ADOPTION + ADAPTATION IN PERFORMANCE CYCLING

Exploring the relationship between Bicycle + Rider

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EMILY CARR UNIVERSITY OF ART AND DESIGN

MASTER OF DESIGN THESIS 2019

Adoption + Adaptation in Performance Cycling

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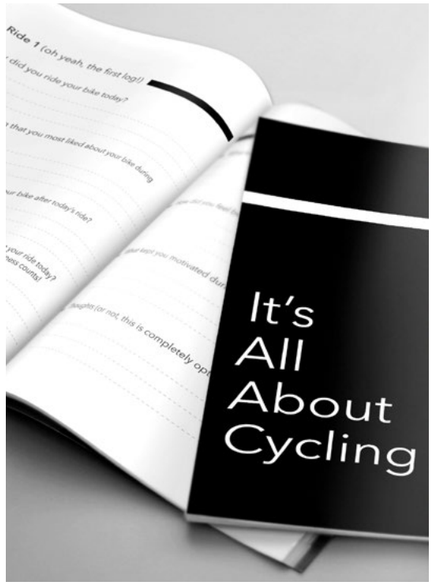

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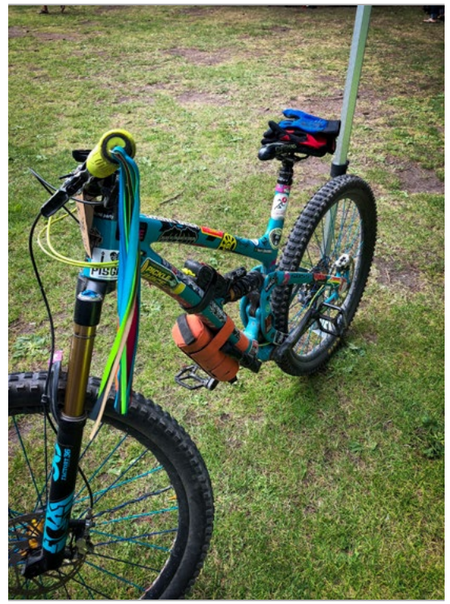

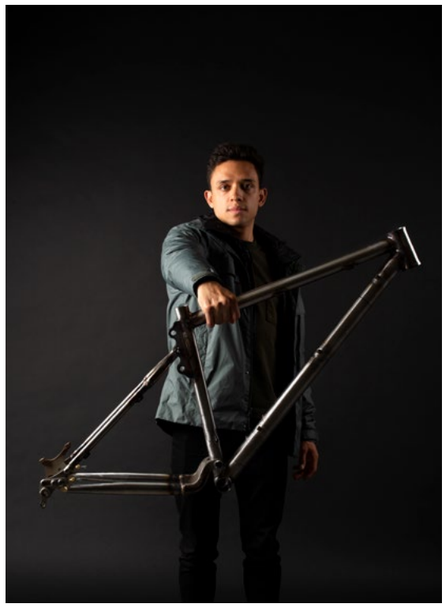

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THANK YOU!!

I would first like to thank my thesis supervisor Keith Doyle, for your support and encouragement throughout this journey. I would like to thank Blake Startup and George Bailey from the Landyachtz family for trusting me and giving me the opportunity to create what I love, by sharing my excitement and always contributing with a big smile. This concept happened thanks to you, to many more projects together.

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Thank you
Alejandro Alarcon

Fig. 1: The Enabler - Frame

A snaphot of the concept frame developed after two years of research. The Enabler

ADOPTION + ADAPTATION IN PERFORMANCE CYCLING

Exploring the relationship between Rider + Cyclist

This research has explored the relationship between cyclist and machine, through exploratory research methods and heuristic exploration by proposing a series of custom hardware interventions as way of enriching mountain bike rider's experience. Changing the mountain bike rider's experience and the mindset of the community of avid cyclists and industry by thinking outside the frame to thinking inside it.

The work ahead focuses on performance hardware development as a gateway for avid mountain bike riders to think deeply about their relations with the bike, by exploring rider's experience from a cyclist's point of view, and by exploring ways in which industrial design can bring performance and improvement into the bicycle industry through adaptability of the frame to rider and terrain.

Adaptability is a key factor between the terrain, the cyclist + machine. This research explores adaptable hardware systems allowing for changes or adaptations to the machine's geometry depending on terrain, preferences or affinities. Focusing on the means of change, particular to the bicycles' frame geometry, the frame transforms from the fixed hardware of a simple conveyance to a system of an enabler, making the cycling experience more emotional and self-reflective. Exploratory and applied research leveraging my own experience has emerged as a model, journaling and describing experiences, forming case studies for others to understand broadly how we meaningfully engage in bicycle riding.

Cycling culture and its community as observed through volunteering for one of the most prestigious race in the world called the British Columbia Bike Race, served as multi method tool, where observation, conversations and stories helped inform my research, and explore how humans relate to objects and how adaptable objects become for a specific use. Applied heuristic assets and integrated experience design, with a focus on the user experience and its role in the cycling environment, demonstrates the very present cognitive improvement of human beings through the use of invention and mechanization.

This research and the design outcomes will take into account several aspects specific to the

bicycle like: Fit, Geometry, Materials + Processes, Culture + Ergonomics, accomplished through Practice based research by way of a collaboration and partnership with Landyachtz Bicycle Company, of Vancouver BC, where bicycles are hand built and crafted.

Adoption + Adaptation in Performance Cycling

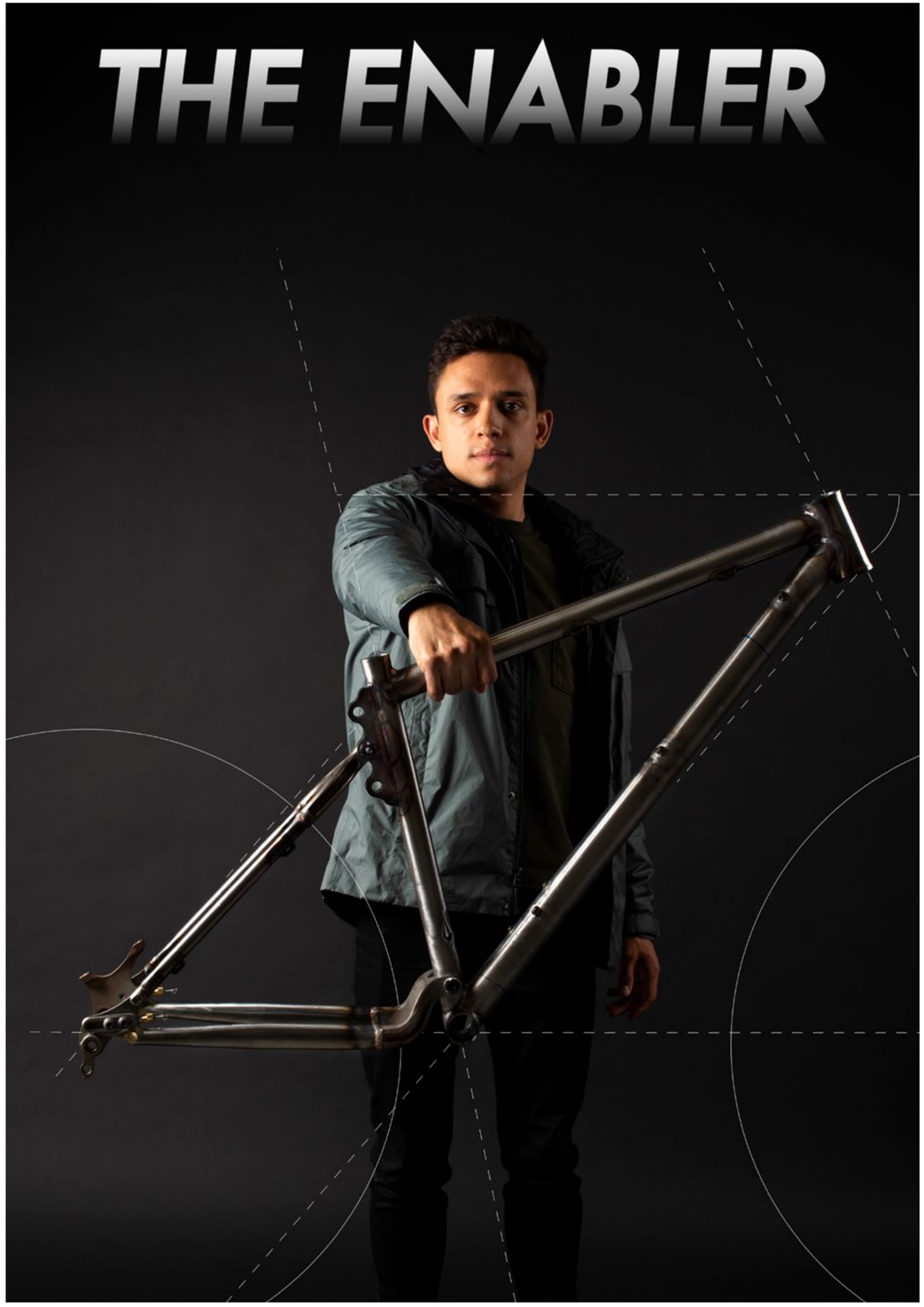


Fig. 2: Alejandro Alarcon and his frame, The Enabler

INTRODUCTION

I am exploring rider's experience from the cyclist's point of view and questioning how can the rider have more agency in the cycling experience.

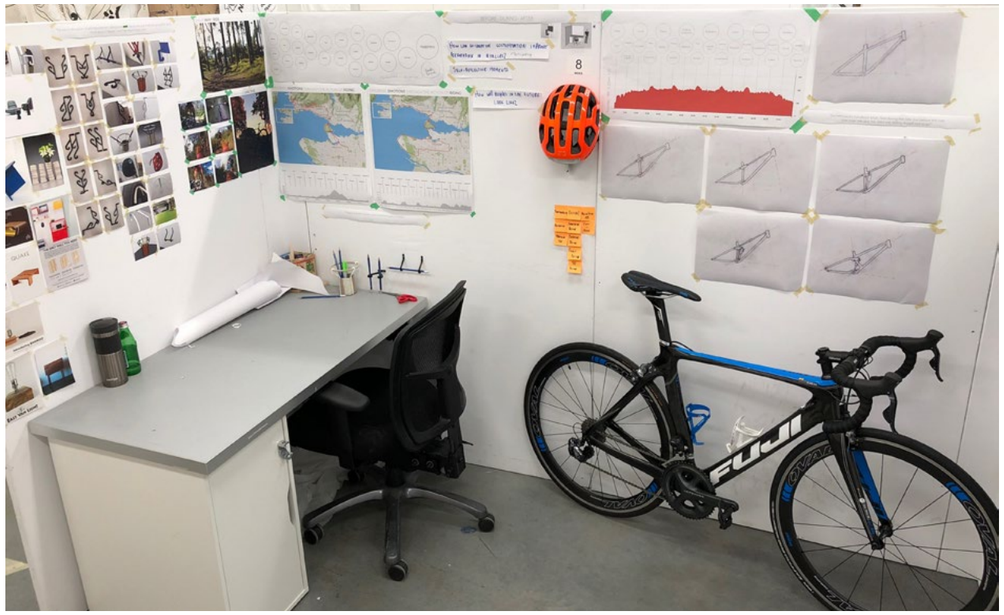


Fig. 3: Studio Space

Many of my experiences on a bicycle are based on what German long-distance touring cyclist, Heinz Stücke, once said. "It is the unknown around the corner that turns my wheels." It is this sense of exploration, of giving oneself to the moment and embracing whatever comes next that drives me. This quote is not only a reflection of what bicycle riding means to me, but also acts as a metaphor reflecting on my design process where iterations take a trail leading to unexplored places that shaped my research. Bicycles have been a part of my life from a very young age. As I grew up my passion towards these machines only kept growing. I have been riding bikes competitively for all my life, embarking into this research was my attempt to give something back to this culture.

