O B S E R V R

Interdisciplinary Senior Project ENGR 460/Bus 464

California Polytechnic State University San Luis Obispo, CA USA

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Contents

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1 Introduction

1.1 Executive Summary

According to Superdata Digital Market Research, investors have poured more than $6 billion into the virtual reality market in the last three years, mostly to catalyze application development for virtual reality gaming. In the last decade, watching live streams of other gamers playing video games has skyrocketed, with the world's largest esports streaming platform Twitch.tv receiving 53 million unique visitors daily. ObserVR intends to package these technologies and change the way users watch multiple 2D video streams in an immersive 3D environment. By accessing our service, a user can embed URLs for existing video streams through our online application and then launch a motion controlled multi-screen view within their virtual reality headset. By utilizing existing 2D content, our service is changing the current viewing experience by eliminating the hassle of manually changing web browser tabs and offering a way to become your own producer by choosing what camera angles you want to watch at any given time. By providing this service in three dimensions, we are able to bring benefits to each user that current technology does not allow. These benefits include saving time, decreasing hardware space, and providing a community base while enhancing current viewing methods. While most of the technology's early adopters are gamers, virtual reality devices are expected to become the next household entertainment standard, meaning that the applications for this technology beyond gaming are boundless.

To meet our customers' needs, we will be building an online application that allows users to incorporate any available online video stream into our interface and create a customized viewing layout. Our initial interface will support up to four streams at any one time. By allowing users to embed and launch personally selected content, we are decreasing the amount of behavioral change needed for user adoption. We plan to include the ability to select content directly through our application dashboard, providing a library of all online streamable content.

Partnerships are a key part of our business, and they will help us expand in the future. By partnering up with companies such as Twitch and Riot Games and other major content providers, we hope to become part of a service that can be offered during streamed events to enhance their viewing experience. We think that VR is going to be a frontrunner in the entertainment industry in the near future, and expanding our reach will be integral to successful company growth.

1.2 Background

Essential to the success of our project, is the creation of a multi-viewing platform that enhances one's current viewing experience. Ultimately, our goal is to project this environment within a virtual reality device to maximize one's viewing capabilities. Therefore, the progress of companies such as Oculus, HTC, and Samsung are vital to our own venture into the virtual reality space. However, if VR does not receive user adoption, we can alter our offering to capture a similar audience on existing devices such as computers or tablets. This would include utilizing our stitching software, however a user would watch via their current monitor and control the layout with their mouse. A similar value proposition persists if we are forced to change directions from multiple views in a VR space to just a computer monitor. A user will still be able to choose multiple views and alter their layout to create an optimal viewing experience. Our primary offering is allowing viewers to become their own producers of what they are watching. Also pertinent to our goals is the work of other companies concerning sports in virtual reality, such as the work of two leaders in the space: NextVR and LiveLike VR.

Additionally, the ability to transcode streams from their original format into .ogg format or any other format that is readable in VR is a determinant of our advancement. By constructing this flow and having it performed on "the cloud" rather than the user's individual computer will allow us to expand into other fields of interest. This procedure is potentially patentable and will allow us to shield ourselves from early competitors in this space.

While Oculus has been leading the pack in hardware development for virtual reality, many other companies have also been making strides in the same space. The HTC Vive

is a developer prototype headset made in collaboration with game publisher Steam, recently available to the public for $800. Samsung currently provides a headset accessory for a subset of their phones that allows the user to have a virtual reality experience with limited quality, but at the lowest price of $99. Sony is the newest player in the market, creating a VR device to pair with their PS4 console. They are targeting the gaming market, bundling the features of the Playstation to integrate VR into actual gameplay. As a whole, it is estimated that throughout 2016, Samsung will sell 5 million Gear VRs, Facebook will sell 3.6 million Rifts, HTC will sell 2.1 million Vives, and Sony will sell 1.4 million PlayStation VRs. Looking further ahead, market leading investors believe that annual sales of VR headsets could reach *half a billion* by 2025 and the market as a whole to be worth $30 billion by 2020. By tracking the progress of these and more companies, we determined virtual reality would be a promising avenue to pursue as interest in the technology from both consumers and content producers has rapidly grown.

To further support our claim that sports in the virtual reality space will be successful, we looked into other companies that have been innovating in this industry. The first competitor we researched, NextVR, has become a forerunner in virtual sports viewing through many patents and various applications. Their main offering currently places multiple wide angle cameras in a stationary position on a sports field, allowing viewers to immerse themselves in the sporting event like never before. Next, we researched LiveLike VR. They are bringing fans into sporting events through wide angle views of stadiums paired with existing broadcasts to emulate a "box seat" experience at a real game. They have partnered with multiple international sports teams to create unique offerings for viewers, but do not enable users to create their own experience using existing content streams. While these companies are working in the same domain, we feel that they are integrating newly captured video in non-native formats, ultra wide. Because they have to focus on capturing new video formats as well as integrate into a new technology, user adoption and growth will be a slow process.

Finally, we researched Oculus Social, whom we determined to be our closest competition. This is a social application in production by the Oculus team. They have created an environment where a user can create public and/or private rooms with friends. In a room, users can watch Twitch or Vimeo streams in a room with people they know. Currently, you are only able to watch one video at a time with no control over the layout. The video is projected at one size in a virtual room. Therefore, while we plan to watch their progress closely as a useful benchmark, we hope to surpass their service in terms of customization and content selection.

