# Project: Delta Gamer

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### Abstract

Video games have grown in popularity in recent years, and with this popularity, concerns over accessibility have come to the forefront of discussions for game design. There exist many websites which cater to providing resources to developers, but a comprehensive resource for utilizing games from an accessibility standpoint does not yet exist. While some sites do offer information and insight into gaming accessibility options, they lack the ability to easily allow end users to resolve issues and answer questions about how to better accommodate their gaming experience. To this end we have conducted research on gaming accessibility through investigating current applications and conducting surveys to gather insight on the subject from everyday players both affected and not affected by disabilities. We have created a wireframe website to be a platform for individuals with disabilities to find information about video games, access articles, and communicate with others in the community. Throughout the development of Delta Gamer we realized how important it is to have a centralized hub for information of this nature.

## Introduction

Delta Gamer is a website designed for gamers with disabilities. It was created to be a hub where people can find resources to learn about how to modify their favorite video games to make them more suited for them and their own abilities. It features sections dedicated to motor, visual, audio, and mental disabilities with subcategories of each, so that users can narrow down what they are looking for. Delta Gamer also features a forum section so that users can talk and ask questions to other people in the community.

#### Motivation

Video games, in general, are being made more accessible for players subject to a wide array of disabilities. However, these players may be unaware of these options in the games they play or additional hardware that can give players an easier, more enjoyable experience. The primary motivation behind the Delta Gamer website is to create a better experience for disabled users in two distinct ways. Firstly, our website will provide disabled users with instructions on accessibility options, both through in-game options as well as through hardware that can interact with their console or computer. Additionally, we will provide resources for game developers to learn how to increase accessibility for their users. Through these two elements of our website, we aim to make video games more approachable for players who may benefit from these accessibility options and hardware as well as further encourage developers to provide such options.

#### The Problem

Due to their interactive nature, video games can be a difficult medium to engage with based on players' ability to perform certain mental and physical tasks [9]. Despite these inherent difficulties, those who enjoy games are not deterred from playing them because of their disabilities. Instead, they find ways to cope with them [10]. While more and more accessibility options are provided to players, making it easier for diversely abled players to engage with the games, some individuals may not know of these options and may not have a comprehensive way to set them up or use them.

## **Existing Solutions**

Several resources currently exist to aid video game players in finding accessibility options and implementing them into their game play. These include:

The National Library Service (NLS) provides a trove of resources for people with both temporary and permanent visual impairment. The video gaming accessibility page provides an extensive list of game-accessible websites. However, though the NLS highlights noteworthy resources on disabilities, it does not address several underlying issues. NLS does not provide assistance to mitigate the difficulties encountered by this large segment of the gaming population. Approximately ninety-two percent of people

with impairments play video games despite difficulties. [10] NLS does not provide assistance to mitigate the difficulties encountered by this large segment of the gaming population. DeltaGamer addresses these issues by providing accessible game design patterns and tutorials on accessibility settings.

Blind Gamers is a website which, in addition to providing a curated list of games by the website's author, allows users to vote on how accessible games are for the blind. There is also a list of resources for configuring software for us by blind individuals. Though this website is a good resource for those who are blind, it is very specialised and so does not help users with any other types of disabilities. We aim to provide a resource which encompasses a large variety of disabilities, including sight disabilities.

Games for Change is an organisation which promotes game making. A subsection of their website lists resources for developers interested in making their games more accessible. This website is largely focused on making resources available for developers, not for those who play games. We aim to focus more closely on individuals with disabilities who play games, but this could be a good resource for developers.

As a resource for developers, Accessible Games promotes design pattern tools to improve game accessibility. Better yet, developers can gather feedback from players with disabilities. Although beneficial to developers, it lacks the needed resources for player assistance. While the site gives developers extensive guidance on improving game accessibility, it is still uncommon for these features to be integrated into standard gameplay. Players must independently alter accessibility settings to better their game experience. Unfortunately, websites that assist with gaming accommodations are sparse. Worse, games assessed on Accessible Games are works in progress. Hence if they are not eventually released, the majority of user feedback will have little opportunity to come to fruition in the public sphere. For what Accessible Games lacks, DeltaGamer provides. As a platform for players with disabilities, we strive to improve the gameplay experience with the necessary tutorials for both physical devices and software accessibility settings. Our website's main target is the players, not the developers. Users will be able to contribute on the public forum for feedback. By doing so, we not only assist players but foster an inclusive community.

