Future Propositions for How People Use Technology: Designing Through Ethnographic Research Methods

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Carnegie Mellon University's School of Design partnered with Cognizant Technology Solutions on a design project for a semester-long elective course called UX Design Tools. The intent was broad in its inception: identify emergent opportunities where technology will play a significant role in people's interactions and experiences. What is the future of physical space? How are advancements in IoT, augmented reality, and telematics influencing how we experience environments?

Students were asked to anchor their problem solving in evolving human needs and to understand the role technology plays. Cognizant's human-centered development approach relies primarily on ethnographic inquiry. This evidenced through integrating their anthropologists from acquired firm Idea Couture, and associates from strategic partner ReD Associates. The interdisciplinary majors from upper-level undergraduate to graduate level students learned to use and create multi- method research approaches to identify unique opportunities.

Seven teams created future scenarios with newly developed physical product designs, digital interfaces, and new service strategies utilizing various technologies. Three case studies highlight a trio of observed emotional themes in relation to how people utilize technology to benefit their daily life or work: self-election, introduction-exchange, and co-dependency.

This poster presentation will showcase three projects that will serve as examples of how industry and academia act as research and development entities; how to approach research as a fundamental tenet for innovation and design; and show how breadth and depth of interdisciplinary skills and experience is a necessity in an ever expanding climate of technology push.

Keywords: ethonographic research, future casting, design systems

Taming Technologies Role in the Future Through Design

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This project's premise is at the heart of today's role of technology and how people will adopt and interact with the world. Currently, people are reliant on a range of personal technology products to being networked into a complex digital ecosystem connecting work, play, and everything in between. With logarithmic advances in computing power, artificial intelligence, new material technology and manufacturing options, design and designers are at the forefront of humanizing these tools and interactions.

What processes can be employed to leverage digital, material, and unimagined technologies? Discovering these possibilities and how technology may play an essential role to our new future is why ongoing investigations through contextual research is essential. And it is a necessary tool to mine the diverse range and depth of each business and industry sector's opportunities. The possibilities to change and improve people's everyday lives through starting with a human understanding versus technology an idea, opens greater possibilities for impact. And designers are trained to seek and see things through the lens of the user. Designers possess a unique set of abilities that generate new perspectives and unique opportunities by using behavioral research skills, analytical abilities, collaborative nature, and generative skill sets. They apply these methods and skills in both intangible and tangible building to propose and produce unrealized solutions.

In the perpetual march of exponential technological progress is important to note that this project's approach purposefully started with observing and engaging people, as people and not as users. Human centered designing starts with a particular mindset. This mindset requires empathy and understanding at individual to societal levels. Being contextually aware and listening to other people's experiences is the starting point and essence of qualitative research richness. We have seen prior examples of when man machine interfaces were not properly considered. Or when efficiency is prioritized over human needs and control is stripped from human operator. It is the study of people and their behaviors that is the core enabler of how latent opportunities are derived. This mindset and journey of discovery provides a map to natural and safe solutions to human machine interface - and ultimately ethical technology development centered on human needs.

Interdisciplinary Project Overview

Seven interdisciplinary teams with three students per team were organized in a 15-week elective course called UX Design Tools. The students ranged from junior, senior and graduate level students. Each team consisted of three members, comprised of at least two designers, a communication designer and an product designer. The third member included

computer science, human computer interaction, engineering, architecture, or humanities majors. The course is a longitudinal mixed method research project based studio. Significant emphasis is given to applying traditional behavioral research methods that are the basis for developing participatory, generative action tool methods.

Concurrent with the research processes, design teams used visual conceptual mapping and modeling to understand the problem space. Progressively in the process, design teams created low fidelity prototypes and/or generative tools to test and iterate with participants. Depending on the design opportunity, the teams designed physical and/or digital solutions. These designed artifacts act as assets for a future-state scenario that culminates into a final video sketch. Each team member has overlapping levels of experience, range and depth of skill, and some prior internship or professional experience. This paper highlights portions of the teams' processes and artifacts created that lead to deeper human understanding and ultimately their product and service solutions.

Why is Carnegie Mellon University a strategic partner with Cognizant Technology Solutions? Cognizant is one of the world's leading professional services companies, transforming clients' business, operating and technology models for the digital era. Their industry-based, consultative approach helps clients envision, build and run more innovative and efficient businesses.
Headquartered in the U.S., Cognizant is ranked 230 on the Fortune 500 and is consistently listed among the most admired companies in the world. Their specialties include: Analytics & Information Management, Business Process Services, Intelligent Products & Services, CRM, SCM, IoT, Cloud, Intelligent Automation, Infrastructure Services, Quality Engineering & Assurance, Application Services, Enterprise Risk & Security, etc. As a large scale, multi-national technology service provider of information technology, consulting, and business process outsourcing services, Cognizant is aimed at identifying and developing new solutions, services and strategies that change the way we experience the world and do business.