This research aims to explore ways in which industrial design can bring performance and improvement into the bicycle industry through customization. A culture surrounded by people who form profound emotional attachments to these artifacts. Nowadays, most bicycle riders find themselves trying to improve their bicycles, making them unique and fitted them in every

Fig. 4: Photograph of the Chilcotin mountain range

way possible. To better inform my research and design process I perform surveys, journaling and documenting, expert interviews and workshops for collecting thoughts, ideas and inspiration.

I am exploring rider's experience from the cyclist's point of view and questioning how can the rider have more agency in the cycling experience. I'm exploring the experience from a mental side as well, on the focal practice that cycling becomes once one is fully engaged in the ride. Analyzing the point of view from my target audience perspective, differentiating between the 'adaptors" and the "adopters'. The role that each of these types of riders have in the cycling culture and furthermore, to whom the research is aimed at. Transforming the tacit and qualitative data collected through research and creating equivalency between the observed and the pragmatic. This later informs the research through the concept of the bicycle as the enabler. To achieve this, design and prototyping take form as a bicycle that would allow the rider to be more aware during the ride. Finally, localization is also considered within this exploration. The components and materials used to build the proof of concept have been locally sourced, contributing to the community and being a part of the local cycling culture.

I ask myself the following question, "what do I think when I think about the future of competitive cycling?" The answers are not simple, but I am determined to speculate. I see a customized market, direct sales based on custom geometry, adjustability and multi-disciplinary bicycles. If I ask myself, what would be my ideal bike? I think it would be a mix between a cross country bike, a trail bike and an enduro bike; for some, it might be a completely different bike. Customization could change the behavior of the market, a custom-made machine specially suited for your own style, likes, terrain or affinities.

APPROACH

Exploratory research, human factor research, human centered activities and auto ethnography support my emergent research methodology. The creation of a blog where I log my experiences through the sport (and my life as an athlete) plays a part in informing my direction, my project and most importantly guides my explorations and reflection on the action of riding, to further explore my connection with this mechanisms, the experiences and culture that surround it.

Applied research and design using my own experience as a model and documenting them, forming case studies for others to understand how I was engaged in bicycle riding. Experience design plays a big role in the cycling environment with a focus on the user experience, understanding the quality of the practice, analyzing the very present cognitive and physical benefits through the use of these mechanisms. For this, I spent many hours on the saddle, keeping my self present and aware of my relation with the hardware. Traveling around British Columbia, riding for days in a row, sharing moments and experiences, riding local trails, engaging with riders from the local context, broadening my experience.

Bikes in context - Fieldwork and observation began through volunteering for one of the most prestigious race in the world called the British Columbia Bike Race, this served as foundation for a multi method approach in creative and exploratory research, where observation, conversations and stories helped me validate my objectives. Analyzing the human relations and interactions with bicycles and accessories led me to question; why do we collect and adopt so many accessories, how do we adapt our hardware? Generally speaking, every rider has an emotional connection to the artifact.

In an attempt to diversify my observation and immersive creative research activities, I had planned on participating in a triathlon competition called the Ironman 70.3, in Victoria, BC. But I was forced out of the competition due to illness, this allowed me to reflect on the emotional affordance through design research and my life as an athlete. Instead, I volunteered where I focused on journaling and documenting my experience from the sideline, conversing with cycling enthusiasts and fellow athletes, discovering experts who later informed opportunities for research. In sum this event comprised my immersive field work together with attending the BC Bike Race.

I took into consideration the social context of the sports to deepen my understanding of the culture of cycling by acquiring more knowledge in the social aspect of the sport; the differences that exist within it and the respective subcultures, and looking into the social constructs such as the after ride beer or coffee.

Bikes in action - Creative practice based research was done through two channels, first, via a collaboration with Landyatchz Bicycles, a local bicycle manufacturer. Landyachtz has more than 6 years of experience building custom bicycles in different materials and components, this allowed space for design, prototyping and expert consultation as the research project evolved. Second, making to know and material practice through modeling, making and prototyping, directed studies, consultation, additive manufacturing and testing. This helped me to increase my knowledge on frame design from alternate and varied perspectives, the sum of which, informed my research with more precise and conscious prototyping and modeling.

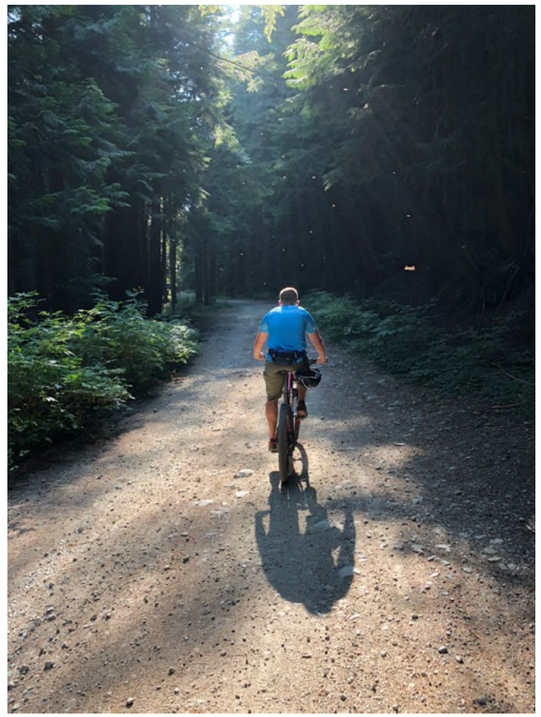


Fig. 5: Riding thorugh the gravel roads of Mt. Fromme

RESEARCH QUESTION

How might a better understanding of the rider experience influence the outcome of the bicycle design?

CONTEXT

Through riders experience and performance, I find my research space.

The cycling world has been focusing on performance through material, shape, suspension technology, etc., to solve different aspects like performance and style, surrounding the bicycle. But, there has been one constant that has remained the same and that is a diversity and specificity to frame geometry according to segment and application. My research and development focuses on variable frame geometries through an exploration of systems that may allow for the same frame to change or be adaptable depending on specific cycling conditions, such as, terrain, riding style, mood, skills or affinities.

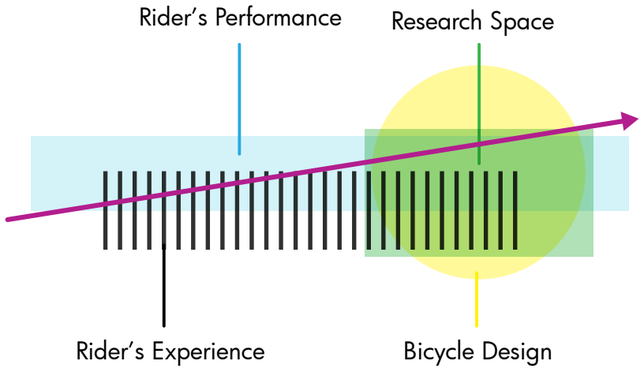


Fig. 6: Context Illustration

Analyzing three aspects of customization throughout my research, geometry, discipline and feelings/emotions. Together with experience design, I will investigate the quality of user experience and cultural relevance. Understand why the endorphin release when we are in the 'flow' or 'bike high' make us feel so good, this has to do not only with human psychology and biology, the serotonin release in the system, creating that feeling of interaction to oneself (Bailey, 2016); but also the aesthetic factors of the bike you own also helps - related in the sense that adaptability for increased performance may also aid to this 'bike high' feeling.

Fig. 7: Arriving to Spruce Lake and assembling bikes

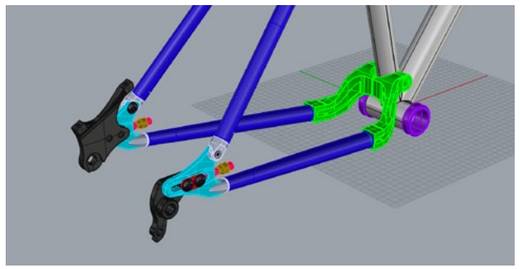


Fig. 8: 3D Model of the concept frame

Fig. 9: Contemplating nature in Gold Bridge, BC.

LIMITATIONS

This research may be affected by engineering, the extent towards the direction of my research may need engineering analysis depends on the result. Other limitation may be material use, the availability and cost of materials could mean a limitation to my research, the investigation may suggest a material and a proposition on to how this material may play a role within my research will be included.

KEYWORDS

Cycling

Exploratory research

Experience

Industrial Design

METHODOLOGY

Questioning - Defining research space - Intuition/Grounding - Technical Data review - Synthesis

Starting with Tim Brown's Design Thinking methodology (Brown & Katz, 2009) I realized that a single methodology wouldn't correctly ground this research, using exploratory research (Martin & Hanington, 2012, pp. 84) as my main methodology, and within that, heuristics and applied methods as well, borrowing segments from each methodology that best suited my explorations, I developed a more linear methodology that better grounded my research.

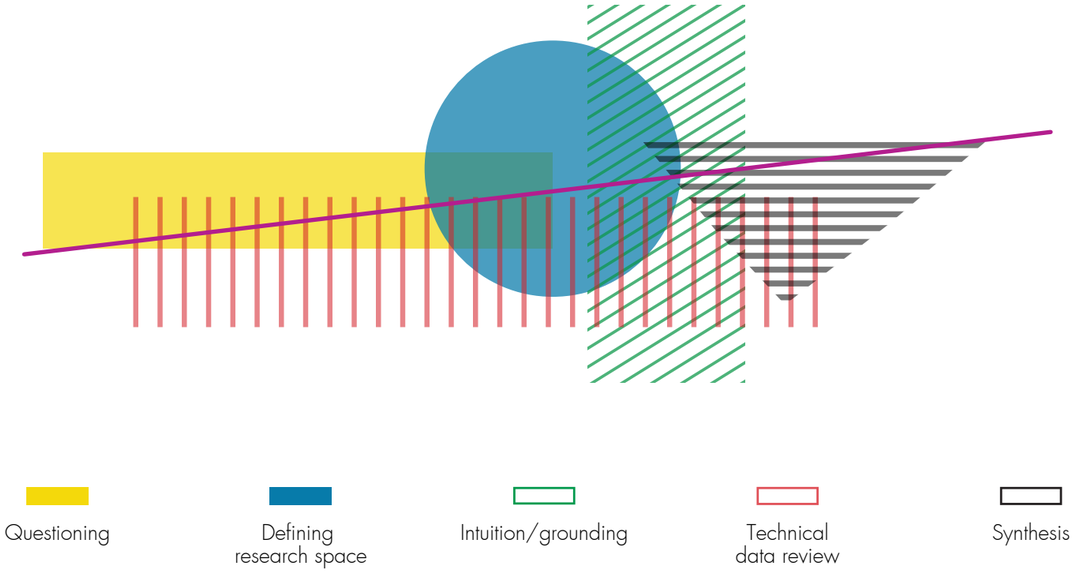


Fig. 10: Methodology illustration

My research began with the exploration of the relationship between rider and machine, which reflects as the Questioning aspect of my methodology while in the mean time, technical data review interprets as secondary research and exploration, where riding, journaling, immersive and field research took place. Later defining a research space or context translated into the focus of adaptable geometry and the agency of the rider. Followed by an exploratory phase of intuition and grounding where concepts, designs and prototyping took part. Finally leading to a synthesis where the concept is conceived and developed.