Due to the recent innovations and increased interest in virtual reality technology, we have come to the conclusion that it will be a viable space for applications to succeed in the coming years. As such, we have decided to enter the industry by becoming a platform which provides viewers with the ability to stream 2D content in a 3D space.

2 Customer Development

Each interview helped us gain insights to the behaviors of our potential customers. The current behavior we found for most of our customers is that they watched esports for both the entertainment and learning value. These two aspects make them consistently focus on gameplay, rather than viewing content as peripheral entertainment. The biggest change we made to our business model canvas came when we realized that when users are in the virtual reality environment, they aren't necessarily looking for a social experience. We were hoping to bring in a social voice or text chat feature so that we might be able to mimic the experience of physically attending an esports tournament, but what we found was that when users watch esports at home, they rarely watch with friends (online or in the same room) and they almost always avoid the general chat that runs alongside the streaming video.

During numerous customer interviews, users expressed that they would like the ability to get a "big picture" overview of the game statistics while they were watching, as well as a replay function so that they can truly be their own director. Because of this, we have added a key partner to our business model canvas, Overwolf. Overwolf is a third party company that provides current professional streamers with overlay data. These include statistics, maps, and instant replay functions. By integrating such functionality we hope to increase the level of emersion a viewer feels while using our application

Finally, one major concern for our team is the hefty price tag on currently available VR devices. Most of our interviewees mentioned that they are excited about the future of virtual reality, but right now the technology is unproven and far too costly. Currently our users do not incur any costs with watching esports and most of them wouldn't consider spending more than $200 on a VR device unless they could physically try it prior to purchase. This is possibly due to our initial sample size consisting of college students with minimal disposable income.

See appendix C for summaries of all customer interviews.

3 Formal Product Definition

Our product will be defined by its ability to create a multi-screen viewing experience that is of better quality than a user's current method of watching video streams. Due to the complexity of creating an environment that does not currently exist, each user needs to see the apparent benefit in the early stages of creation. As we spoke to our initial customer base, we were able to highlight key characteristics within their current viewing routine that pinpointed necessary components for our system. The three key findings were the number of streams/additional content that they follow at any one time, the quality of each of their streaming sources, and an overarching dilemma with the number of tabs present. Analyzing the core of each customer's

problem, we have developed nine specifications that need to be met in order to satisfy our customer and create a product that is noticeably better than the current on screen solution.

See Appendix B for complete requirement specification table.

Specification #1

This specification is targeting the user's true need. It was apparent that a user tends to follow multiple streamer's at any one time throughout their viewing experience. By providing multiple screens, a user eliminates the pain of toggling through tabs, and is able to be fully immersed in an environment with multiple screens. Additionally, through customer development we concluded that a user tends to track no more than four activities at any one time. As a result to these findings, we have limited our product to display one to four screens.

Specification #2 & 3

A commonality amongst most of our initial interviews was that high quality is a requirement in the streaming community. In order to satisfy viewers, the quality of each stream needs to be in the highest possible quality available online. By presenting the main focal point screens in higher resolution, and adjacent screens in a decreased value, we are able to decrease the overall processing power for their computer. When a user pivots to view an adjacent screen, quality will be reinstated to maximum resolution. Our customer has a high standard of top quality, making it a requirement that the screen in view equals or exceeds 1080p. If we are unable to meet viewers' expectations, they will not adopt our experience.

Specification #4

This specification is regarding the overall ability to utilize our application on a user's existing hardware. Because of the large amount of processing power needed to stream multiple assets, the user must have adequate hardware specifications; however, we do not want to overload their computer in such a way that it becomes a hassle to use. By limiting our use of RAM, we can decrease our application's likelihood to hinder other applications performance. This requirement must be tested throughout development in order to minimize necessary memory usage in order to achieve user acceptance once produced. This specification can be eliminated if we choose to run our application through firefox's new VR web application. By integrating our application through soly a web server, we can eliminate local storage and focus on bandwidth requirements.

Specification #5

This specification is regarding the overall RAM used by our application when a user is streaming the maximum number of screens. Because most virtual reality hardware devices recommend that the user has six to eight gigabytes of ram to properly run the device and its supporting applications, we feel that our users will have adequate hardware to support our two

gigabyte requirement. We will be testing this requirement by streaming four 4K video streams and analysing the ram usage of our application.

Specification #6

The number of concurrent users is important for two separate aspects, first needing to support enough users during peak hours and second needing to support enough users to generate traffic at a high enough volume to generate advertising revenue. We have drawn the conclusion that during early stages of adoption, we can expect no more than one percent of twitch users to purchase a virtual reality device and change their viewing methods. For this reason we have set our initial number at 10,000 users. While this is not enough users to generate significant revenue upfront, we feel that it is a large enough sample size to test feature sets as the market expands.

Specification #7

In order to satisfy our customer base, we need to match the resolution rates that is being outputted by the stream provider. For example, if a stream is embedded with a resolution of 4K, we need to replicate that resolution inside of our application. To test this requirement we will be embedding various streams with resolutions varying from 720p to 4K. Once in our application, we will test the compressed resolution rate and compare to verify no change.

Specification #8

Because our application does have a web based component and user accounts, we need to meet the security standard of SSL compliance. Once we integrate a secure layer, we will be verifying our security by running a test provided by https://www.ssllabs.com/. By achieving a grade of A- or better, we feel that a user's information is safe within our application.

Specification #9

To broaden the usability of our application, support is necessary on the top three most popular internet browsers, Chrome, Firefox, and Safari. By increasing the amount of available browser options, we feel our user base is more likely to grow. This is important because we are already changing user behavior drastically. Our goal is to create an environment that has no barriers to entry, making it one step easier for users to adopt this new viewing method. We will test compliance by running our application on all three web browsers to make sure functionality is as expected. This is a pass or fail requirement.