To be a continual leader in this highly competitive field, Cognizant focuses on being a partner for end-to-end digital transformation - believing a successful enterprise must understand the context in which they compete and invest in new business, operational and technology solutions. To commit significant investment towards transformation, Cognizant needs a robust understanding of the primary benefits and goals to the business and intended audiences. One of their means of staying at the leading edge is contextual research - a combination and series of ethnographic and longitudinal research uncovers problems or gaps through the investigation and process of human interaction and behaviors.

The primary Cognizant project lead for the course, Carly Burton, Global Director of Human Sciences Technologies, primed the project initiative with various scenarios spanning from the future of retail, transportation, communication, to how entire cities and infrastructure will be reimagined. As a proponent for human sciences and appropriate user centered design in a technology services company, Burton focuses on extracting insights from people to understand their contextual norms and behaviors and how their collective beliefs influence a system.
Specifically, through the process of social study, Burton exposes unarticulated needs and

discovers historical experiences and critical pain points to design against. Overall the ethnographic methods are used an open-ended approach to research, so people speak to what matters most to them, sharing how they relate to the world.

Cognizant's acquisition of innovation firm Idea Couture, and strategic partnership with ReD Associates, provided further exposure for the project teams to understand alternate methods of human inquiry. ReD Associates consultants, including Partner Mikkel Krenchel, gave guest lectures on how ethnography and behavioral research methods are a starting point for deeper understanding, analysis, and insights. They emphasized the value in framing questions around human phenomena and the sensitivity necessary to understand another culture and people. Paul Hartley, PhD, Executive Director, Institute for Human Futures, Sr. Resident Anthropologist from Idea Couture also participated later in the semester to review the project team concepts and proposed storylines. Hartley provided critique on the translation of human insights into the design solutions.

Course Dynamics and Common Denominators

Significant challenges occur when managing interdisciplinary teams. Concerns for enabling each member to utilize their own experiences and capabilities is paramount. One of the common denominators used to align teams was the design research process. The barrier to entry is relatively low for using observational methods such as AEIOU. The value and richness of the information becomes self-evident. This starting points provides a basis for framing the situation and next steps of research methods. When presented with the relatively broad scope of the project, teams devise research plans and tools that would give them an understanding of the subject area in question. Creativity in devising the research methods and protocols is becoming a significant role of studio-trained designers.

Designers naturally visualize and map the collective team's participants' current state. Working with the qualitative information in tangible forms such as images, quotes, maps allows for synchronous team analysis and synthesis. Outliers, significant aspects, pattern identification, and other notable results of the research occur during this fluid part of the process. Both instructor and client sponsor ensures the team members ask themselves critical and relevant questions that probe for latent needs and what is the norm.

The design research process builds on observed and recorded research. This traditional behavioral research becomes the basis for subsequent generative research methods and tools, where the project teams can gain additional insights that challenge and refine their design hypothesis. In essence, designers extract insights on human behaviors and then experiment with solutions they believe will drive the most value, and then take those ideas into a learning cycle. The generative learning cycles enable team members to build solutions that enhance and influence human experience.

When the project teams apply this process to the design brief, several topics immediately emerged on core changes facing the current infrastructure's inability to cope with the rising and changing North American population needs. The final topics of each of the seven teams

included: augmented reality as an enabler for airport experiences, physical and digital props to create interconnected neighborhoods, the future of autonomous car ownership, multi-modal transportation in urban environments, helping expatriates meet new people, enabling ADHD students to succeed, and refining EMS processes and technology systems.

This paper will focus on three primary project team cases that best highlight how and why longitudinal and contextual research was essential to finding new opportunities. At a meta level, we found that these project teams, uncovered very special human emotions that became the driver of opportunity for combined technology and enhanced human interactions.

The three teams included: Compass, Time Management in Mixed Reality (inspired by aiding ADHD students); Fika, helping expatriates meet people to mutually share each other's culture; and Claro, a connected EMR system built around each person affecting the care system. In retrospect, the journey through ethnographic, contextual research led the teams to identify interaction archetypes that we identified as: self-election, introduction-exchange, and co- dependency.