Fig. 11: Portrait of the Chilcotin mountain range

Fig. 12: Admiring the landscapes of Gold Bridge, BC.

RIDER'S EXPERIENCE

Exploring the relationship between bicycle and rider

METHODS

I intend to understand both subjects, bicycle and human in a cultural context, performed through symbolic interactionism. As a methodology this fits within the field of ethnography, as stated in the book 'Creative Research' written Hillary Collins "this research paradigm postulates that we can only comprehend a culture from within by getting inside" (Collins, 2017, pp. 41). I am comprehending cycling culture from within, and knowing its subcultures, in other words, getting inside the local cycling culture and forming part of it. I wanted to understand this social phenomena and experience what makes bicycle and human bond so strong. According to this research method, the research is best understood through the perspective of the role of the actor within the research, in this case, myself. I have been involved in the culture of cycling for years now, ranging from different styles of cycling, I have gotten a broad understanding of the culture. With this in mind, axiology (Collins, 2017, pp. 37) plays a role within my research in relation to my how my own values will play in the research.

As an avid bicycle rider, both road and mountain bike, I used the method of auto ethnography by Leon Anderson who explains in his research paper called 'Analytic autoethnography' that this method is "a form of qualitative research in which an author uses self-reflection and writing to explore anecdotal and personal experience and connect this autobiographical story to wider cultural, political, and social meanings." (Anderson, 2006) With this method intend to use myself as subject throughout this process and understandings. My input, feelings and emotions defined how to give it a role within my life, learning how we anthropomorphize in relation to ourselves and our environment, this method later helped me with defining what would be an ideal bike for myself, this could be later transmitted to other individuals using the same methodologies.

THE EXPERIENCE

I set out to explore the relation between rider and bicycle

Rider's experience has been the backbone of this thesis. The effect that riding has on people, and why they keep doing it and seeking for more. Perhaps it's more than just the effect, I found that cycling experience manifests differently on each individual. For some, it's a way of proving something to others, for other cyclists, it's an internal battle of proving something to themselves, then there are the ones who ride just for the progression and skill that cycling requires, and others cycle to find themselves. Experience then becomes a big word that encapsulates many of these different personalities. Instead in focusing on either one of them, I decided to focus on the experience itself, asking myself the question 'Why do riders ride?'. Understanding that the body is the best sensor and the input it provides, relating to how the rider can have more agency in their experience, and how the bicycle acts as an enabler for experiences.

RIDER'S EXPERIENCE

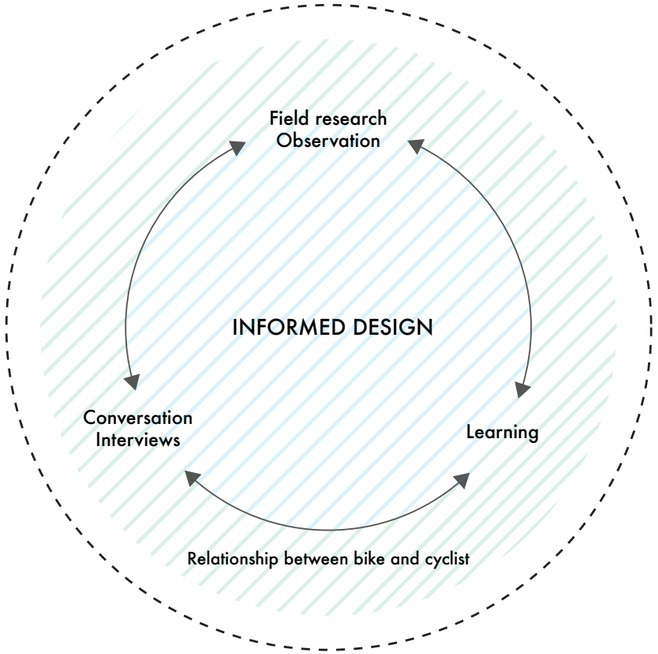


Fig. 13: Diagram of the "Riders Experience" methodology.

BC BIKE RACE

British Columbia Bike Race

I set out to explore the relation between rider and bicycle in a competitive setting. The BC Bike Race is a 7-day stage race known around the cycling culture as one of the most beautiful races out there as said in an article by Canadian Cycling Magazine (Magazine, 2018). The race consists of riding your bike through the trails and roads of BC, each day takes place in a different location around the province going through the most iconic and well known trails. Each day riders camp in a new place, the race takes around 6 hours a day on average for the regular rider, it's a test between physical and mental endurance.

I decided to volunteer and be a part of this race with many objectives in mind, but most of all forming part and understanding the cycling culture in BC and then as I mentioned earlier, explore the relation between cyclist and machine.

I conducted field research and observation, had many conversations about bikes, geometry, my research and interest. I expanded my understanding about rider's experience and this all later informed my design research.

What I didn't think I would stumble upon is the degree where I got to understand the relationship between bicycle and cyclist. After doing extensive field research and observation I finally got to understand the want & need.

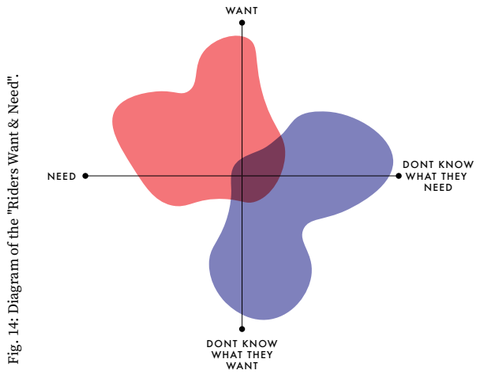


Fig. 14: Diagram of the "Riders Want & Need".

Some riders knew what they wanted and what they were looking for in their bike and the race as well. While other riders seemed more focused on the act of crossing the finish line, their bikes seemed more appropriate for other type of riding, not for this kind of race. This led me to understand that some riders really do their research and relate to their bikes and the terrain while others think that the bike they have will sufficiently serve the purpose of finishing the race.

Fig. 15: Sunset at the BC Bike Race

Fig. 16: Flying over Gold Bridge, BC.

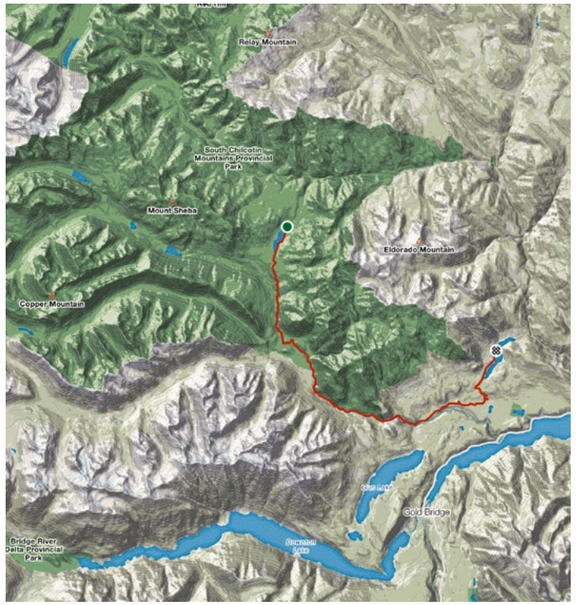


Fig. 17: Map of the distance travelled during one of the days in the Chilcotin Mountains.

EXPLORING THE NORTH

Afterwards I headed out towards an adventure that helped my research in terms of having first hand knowledge by focusing on the rider's experience and the relationship between me and my bike. I travelled to the Chilcotin mountains located in northern B.C., were me and 6 friends hired a float plane to fly us around to help us expand our range to explore new trails. We did this for five days around Gold Bridge, BC. Having Tyaughton Lake as our base camp, each day we headed to different places, riding and average of 50km a day. Carrying my journal and Gopro I got to externalize how I felt everyday towards my bike, observe my friends struggle with their bikes. After looking at several hours of video, reading through the notes made in my journal I became aware that there an infinite number of variables that may affect the experience of riding whether that is positive or negative. It became so relative to what you're feeling before, during or after the ride, the extent to what you think you may stumble along the way of the ride is major and there is only few things you can usually do about.

Fig. 18: Tyax Air float plane

My friends and I used this float plane to fly us around the area. We put our bikes in and used the plane to land in different lakes, where we would have to pedal back to our basecamp.

The BC Bike Race, Exploring the north, doing local rides, it all made me remember what Nick Moore says in his book Mindful Thoughts for Cyclists -

“By accepting whatever the elements throw at us, we grow as cyclists, and as people. It also helps us forge a deeper bond with the bicycle - as true partners, not just fair-weather friends.” (Moore, 2017, pp. 32)

His words resonated in me for a long time. Later I discovered that its only through accepting what's to come ahead that you'll become a better rider or form a deeper bond with your bicycle. If I could summarize my experiences and the observed throughout this research in some words it would be the quote above.

I came to the conclusion that riders experience is dependent in many factors, starting with the fact of riding together or alone, scenery, weather conditions, the bike itself. But as many things, variables can be attended, and the bike can be one of them.

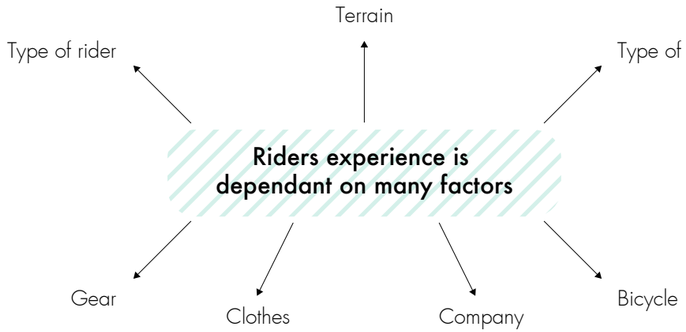


Fig. 19: Diagram showing how riders experience is dependant on many variables.

Fig. 20: My friends looking over at the maps to find our way back to basecamp.

Fig. 21: Arriving to the destination point.