3.1 User Stories

Additionally, we have created user stories to outline the most basic user actions to build, launch, and watch our experience. Customer requirements outline an application

that not only views a quality stream, but also does it in a simple manner. By highlighting these three processes, we can perfect how the user inputs streams into our web application in addition to how one views selected streams. First, we want to limit the time and number of clicks it will take a user to open and launch their viewing experience. Additionally, we are focusing on how a user views multiple screens with the headset on. This set of stories is dependent on how the viewing layout rotates to make sure a user's neck is not manipulated at an uncomfortable angle. By maximizing these stories we can guarantee to meet all customer requirements for initial testing and early adoption.

- As a first time user, I want the ability to choose between making an account or browsing as a guest, so that I can immediately start using it if I choose.
    - Acceptance Criteria:
        - Easily choose between account/guest modes
        - I'm brought to the web app home screen if I choose to not make an account
- As a first time user, I want the ability to make an account, so that I may save the channels that I enjoy watching for easy access
    - Acceptance Criteria:
        - Ability to create username and password
        - Validate email
        - Validate hardware specifications of user
    - Definition of Done:
        - All required user information correctly entered
        - Email is validated by responding to email sent to inbox
- As a user with an account, I want to see the streams that I watch most often, so that I can quickly start watching
    - Acceptance Criteria:
        - Immediately after logging in, my favorite streams are on my dashboard
- As a user, I want to be able to search for content using the built in search field, so that I can find the games/streamers/content that most interests me
    - Acceptance Criteria
        - A textbox on the dashboard can be easily filled so that I can search for exactly what I want
        - The search request gives results from several different media outlets, including Twitch, YouTube and more
- As a user, I also want to be able to find a link elsewhere on the internet, and copy the link into the textbox so that I can watch whatever I want in the headset
    - Acceptance Criteria:
        - Any streaming video on the internet with a shareable link can be loaded into the headset

- As a user, I want to be able to load one to four video streams to a web page to preview the layout, so that I can watch multiple game streams at the same time
    - Acceptance Criteria:
        - Accept up to 4 live streaming videos and play them back simultaneously, in the same quality the original stream is being delivered in
        - Validate that all content is playing correctly before loading into headset
- As a user, I can launch the content into the headset with the click of a button, so that I can start watching right away
    - Acceptance Criteria:
        - The content loads into the headset in less than 10 sec
- As a user wearing the VR device, I want to be able to control the entire experience without taking off the headset or using my mouse and keyboard
    - Acceptance Criteria:
        - I can turn my head to direct my gaze at a certain video, and that video becomes the 'primary video'
        - When holding gaze on a video for a few seconds, that video becomes the largest in the view, and the audio from the other videos fades out
        - I refresh the feed by tapping the device
        - My head movements control which views take over the view
- As a user wearing the VR device, I can take off the headset and automatically return to the dashboard, so that I can quickly leave the experience
    - Acceptance Criteria:
        - Taking off the headset wakes the computer screen and returns you to the layout view so you can quit the application or change the content

4 Design Development

4.1 Initial Design

The application will consist of a web-based component and a VR-based component. Users will need to create an account online in order to save and synchronize their preferences with the VR application.The website interface is used to create and customize the layouts that are then viewable in the VR application. After selecting your desired content online, a user will "launch" their self curated channel to activate the streams in virtual reality.

4.2 Website Interface

The primary function of the website is to allow the user to easily setup and modify their personalized content that will be viewed using the VR device. We determined that this is an essential component of our product because doing the setup from a web interface would be easier than setup from within the virtual reality environment. In addition, after users have completed their layout and setting customizations from the website, they

would be able to pick up their device and use it without the clutter of additional dialogs or settings, providing a cleaner user experience.

