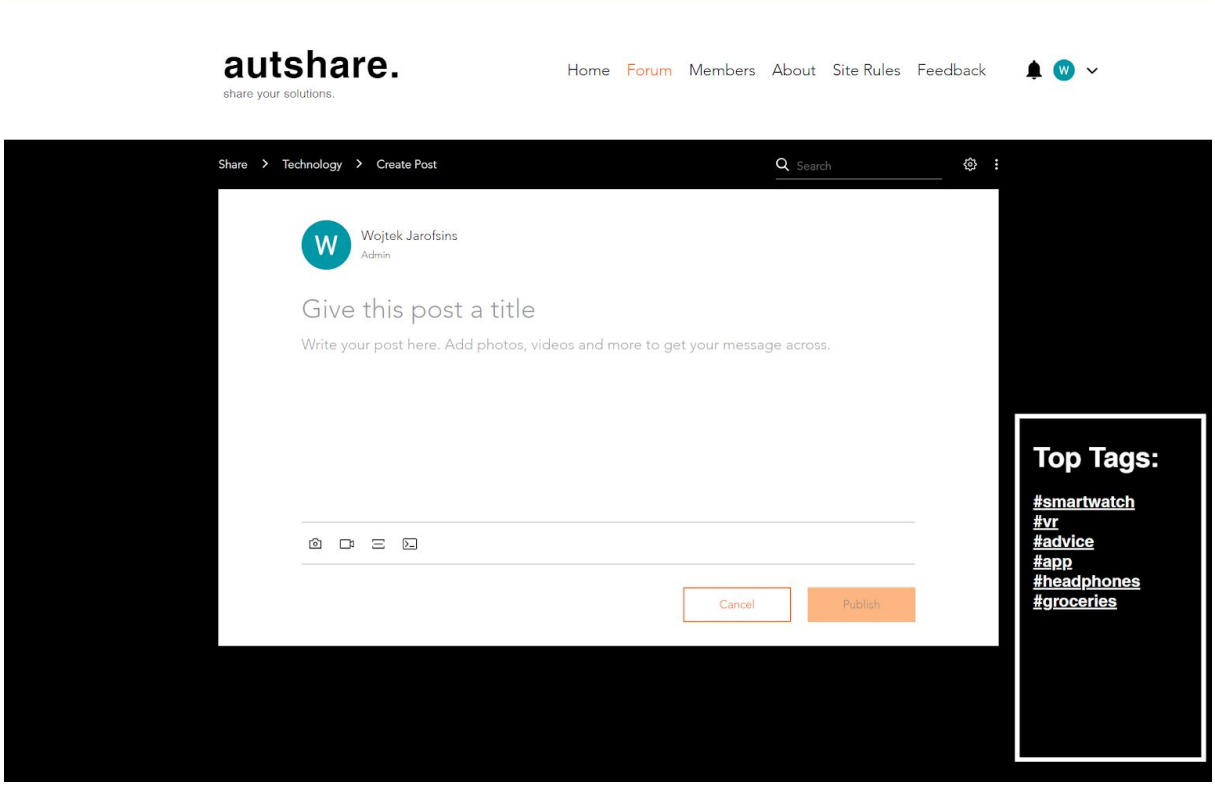


Figure E5. Screenshot showing the post-creation screen within the forum, of the final version of the platform.

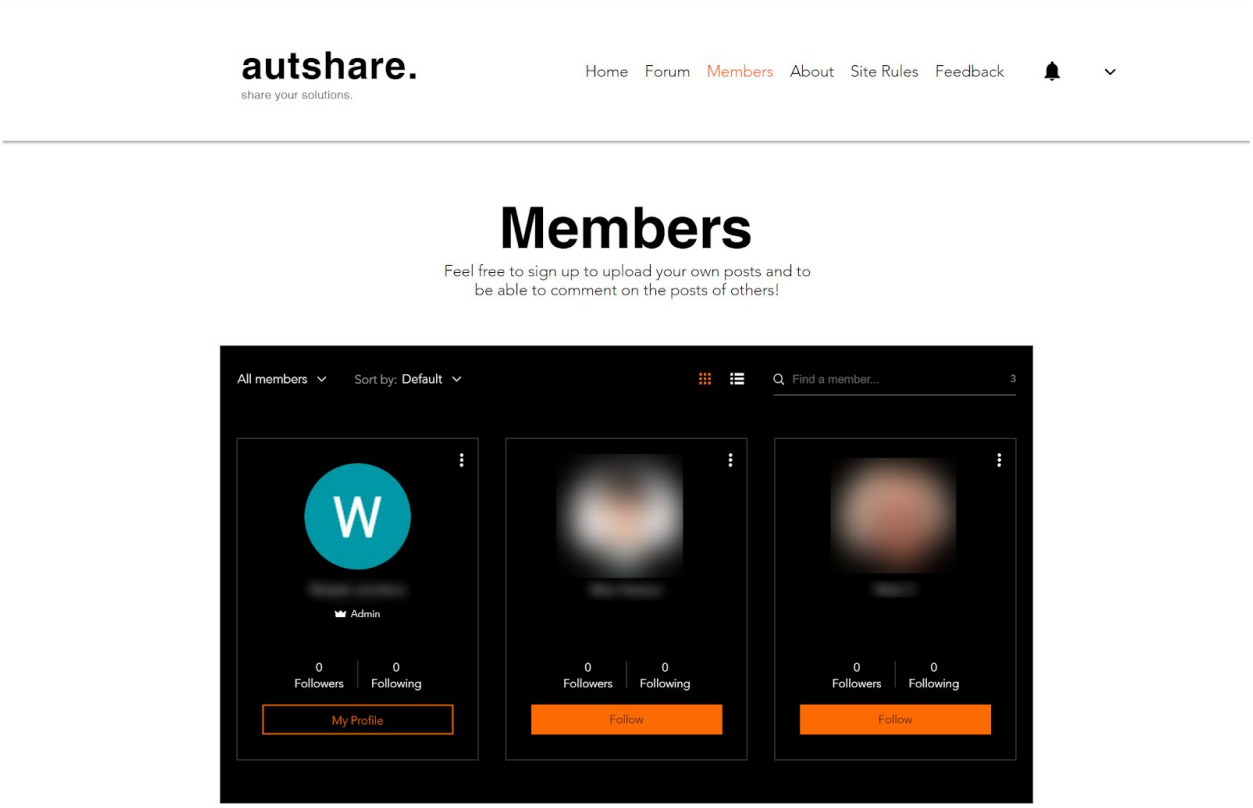


Figure E6. Screenshot showing the members of the first version of the platform.

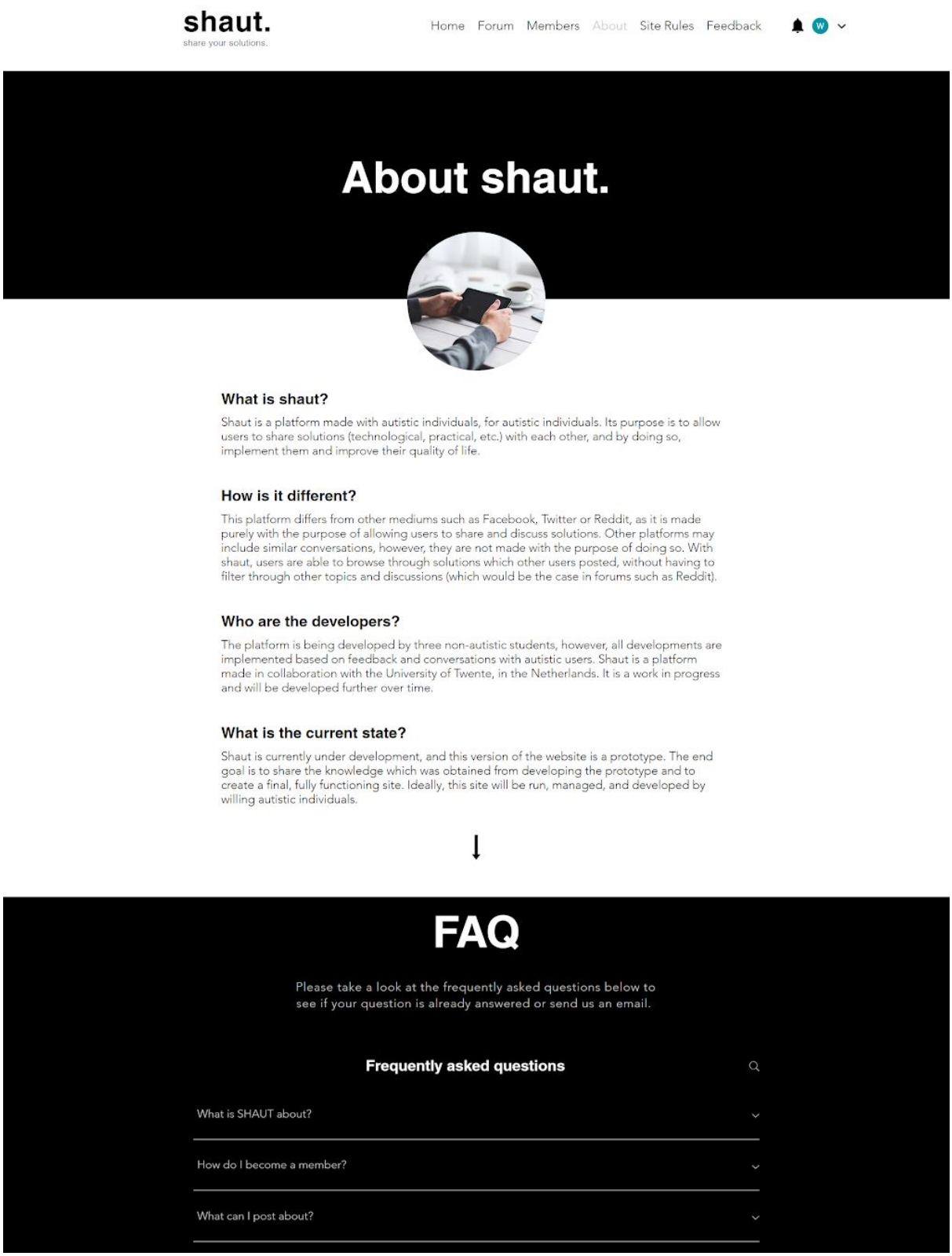


Figure E7. Screenshot showing the about page of the final version of the platform.

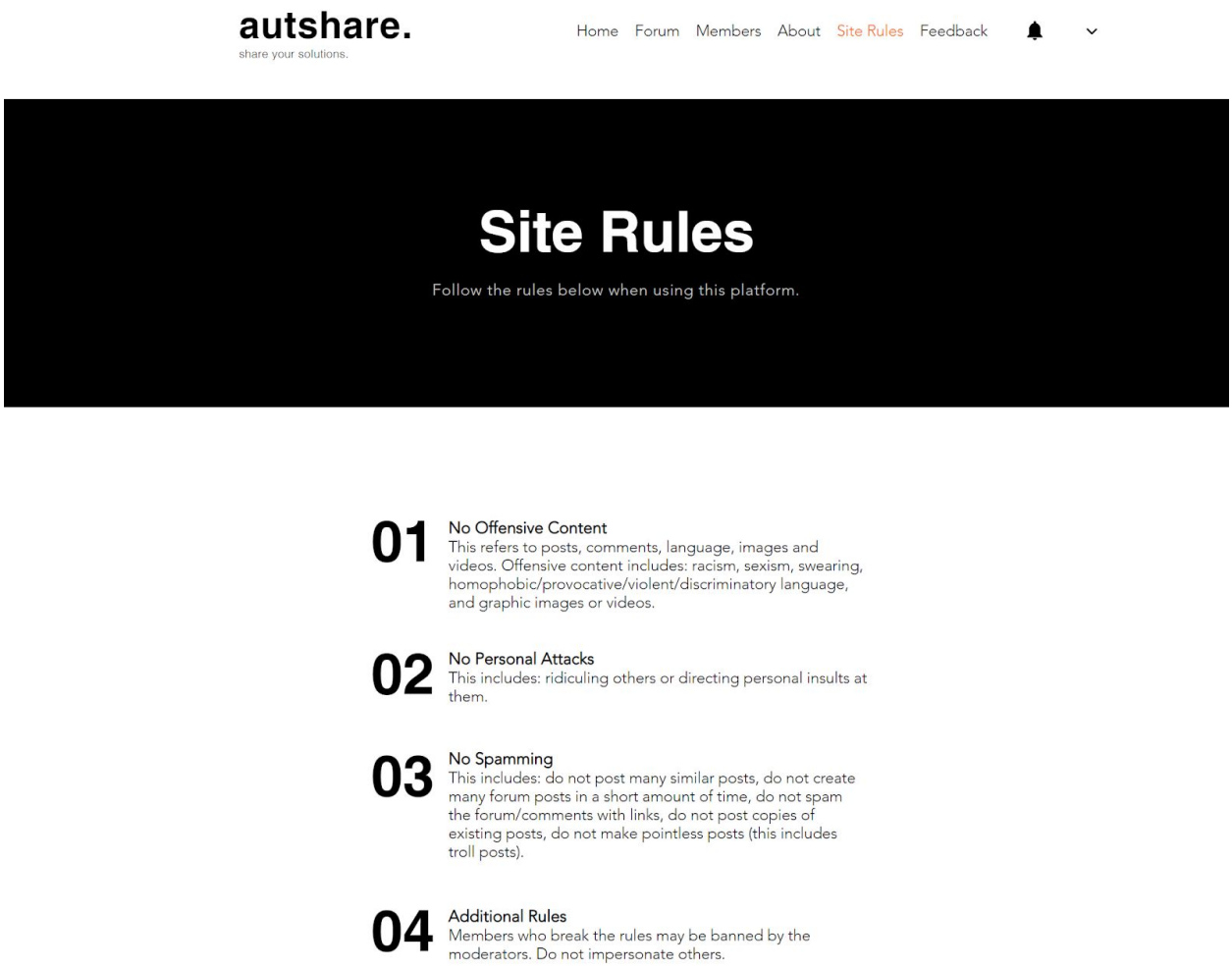


Figure E8. Screenshot showing the site rules page of the final version of the platform.

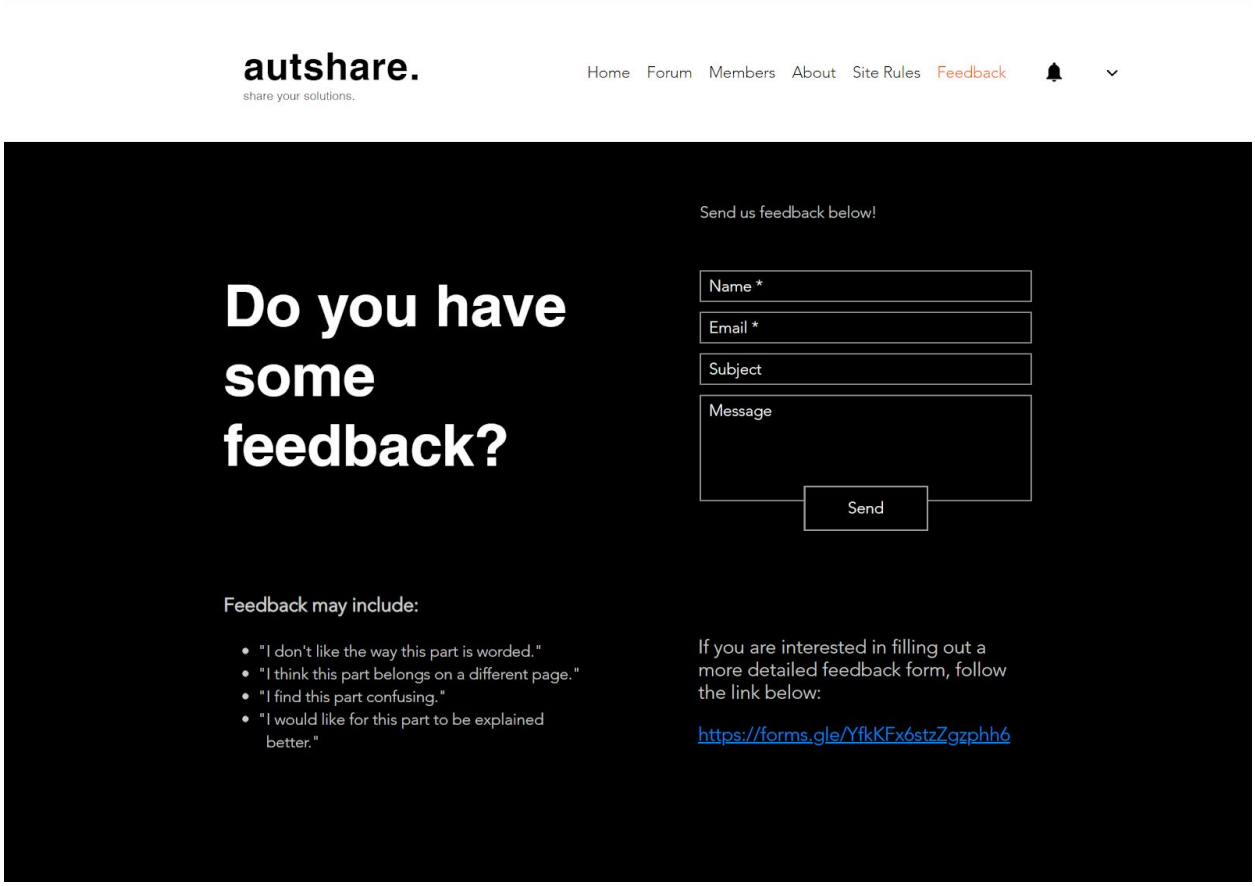


Figure E9. Screenshot showing the feedback page of the final version of the platform.