The Family Video Games Database is the closest website to our project we found. This database provides a large variety of resources for finding information about games. The website caters to parents, those looking for game recommendations, and those looking for games with specific accessibility settings. For parents there are articles talking about games. The website hosts an impressive list of games which can be filtered using a large number of settings which cover everything from violence settings to difficulty to UI size. While Family Video Game Database contains a large number of resources for filtering games based on accessibility options, it does not provide resources for configuring settings for these titles or resources for physical devices to make playing games easier. Our project aims to both provide a streamlined list of games which cater to audiences who require specific accessibility options, as well as provide instructions on how to configure them.

#### Research Question

The research question being acted upon is whether it is beneficial to individuals identifying with some impairment, disorder, or disability to have a central location for assistance and resources regarding accessibility settings in gaming software and consoles.

#### **Our Solution**

Upon identifying the issue, we conducted research on existing gaming accessibility resources and advocacy groups, as reflected above. In each of these existing platforms, we were able to identify areas that could be improved upon and made a note of including these components in our website. Aside from our own interpretations of how accessibility has been approached in the gaming industry thus far, we created a questionnaire to gather responses from a variety of individuals. Our survey allowed us to gain further insight on how the community views this topic. The questions in the survey were split into distinct sections concerning the following topics: an individual's general experience with gaming, an individual's disability, impairment, or disorder experience (or lack thereof) within gaming, and the individual's views on accessibility in the gaming industry. From this survey, we garnered 22 unique responses that provided a variety of opinions on the subject. Using this feedback in addition to findings on other, similar projects, we created a prototype of a website that answers the aforementioned research question. This site implements components of existing online community forums to allow collaboration and communication between individuals having shared experiences. From this, a key learning point was that involving users in the content of the site makes it more useful to solving their issues, as they are able to ask exactly what they want as opposed to settling for solutions to similar, but not guite the same problems. Resources and forums are scarce online, and even more so for those pertaining to accessibility and assistance in gaming. Participants in our survey noted this fact and made it apparent that it was one that needed urgent attention - as video gaming is becoming increasingly popular among younger individuals of all backgrounds and abilities. Overall, our team concluded that it was necessary to create a central hub for assistance directed straight to the gamer who needs it as opposed to a site dedicated to commentary or game developer insight on the issue.

## Methodology

The data collection process began with the construction of a questionnaire to distribute to the general public. Within this questionnaire were three distinct sections inquiring about different views of accessibility in the gaming industry. Questions in section one pertained to the individual's overall experience with gaming, asking about preferred gaming genres and console systems, and the amount of time dedicated to playing video games. The following section incorporated questions regarding personal

experiences with impairments, disorders, and disabilities as it relates to the gaming experience. These prompts let the user supply any information about their disability identity and how they are affected in terms of gaming ability. The final section of the questionnaire solicits individual opinions on how the gaming industry is performing in terms of how well developers incorporate accessibility features. These prompts are an opportunity for respondents to give open-ended answers and suggestions as to what they would like to see in the future. It also asks individuals where their primary resources are for guidance on what accessibility options exist for different gaming platforms and how to implement them.

The survey was distributed as a link to a Google Forms survey via the following means: The Chapman Fowler Engineering School "General" channel. Additionally, the Chapman Disability Services Center was contacted about distributing the survey, an additional professor at Chapman was contacted to solicit her help in distribution, and a post on Reddit subreddit of "/rdisabledgamers" was sent to be reviewed by a moderator, but neither of these methods were effective at distribution, as none received an effective response.

The persons involved in the data collection are assumed to be students ages 18-22 at Chapman University. Because questions regarding the respondent's disability status were included, the questionnaire promised anonymity and no personal demographic information was collected about users. However, this aspect of the questionnaire does allow us to recognize that the majority of persons involved identified with having some form of disability, impairment, or disorder. From the 22 unique responses collected, five people noted some form of cognitive disorder, three had a visual impairment, three had a motor impairment, one individual stated that they are only able to utilize one hand, two people had no disability, and one opted not to disclose that information.