The website would include the ability to add, edit, and delete layouts - layouts are composed of screen configurations including number of screens, user-selected content for each screen, screen positions, and audio settings. Within each layout, the user will be able to add and remove their content. For adding video streams, a user has two options: the first is a search bar that would let users type in keywords to search for available video from a selection of providers, and the second is allowing the user to copy and paste a direct link to the video for supported providers. We have not made any design decisions on how to implement adding social media and statistics widgets.
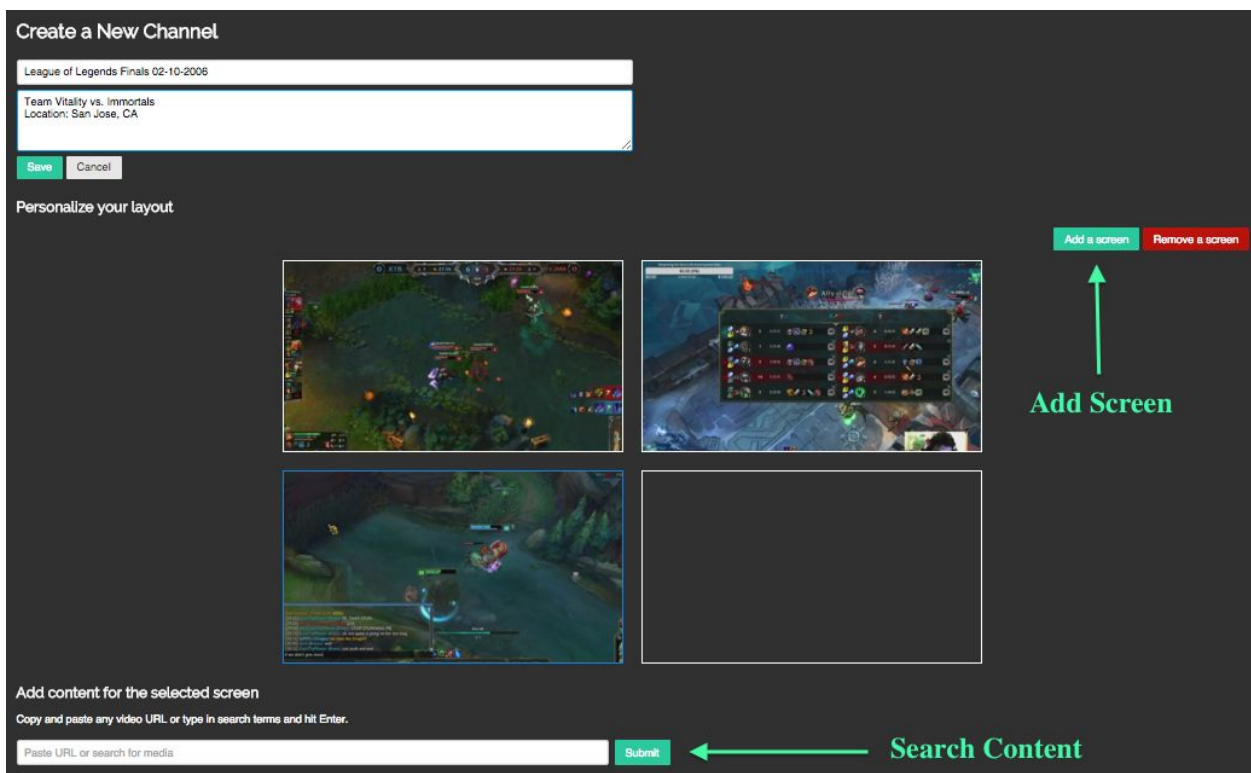
4.3 Virtual Reality Interface

The virtual reality application will be used to view the screens that the user has configured from the website. After logging in with a user's account, there will be a simple layout selection upon application startup based on the user's options. The user can start watching based on their selection, which we'll refer to as the viewing mode.

While in viewing mode, the user can turn their head to indicate which screen they are actively paying attention to, and the application will recognize this as the "active" screen. This screen will adjust its volume to be the primary audio source by default (audio settings can be customized from the layout settings on the website). The screen

placement will change based on the "active" setting, to position the dominant screen in a central location. This will create a comfortable viewing angle, keeping the viewing experience consistent with a viewer's current viewing angle.

5 Revenue Streams

In the next ten years virtual reality is expected to be utilized in healthcare, education, tourism, military training, and of course, advertisement. Advertisement in VR will be unlike any other, because it puts the user in the actual environment. If recent search history tells an ad giant like Google AdWords that a consumer is looking for a new pickup, then an advertisement that puts them in the seat of a new Ford F150 can be cast into their headset before their content loads. Most of the VR content we have seen thus far is either video games or films. Many of them are even free to play, yet no one is taking advantage of the fact that consumers are putting themselves in a new world. For a few seconds before the content loads, that world could be the showroom of your neighborhood Ford dealership. After all, consumers are 144% more likely to make a purchase of a product after watching a regular 2D video of that product in action. If the user could interact with the product as if it were in their living room, conversion rates would expect to increase.

YouTube receives about 10 cents per 1000 views on their rollout ads (ads that play before the video starts) for standard definition videos. We would add a premium for advertising in our VR space because it takes more processing power to deliver content into a virtual reality environment. One ad would play when the application is launched and then another when the

game finishes. Not only would products be advertised, but there is no better way to advertise a virtual reality experience like a game, movie, or training application than in the VR headset.

Another consideration would be to enter an exclusive licensing agreement with some of the major players in the entertainment space. By partnering with the broadcasters who distribute sports content, we can couple our service with current premium packages such as NFL RedZone, MLB Extra Innings, NHL Center Ice, or any other multi-screen offering. This means customers who already pay for this service would receive access to our virtual reality application through the partnered broadcaster, allowing them to enjoy their premium content on a whole new level. This is more of a long-term strategy, as these partnerships will likely require much discussion and evidence that we can provide this service reliably to customers.

6 Team Development

Our team of six has been working cohesively to bring our product to market. We have integrated an agile development method, utilizing fast development phase to generate prototypes of both the web and virtual applications. We have seen more forward progress using this method because all four developers are accountable on a quicker turnaround period. Since our last design sprint we have focused heavily on completing our landing web page and supporting content. The virtual reality application has made forward progress as well, integrating head tracking capabilities and a new three dimensional living room. We are still working to connect the web application to the virtual application.

A major key to our success has been having team members who fall within our target market. Being gamers and game enthusiasts has been a key asset for customer development and general knowledge about the esports industry as a whole. We plan to continue our customer development within the college esports market. With many college campuses expanding their involvement within this space, we feel that college level competitions will be an excellent place for product testing and industry viability.