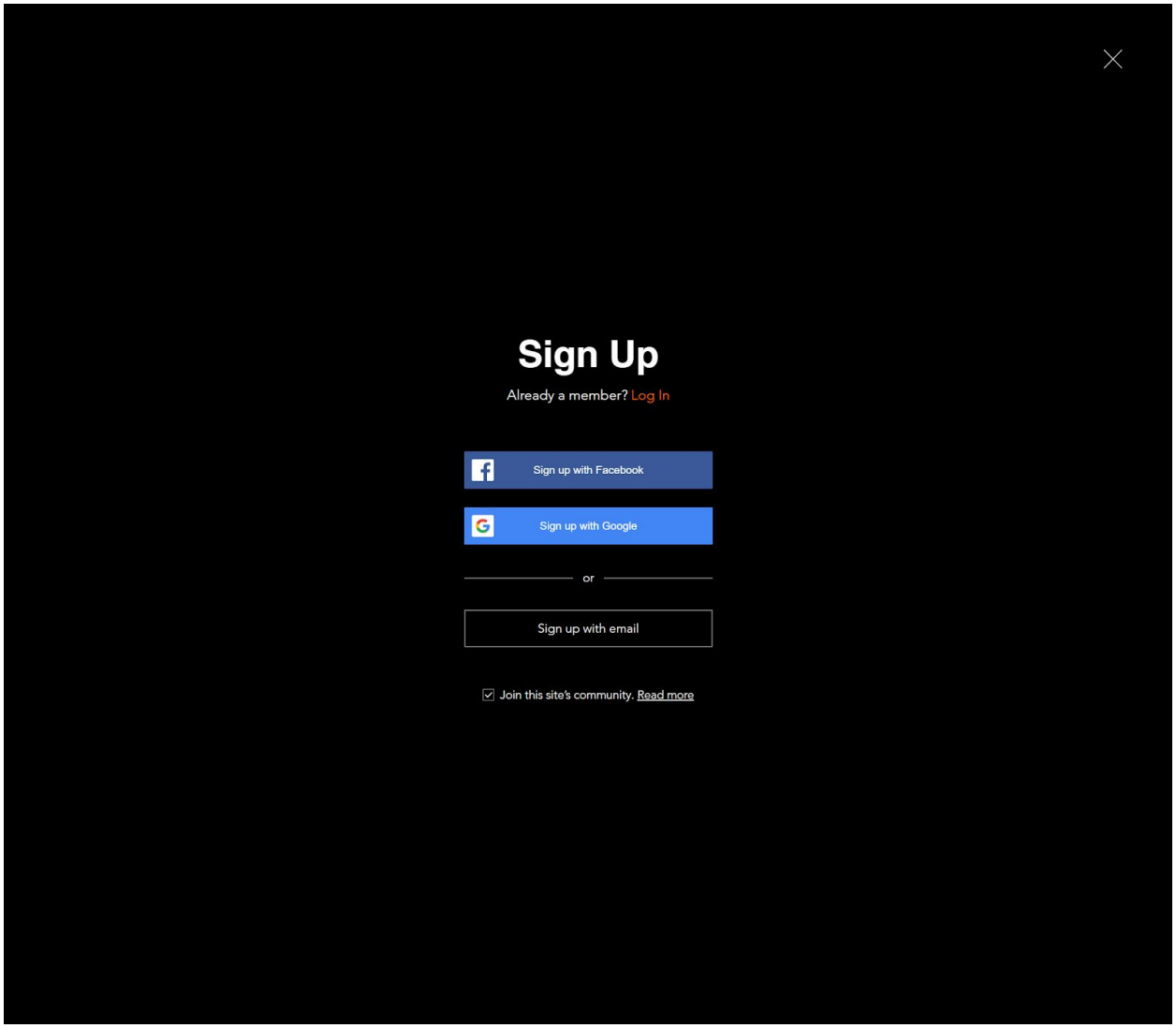


Figure E10. Screenshot showing the sign-in page of the final version of the platform.

Appendix F: Survey 1 - General Questions

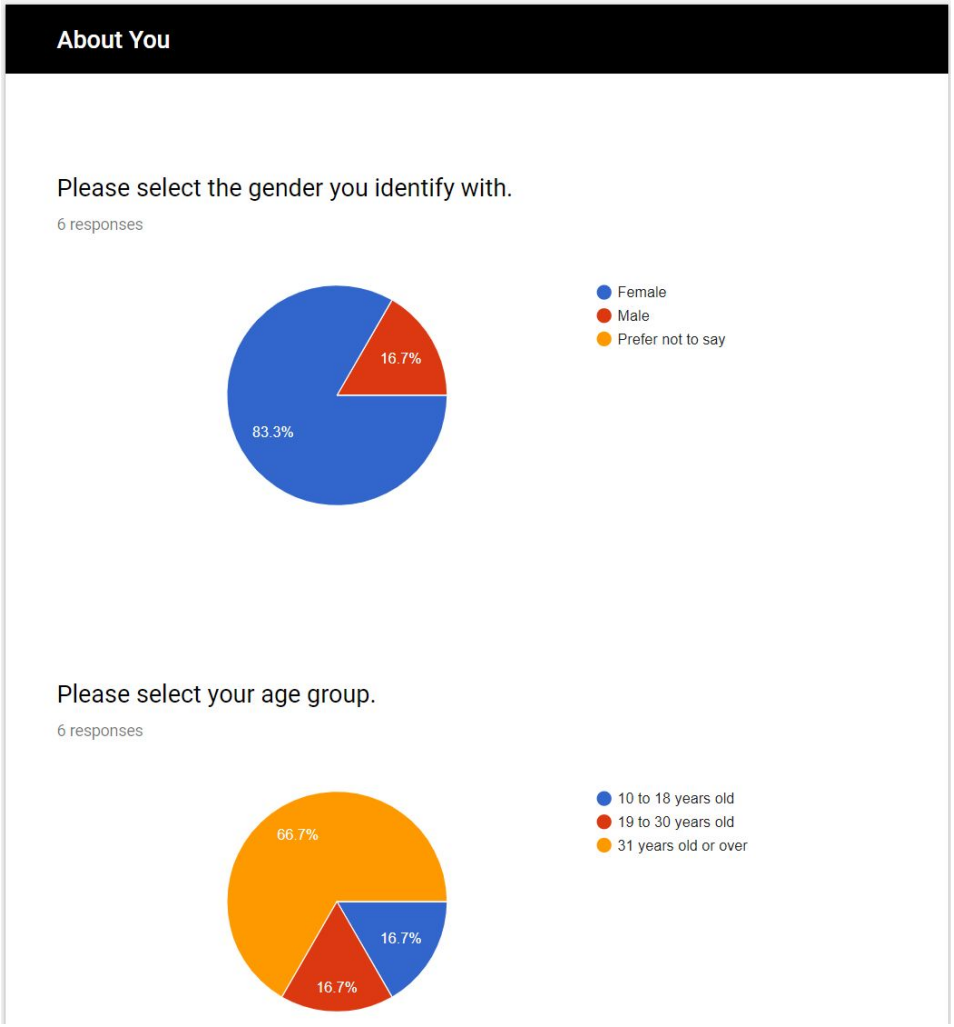


Figure F1. Screenshot showing part 1 / 9 of the survey from Iteration 1.

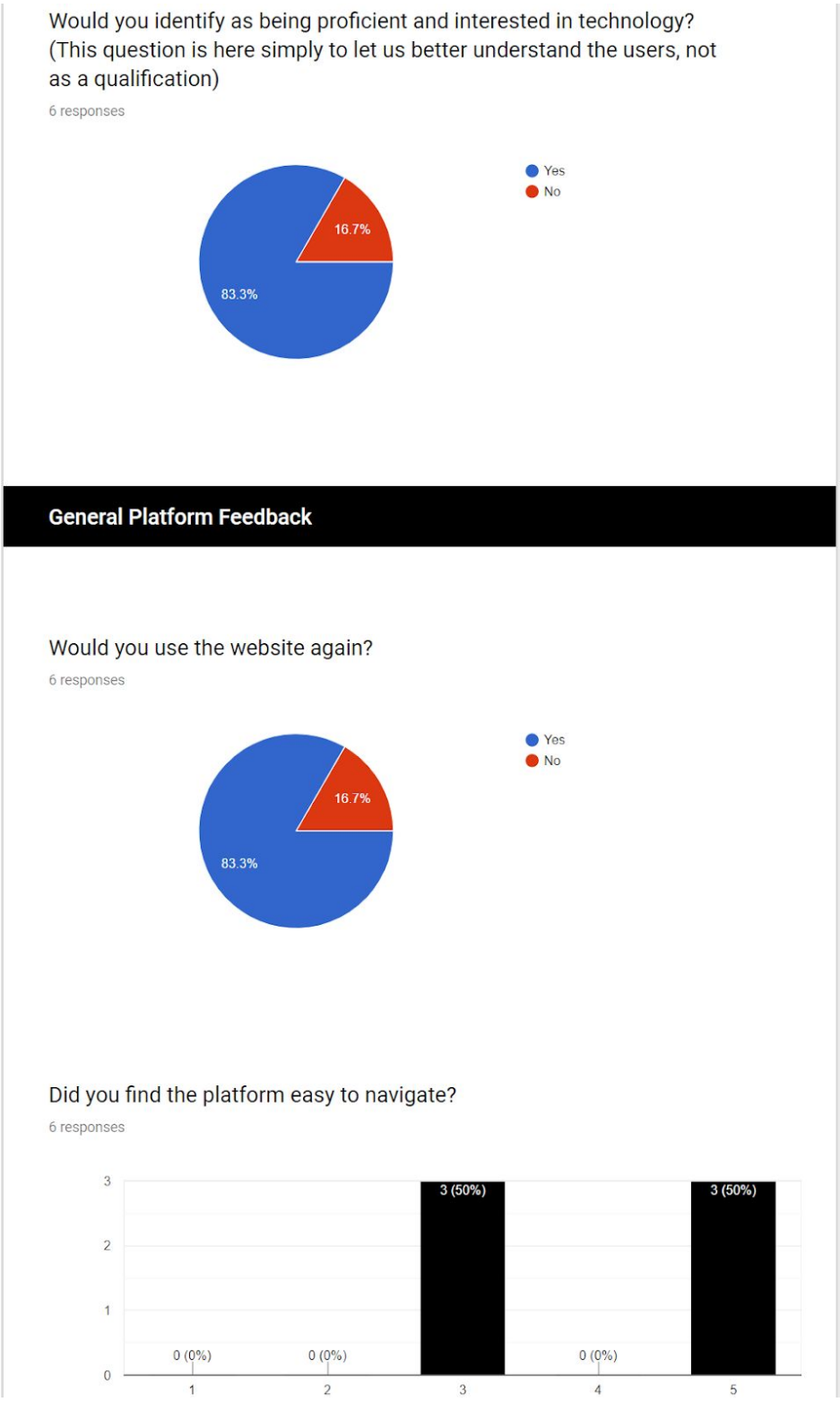


Figure F2. Screenshot showing part 2 / 9 of the survey from Iteration 1.

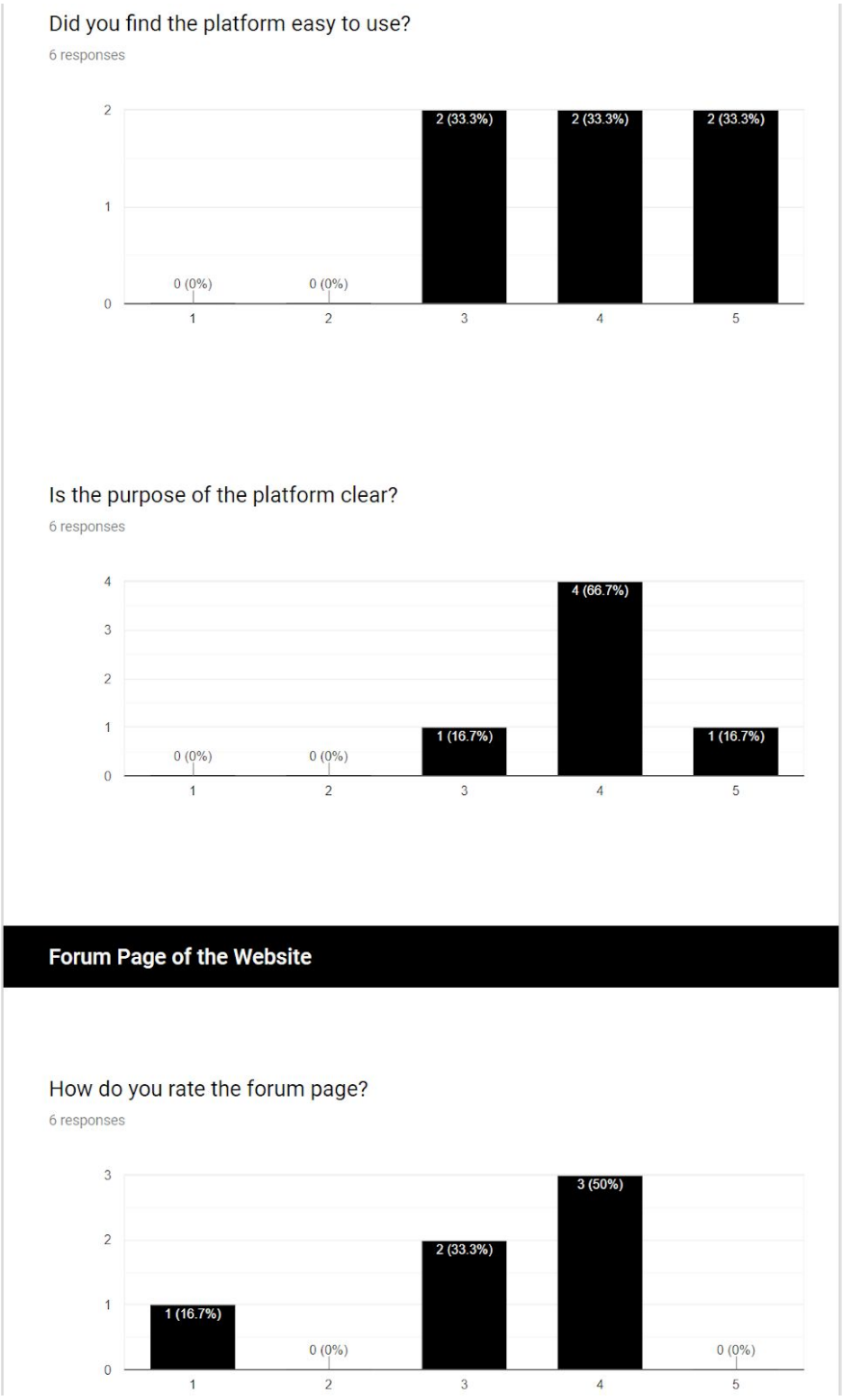


Figure F3. Screenshot showing part 3 / 9 of the survey from Iteration 1.