The goal of the questionnaire was to learn about individuals' habits in regards to gaming, and to observe what resources these individuals use to heighten their gaming experience. Responses took the form of multiple choice (with a one answer maximum), multiple select (allowing for multiple answers), as well as open ended questions. Most questions also had the option of 'Other', allowing respondents to provide a unique response if they felt the given answers did not accurately represent their experiences. Responders were not required to answer any questions, therefore some questions did not have a 100% response rate but all 22 responses had at least one question in the survey answered. While this creates scattered information, there was opportunity to answer both qualitative and quantitative data from a diverse group of individuals. A trend was noticed that individuals often use and would like to see improvements in sensory aids in gaming software and consoles, frequently noting the use of subtitles and color scheme alterations.

## Results of the Survey

### **Qualitative Data Analysis**

Question 2.3) Can you provide more detail on how the above disabilities, impairments, or disorders have affected playing video games in general, if you feel comfortable?

There were three responses to this question out of the 22 survey responses. While this number was relatively low, the responses we received were especially useful.

- 1) The first response stated that "insufficient colorblindness filters can make it difficult to discern between teammates' and enemies' names in games like Call of Duty, where the greens and reds are washed out".
- 2) The second response also talks about color blindness, specifically with difficulty distinguishing characters from similarly colored backgrounds, and how ability effects which are red in League of Legends contrasted against green grass is "almost impossible to see".
- 3) An individual who responded that they have one hand stated that "Anytime the mouse and keyboard need to be used together such as running and aiming things get difficult. Remapping to a multibutton mouse helps a lot, but can take a while to set up until I know what stuff in the game is frequently used."

From this we can see that color blindness is an ongoing problem in video game design, and more specifically for games like Call of Duty, some stealth games, and League of Legends. The reason for these games being especially difficult for individuals is due to the fact that colors, intentionally or not, are used to denote key gameplay information for which there are not easy alternatives. There has been a large push in recent years for greater color blindness accessibility, and color blindness settings for UI has gained prominence. This does not seem to be the only problem in these games, because the elements causing difficulty are not UI, but rather directly in the game itself. This is more a problem of *contrast* than a question of *color* itself.

Additionally, one-handed individuals have trouble with games even when using hardware to accommodate for their disability, such as a multi button mouse. Some games require a large quantity of inputs from the player, each with a distinct function. Due to the limited number of inputs accessible to someone with a single hand, this can provide difficulty. Perhaps a solution to this would be to provide additional modifiers for buttons, such that different combinations of buttons correspond to different inputs. An example of this which is commonly used is the "shift" key. Instead of having 52 keyboard buttons with separate buttons for upper and lower case, we have a "shift" key which modifies the type of letter which is typed.

Based on these respondes, visual settings, specifically colorblindness, should be a focus of our website. Additionally, dealing with accessibility features for individuals

with physical disabilities, such as those with the use of only a single hand, is not as easy as simply suggesting an alternative input method.

External color blindness settings, such as system-level settings, because users responded that colorblindness continues to be a problem in certain games.

Question 3.2) Regardless of disability status, are there any accessibility features you use in video games? For example, some gamers enable subtitles even if their hearing is not impaired.

Fourteen of our 22 participants responded to this question. There were some very clear trends in their answers. Firstly, of the 14 responses, 9 users said that they use subtitles when playing video games. Additionally a 10th user indicated that they use a similar textualization feature for converting sound effects specifically to readable on screen text. Our question did make explicit mention of subtitles, so it may have prompted more users to list it, or at least remind users that they use this feature. With subtitles being such a popular feature, game developers should make sure to have a subtitles option when developing their game. We will need to make sure we have information about accessing subtitles on our websites.

The second most common response was the use of color blindness mode with a total of five participants using this feature. Of these five participants, only two of those who use this feature do so due to vision difficulties. The other three reported no visual impairments. They instead said they often use color blindness settings because they prefer these more vibrant colors. Again, the popularity of these features shows us that we will want to devote time to including it on our website.

Every other accessibility feature was only mentioned by one user each. Those listed include less screen shake, screen smoothing, photosensitive mode, and displaying hitboxes. With a larger sample size, it is likely that more users would have reported similar features. Regardless, we will likely dedicate sections of our site to the use and implementation of these features.

Question 3.3) Are there any accessibility features or additional hardware options you would like to see more often in games?