In the last three months we have participated in a number of events to help move our idea forward. Last month, our team presented in front of a panel of sixteen judges in a competition called Innovation Quest. Teams were judged on the innovation of the idea and viability in the market place. We ended up placing third in the final round of twelve teams. Going through the process of Innovation Quest was immensely helpful for us because it allowed us to really refine what it is we're doing and practice our pitch. We also gained a fresh perspective from outside judges to reevaluate our direction. Shortly after Innovation Quest, we applied for the SLO Hothouse Accelerator program and were accepted into this summer's cohort. This summer, we will devote thirteen weeks of hard work to grow and launch our business.
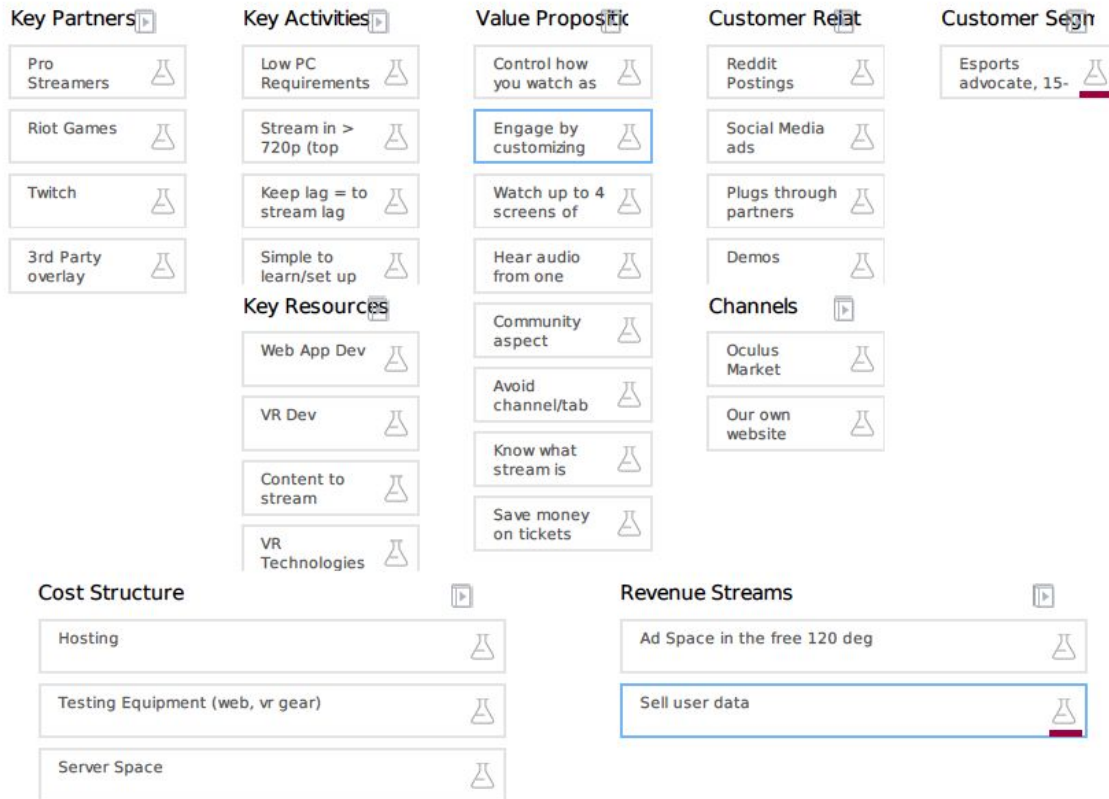
Appendices

Appendix A: BMC Evolution

Final Business Model Canvas - March 14, 2016

Key Partners	Key Activities	Value Proposition	Customer Relationship	Customer Segment
-Pro Streamers -Riot Games -Twitch -Overwolf	-Low PC Requirements -Stream in >720p -Keep lag = to stream lag -Simple to set up -Offer streams for best/most popular games **Key Resources** -Web app dev -VR Dev -Content to stream -VR Tech to test our platform -Streaming expert -Backend Dev	-Control how you watch as your own director -Engage by choosing your own viewing layout to focus on the most interesting content -Watch up to 4 screens of selected content -Hear audio selectively -Avoid channel/tab change -Know what's most popular -Save money on event tickets	-Reddit postings -Social media ads -Plugs through partners -Demos -Ads on Twitch -Oculus market ads **Channels** -Oculus market -ObserVR website	-eSports advocate, 15-30 years old, plays console/PC games 20+ hrs/week, tracks professional gamer's careers, tech enthusiast

Cost Structure	Revenue Stream
-Hosting -Testing equipment -Server space -Promotions -Conversation plug-in	-Ad space in the free 120 degrees -Advertising for other VR experiences (games/films) as feed loads up -Seller user data

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Appendix B: Design Requirements

Spec. #	Parameter Description	Requirement or Target with Unit	Tolerance	Risk	Compliance
1	Maximum viewable/projected screens	4	1-4 views	Low	T,A
2	Stream Resolution for main view	1080p minimum	1080p-max possible	Med	T, A
3	Stream Resolution for alternative views	720p minimum	720p-max possible	Med	A
4	Stream Rate	30 FPS	Minimum	Med	T
5	Ram used by application	At most 2GB of memory	+/- .5 GB	High	T, A
6	Number of Concurrent Users	10,000*	+/- 500	Low	A
7	Content provider stream resolution	1080p minimum	1080p - 4k	Med	T, A
8	Application Security	SSL Compliant	Receive an A- score at a minimum	High	T
9	Application supported on Chrome, Firefox, and Safari	Application must run on Chrome (49.0.2623.110) Firefox (45.0.1), Safari (9.1).	Minimum	Med	T

* Number based off of Twitch peak hour concurrent user base. We are assuming 1 in every 125 users have an Oculus and are choosing to watch Twitch streams via our app at peak hours.