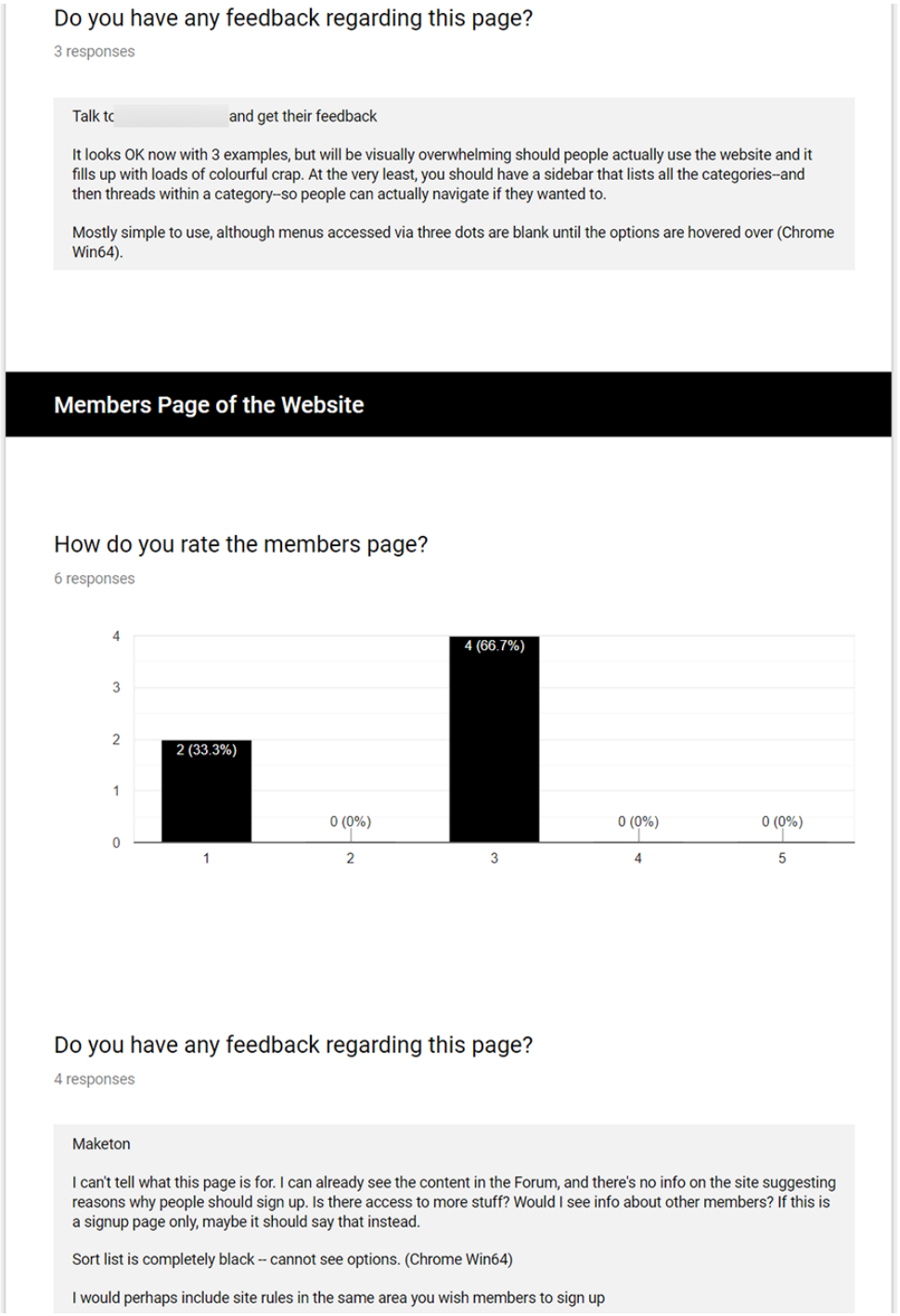


Figure F4. Screenshot showing part 4 / 9 of the survey from Iteration 1.

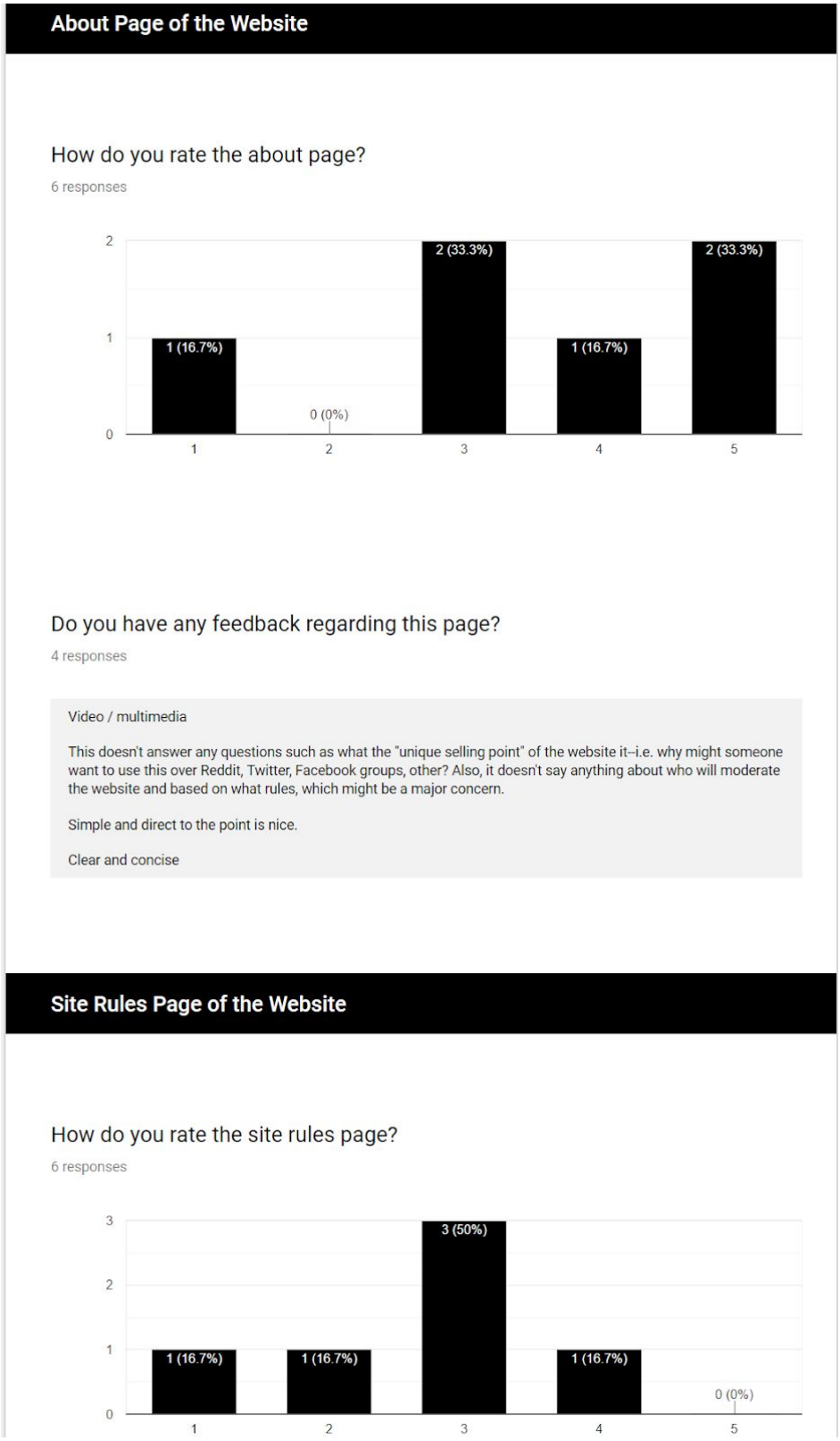


Figure F5. Screenshot showing part 5 / 9 of the survey from Iteration 1.

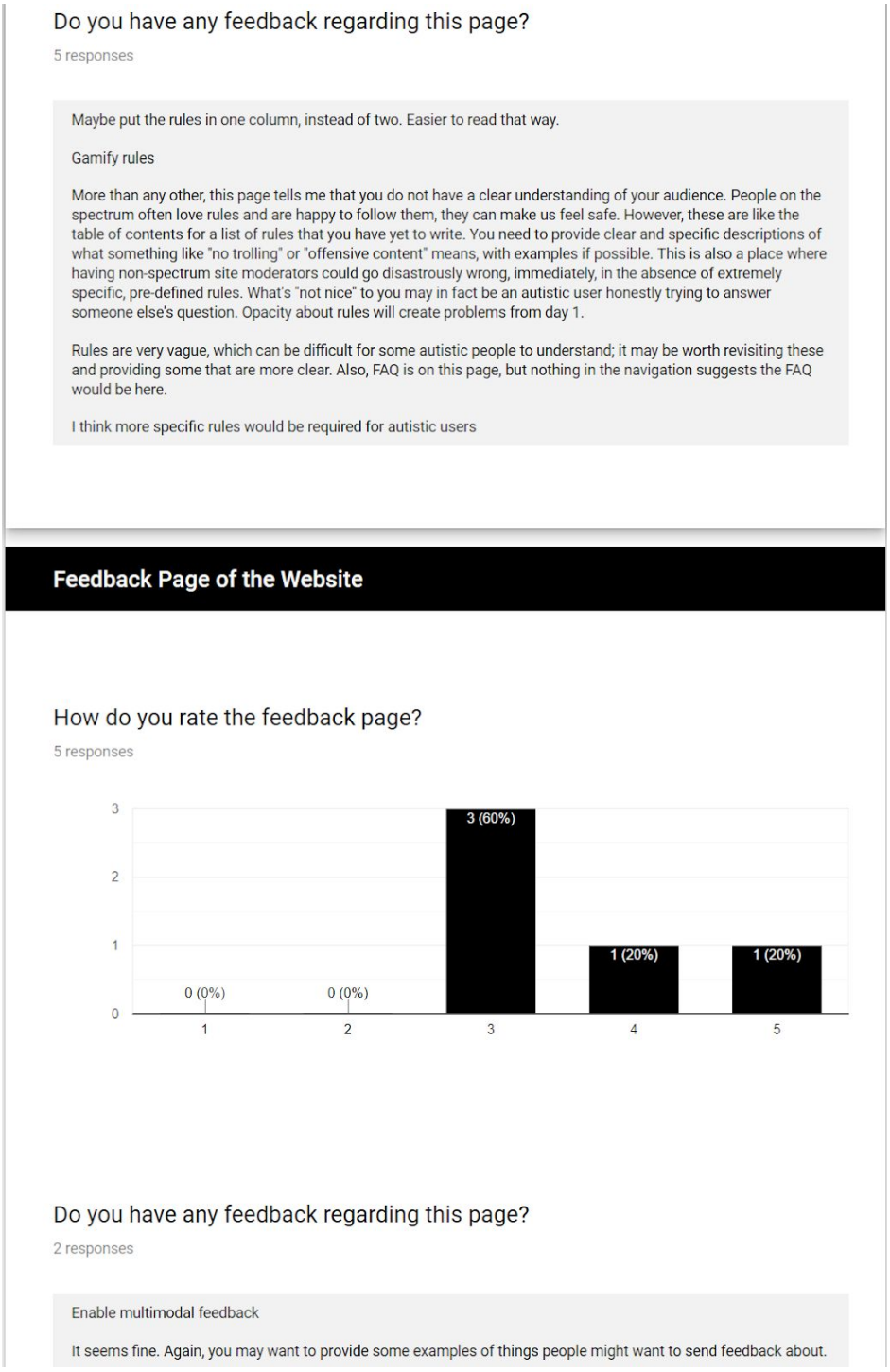


Figure F6. Screenshot showing part 6 / 9 of the survey from Iteration 1.

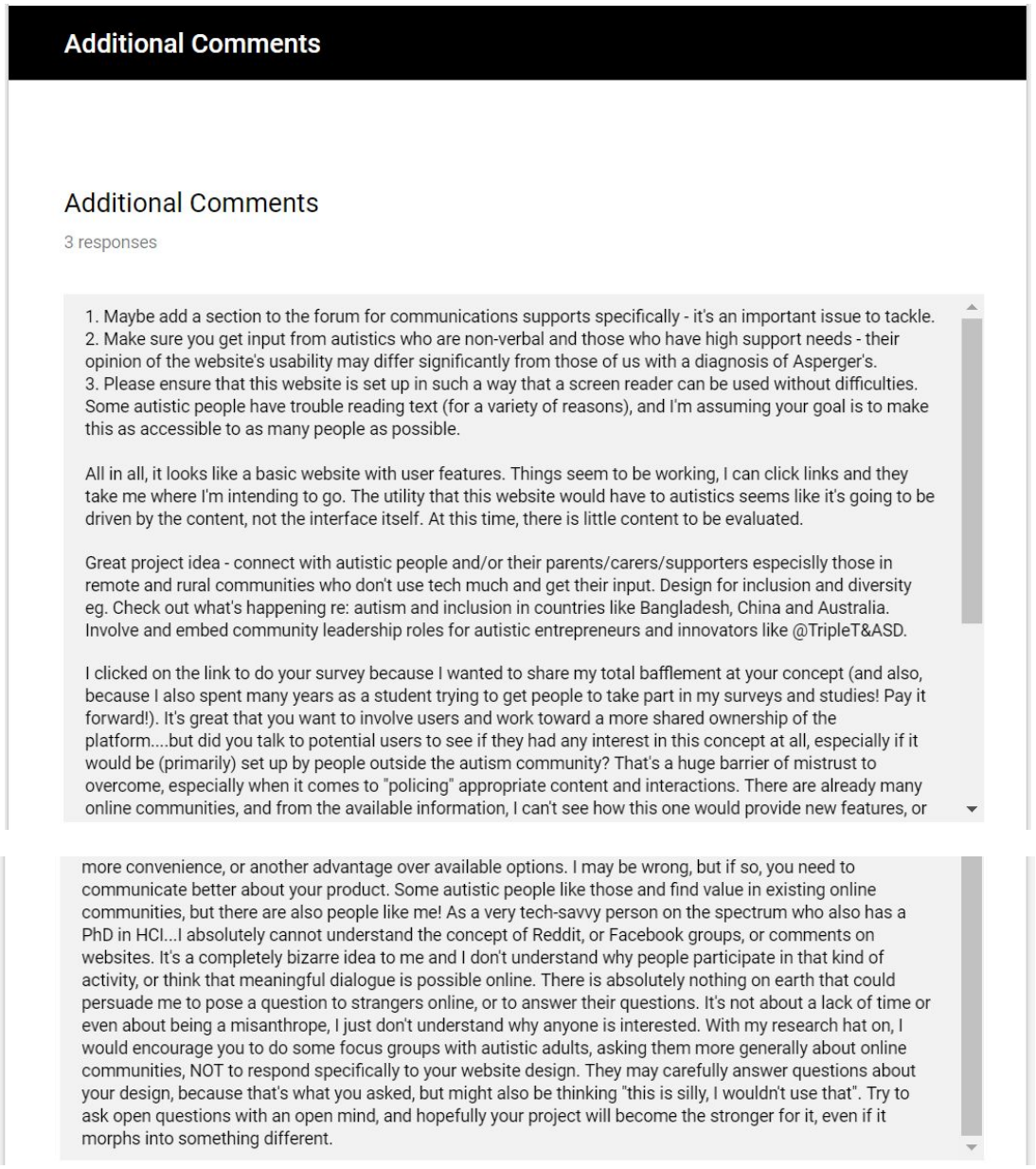


Figure F7. Screenshot showing part 7 / 9 of the survey from Iteration 1.