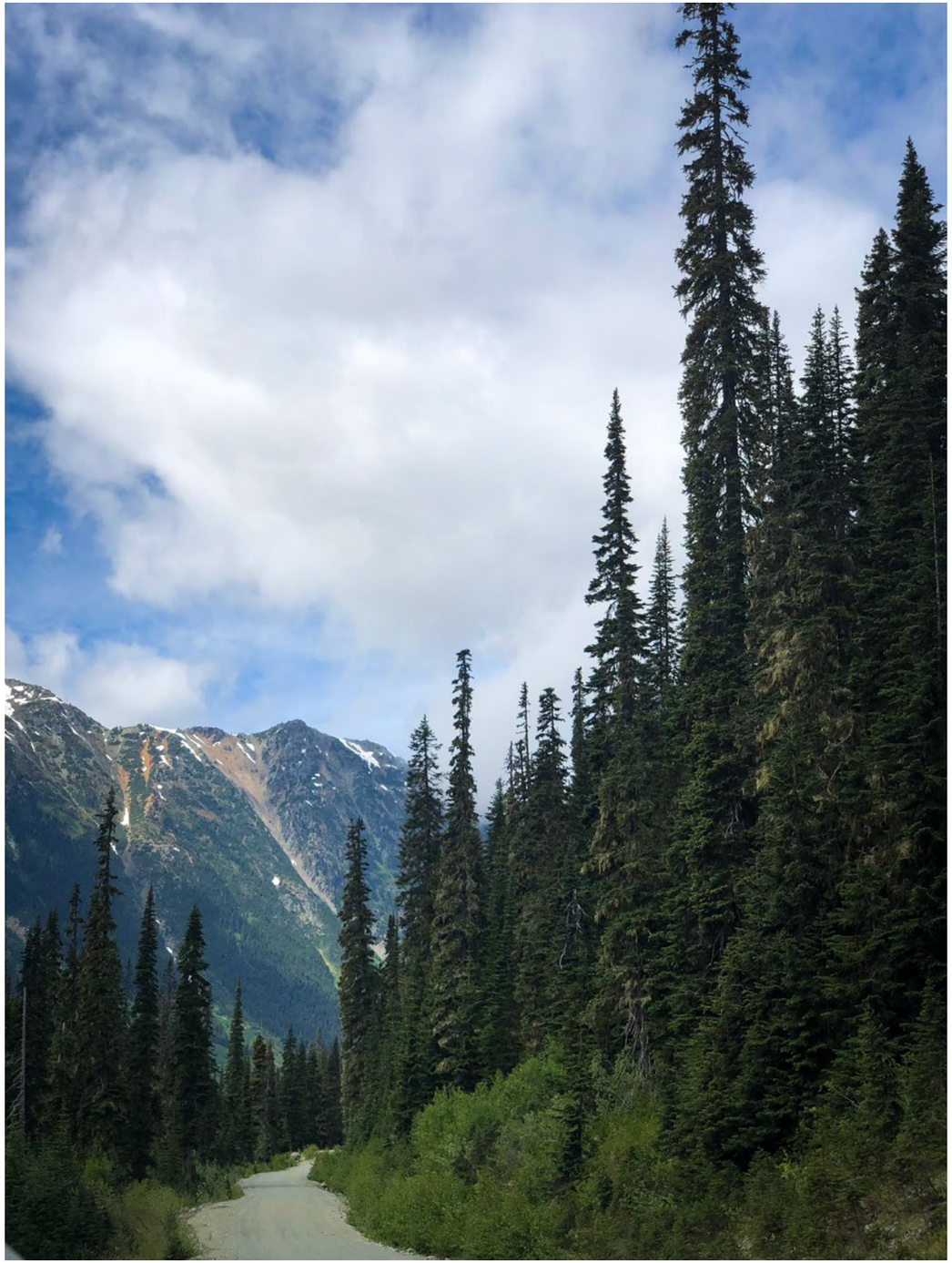


Fig. 22: The long gravel roads leading to Tyaughton Lake.

Fig. 23: Riding through the roads if Scottsdale, AZ.

FOCAL PRACTICES

METHODS

My research focuses on performance as a gate to make the avid bicycle rider think about their relationship to the world, and how in touch they are with their sentient being. For this reason, heuristic inquiry plays an important role through this thesis. Clark Moustakas's Heuristic method gives researchers the opportunity to explore internal and personal questions. It suggests that the personal nature of these questions can contribute to the contexts and environments in which research takes place. (Moustakas, 1992). The heuristic process involves getting inside the research question, becoming one with it and living it. Focusing on the reasons like, why does a bike creates this sense of admiration to the rider, and amplifying this feeling through customization, making the subject perform better in different types of situations with their bike.

THE PRACTICE

According to Albert Borgmann, focal things and practices are human activities that make life meaningful. Focal practices include reading, playing musical instruments, doing athletic activities, doing art, dining, walking, exploring nature, and so on. These activities engage our better sides: our ingenuity, creativity and sociability, these are re-creative activities even as they require investment of self. As explained in the article Focal things and Practices' by John O'Brien. (O'Brien, 2012)

Fig. 24: Long training sessions in the home trainer.

Fig. 25: A sunset in Stanley Park.

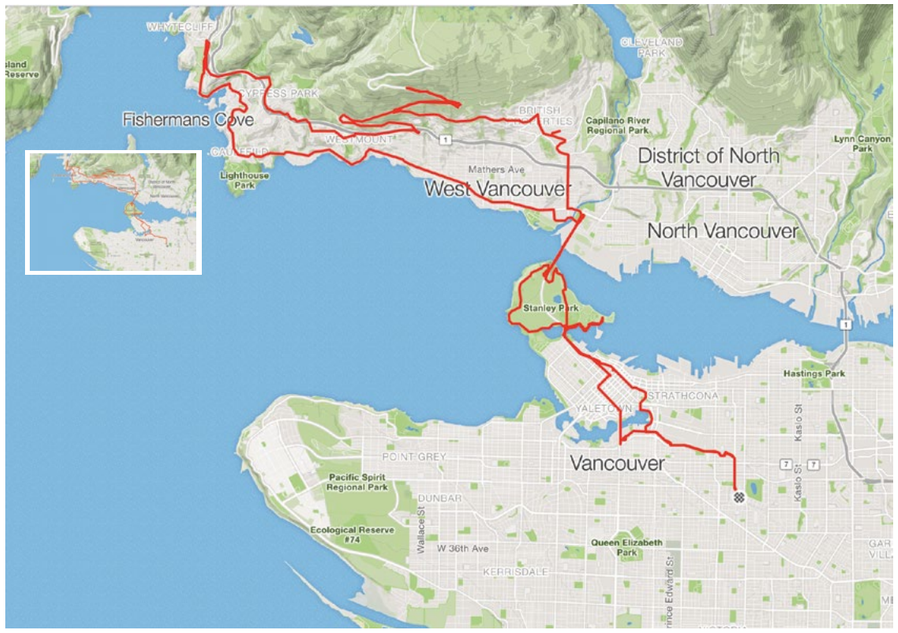
Reflecting on this I scaled in and analyzed the ride as a focal practice, and how this activity can be more engaging and mindful through the act of cycling with a scope on the bicycle as a facilitator.

"There is an investment of effort, however, that needs to be made in the focal practice" (O'Brien, 2012)

Cycling is an activity that requires focus. This focus becomes one of the main reasons why many cyclists seek the thrill of a ride, the effect that this practice has on the rider's mind sometimes could be relieving and mindful. The state of attention of the cyclist's mind narrows down to just one thing, cycling. As all activities, they need a start, this is no different to the beginning of the ride, it might be dreadful and hard for some while others may find it easy, but once the rider is fully engaged in the activity, the practice becomes focal and almost meditative to a point where as I said before, the rider can only think of one thing, that could be either pedaling, focusing on what's ahead, cadence, and so on. I find myself thinking or focusing on single things a time, it could be a mantra, my cadence or my breathing.

I decided to examine the ride by exploring my own feelings through a series of long training sessions in and around the city of Vancouver, some were done using a road bike, others using a mountain bike. Using heuristic inquiry as my main method to analyze this, I created a map where my feelings are tagged along the duration of the ride as shown in the figure below.

Through journaling, GPS tagging and videotaping I examined the ride itself and how in tune I became with the ride alone. Video recording helped me realize and reflect on different aspects of the types of riding I did.



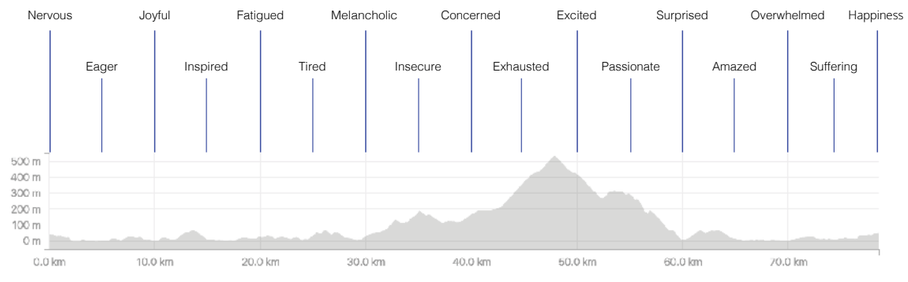


Fig. 26: Diagram showing the studio exercise "exploring my emotions through the action of riding".

MOUNTAIN BIKE VS ROAD BIKE

Mountain biking in comparison with road cycling were two different channels of focal practices. Riding in the mountain required greater concentration in terms of how I related with the surroundings, it is a moment where there is absolutely no space for thinking except for what's coming ahead and how to overcome it. Whereas road cycling was more challenging on a physical aspect, it required a different kind of concentration, while the ride might be easier than mountain bike riding in terms on technical difficulty, the level of concentration to surpass the pain threshold becomes focal and my mind tends to concentrate or isolate my thoughts to take the pain off of it.

EXPLORING EMOTIONS THROUGH THE ACTION OF RIDING

This was a very interesting exploration within my research, my goal was to determine the emotions I feel during a ride. I recorded every feeling or emotion every 1km to 4km. The result was a roller coaster of feelings that helped me define the effects of cycling on me to a deeper understanding. The mapping of feelings was done through an altitude map and tracing where I went using a GPS watch. On the other hand, I decided to compare the feelings or emotions that I felt on a stationary bike (bicycle trainer). The results were somewhat different, I found there is more negativity involved in a trainer ride but the end result was persistent on both types of ride, a feeling of fulfillment and happiness.

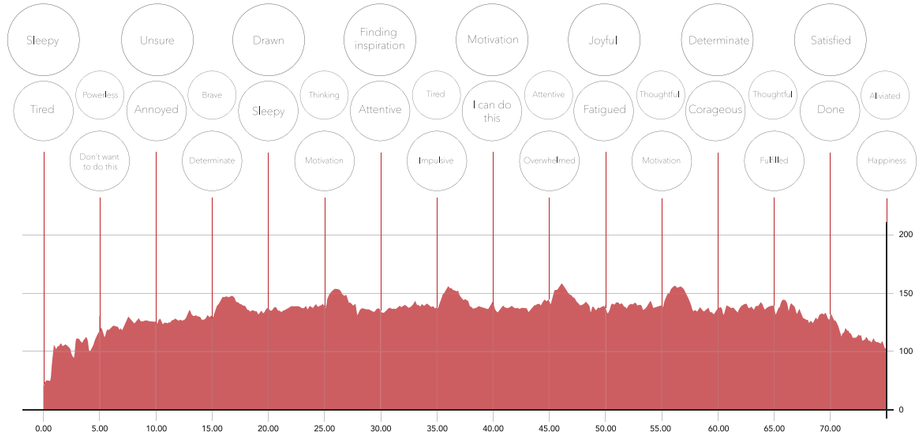


Fig. 27: Diagram of the exploration of my feelings during an indoor ride.