Appendix C: Customer Interviews

Date	Name	MVP 1		MVP 2		Preferable Search Method	Number of Screens Preferable	Key takeaways
		Yes	No	Yes	No			
11/12/2015	Will Tran		X		X	N/A	N/A	Dota2 player. Showes loyality to only one game. Would not pay for additional products becasue everythign is free online. Gave a general idea of a typical customer archetype for our product.
11/12/2015	Matthew Stewart		X		X	N/A	N/A	Esports is a mostly free-to-watch form of entertainment if you're just enjoying them at home. If we could create a more immersive and social experience at home, that could be an alternative to attending a live event. Since we have been interviewing college students, they are probably less likely to be willing to pay for premium services. However, if the cost was relatively low and there was a real benefit, they would be willing to pay a little extra for a better viewing experience. VR devices are also still relatively new and not in the consumer market so they have yet to be proven to be worth the cost.
11/14/2015	Nathan Lemay		X		X	N/A	N/A	Amateur/pro esports for 6-7 yrs, not currently an active competitor. Watches pro League almost every day, have stream open on tab 2-3h per day. Curent method of watching is Twitch, Stats on Riot. No cost incurred to watch. Feels that the community is growing at live events. Doesnt see LOL and VR being able to create VR game but entertainment posibility.
11/15/201	Gunner Johnson		X		X	N/A	N/A	The amount of information that he follows on a "game day" (usually sunday) at any one time is no more than 4 aspects of a sport. There did not seem to be a need for displaying more information than his true needs. Even though he participates in multiple fantasy leagues, sporting statistics change infrequent enough that checking stats using his current methods (mainly ESPN app) is not a pain. Because you pick a line up and cannot change your fantasy team once the game has started, watching minute by minute score breakdown was an insignificant problem
11/15/201	Braden Chase		X		X	N/A	N/A	The community aspect to sports fuels the passion. The concept of "it is an event" and to share the experience is key. A sports enthusiast has the most commitment to watching "their" team over anything else. This plays a huge roll in being ones own director because he loves the "red zone" concept but wants the most % of time spent watching his team regardless of their field position.
11/16/201	Robel Berhane		X		X	N/A	N/A	So here, I noticed that the cons and pros of both going to a live event and staying at home were similar to previous interview. The big issue with going to a live event was no convenience and the big issue of watching it at home was not a good social experience(cheers, support for same team, get a community experience). Now, we may think about integrating the community experience in our product. Robel also mentioned that he didn't pay for any sorts of esports subscriptions. He mentioned in the interview that he may pay a small amount for quality content but if costs were to high (don't know approximation), he wouldn't be interested.
11/20/201	Dennis Wong		X		X	N/A	N/A	LOL club prez. Watches LoL Regular season (Jan-Aug), every weekend. Live streams on Twitch, Azubu, YouTube Riot better for non-live because they split the games into individual videos on YouTube. Prefer going to live event, experience is worth it, but travel and ticket cost increasing.
11/22/201	Ryan Askew		X		X	N/A	N/A	eSports streams once a day one to two hours. Majority of his sporting hours allocated to playing. . eSports - some interaction with others in person. Loves reading Twitch comments during live stream. Spends no money on current esports model. Uses lolesports.com aswell

Date	Name	C1	C2	C3	Method	Screens	Rating	Notes
11/22/201	Nathan Wicka	X		X	N/A	N/A		The key insight that I got from this interview was that the main problem with streaming in general is that they are not always the best quality; streams lag with increased number of viewers and it's hard to find streams that are enjoyable to watch for a long period of time. Aggregating streams in a VR experience will not change that.
11/22/201	Jonathon Elfar	X		X	N/A	N/A		The key insight we got from this interview was that there are no real cons to watching sporting events at home. Our interviewee said that the pros of going to a sporting event were mainly that it was cool being in a fun environment and actually seeing players you follow is cool. With our VR experience, our goal is to mimic the experience of being at a live event while still having all the benefits and convenience of being at home.
1/27/2016	Garrett Morgan	x		x	Search	3 to 4		LOL twitch is perfered game to stream. Streams to learn when to tired to play. Entertainment + learning value. Search function allows for ease of use/convinience. Wouldnt use copy and paste. 2 to 3 screens with actin 1 to 2 with suplemental features.
1/27/2016	Bradd D	x		x	Search	4 to 5. 5 is tolerable with suplemental		Watches more than he plays. Main interest is to learn from people that are better than him. Entertainment. Liked the search function integration. Expects both live and past content. Follows statistics so multiple screens with additional information is an advantage.
1/27/2016	Matthew Stewart	x		x	Search	4, Rows of 2		Search over copy and paste. Both useful. Expected more media sources (youtube, Azuba). Enter should resut in search. Viewing multiple screens is not better than current method because of lag. Tournament play is of interest.
2/1/2016	Wyatt	x		x	Search	4 max, 2-3 idealy		Definitely include both, search feature worked both. Interface similar to twitch would definitely would incline to use Search. #of viewers is an important feature. Top 10 games being played etc. Twitch offers feature streams and would like it if we had a similar feature. It keeps him coming to the front page to check for different content. Add Azubu and Hitbox. 4 Maximum, 2-3 ideal, Two different games instead of the same game, Multview with one primary and others in side. Focus on one with others used as support
2/3/2016	Jo	x		x	Search + URL		4	Plays, watches, and attends. Follows CSGo and LOL. Watches for personality and level of play. Would perfer more content to search for (youtube). Search allows for a quicker process. Does not have bookmarks. Would watch seqmented screens.
2/3/2016	Owen	x		x	Search		3	Watches LCS, LCK, championships for CS:GO, PAX, play League, more involved in following scene. Follows a variety of streams on Twitch, 85% League, some CS:GO, Clash of Clans, H1Z1 (specific player). Would want more content to search directly on sight. Sees advantages with tournament lay with multiple views for one game.
2/7/2016	Brian Hardy	x		x	Search		4	Mix of windows to view both CSGo and other top rated streams. Only watches for fun. Usually as background distraction rather than comitted entertainment. Needs to have sugustions and top rated streams for quick access. Uses twitch as a way to watch new games, without their top rated, wouldnt know what to watch.
2/8/2016	Tyler Garing	x		x	Search	5 to 6		Past functin brings reassurance that I could implement anything. Rather use search for convinience. Needs to relay same layout as twitch for user adoption. If tournament play could be brodcasted in multiple views, 4/5 action. 2/3 suplemental.
2/8/2016	Sean R.	X		X	Search		2	Was difficult to switch focuse enought to make multiple screens worth while. Supplemental windows would assist with multiple action windows. A larger map during tournament play.Categories to segment each game on the seach page would help visualize the concept. Copy and paste would be last resort.
2/8/2016	Matt T	X		X	Search + URL	4 to 5		Two screens with action. Would use it for complementing windows. More applicable for tournament play. Additional window with features that don't exist (stats, ghost view, non-riot commentary)