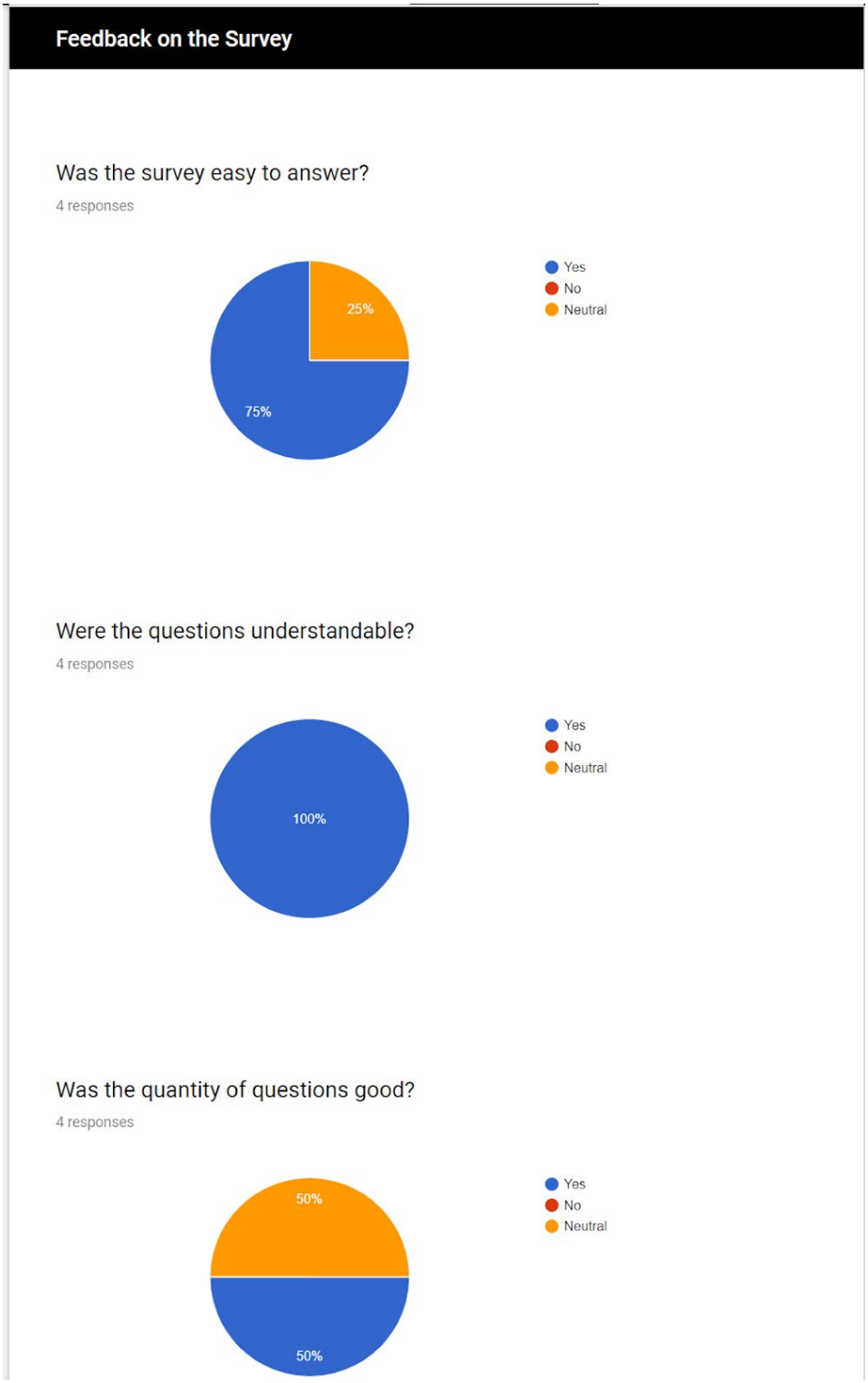


Figure F8. Screenshot showing part 8 / 9 of the survey from Iteration 1.

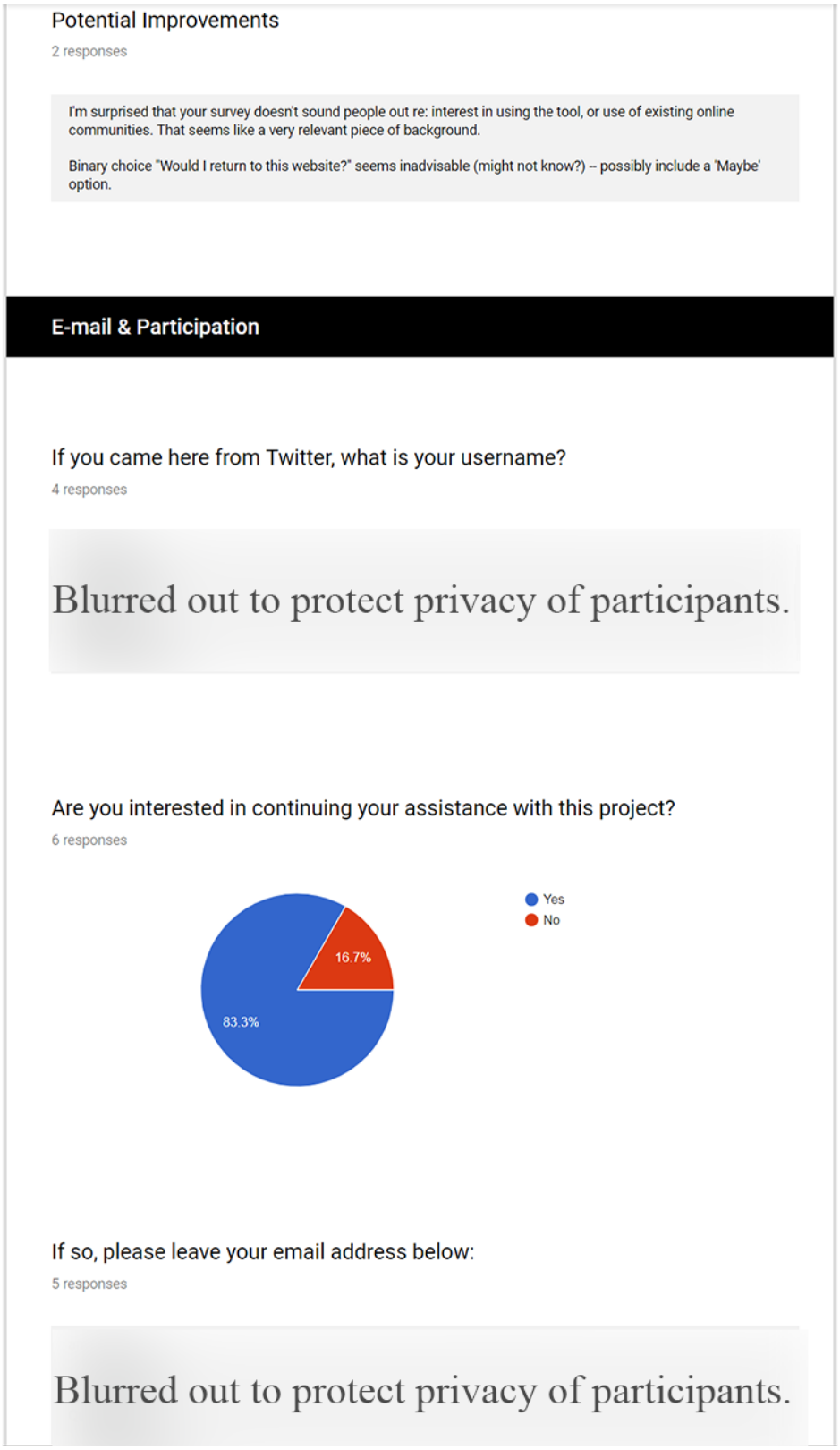


Figure F9. Screenshot showing part 9 / 9 of the survey from Iteration 1.

Appendix G: Survey 2 - Functionalities

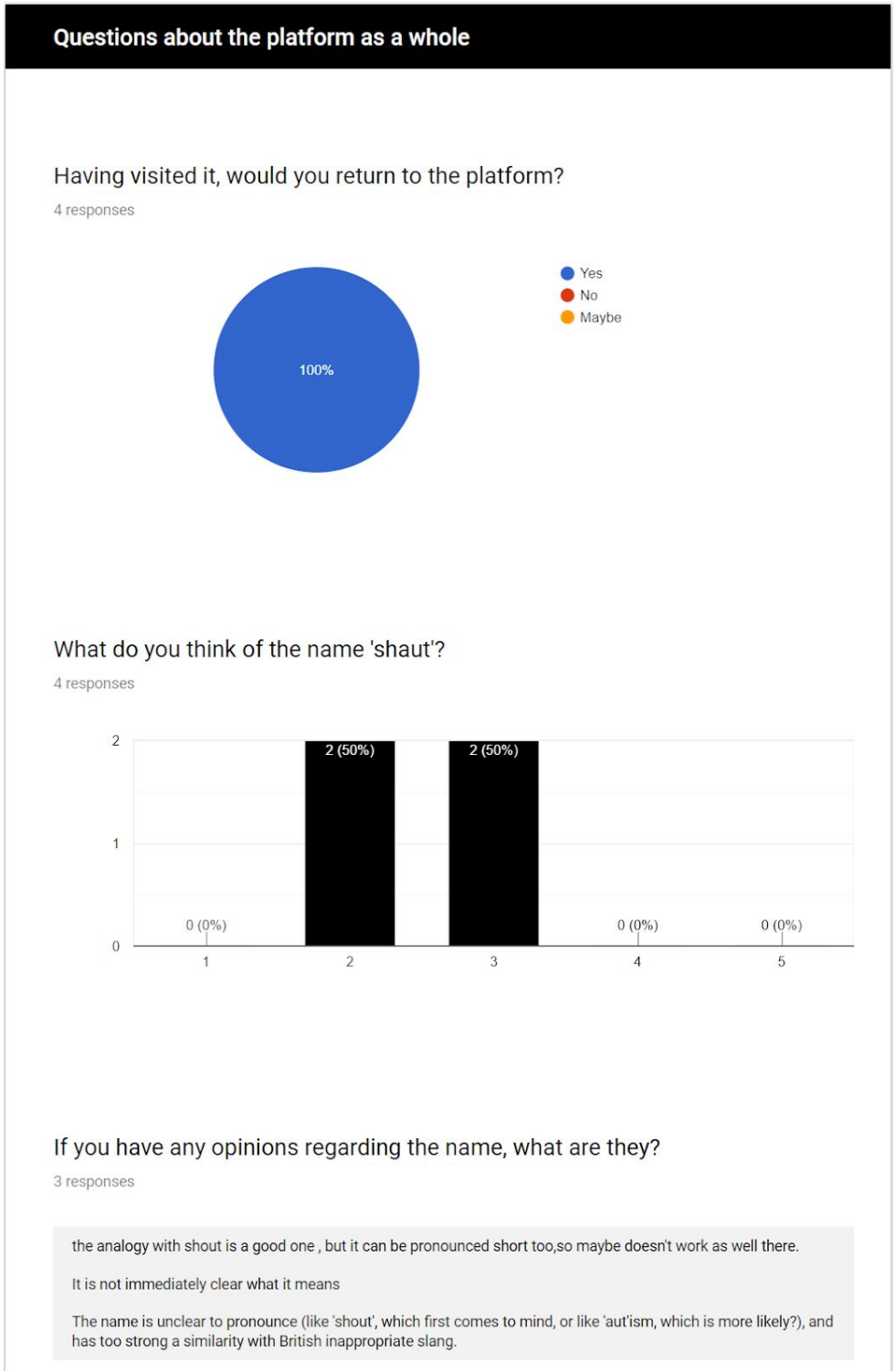


Figure G1. Screenshot showing part 1 / 10 of the survey from Iteration 2.

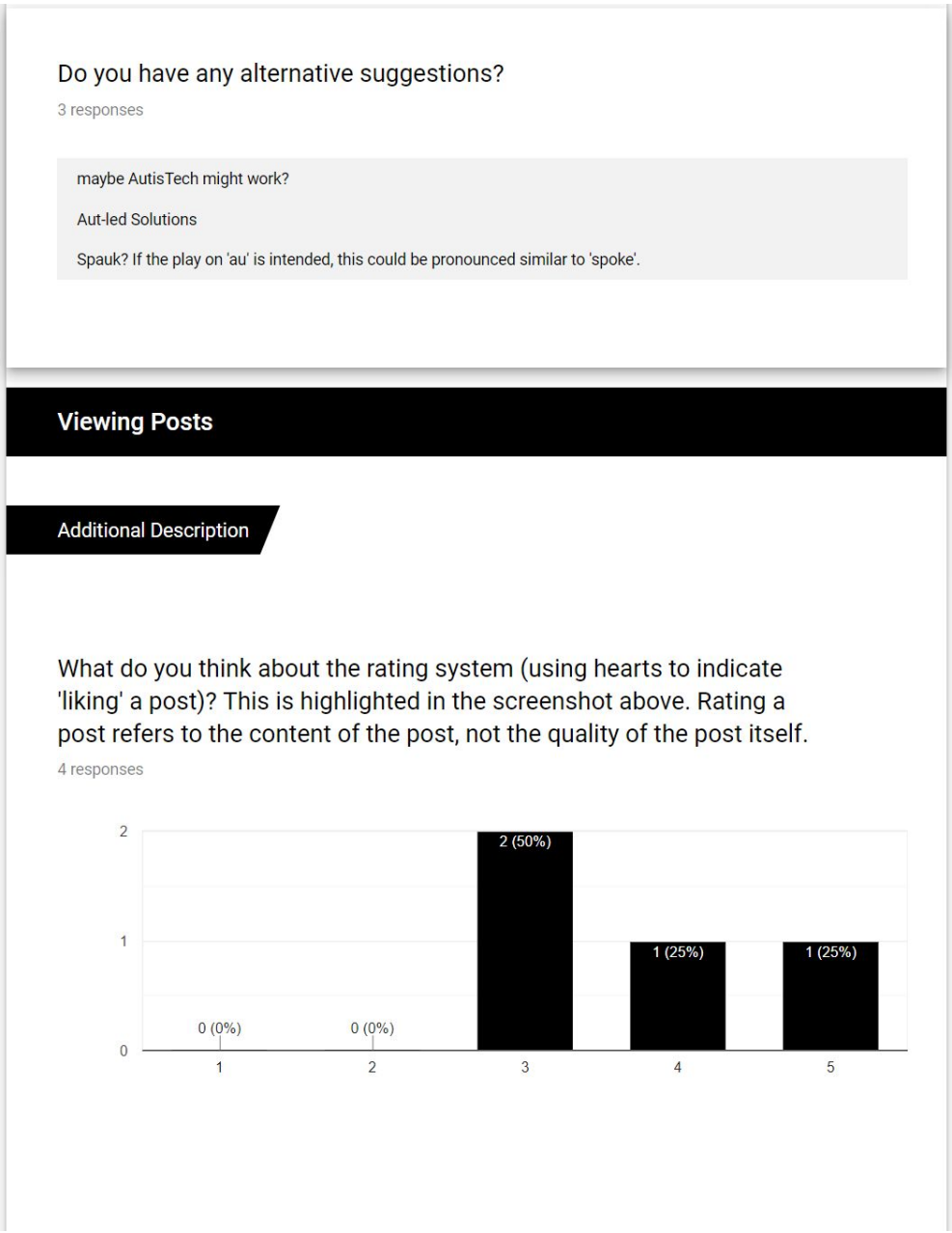


Figure G2. Screenshot showing part 2 / 10 of the survey from Iteration 2.