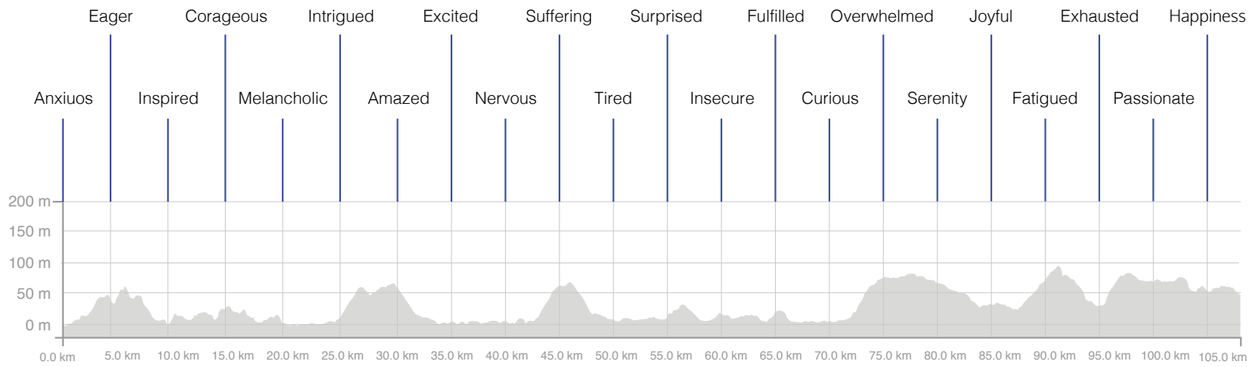


Fig. 28: Diagram showing my feeling during an outdoor ride.

The activities are then broken down into two different channels. One being the action of riding outside and the other indoors. I found both activities to be completely different with just a few similarities. Riding outside requires a different mental state, where the daily or mundane thoughts of real life are not as inviting during the ride, there are many distractions around and one can't afford to lose attention on the road, this ride felt much more freeing. I had no choice but to ignore all thoughts and focus on what I was doing, if were to lose my attention I would be putting myself and others at risk. On the other hand, riding indoors was a different experience, during an indoor ride, your bike is attached to a device that basically holds you up and there is no danger around, one is sitting there, pedaling, the only effort that kind of ride requires is 'cardiovascular'. I finally asked myself why do I do this? And how is this a different approach to the focal practice of riding outside?

"The bike is one the few places where, if we wish, we can be left alone. Even at home, the phone rings, people come to the door, and partners, children and pets demand our attention, while unpaid bills and undone chores eye us accusingly. When we ride, these things can come with us only if we invite them" Nick Moore. (Moore, 2017, pp. 56)

It is harder to focus, your mind is not focused on one thing during and indoor ride, your mind can wander around and open invitations to all kinds of thoughts, pain suddenly becomes more present and real, negative thoughts flood through your brain, but it's how one overcomes this mental process that will make you a tougher cyclist, more resilient. Indoor rides in my opinion is the ugliest part of being a cyclist, but it's a necessary evil, as Albert Borgmann says "it is important that one loves the focal practice, so it not simply become pursued out of guilt or mere necessity." (Borgmann, 2003) The practice has to be something that you love, a part of a goal, a hobby where your mindset is in tune with the action.

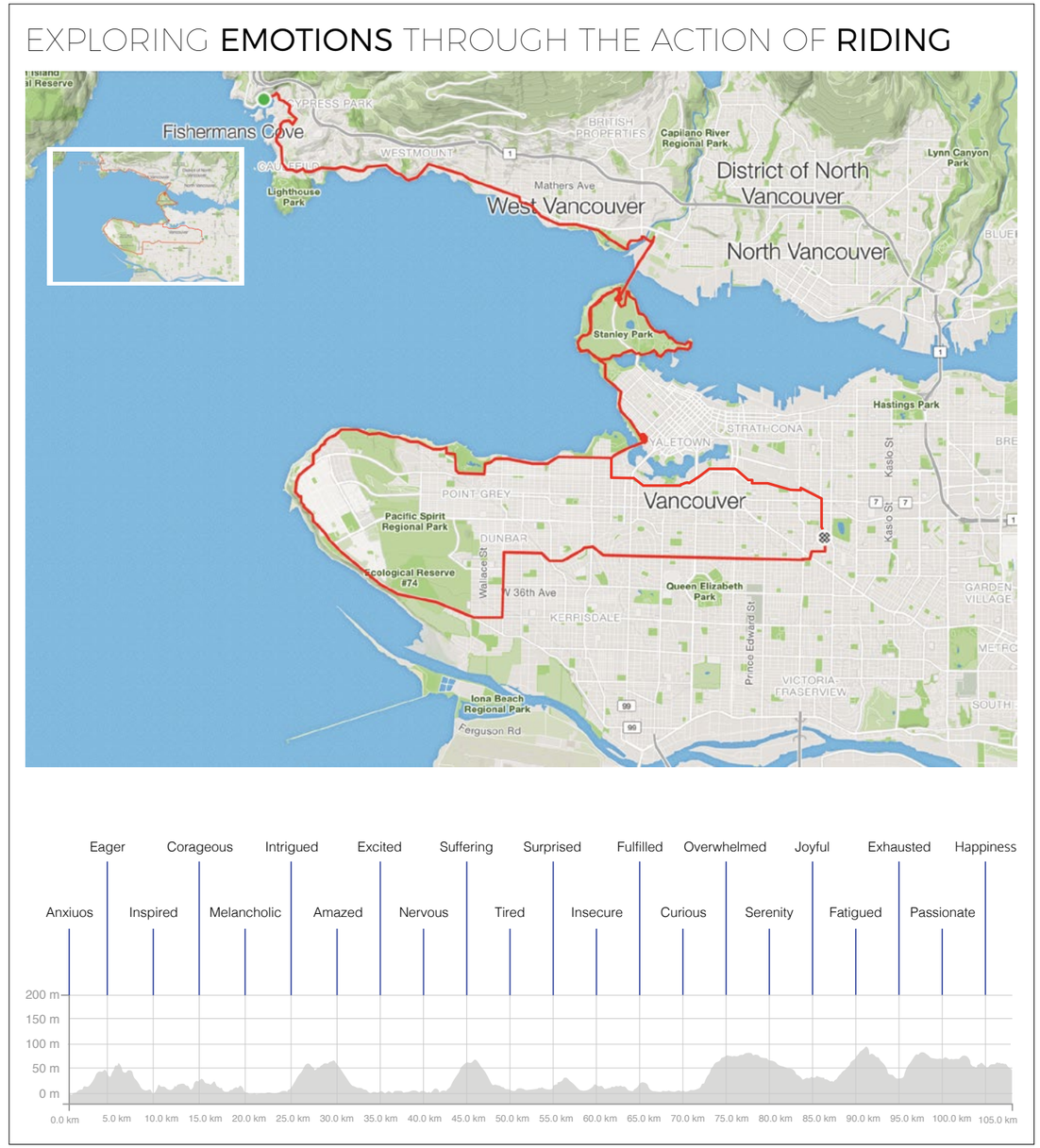


Fig. 29: Diagram showing the studio exercise "exploring my emotions through the action of riding".

ADAPTERS

The Adapter

This rider is more involved in the relation to its bike(s), this rider does extensive research, speaks to people within the culture, informs his needs and looks for the best and more suitable bike. Afterwards, they will keep adapting the bike to suit its affinities and style of riding. Buying what is already pre-made is not enough. In a nutshell, this rider feels the need to customize their bike.

The Adopter

Rider who is involved in the cycling culture but finds the equipment they buy without much research and may not feel the need to further adapt the machine to suit its riding abilities. In a nutshell, this rider doesn't feel the need of customizing their bike.

Fig. 30: An example of a bike that's completely adapted to riders input.

METHODS

As an approximation of experiential research as explained by Brice Taylor in the article A Guide to Inquiry and Experiential Research: The Oasis Approach "is a research paradigm that breaks down the traditional distinction between the role of the researcher and the role of the subject…In other words, the subject's involvement is solely restricted to the action phase i.e. they are 'studied'." (Taylor, Pp 7. 2014) This method played a role within my research in the understanding the interaction of rider and bicycle. The bond between human and elements of the system. The notion that we can become one, having on mind the five points of contact between bike and human and how this develop into action and reflection. The performance of oneself with the bike, it becomes an experience larger than just transportation.

Fig. 31: The start of one the the day at the BC Bike Race.

BC BIKE RACE

As I said earlier in this paper, the BC Bike Race is a mountain bike stage race held in around British Columbia, Canada. This race consists of 7 days in a row were riders get to experience the single tracks that BC has to offer.

During this event, aside from observation and analyzing riders experience as explained earlier in the Rider's Experience chapter, I got to understand the personas within my research. Getting deeper into the mind of the adapters, gaining more grounding data that could later inform my design process.

Considering my audience and cycling culture has given this thesis a better basis for grounding, exploration and target of opportunity for the design process. After the research was done, the identification of personas was possible.

These personas are divided in two different groups of riders. One where the riders buy and own bicycles, this is the type of cyclist that is engaged in the sport but is fine with buying a bike and using it, while the other group of riders are the ones that are also engaged in the sport but the bikes they own are adapted to their preferences style of riding or affinities. These personas are called the adopters and the adapters. The design and concept elaborated after recognizing these two groups is intended to target those riders who are looking for more than just a bike. Adaptation is key to the development of the concept, for this reason the concept developed is aimed to allow the rider have more agency through adaptation of the bike.

IRONMAN 70.3 VICTORIA

Fig. 32: The penalty tent at Ironman 70.3 Victoria.

Ironman 70.3 is a middle distance triathlon, it consists of swimming 1.9 kilometers followed by a 90 kilometer bike ride and finally a 21 kilometer run. I had several objectives planned for this event, one of them was to compete and participate in this event, gain insight as to how I feel the difference is between my triathlon bike and my mountain bike, understand how I feel and care for each of them in different ways. Also, think about personas by comparing triathlete's behavior within this segment of cycling culture their bikes in comparison to people in the mountain bike community.

The reality is that I couldn't achieve one of my main goals, which was to participate in this event due to illness. This was a very emotional moment for me, after training for so long and not being able to race made me realize how much time and effort is put into training, and the emotional affordance I needed not only as an athlete but as a designer as well. I decided to volunteer; with my experience in triathlon I asked to be in the penalty tent of the cycling part of the race. I got to observe hundreds of riders with their bikes.

After several hours of being involved in the race, getting a 'back stage' look from the event, I started differentiating the behavior of triathletes with their bikes compared to mountain bike riders. There was clearly a huge cultural difference, triathlon is a sport that in my words I would call 'formal' were everyone is in a race mode mentality. If I were to compare this to the mountain bike culture, I would say this culture is more 'relaxed' while there is still a competitive side, there is something from this sub-culture that invites comradery. Needles to say, from a bike-rider relationship, I realized that triathlon has more adopters, and I could totally understand that, while mountain biking is solely surrounded by one thing, the bike; triathlon on the other side consists of three sports and many people in triathlon are not in this sport because of the bikes uniquely.