Of our 22 participants, seven responded to this question. Seven unique responses were received, however one was irrelevant to the data as it was 'N/A'. Two of these requested features pertained to visual settings. One participant requested the ability to reduce a game's HUD, or heads up display, defined commonly as first person point of view games where a player's health, ammunition, and other data is displayed. More specifically, this participant said they wanted to achieve a more "cinematic experience", but it could also be useful for those who need help focusing on what is important to gameplay. Another participant requested better color blindness options. This participant suffers from color deficiency and while they currently use the color blindness options in their games, they aren't always sufficient.

One participant requested the ability to modify the size of subtitles. In particular, they cited *The Legend of Zelda: Breath of the Wild* as a game that would be greatly improved by this feature. As so many of our participants already claim to use subtitles, the ability to adjust the size would be very beneficial to a large number of gamers.

The last three contributions all related to physical difficulties. The first participant wanted to see the ability to adjust reactivity for games which require precise and specific button combinations. Our second participant requested the ability to issue in game commands while paused. For example, changing equipped armor while pausing a combat name. This was requested by a participant who specifically had only one hand. Giving them the option to modify this while paused would help them better control their player. Some games already do this, though some seem to consider it "cheating." Having the option for a player to set this themselves would give players the option should it be beneficial to them. Our third participant wanted to see more options for game controllers. While Xbox does have an adaptive controller, most other consoles lack easily available nonstandard controllers.

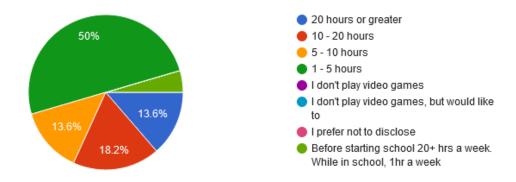
While our website cannot force developers to include these desired features, we are able to bring these ideas to the attention of game designers in hopes of making them more commonplace. By including a suggestions section of our forum, gamers would be able to communicate and discuss ideas and give developers direct access to a community of disabled gamers to help improve their products.

### **Quantitative Data Analysis**

Question 1.1) How many hours per week do you play video games; whether on a PC, a mobile device, or on a dedicated gaming console such as a Playstation, Xbox or Switch?

All 22 unique responses answered the first question. Question 1.1 pertains to the number of hours users play video games per week. The following comprises the data collected: 50% of participants play 1-5 hours, 18.2% play 10-20 hours, 13.6% play 5-10 hours, 13.6% play 20 hours or greater, and no individual said they do not play video games.

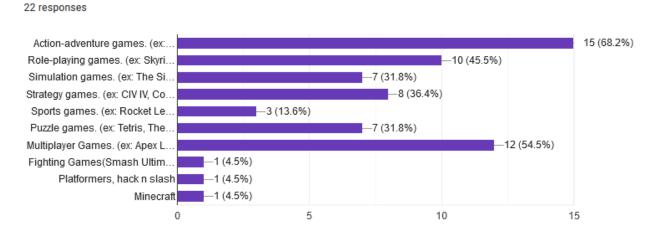
Given that all of the participants play video games, DeltaGamer has achieved its target population. As a representative group, we can gauge the target audience's interest of video gamers and gain valuable information to improve development.



Question 1.2) What genre(s) of video games do you play?

Again, all participants responded to question 1.2. Popular video game genres played by participants are the following: action-adventure constitute 68.2%, 54.5% play multiplayer games, and 45.5% for role-playing games (RPG). Genres that border the popular video game genres are the following: 31.8% play puzzle games while sports games constitute 13.8%. The least popular game genres tied at 4.5% for fighting games, platformers, and other (minecraft).

Given the enormity of games for all genres, DeltaGamer's site should focus on the most popular categories to appeal to the highest number of players. Furthermore, performance is improved by limiting the games stored in the database. Users can effectively use the site without worrying about page delay.

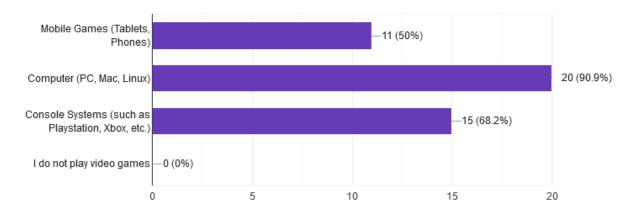


Question 1.3) Select all the devices you use to play video games?