Date	Name	C1	C2	C3	C4	Method	Rating	Notes
2/8/2016	Grant Wensley	X			X	Search	1	Watches twitch streams while doing hw, bored, entertainment. Usually secondary sourch of action. Selects top filtered options on twitch or searches highlights on youtube. Only used search function. Toggled between 1-3 screens. Feels that if he is going to fully emerse, there needs to be a "decent" amount of content but it is difficult to focus on so much action
2/8/2016	Jono Keedy	X			X	Search	4	Plays more than he watches, but when he watches it is to kill time and maybe learn something. Entertainment + Knowledge. Rather search directly on the application if all content is there. "Would probably just watch twitch if I had to go there first." Multiple screens would be a good learning advantage to get rid of down time. Secondary material would be helpful duting LCS events and tournament play.
2/9/2016	Drew Rider	X			X	Search	1	Watches when he doesn't have much time, but sits down to watch LCS events on the weekend. Has favorite players that he follows, and searches for by name to see how they play. Often watches instructional YouTube video recordings of games with commentary from player overlayed. Did not like having to focus on more than one screen at a time. For him it's about learning.
2/9/2016	Alex Talbott	X			X	Search	2	Would likely watch with more than one screen if the content was from the same game/ offered something new. Did not like the idea of watching two games at once. Views when he doesn't have enough time to play. Preferred search because of convenience.
2/9/2016	Shane Colvard	X			X	Search	4	Watches primarily CSGO, no LoL. Watches for giveaways during streams and because some commentators are entertaining. Could see value in tournament play if all screens were broadcasting different views from the same game.
2/9/2016	Stephen Abrahms	X			X	Search	2	Watches to learn, and sits down to watch a full game. Sometimes spectates friend's games to see how they're doing and to learn from them. Watches tournament play when a player he cares about is in the game.
2/9/2016	Bryce Zander	X			X	Search + URL	4	Watches occasionally when there is a big tournament, but not day to day. Watches purely for entertainment, not necessarily a learning experience. Thinks best use would be to make tournament play more interesting.
2/12/2016	Mitch Rutgard	X			X	Search	3	Rarely watches eSports. Spends most of his free time playing. Watches only when his roommates are watching for the entertainment value. Doesn't play often enough to watch for educational value. Prefers multiple screens because it gives you something to watch while there is a lull in one game.
2/12/2016	Randy Hegeler	X			X	Search	3	Never watches eSports, plays LoL occasionally when roommates are playing. Doesn't have time to play, doesn't care enough to watch because he doesn't necessarily need to learn anything - he doesn't play enough.
2/12/2016	James McHugh	X			X	Search	1	Plays LoL often, cares about competitive ranking. Watches tournaments and twitch streams only to learn and apply techiques in his own gameplay. Watches intenseley and having distractions would inhibit learning. Chooses streams carefully and only watches professional/highly ranked players/.
2/13/2016	Scott McBride		X	X				Felt uncomfortable. Eyes could not focuse and was unnatural. Thought that 4 screens would be fine once you got over the new concept of VR. Can see the concept working across multiple sports, especially football early games when they overlap.
2/25/2016	Greg L.		X	X			4	Thought experience was new and exciting, reminded him of how producers would cut live production. Felt that four screens was enought content. Could use more supplemental content if it was static or number driven. Replay feature would be a +. Can see it more applicable to baseball or coding

2/27/2016	Dennis Wong	X	X			4	would like to see more immersion, utilizing gyroscope. 4 screens is a good number, 3-4 probably best In comparison to current method = allows for watching different games, current res is bad pre-recorded game from different perspectives
2/27/2016	Robel	X	X			4	Better resolution needed, but liked 4 screens = good amount. Multiple camera angles in a game would be a plus Would like to see chat features, text for public, voice for friends. Would watch YouTube videos.
2/27/2016	Josh	X	X		3 to 4		- it was cool, higher res needed, choosing a screen would be cool - Was not distracting but not huge advantage, get to choose what to watch was a + - watching multiple streams, not a frequent viewer so not as motivated to buy - Would like to be able to switch between watching and playing. - Other applications = march madness, twitch
2/27/2016	Michael Lenahan	X	X			4	- liked it a lot in the sense that being able to watch multiple videos at the same time, as opposed to multiple computer screens, panning, 3d experience low res - not to many screens, wanted control over when screens change - advantage, can watch more, don't watch streams as much but will watch pro tournaments watching multiple players for a game would be cool Other application uses: watch youtube videos, sports / ESPN, cable TV, watch 3 shows, Netflix, iTunes in the bg
2/27/2016	Matt	X	X			4	-it was good, VR headset felt heavy -Big screen was kind of distracting, amount was fine -Wanted to play audio for focused screen -Add Twitch chat -Application uses: league esports, tournament streams
2/27/2016	Vincent Stumpf	X	X			5	-VR would work with moving the screens! -it was great, could be more things to add to it like supporting content -Experience was "different", move mouse around to switch to a different stream, not sure how long you can wear VR headset -Wants to be able to move screens around to change sizing, and add replay system -Add Twitch chat, control which audio sources (diff volume for each)