In the end I got a clear idea that triathletes and mountain bikers have many similarities, like their love and affection towards very expensive machines, triathletes are adopters just like mountain bikers. This culture embodied the adaptation of the human to the bike, making every bike unique. People in this culture spend many hours on the saddle, seeking to be more comfortable in longer rides, translated in making changes to their bikes where triathletes had to think deeply how they relate to their bike. This made me think if it's the sport that dictates whether we are adopters or adapters. Triathletes sometimes don't have another option, this sport is based on endurance abilities rather than technical, therefore making the bike an extension to serve a purpose, complete the race. But there are many implications when relating to your bike as and extension, primarily, how you adapt to your bike. Triathlon bikes are made to be adaptable to human's ergonomics because the nature of the sport allows it, in comparison to mountain biking where the sport is based on technical abilities, leaving less space to make the bike more adaptable to the rider.

Fig. 33: Me at the finish line of Ironman 70.3 Victoria.

THE MAKING

This chapter will explain the making to know process of design. I will briefly guide you through the design process and exploration taken throughout my research

METHODS

I approached my research using induction, taking this approach opens up the possibility for data gathering and further developing theories as the result. Based in the book Creative Research by Hillary Collins, this method helps with the understanding of my exploratory process (Collins, 2017, pg 42), considering competitive cycling, performance and customization, gathering information in the form of qualitative data, being concerned with the context of my research and working within the competitive cycling culture. A small sample of data was gathered in order to establish different views of the bike and human relation in terms of performance improvement.

This chapter will explain the making to know process of design. I will briefly guide you through the design process and exploration taken throughout my research, these are stepping parts of my research where the most insight and reflection were taken which later led to and informed the final concept of my thesis.

Using 3D printing as a media for fast prototyping I was able to test shapes and sizes of different bike parts.

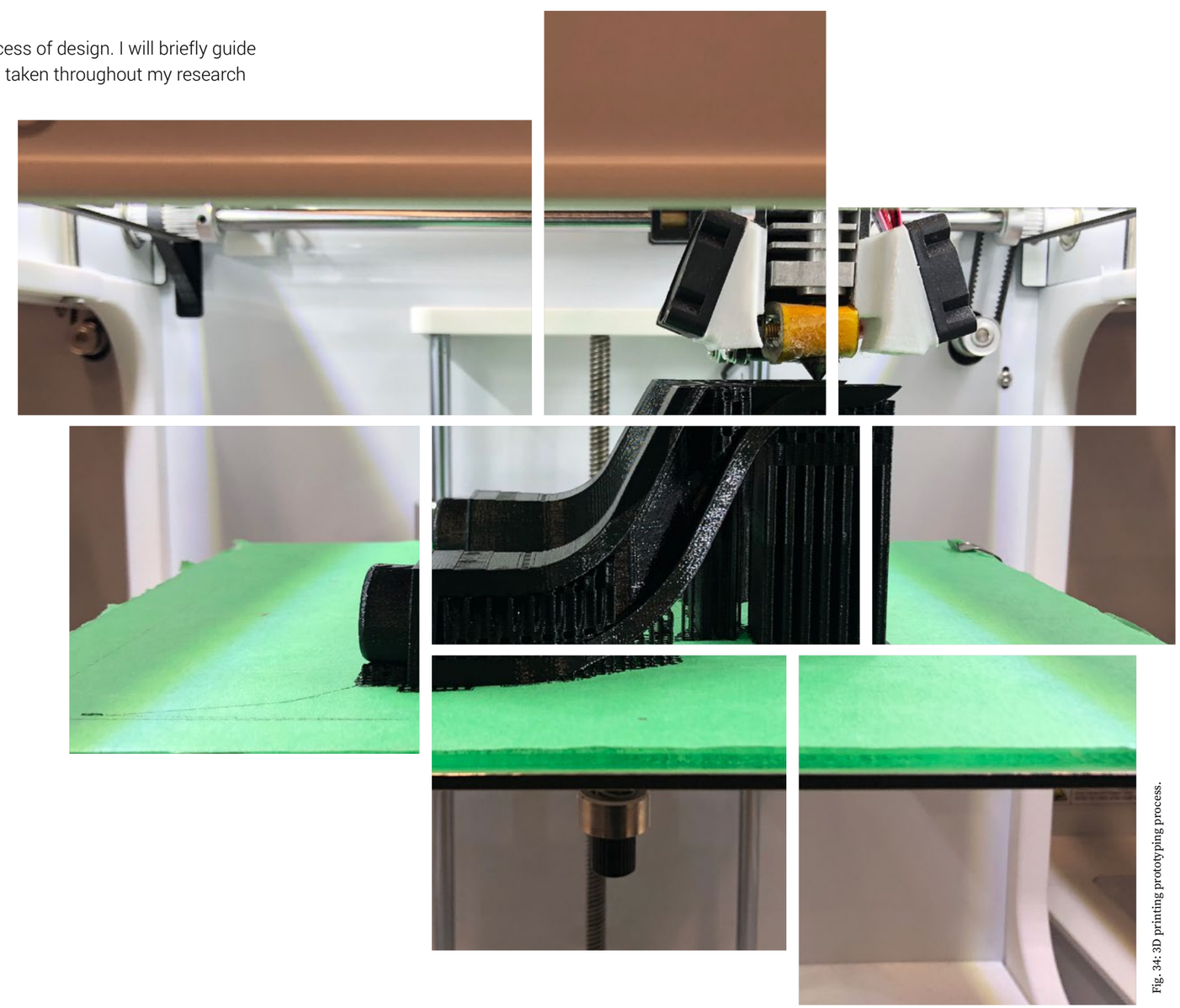


Fig. 34: 3D printing prototyping process.

THE CONFIGURABLE BICYCLE CONCEPT

During this studio experimentation I decided to think about the “impossible” bicycle. I used my influence on geometry and this was the result. It was a very good exercise since I was able to create a concept that is far beyond from engineering but informed me in different ways.

This was the result, a bicycle that is found on the idea of full geometry adaptation. The pivots on the center of the main tubes of the bike allow it to change as shown in the image above.

This experimentation translated into a series of ideas around the changes of geometry and this very important part of the bike design affects completely the way the bike handles. This made me question the fact that why are most bicycle in the market just fixed to one geometry style, why not make a bike that is able to change geometry instantly?

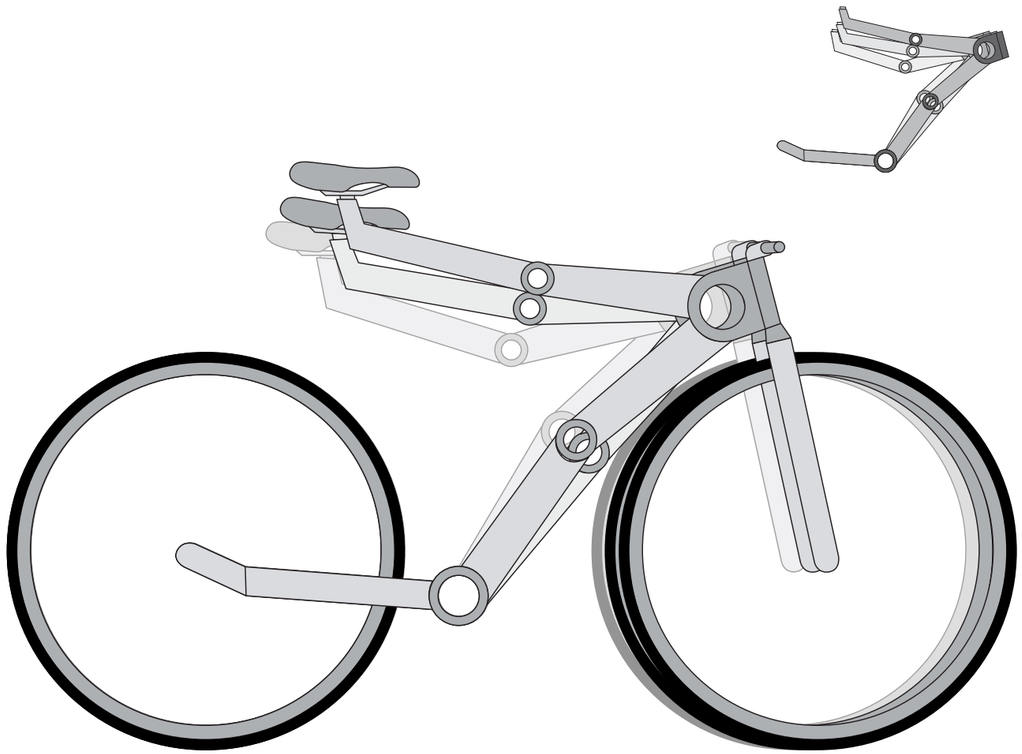


Fig. 35: Diagram illustrating the configurable bicycle concept.

THE HEAD TUBE GEOMETRY PROPOSAL

After the insights I gained from the configurable bicycle concept, I started reflecting on the question I had previously asked myself, ‘why are most bicycle in the market just fixed to one geometry style, why not make a bike that is able to change geometry instantly?’

I started to fixate into the changes of geometry and how could I make that possible through design, after all, my secondary research was aiming towards a more engaging connection between the bike and rider.

Arriving to a big moment on my research, looking at the changes on the angle of the head tube and how that may change the geometry of a bicycle, affecting completely the way the bicycle handles. After some excitement and hours put into defining this idea, I thought that the idea was too good to be true. I did some research and it turned out that this concept already exists as a product on the cycling market.

Although this is a concept that had been created already, it was a valuable moment for grounding because this informed that my research was leading me to concrete creations and ideas. The extent towards my research was leading made me feel confident that my research was gaining some ground.

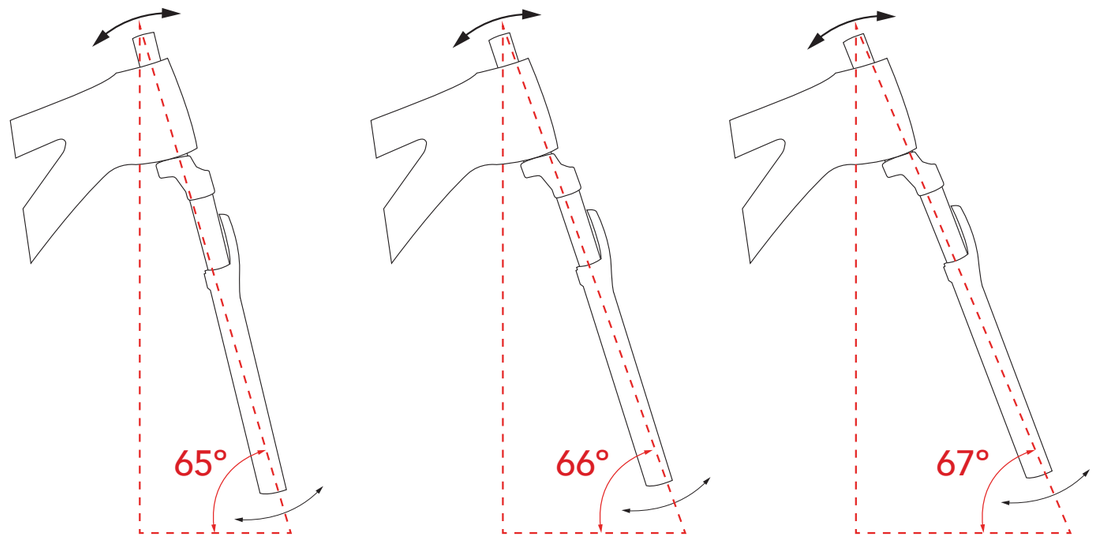


Fig. 36: Illustration of the changes in geometry through the exploration of the head angle adapter.