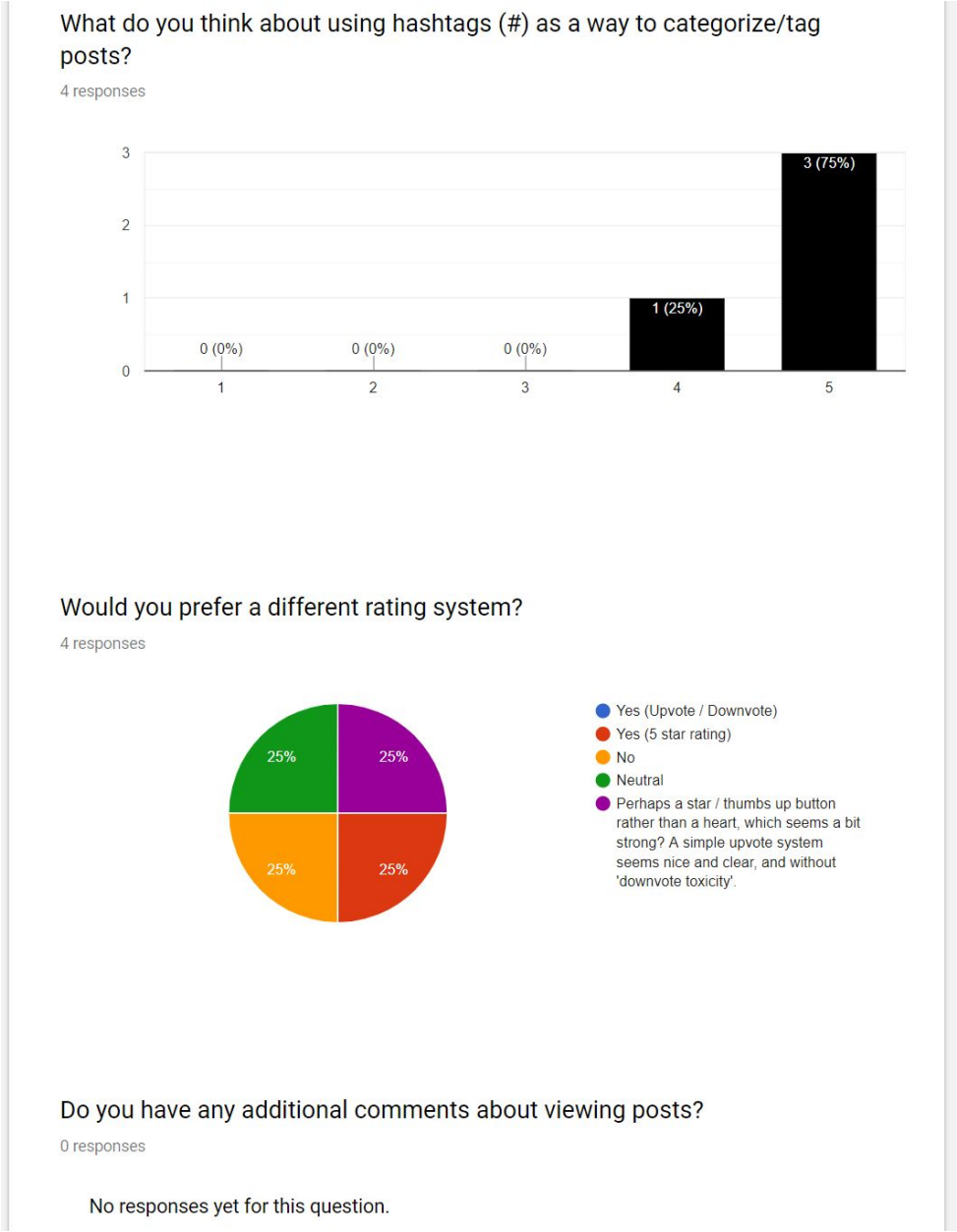


Figure G3. Screenshot showing part 3 / 10 of the survey from Iteration 2.

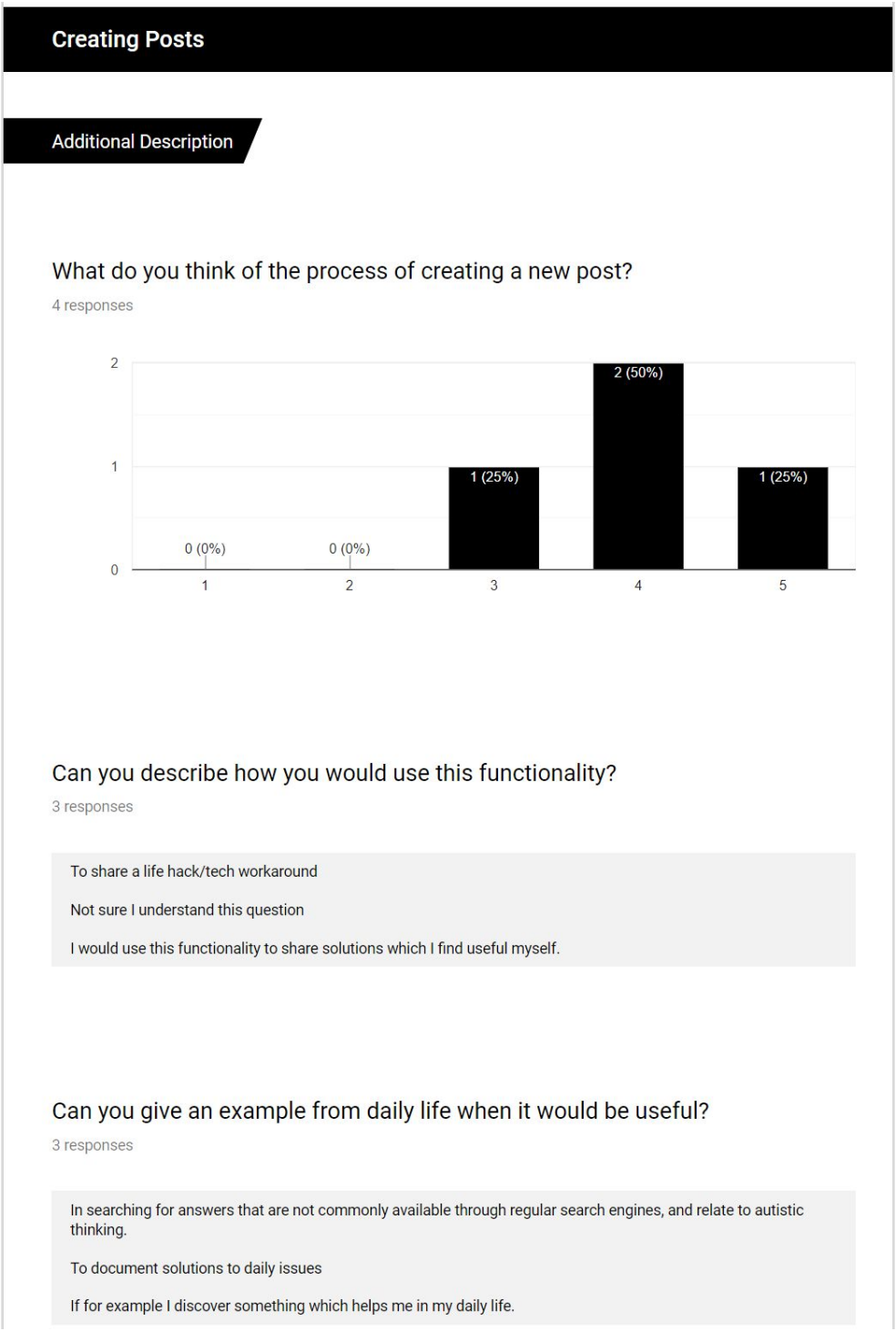


Figure G4. Screenshot showing part 4 / 10 of the survey from Iteration 2.

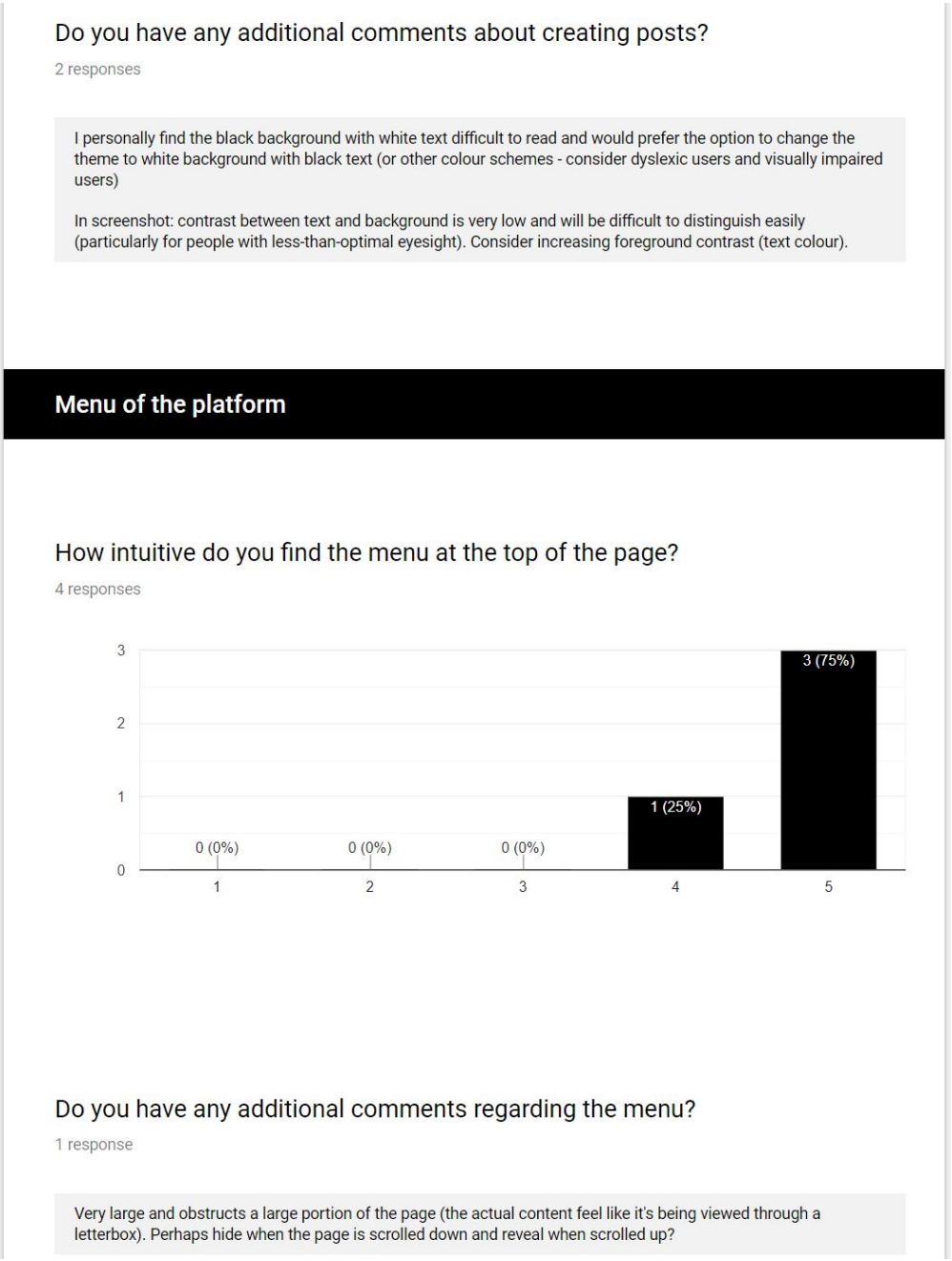


Figure G5. Screenshot showing part 5 / 10 of the survey from Iteration 2.

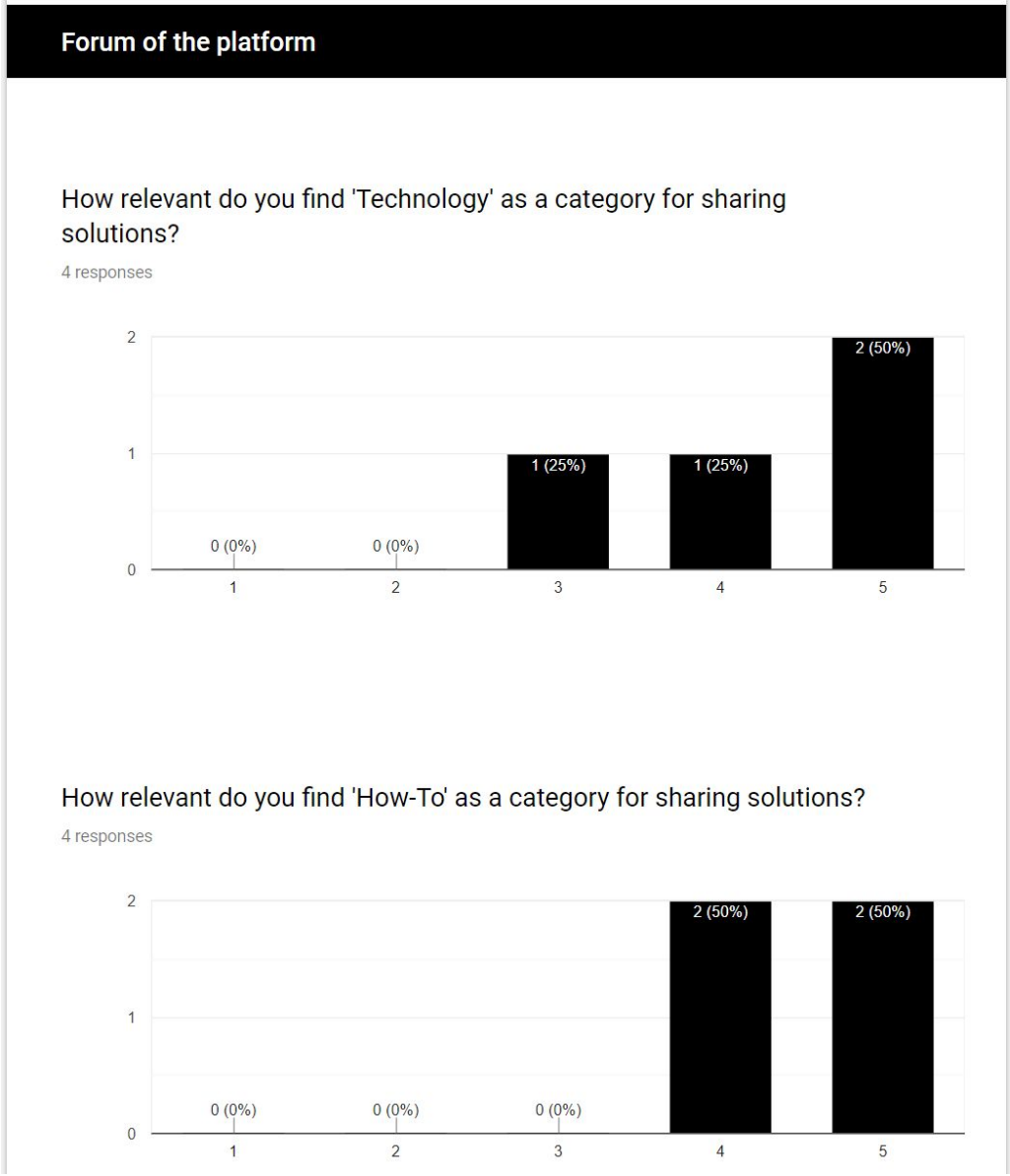
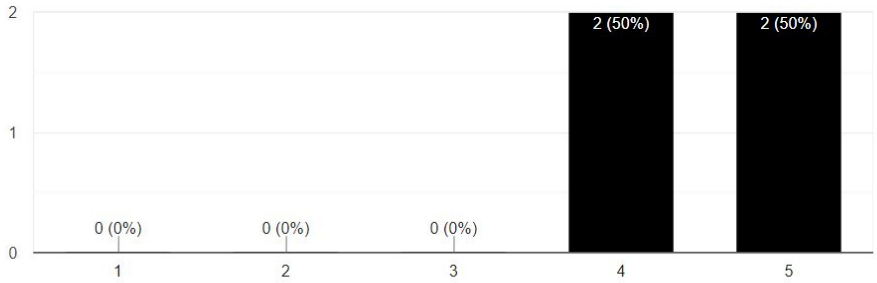


Figure G6. Screenshot showing part 6 / 10 of the survey from Iteration 2.

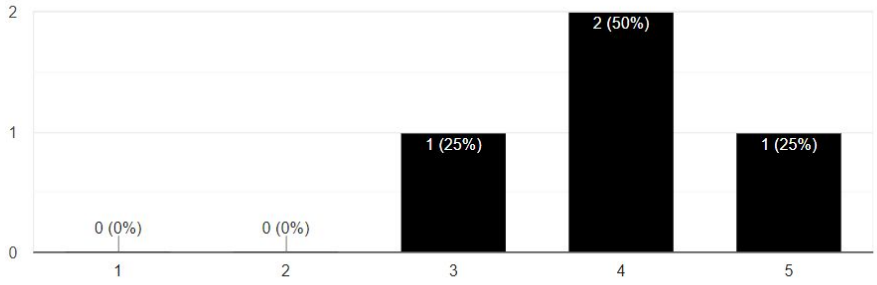
How relevant do you find 'Ask for Advice' as a category for sharing solutions?

4 responses



How relevant do you find 'Communication' as a category for sharing solutions?

4 responses



If applicable, what category would you like to see added (for solution sharing)?

1 response

Legal Help: for sharing legal rights and frameworks within which we operate. To clarify how to form fill and what criteria are assessed when accessing help

Figure G7. Screenshot showing part 7 / 10 of the survey from Iteration 2.

Do you have any additional comments regarding the Forum?

3 responses

I think the idea is great, and categories could be added. I get flustered by dealing with authority and government departments so categories supporting these aspects of daily life would be good.