Team Compass: Self-Election Behaviors and Interactions

Compass team started simply by attempting to help students with mental disabilities. Several weeks of literature reviews and interviews with trained educators in special needs helped them further focus their project scope. The main qualifier to this course is that students have to have access to the targeted participants in order to administer first-person interviews and subsequent action research. This criteria ruled out a significant portion of mental health subjects due to Institutional Review Board regulations and course limitations. However, college students with Attention Deficit Hyperactivity Disorder (ADHD) self-identified and were willing participants in the project. The unique aspect of this participant group was that they in some form, conquered part of their own disorder. Their presence in a higher-education academic institution proved to themselves and others, that they can achieve goals regardless of their personal disabilities. The team focused their research process and methods on six, self-identified ADHD college students. One of the primary take aways that served to be a difficult challenge was that ADHD students all learn differently and there is no 'best practice.' A second mantra was simply stated: 'being successful in school is a a lot about getting sh*t done.' Interviewing these students was incredibly value because they had already developed their own tools - self awareness, cognitive strategies, time management, and other methods of accomplishing short term tasks that built towards larger goals. With numerous organizational tools in both physical and digital forms, the team used these prior tools as a basis for mapping and understanding basic fundamentals and benefits of each one. Alternately, from the human perspective, they identified that productive people needed: flexibility, focus, and motivation. Contextually to ADHD college students, Flexibility meant the ability to manage or flex to a task dynamically and not build strict rules or timetables; Focus was the ability to be notified or shown relevant tasks in relation to their location and other task priorities; and Motivation was a personally relevant and perpetual way of showing progress and improvement.

The following images and illustrations will provide an overview of the research methods and processes this team employed to arrive at their mixed reality design solution. As with most

design thinking and design processes, there is a convergence, divergence flow to the process. The literature review and early interviews with educators led to a broad scoping of the potential situations surrounding mental learning disabilities. This is visually represented in Figure 1: Concept Mapping / Compass. Convergence to ADHD college level students is represented in Card Sorting Activity and learning about their current digital tools and strategies that go along with these tools.