THE GEOMETRY OVERLOOK

After the head tube geometry proposal, I took the decision to take a closer look at bicycle geometry. The goal was to look for an opportunity space were changes in geometry could affect not only the head tube angle, but the rest of the bike as well. Also, to deepen my understanding on frame geometry and get familiarized with the different numbers and measurements depending on the cycling disciplines. The consequences of this exercise were of major significance to me research.

Comparing different frame geometries form different bicycle manufacturers, I created a parametric model on AutoCad were I wrote down every measurement for each part of the geometry.

I used 5 different bicycle manufacturers, and within those I chose three different bicycles according to discipline, Cross-country (XC), Trail and Enduro.

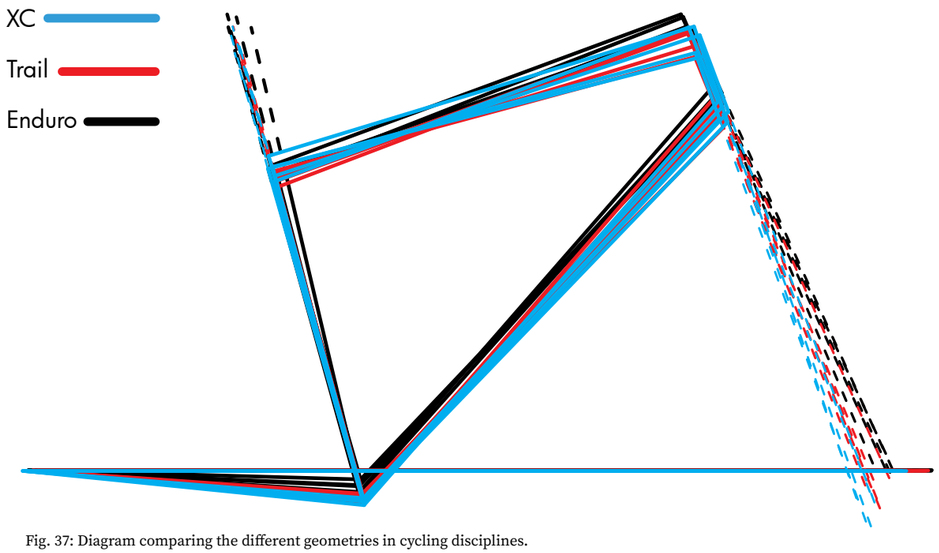


Fig. 37: Diagram comparing the different geometries in cycling disciplines.

This exploration sparked many ideas and helped me realize that this might be the focus of my whole research where the insights gained during the secondary research stage would justify the concept.

After looking at the changes on geometry I realized that there have not been many explorations on changes of frame geometry on the industry and there was a chance that my opportunity space had been found.

This led me to the one of the objectives of my research which is to make the bike more adaptable to terrain, by having a bike that could be able to change geometry depending on the discipline, preference or convenience.

THE REAR TRIANGLE EXPERIMENTATION

After my focus on frame geometry I decided to go further and explore more possibilities. I came to the conclusion that even having a variable angle head set would not cut it for my expectations.

I thought of a new version, a design that could totally affect the frame geometry. This idea came up. It is centered around a hard tail frame, using one pivot and an adjustable part. The idea behind this is the extent to what the geometry may vary after changing the setting.

The results were very interesting, I managed to create this design were one single adjustment will alter the geometry completely. This change will set the frame, hence the bicycle in a completely different position.

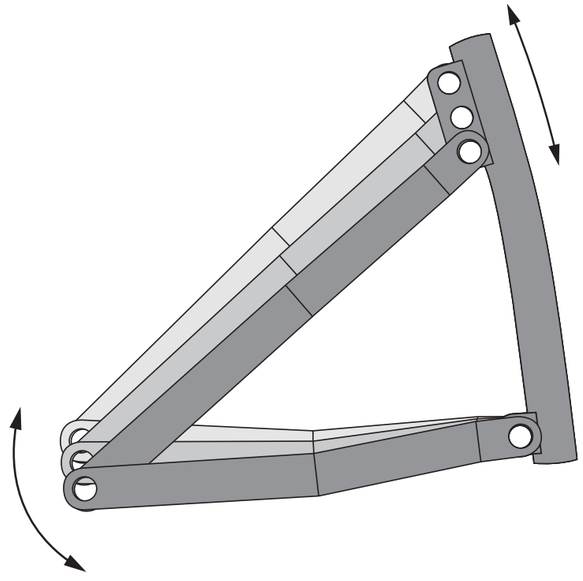


Fig. 38: Illustration of the coupler mechanism

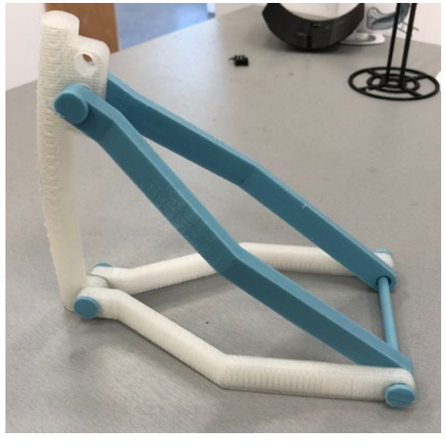


Fig. 39: 3D printed coupler mechanism

THE CONCEPT

The concept developed after extensive research is meant to allow the rider to be an active recipient on the riding experience.

Fig. 40: 3D Rendring of the functionality of the frame.

The frame has a coupler mechanism that allows for different positions, changing the geometry of the bike.

This opened up a possibility for the development of a bicycle that is able to adapt to the riders input instead of the rider adapting to the machine.

This was accomplished through a bicycle geometry study, looking into the variations that will affect the bike's position, therefore how it handles. A change that will make the rider think deeply how they relate to their bicycle and their environment. If the rider has more adaptability and agency in its riding, the experience may be elevated.

Conceptualizing the bike as the enabler is the main objective of the design concept. Building and designing this concept has taken a more collaborative track with Landyatchz Bicycles Company, located in Vancouver, BC. The reason for this collaboration is to help solve of the limitations that industrial design poses when designing a bicycle frame. A frame might require technical and specific knowledge, therefore Landyatchz Bicycle Co. will provide with the know-how and craftsmanship of building a hand-made frame and also providing information to solving engineering challenges throughout the process.

PROCESS OF DESIGN

Borrowing from a previous exploration I had done, the beginning of the design process started with a frame geometry analysis.

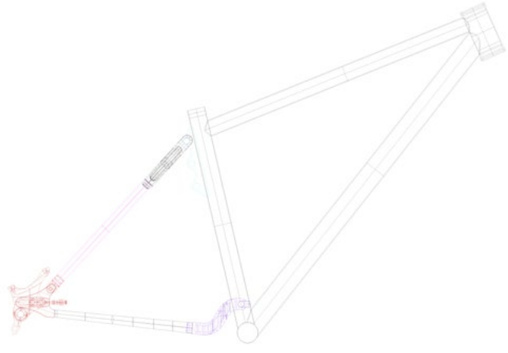


Fig. 41: Blueprints of the frame.

The disciplines examined were Cross-Country (XC), Trail and Enduro. The reasoning behind this is to allow the rider to pick any configuration that suits the kind of ride they will do. Having the ability of setting your bike to a more XC geometry will allow the rider to set itself more straight and aggressive for climbs, this setting might be suitable for long climbs and fast rides through gravel roads.

The Trail mode with allow the rider to have a more neutral position giving them the advantage to climb or descend more comfortably having a responsive ride uphill and downhill. This setting might be more suitable for a trail type ride where the ground varies between uphills and downhills, pedaling is required but at the same time descending is as much part of the ride as well.

'Enduro mode' will allow the rider to have more control during long descents. This setting is made to keep the rider closer to the ground therefore allowing them to travel faster; slacker suspension angles where the rider can have more control on the handling of the bike during downhill sections.

The process then continued to a CAD based media. Choosing the the right angles and lengths of the geometry based from a bike that I rode during this summer, which called out my attention due to its geometry. This served as inspiration to figure out the numbers I think will suit my riding and at the same time incorporate the settings of xc, trail, enduro.

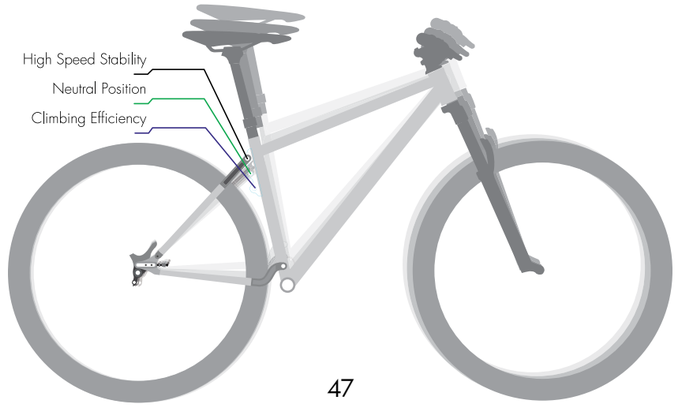


Fig. 42: Illustration explaning how the concept wotks.

REVISING, SOURCING, PROTOTYPING, BUILDING

The design of the bike was then divided into 4 different aspects:
Designing mechanisms - Sourcing components - Building - Putting the bike together

As the geometry of the bike was established, I followed with the process of design of the mechanism that would allow the bike to change geometry. Testing through prototyping using CAD programs and 3D printing gave me a faster channel to rapidly prototype and test different mechanisms. Sourcing components from local manufacturers in mind, making connections and diving more into the local mountain bike culture in British Columbia. The actual build of the bike where putting the tubing and yokes together took place. And finally putting the bike together, building it as a complete bike.

Fig. 43: Steel 3D printed yokes.

Fig. 45: Blueprints during the process of building the frame.

Fig. 44: 3D rendering of the frame.

SOURCING COMPONENTS

Fig. 46: Components and parts of the bike.

BUILDING

Fig. 47: Frame building process.

Fig. 48: Close shot of the coupler mechanism.

Fig. 49: Close shot of the rear triangle.

Fig. 50: Close shot of the pivot point and yoke of the frame.

LOCALIZATION

Localization
to make local; fix in, or assign or restrict to, a particular place, locality, etc.
(Localization, n.d.)

This bike was born in BC, I designed a bike was inspired by the local region, I had to seek ways of making it a local as possible, where component sourcing is as much kept local as possible, the fabrication of the frame is built in Vancouver, BC. The sourcing of components happened through different local manufacturers. Setting the bike build to British Columbia's Market.