Appendix D: Website Link

Observr.tech
*must create an account to log in and watch

Appendix E: Budget

Team Name	ObserVR
Estimated Total Budget	$75.05
Customer Development Subtotal	$30.00

MVP Development Subtotal	$15.05

Prototype & Product Development Subtotal	$30.00

Customer Development

Item	Estimated Amount	Est. Purchase Date
Food for Interviewees	$30	Feb. 10, 2016

Minimum Viable Product Development

Item	Estimated Amount	Est. Purchase Date
Domain Purchase	$5	Nov. 23, 2015
Web Hosting	$9.88	Dec. 11, 2015

Prototype & Product Development

Item	Estimated Amount	Est. Purchase Date
Server Space	$30	Mar. 1, 2016

Subtotal To Date	
Subtotal February	
Subtotal March	
Subtotal April	
Subtotal May	

Subtotal To Date	
Subtotal February	
Subtotal March	
Subtotal April	
Subtotal May	

Subtotal To Date	
Subtotal February	
Subtotal March	
Subtotal April	
Subtotal May	

Appendix F: Partner Map

Name of Partner	Our Benefit	Their Benefit
Pro Streamers	By partnering with pro streamers we will be exposing our product to his/her followers that do not necessarily follow the virtual reality space. Even if a viewer does not have a VR device to use our product, it will still increase the number of impressions to our website to spark curiosity and brand recognition. Additionally, pro streamers already have advertisers paying them for verbal and image advertising. We can then take a portion of this ad revenue. This partnership is our form or endorsement.	The streamer will not have to pay to create their customized channel, which in the long run will increase their number of viewers. In addition, with more space available, streamers are able to create new forms of ad revenue by offering more and/or different types. With a multi screen layout, they can dedicate a screen to soly advertising. The streamer will have more space and creative freedom to optimize their 360 degrees of space.
Twitch	By partnering with Twitch our audience will immediately grow. Because twitch is the largest streaming platform for the esports community, it directly correlates with our target market. A partnership will give us access to their current api overlays, allowing us to segment the current layout, placing the streamer, map and supporting content in individual screens.	Twitch will benefit by being able to create customized layouts. By working with our team, we can create a platform that makes it easy for streamers to customize their stream in our application. This will allow streamers to differentiate themselves from others. Additionally, this service can be a premium service for streamers, creating a new revenue stream for Twitch (and Us).
Riot	This partnership will be for the access of tournament content. By establishing a partnership, we can create an environment where viewers can select individual	Riot will gain traction in the VR space by offering a new viewing option during tournament play. Because specific teams and players have more popularity, they

	team members during a match to better track each game.	have the ability to offer specific views at a premium rate. This new viewing environment increases advertising space and revenue options.
Overwolf	Partnering with overwolf will give us access to numerous secondary features for esports games. By offering these features we will create an overall better viewing environment and attract both viewers and streamers to utilize our application. Because overwolf layouts do include advertisements, we can share in this revenue stream.	Overwolf will be able to create new features that are currently not feasible with twitch. Because their current list of features are overlays, their space is limited. By having the freedom of 360 degrees, they can offer more premium features to viewers. This is an added revenue stream for overwolf. In addition, streamers who do not currently use their products will see the added benefit in our application and start to use them. My use, means more advertising impressions for their current revenue model.

Appendix G: Product Test Plan

Test Plan			
Item No	Specification or Use Case	Test Description	Acceptance Criteria
1	Maximum viewable/projected screens	Run application and verify that all screens appear. Visible approval process.	If four screens appear = accepted
2	Stream Resolution for main view 1080p minimum	Load a video from verified source that has an output reading greater than 1080p, read FFMPEG output reading to verify a an equivalent quality.	If video output reads equivalent quality with zero lag = accepted
3	Stream Resolution for alternative views 720p minimum	Load a video from verified source that has an output reading greater than 1080p, read FFMPEG output reading to verify a diluted quality,	If video output reads diluted quantity of 720p quality with zero lag = accepted
4	Stream Rate	Read FFMPEG output for each screen.	If video output reads 30> = accepted
5	Ram used by application	Run application and open activity monitor on mac/ task manager on windows. Read output	If application uses <2GB of memory = accepted
6	Number of Concurrent Users	Analyze the current conversion charts presented by aws (uptime reliability charts).	TBD

7	Content provider stream resolution	Run application and read FFMPEG input resolution.	If input reads 1080p/30fps = accepted
8	Application Security	Run a test provided by https://www.ssllabs.com/	Receive a grade of A- or better = Passed
9	Application supported on Chrome, Firefox, and Safari	Run our application using each of the listed browsers. Visually acceptance.	If the application runs =passed