Of the twenty-two participants, twenty-two responded to question 1.3. The most popular device used by participants was the computer (this includes PC, Mac, and

Linux) - a representative sample of 90.9%. Console Systems such as Playstation and Xbox constitute 68.2%, followed by Mobile Games with 50%, and 0% do not play video games. The responses gathered strengthened quantitative/qualitative insights about participants. For instance, the quantitative data highlights most to least used devices. To assist the larger representative pool, the DeltaGamer website can gather more accessibility resources on popular devices.

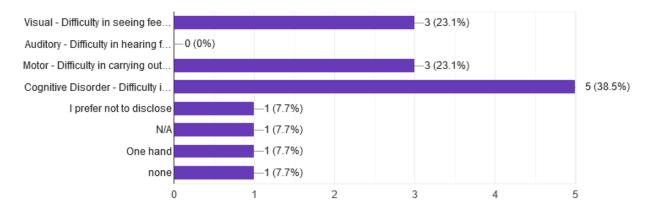
22 responses



Question 2.1) Do you have any of the following disabilities, disorders, or impairments?

Of the 22 participants in the survey, 13 unique responses were gathered for this question regarding personal identification of disability or impairment. Only of these thirteen responses identified with more than one of the options listed. While one individual chose not to disclose any potential disability status and two others expressed that they have no disability, ten of the 22 total respondents identified with the following: visual, motor, cognitive, and physical (due to the ability to only use one hand). Cognitive disorders constitute 50% of participants identifying with a disability, followed by 30% having visual impairments and 30% noting difficulty with motor skills. One participant disclosed that they only have the ability to use one hand. Due to users having the option to select more than one impairment category, we can gain insight regarding video game use for individuals with multiple hindrances.

#### 13 responses



Question 2.2) If you do have any of the above disabilities, impairments, or disorders, how has it affected playing video games in general?

Responses to this question strongly relate to the responses from the previous. Fourteen of the 22 survey respondents interacted with the question. Two participants answered this question that did not answer the previous question inquiring about identification of certain impairments, disorders, disabilities, etc. Similarly, only one respondent to the previous question did not supply an answer to this question. Unlike the previous question, participants were only allowed to select up to one answer. With the option to not disclose any information, only one respondent did not provide insight regarding how their undisclosed impairments affect their gaming experience. Of all answers, approximately 35% stated that they are able to play video games, but with minor difficulty. However, the next most common answers showed that 28% of individuals had no difficulty to begin with, and another 21% had no difficulty due to the use of already existing features. Half of the participants noting no difficulty whatsoever identified with having cognitive disorders, while others with visual or motor impairments noted increasing difficulty in their game play.

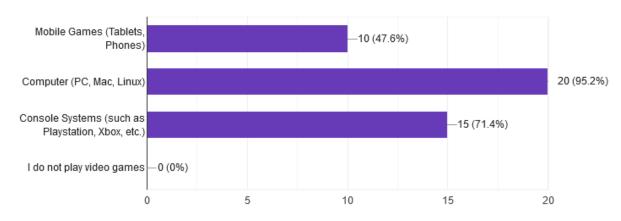


Question 3.1) Which of these devices are you aware of accessibility features for?

There were 21 responses to this question, out of the 22 total responses to the survey. This may be because one individual was not aware of accessibility features on any platform, but the results assume that this user did not engage with the question whatsoever. This may have skewed the results slightly, but we have no way of verifying if that is the case.

By far the largest section of accessibility known are Computers (PC, Mac, Linux) at 95.2%. The second most commonly known was Console Systems at 71.4%. Finally, the least known is Mobile Game accessibility, with 47.6%% of users being aware of accessibility features. Because less than 50% of users are aware of accessibility features on mobile devices, this tells us that of these devices, we would have the most effect if we focused on highlighting the accessibility features of mobile devices. It may still be useful to highlight accessibility features of consoles, as 71.4% of individuals responded that they were aware of these features.

#### 21 responses



Question 3.4) Where do you seek resources for gaming accessibility?