Part of my research is also focused on local context, British Columbia is known for being the world's most attractive places for mountain biking around the world as said in the article 'The ultimate guide to MTB in British Columbia' by Mattias Fredriksson. This province offers a magnificent terrain for this purpose (Fredriksson, 2015). Giving this concept local context gives this research more grounding, this bike is born in the province of mountain biking. Having sense of community and being a part of this local culture, the intent for this concept is to be built around local parts and components and representative of the quality of mountain biking in this context by sourcing manufacturers and small businesses dedicated to making bicycle components. In other words, localization is an objective, through the use of components that are made as locally as possible starting with Vancouver and expanding to British Columbia and then Canada.

Inspired by the chapter of Locality in the book "In the Bubble" by John Thackara, "Authenticity, local context, and local production are increasingly desirable attributes in the things we buy and the services we use." (Thackara, 2004. Pp. 73.) I sought out to design a bike that was inspired by the local region, I had to seek ways of making it a local as possible, where component sourcing is as much kept local as possible, the fabrication of the frame is built in Vancouver, BC.

As a way of networking and making connections, diving myself deeper into Vancouver's cycling industry. It's also a way to expand and share my research, as it allowed me to introduce my project to members within the industry.

Having a local context gave me the advantage of making myself relatable to people within the industry, this way it was easier to source components, introduce myself to different component manufacturers as well as getting industry discounts to complete the build of this bike.

BIKE BUILD

Fig. 51: Perspective shot of The Enabler.

Adoption + Adaptation in Performance Cycling

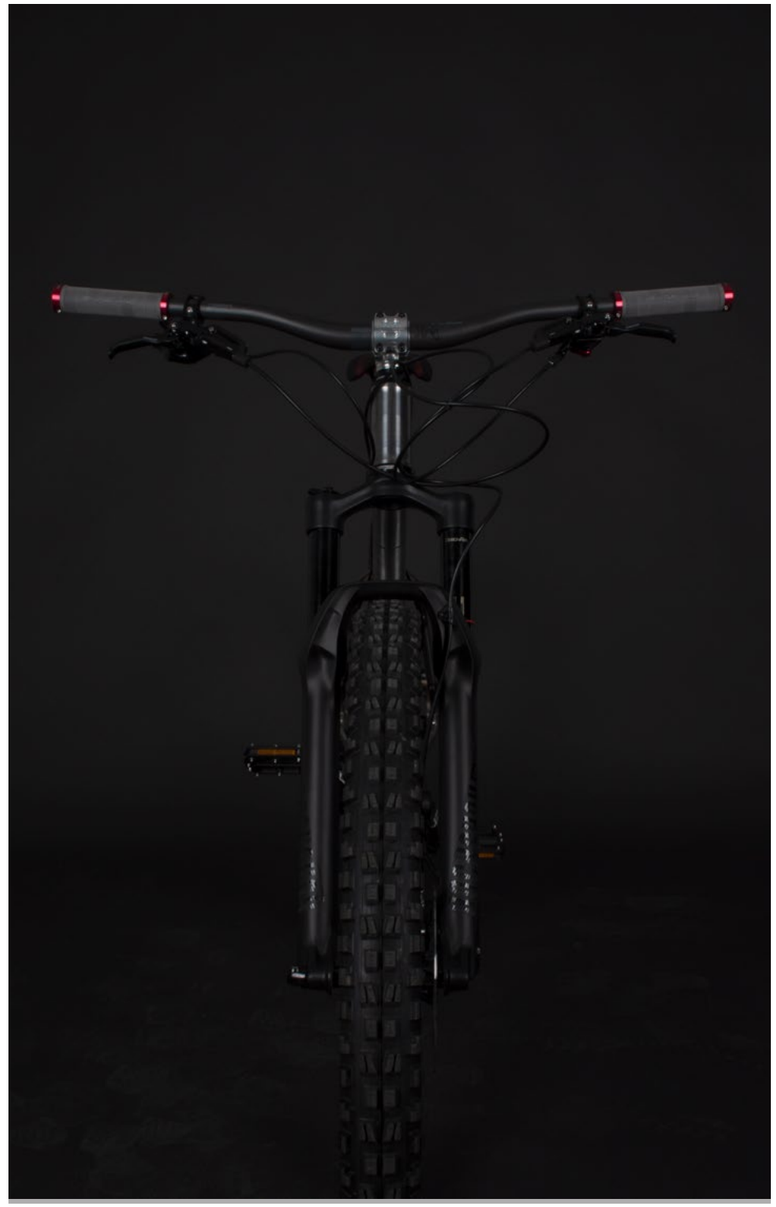


Fig. 52: Front shot of The Enabler.

Fig. 53: The Enabler rear triangle.

Adoption + Adaptation in Performance Cycling

Fig. 54: The Enabler handlebar.

CONCLUSION

I see this concept being a realization for the adaptors in the mountain bike culture. Adaptability on geometry can be an instant action through the push of a button, it doesn't require an intervention on the frame as most bike manufacturers offer nowadays. My research aims at the adapter that's constantly looking for more out of their bike, the answer might be on adaptability and the bike being able to change geometry instantly depending on the many factor of the ride. The effect that riders experience had on this research is considerable, thinking holistically of my own type of riding and doing specific activities based on a niche of the cycling culture.

The concept of the bicycle frame is finally based in the understanding that the body is the best sensor and the input it provides, relating to how the rider can have more agency in their experience, and how the bicycle acts as an enabler for experiences. Opening up a possibility for the development of a bicycle that is able to adapt to the riders input instead of the rider adapting to the machine.

Documenting my own experiences after many hours spent on the saddle, through applied research I was able to focus on the quality of the practice, and understanding that awareness is gained through being able to reflect on the relation of oneself and the actual ride. Exploratory research methods served this research a good basis for grounding, demonstrating how the engagement of cycling happens from a psychological point of view. Human factor research, human centered activities and auto ethnography played an important role informing the direction of this research, guiding explorations and providing space for reflection on the action of riding. These methods also helped to describe my connection with these mechanisms, the experiences and culture that surround it.

Volunteering for the BC Bike Race provided with qualitative data reflecting on the rider's experience and adapters versus adopters. Performing fieldwork and observation gave more supportive findings in the relation and interaction of cyclist and bicycles, finally giving an answer to the question, why do we collect and adopt so many accessories, how do we adapt our hardware? By understanding that one of the reasons mountain bike riders collect and adopt accessories may be to expand rider's experience by enhancing the connection between bike + human in relation with the elements, providing more adaptability to terrain, giving the rider confidence, suiting riding styles, etc.

Diversifying my observation and applying immersing creative research activities through Ironman 70.3 Victoria made me understand the cultural difference in triathlon and mountain biking. Giving me insights on the particularities of each cultures. Realizing that the triathlon culture has more adopters because of the nature of the sport in comparison to the mountain bike culture.

The creative practice based research through Landyachtz Bicycles allowed space for the design, prototyping and expert consultation as the design evolved, verifying each step of the process and priding feedback for the build of the concept bicycle frame.

Expanding my knowledge on frame design from alternate and varied perspectives to more precise and conscious prototyping and modeling by making to know and material practice through modeling, prototyping, directed studies, consultation, additive manufacturing and testing.

I acknowledge that my findings form an archetype for a type of person or personality, the extent towards these methodologies in terms of how I reached to the point of designing the geometry I would like after doing research is possible, but that depends on the democratization of the bike design. This is a concept and its purpose is to demonstrate the adaptability of frame geometry in mountain bikes.

This research has been an amazing experience, where I got to dive deeper into the cycling culture, and get to know British Columbia's cycling culture to an extent. This research has made me more aware of the way I relate to my bike, making me question the extent towards I thought I already related to my bike. Riding as much as possible and being constantly conscious on every ride about how one's body adapt to the bike. Thinking in terms of the bike being not only an extension because that would enable many different opinions, but rather as a static enabler where what you choose won't give much room for adaptability.

The future impact of this research is aimed at the adapters, this a is a concept that is meant to make the rider realize that further adaptability is possible. On another hand the impact this research has created a repercussion on the way I think about bikes, making me more aware of the bikes I ride, and opens up the possibility for further investigation given the right engineering aid.

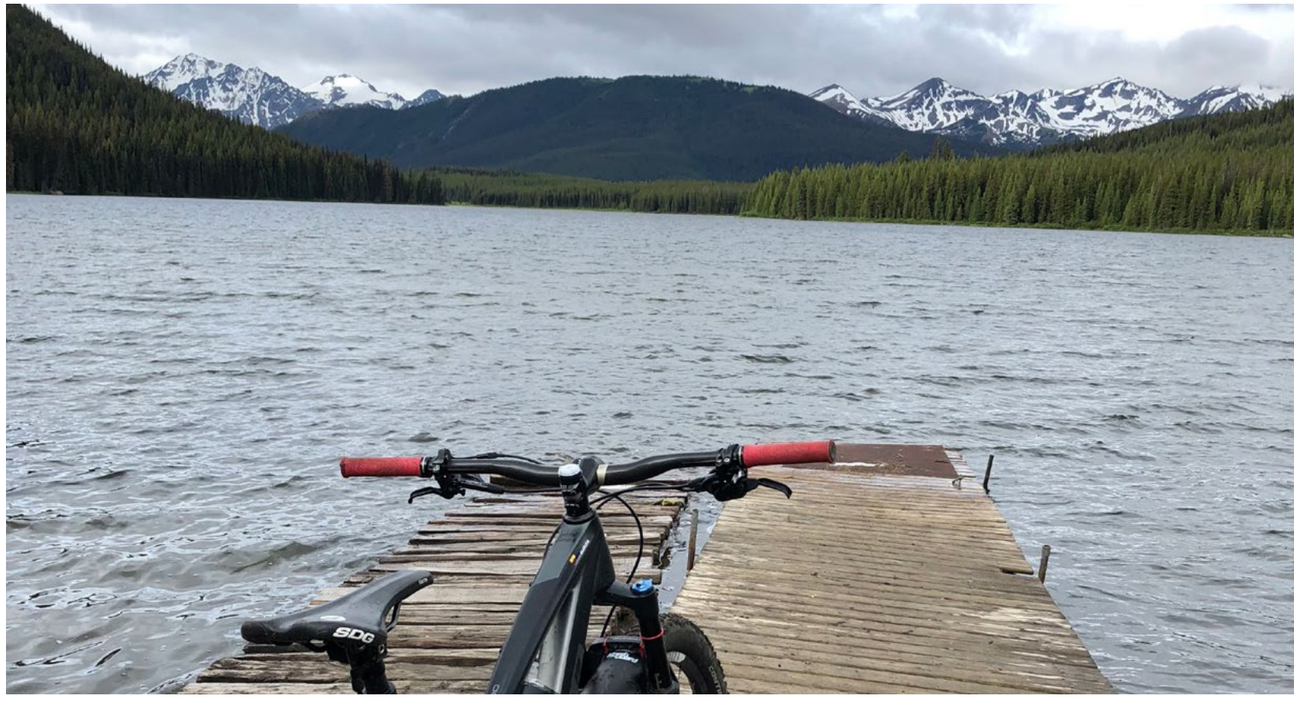


Fig. 55: Arriving at Spruce Lake, BC.

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This concept demonstrates the adaptabilty a frame can have during the riding experience by allowing the rider to have more agency on their bike. Having a coupler mechanism that allows 3 settings to change the geometry of the bike. This frame is meant to incorporate geometry variations instantly during a ride

ALEJANDRO ALARCON