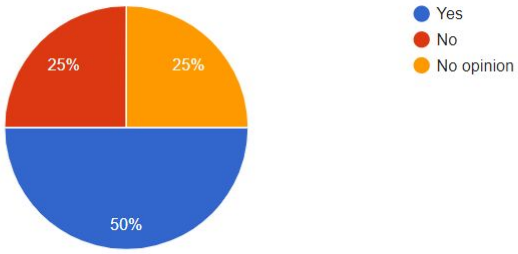
Perhaps have sub-categories - e.g. under 'Ask for Advice' could have 'sensory advice', 'anxiety advice', 'education advice', 'employment advice', 'mixed/multiple topics' etc.

'Communication' seems vague and ambiguous.

Members page

Do you think that the members page should be available?

4 responses



Do you like the feature of being able to see the profiles of other users? This allows you to see information about them, what they posted, and to follow them.

4 responses

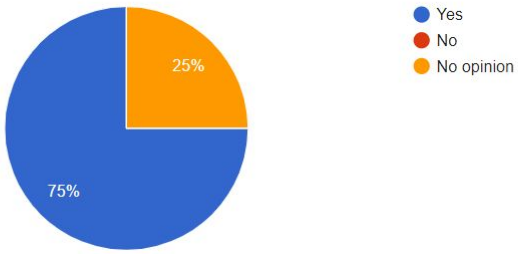
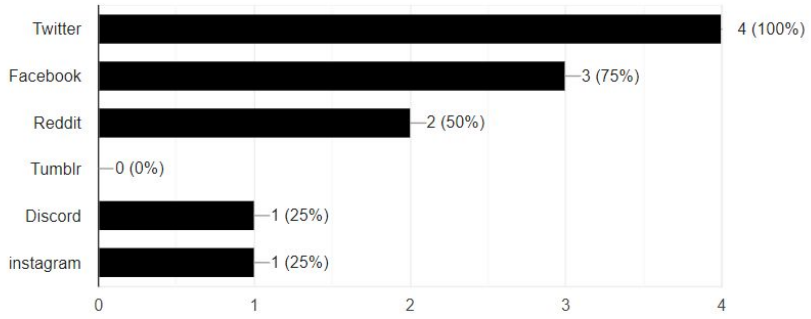


Figure G8. Screenshot showing part 8 / 10 of the survey from Iteration 2.

Other platforms

What online platforms do you use?

4 responses



Where do you find information regarding handy tools or techniques which you can use in your daily life?

4 responses

Search engine searches

Twitter mostly

Twitter and Google Search.

Google

If anything, what do you believe is missing from these platforms for this purpose?

3 responses

Autistic tailored responses to autistic phrasing.

Clarity and on-demand access; Twitter is reliant on other people posting things, and limits to 280 characters hindering clarity. Google search can lack things for autistic people, leading to unclear advice.

Dedicated areas and functions for autistic people

Figure G9. Screenshot showing part 9 / 10 of the survey from Iteration 2.

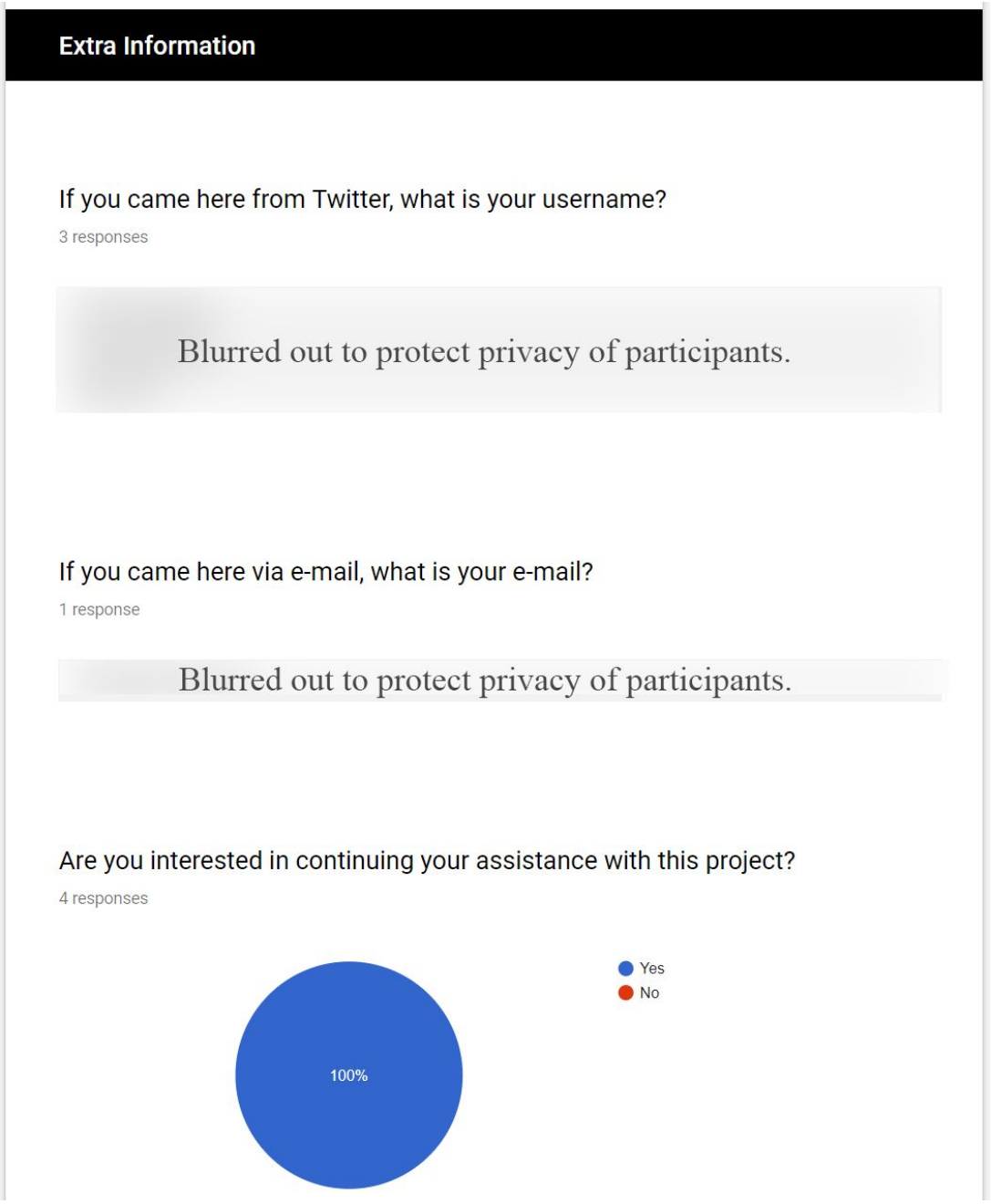


Figure G10. Screenshot showing part 10 / 10 of the survey from Iteration 2.

Appendix H: Survey 3 - Evaluation

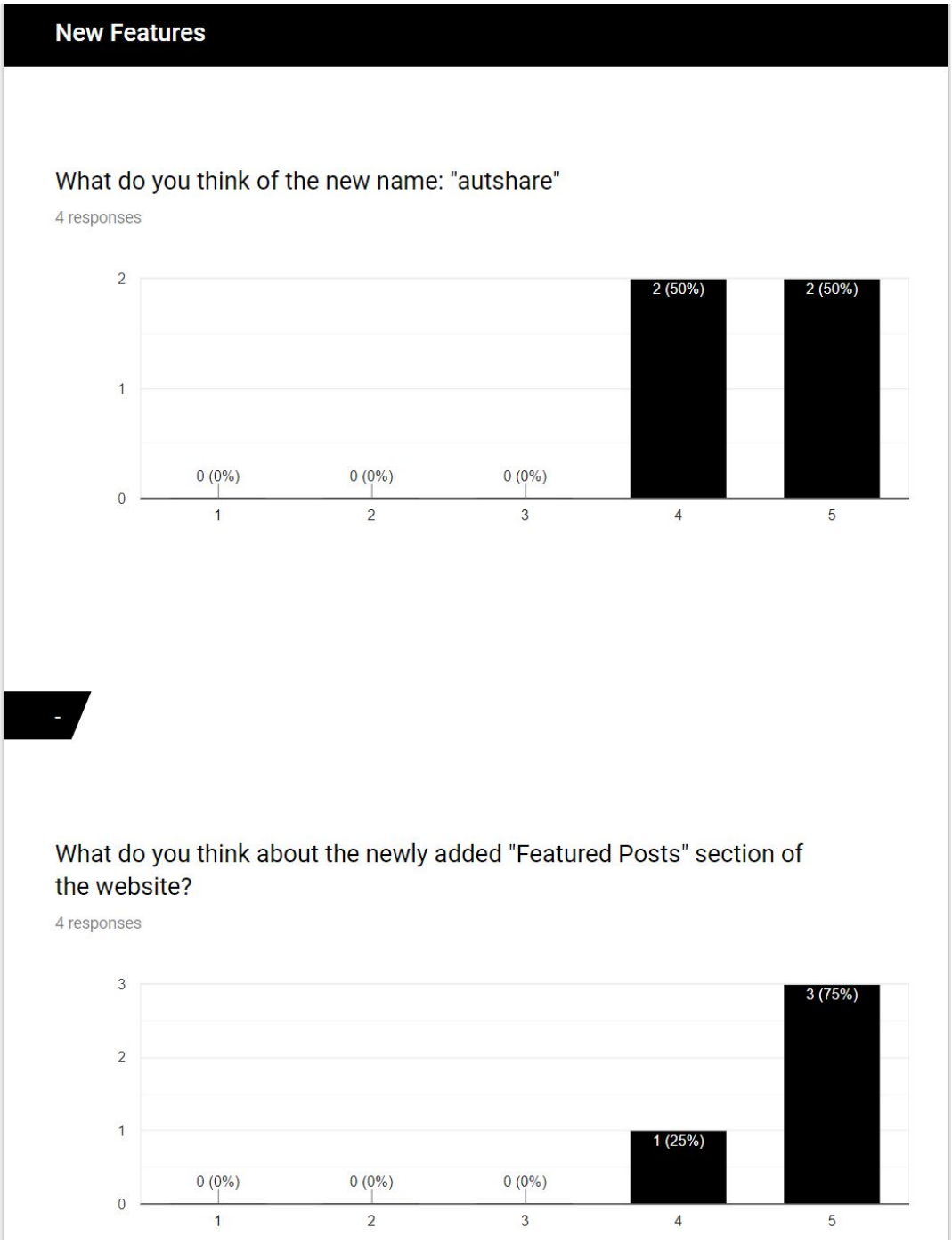


Figure H1. Screenshot showing part 1 / 12 of the survey from Iteration 3.

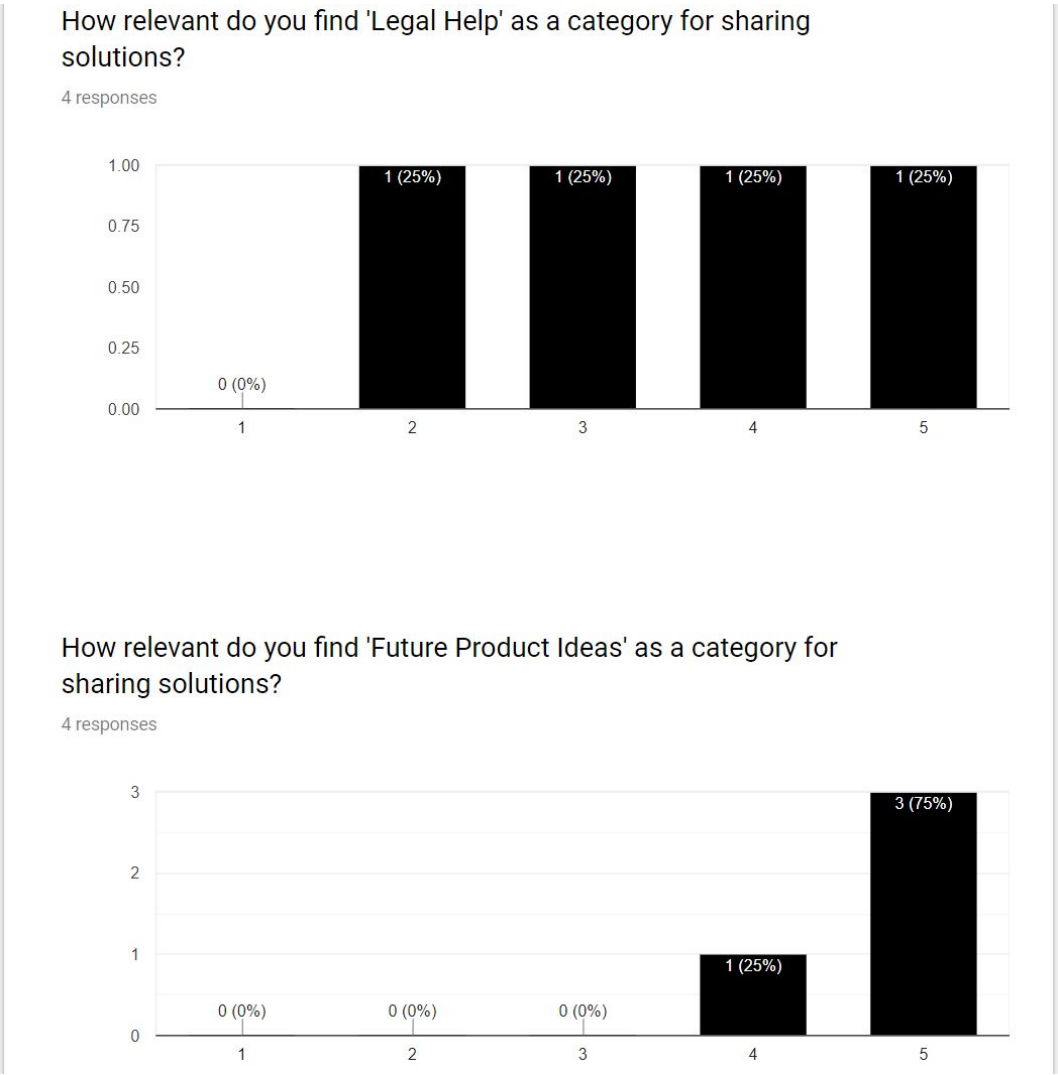


Figure H2. Screenshot showing part 2 / 12 of the survey from Iteration 3.

Do you have any additional comments regarding the new name or the new features of the website?

3 responses

The new name is far clearer than the previous, which is good, and I feel that adding Legal Help and Future Ideas is a good idea, to help with some of us who might be struggling with legal forms / facing difficulties with disability rights, etc, for example. Future ideas would also give a starting point for any apps which aren't available yet that could be useful -- I like it!

I think that Legal Help is a good addition but there should be a disclaimer so that people don't follow legal advice without thinking about it.

Cool name

The type of posts could draw in a wide audience, though a closer connection at the problems they try to solve could be good - its not obvious that the tools could be sued for organisation, lack of short term memory, or social anxiety

what sort of legal help do people with autism even need?

Future product ideas could be a great place for people to discuss (and hopefully better understand) their day to day problems and maybe even come up with new solutions (probably using existing tech)

Design Questions

What do you think about the overall design of the website?

4 responses

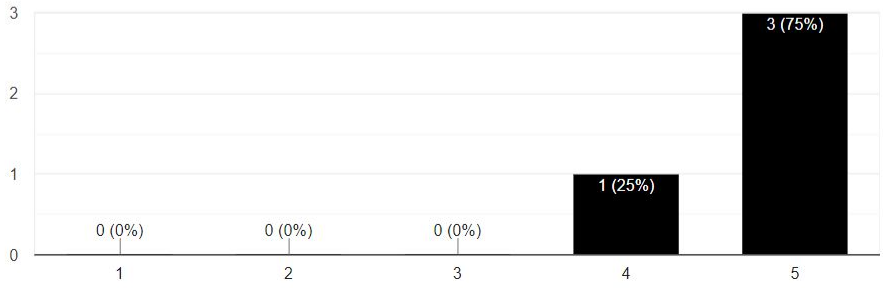


Figure H3. Screenshot showing part 3 / 12 of the survey from Iteration 3.