This question allowed for participants to select more than one of the supplied responses or enter their own. Twenty unique responses were acquired for this question. Individuals responding to this question were able to answer using the options provided, and no uniquely created responses were made by responders in the absence of a sufficient answer. The majority of individuals, 70% of those responding to this question, stated that they seek gaming accessibility resources from online forums and in-game settings. In-game settings describe any guidance to accessibility features within the game itself, while forums could take the form of Facebook groups, StackOverflow threads, Reddit forums, etc. Similar to the use of online forums, the next largest category, resonating with 55% of respondents specific to this question, was the use of web articles as a resource. The smallest subgroup of resource use was word of mouth help, receiving a smaller 25% of respondent identification. It should be noted that of the 20 unique responses, only six selected a single option. The majority of individuals in the

survey seek gaming accessibility information from a wide range of resources in both the physical and digital world. Very few respondents use only one source of information for help in navigating gaming accessibility.

#### **Evaluation**

## **Usability Evaluation**

Users completed creating a post using DeltaGamer's interactive wireframe. Users were encouraged to speak their thoughts during the test including what they liked, displiked and struggled with. This feedback was collected to improve the design's flow. There were several portions the users had some level of confusion with, so we improved these sections immediately following user feedback. Various points were as follows, which combine both the feedback from our work as the revisions we made to the website's design:

- Participants had trouble with the apply filter step because they were required to click the "x" in the top right in order to apply the filters, which seemed couter-intuitive with the concept of applying filters. Because only an exit option was displayed, this left users uncertain if the filters were updated.
  - To remedy this confusion, we added an apply button in addition to the "x" button to reinforce that the filters were being applied correctly.
- Users were somewhat confused by the last page which appeared to be a single defined section instead of a scrollable page.
  - To highlight the fact that the user could scroll down, we added a scroll bar to the side of the page and changed the page content such that it appeared incomplete, suggesting that the user could scroll downward.
- Lastly, we observed that users were uncertain whether or not they had successfully made a post to the discussion board on the final page.
  - We revised the design to update the comments queue with the user's new post, showing that the action had been done successfully.

With these revisions, the third user navigated the prototype with ease. Better yet, the user had no trouble completing the task.

## Discussion of Future Works and Limitations

From our research we have seen that there doesn't yet exist a website like what we have proposed for Delta Gamer. To continue with this work, both a design for the overall website, as well as a way of creating it, would need to be established. To make such a website viable, there would need to be a way to create and manage such a large

database of website information. One such website which already exists and has some of the functionality proposed in the Delta Gamer website is the Family Video Game Database, as discussed previously. The Family Video Game Database already provides a database of games which is searchable by tags, as well as a general page for each game with a brief description. If this website were to incorporate features proposed for Delta Gamer, such as a list of accessibility articles relating to each game, as well as a platform to discuss games and articles, then the Family Video Game Database would be largely equivalent to what has been proposed for Delta Gamer. The Family Game Database is, as the name suggests, aimed at families looking to choose games. Because of this, a solution which may work better than retooling the website would be to use the Family Video Game Database's existing catalogue in a distinct new website in order to grow out the overall features and specialize in accessibility features rather than the website's current audience.

### Conclusion

Delta Gamer started simply is a website to help give gamers with disabilities a place to find resources on ways to customize their gaming experience to their own bodies, abilities, and personal tastes. We started by looking at other similar websites to see if our idea was in fact something the video gaming community needed. We found that while there are some websites out there, Delta Gamer would be a beneficial tool for users. Our survey revealed what we should focus on; primarily visual and audio disabilities. It also showed us that though this website was designed for gamers with disabilities, all gamers may want to have access to this type of information as a way to personalize the game. Our first prototypes helped us to determine the layout of our website. Later revisions lead us to creating our first Figma model. While we thought this version was good, user testing helped us realize that it could still use some improvements. We've tweaked our design to make Delta Gamer the best site it could be.

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# **Appendices**

- Link to survey results.
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- Link to Survey
  - https://docs.google.com/forms/d/1x8BDxuke7TT6Yoh15ZsEZbsfCkXFNLp ZLEbpWiX9D3M/edit
- Link to Figma Demo
  - https://www.figma.com/proto/U0dczpGPcJk7WYoSmAcYEL/%F0%9F%94 %BA-Delta-Gamers-team-library?node-id=1%3A2&scaling=min-zoom&pa ge-id=0%3A1&starting-point-node-id=1%3A2&show-proto-sidebar=1