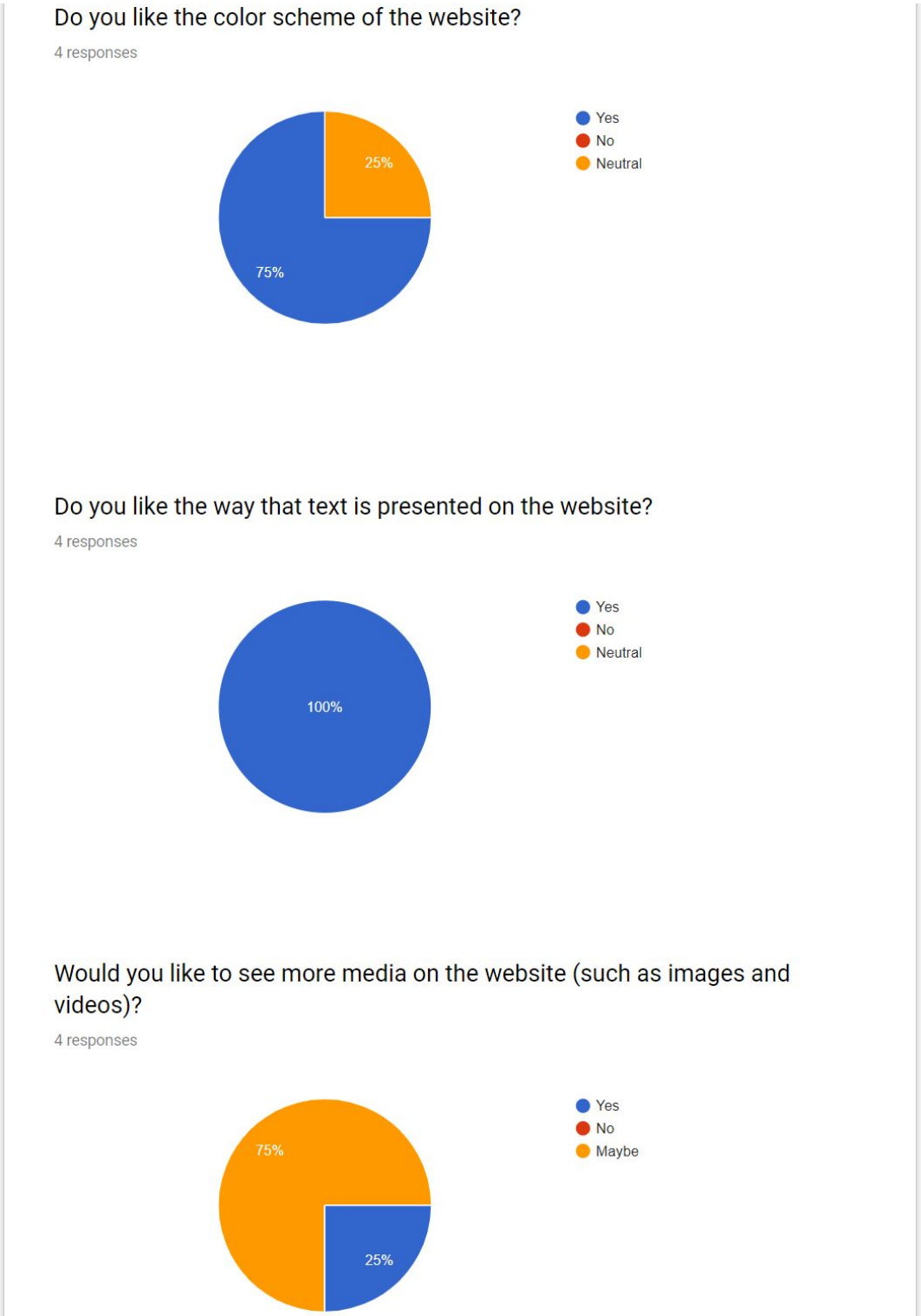


Figure H4. Screenshot showing part 4 / 12 of the survey from Iteration 3.

Do you have any additional comments regarding the design?

2 responses

Design is rather good; only real complaint might be the contrast between the solid black background and solid white background, which is a very stark difference; keep this contrast for text (which is good), but perhaps brighten the black background or darken the white background, to try to keep the colours a touch more harmonious.

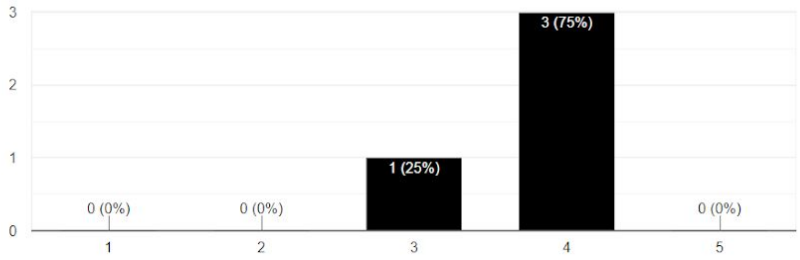
The front page, about, and rule section probably shouldnt be the focus of the web page - imo - (not that i have ever made webpages before, so i might just be rambling)

The categories under forum however - Tech, (info?), How to, Ask - should probably be accessible from the main menu ;p

Usability Questions Part 1

I think that I would like to use the website frequently.

4 responses



-

I found the website unnecessarily complex.

4 responses

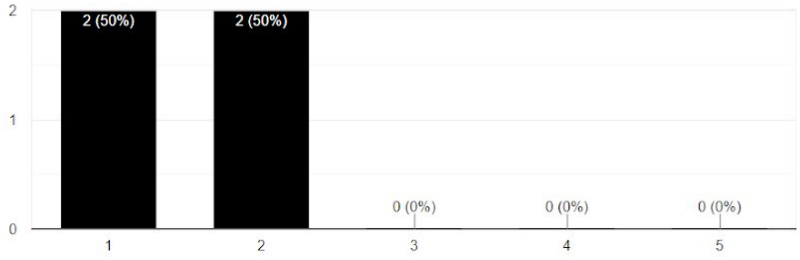


Figure H5. Screenshot showing part 5 / 12 of the survey from Iteration 3.

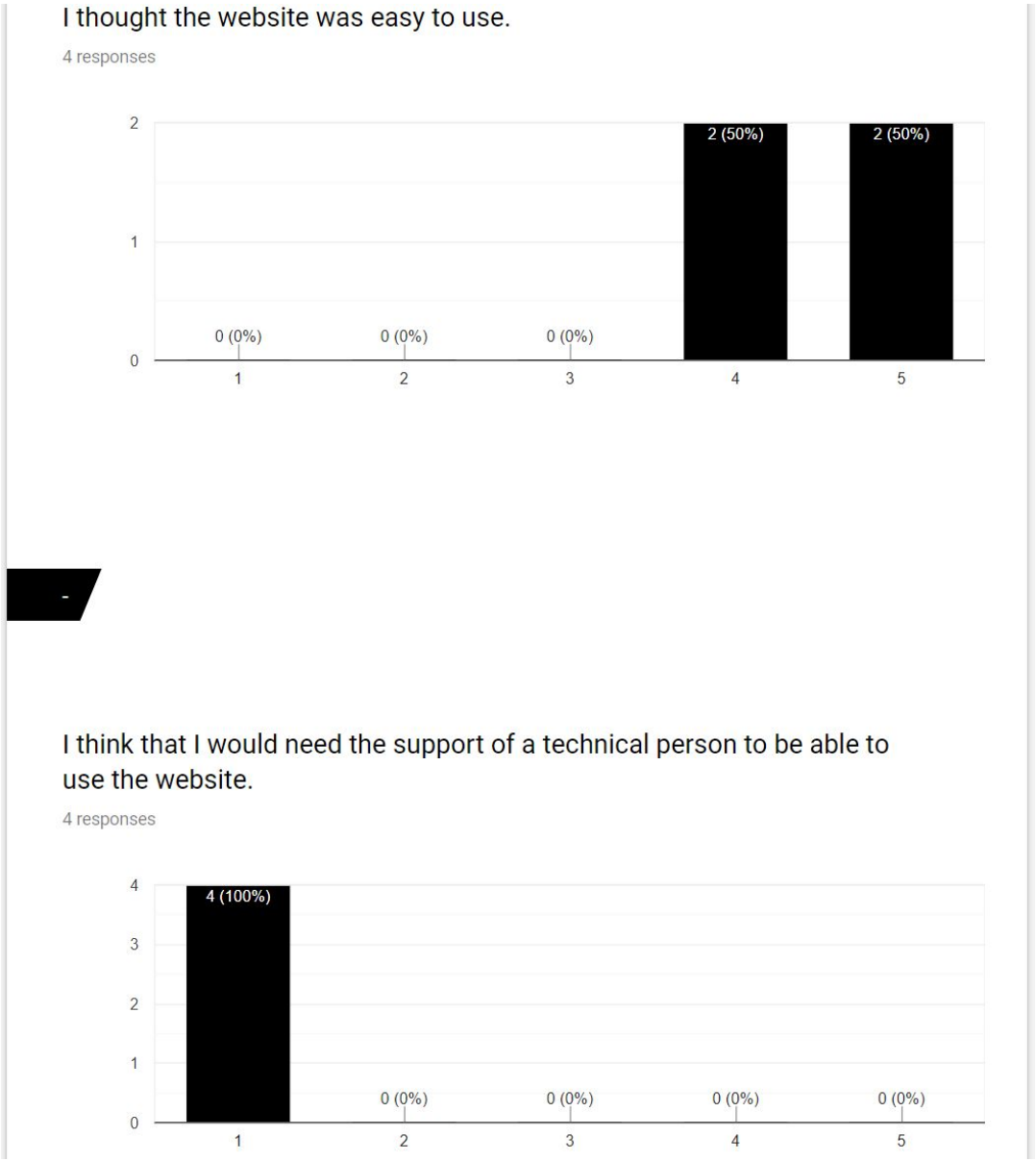


Figure H6. Screenshot showing part 6 / 12 of the survey from Iteration 3.

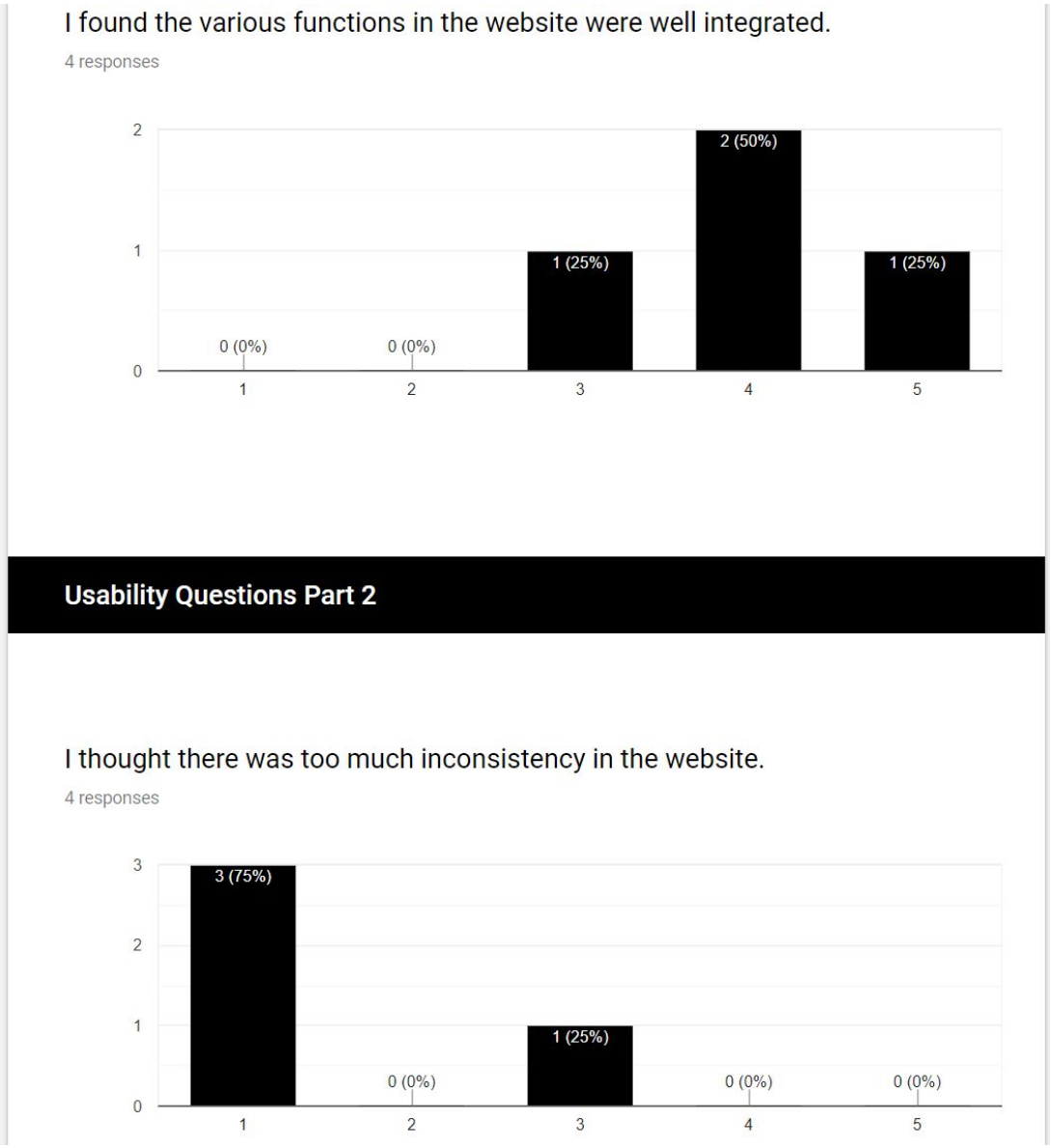


Figure H7. Screenshot showing part 7 / 12 of the survey from Iteration 3.

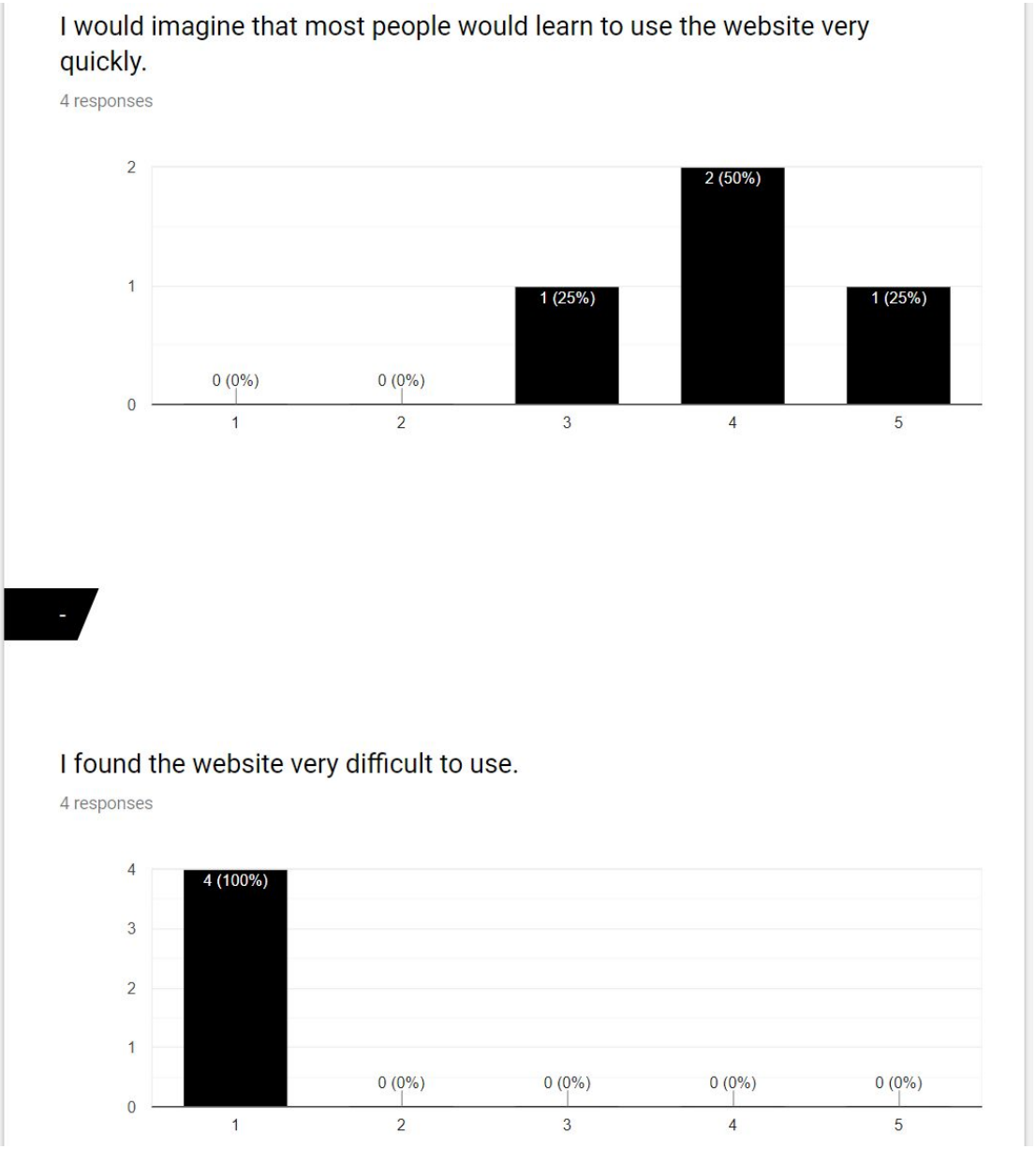


Figure H8. Screenshot showing part 8 / 12 of the survey from Iteration 3.

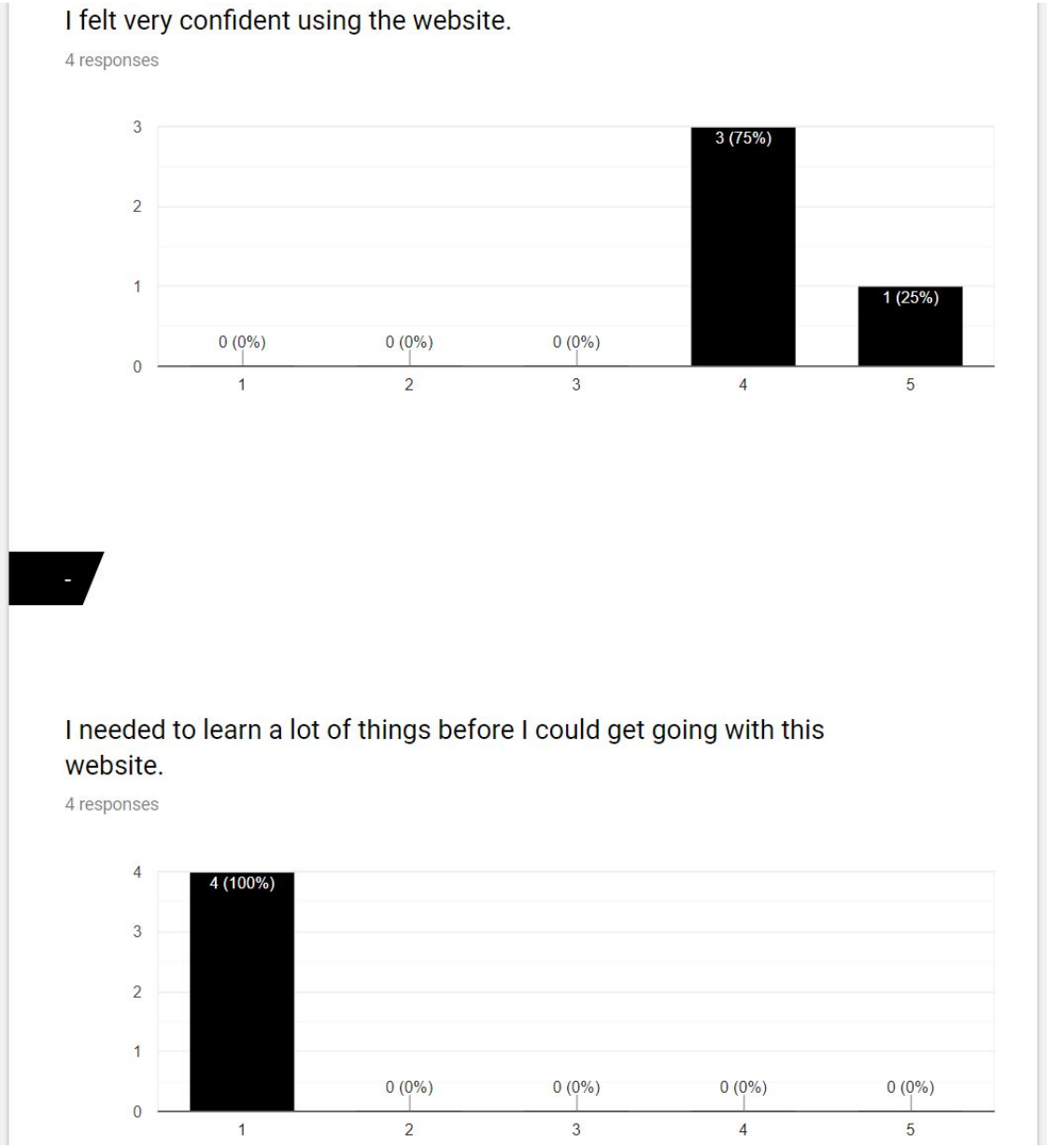


Figure H9. Screenshot showing part 9 / 12 of the survey from Iteration 3.

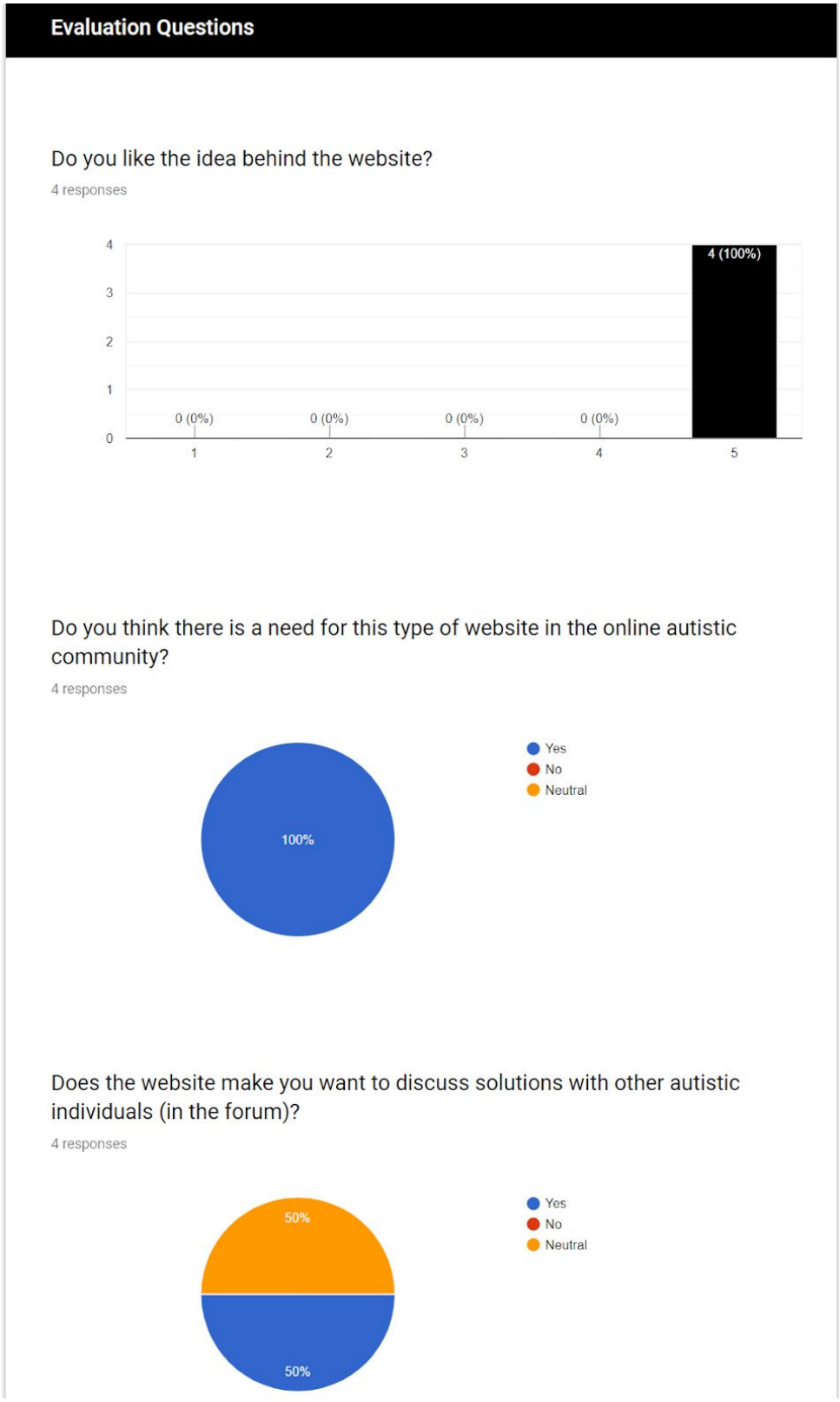


Figure H10. Screenshot showing part 10 / 12 of the survey from Iteration 3.

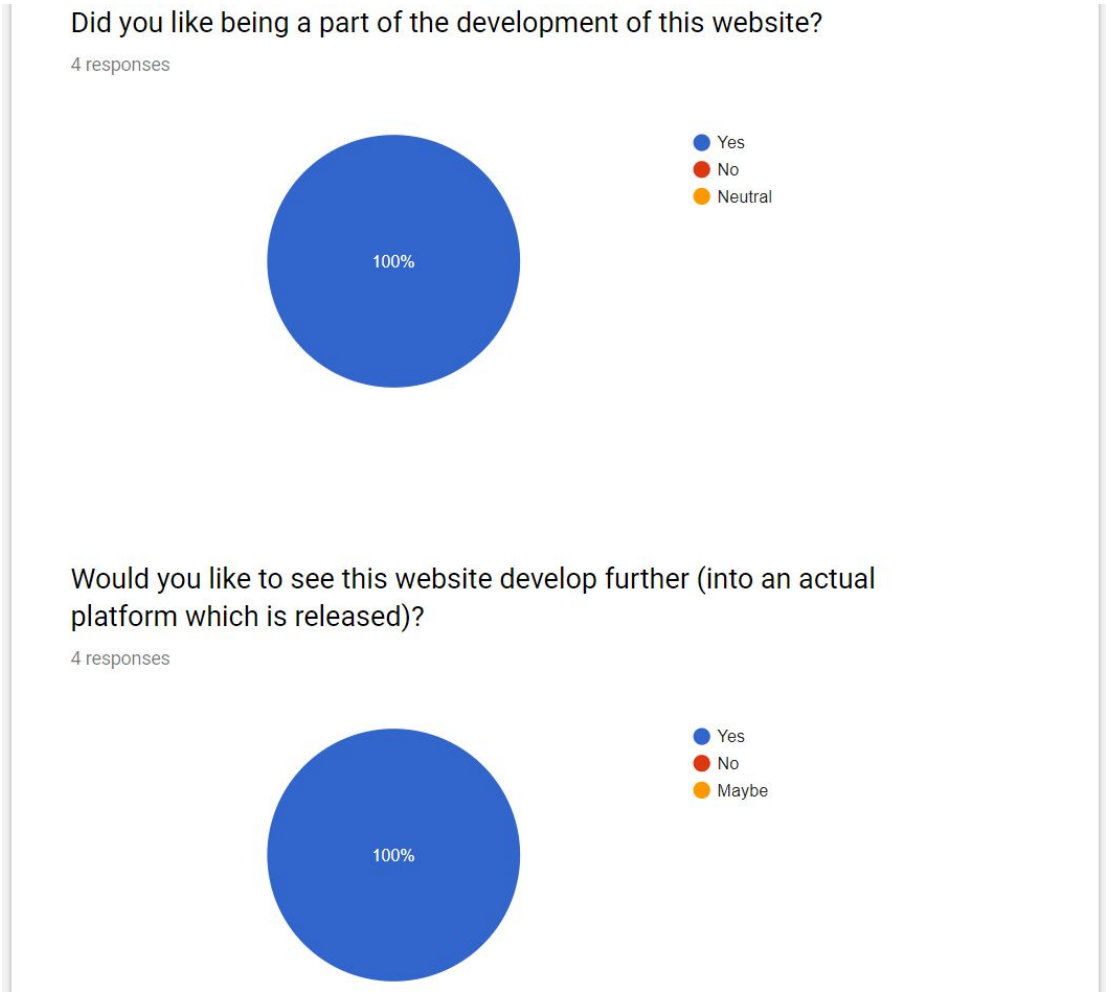


Figure H11. Screenshot showing part 11 / 12 of the survey from Iteration 3.

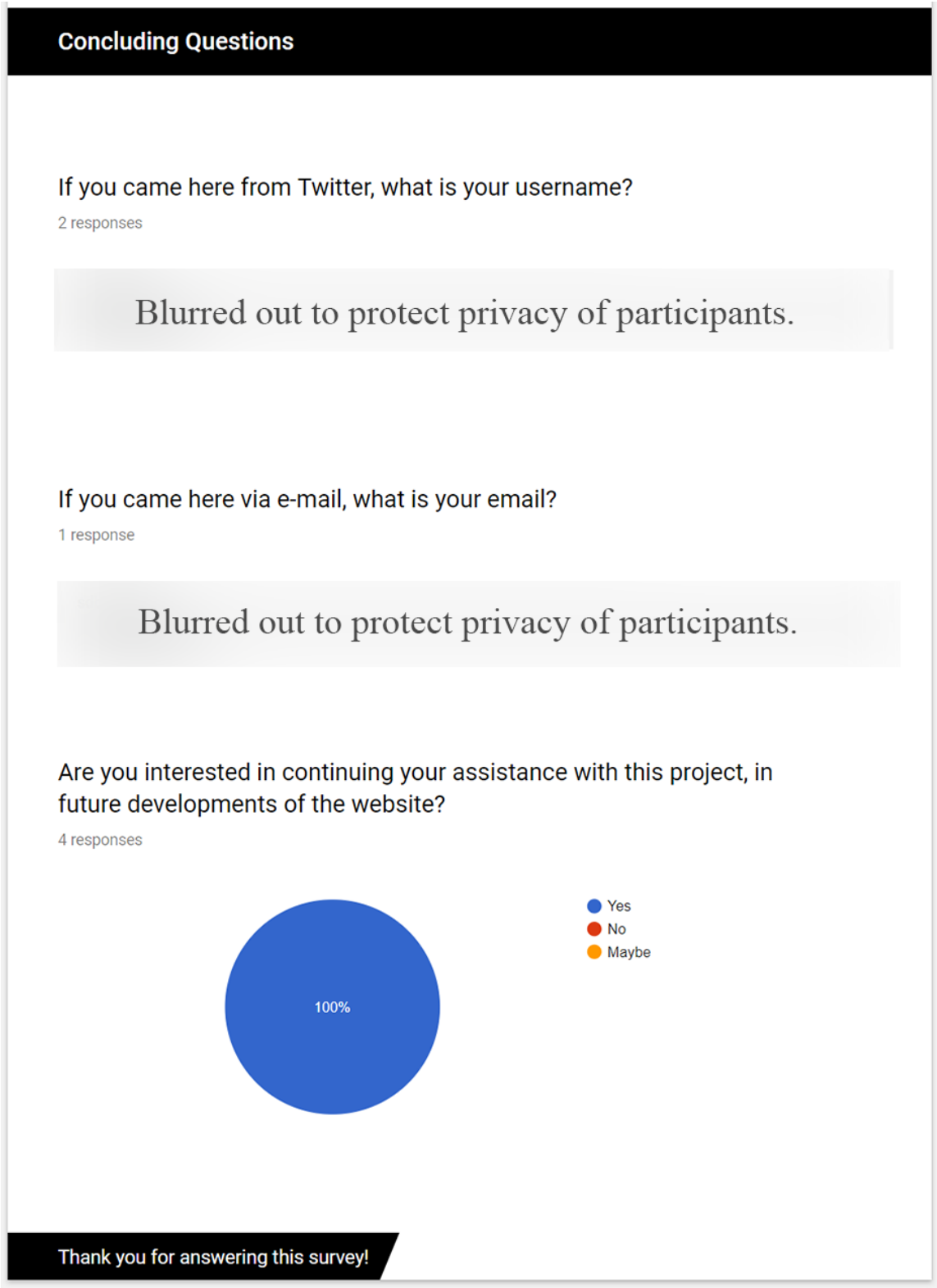


Figure H12. Screenshot showing part 12 / 12 of the survey from Iteration 3.