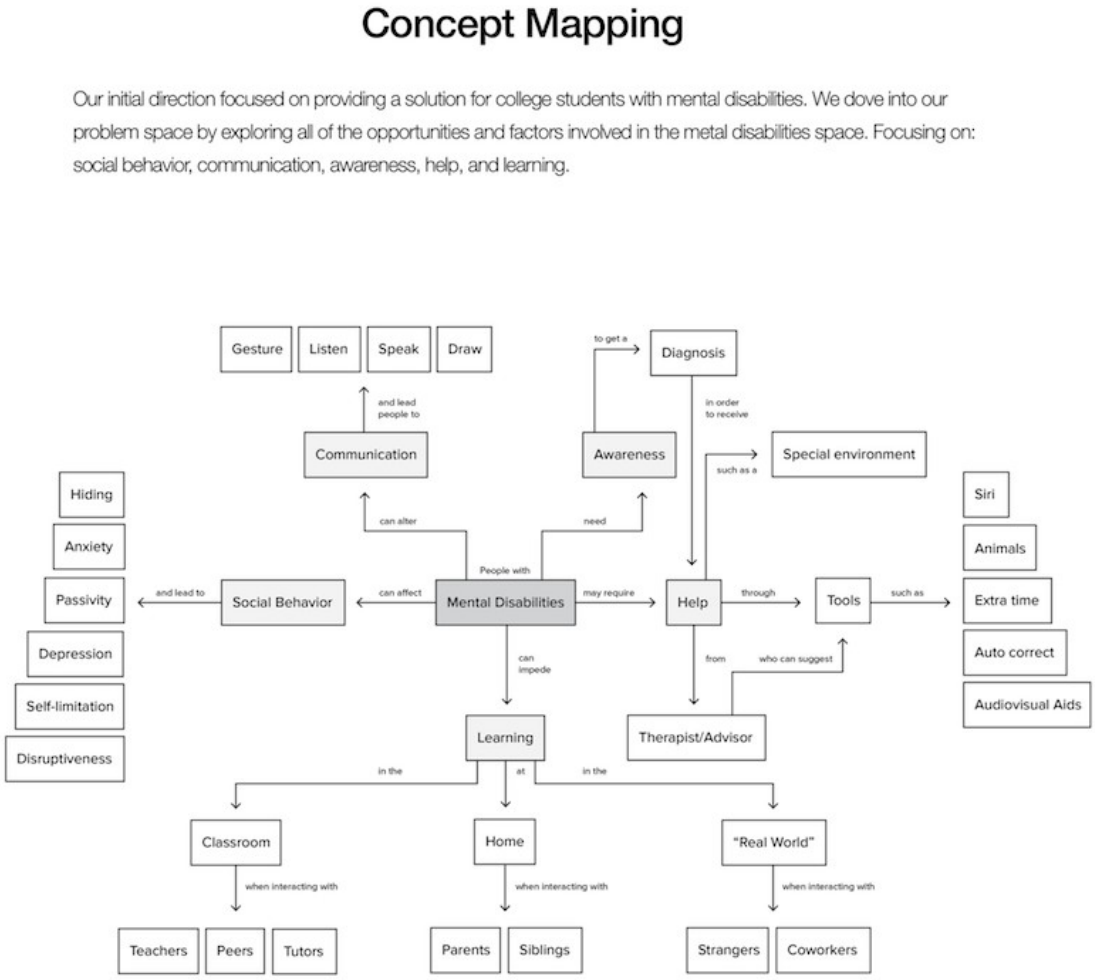


Figure 1: Concept Mapping / Compass

Figure 2: Exploring Existing Digital Learning Environments. At this moment in the research process, since the discussion was about technology, the team used provocations to elicit future ideas and scenarios where the participants could imagine themselves.

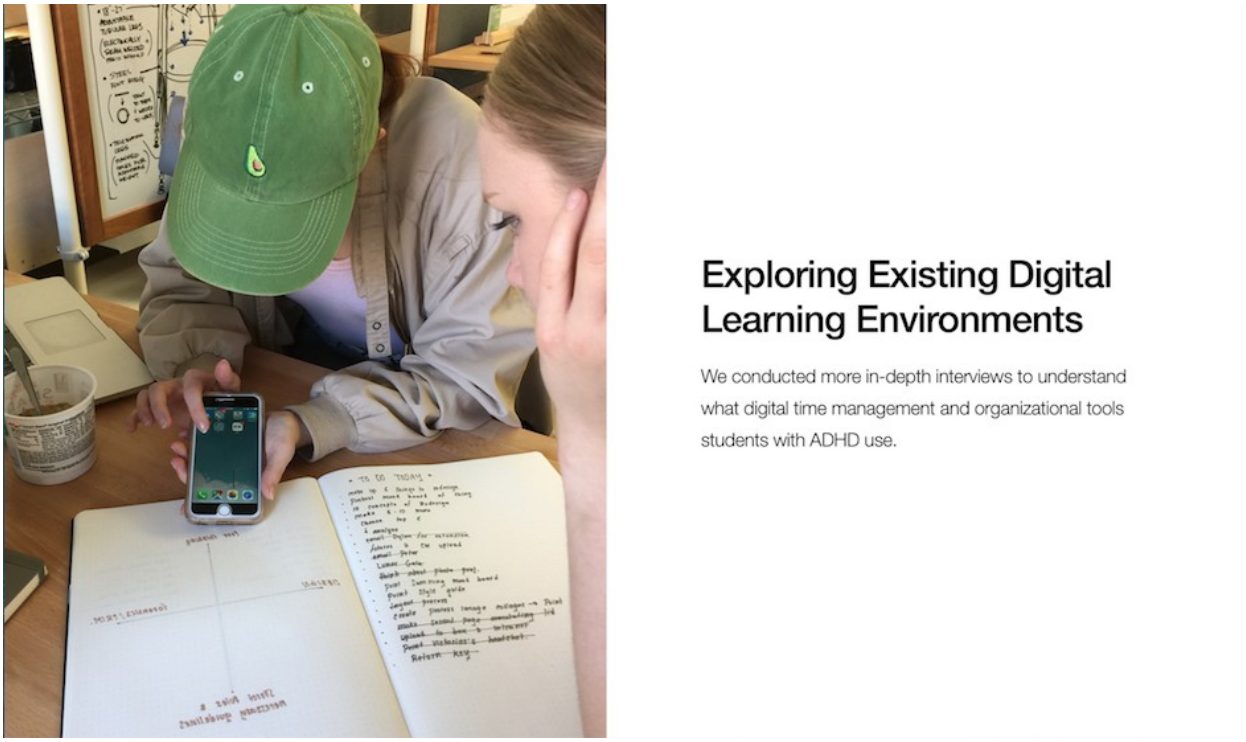


Figure 2: Exploring Existing Digital Learning Environments

Figure 3: Initial Provocations and Figure 4: Initial Provocations Participant Output show the exercise prompt and example responses. Interestingly, a moment of divergence occurred when the team analyzed and started mapping the responses from the ADHD participants. If the tools and techniques were so useful to this population, why couldn't others benefit from them?

Additionally, many of the tools were not ADHD specific. So how were others using these tools and how are the different from the intended user group?

Initial Provocations

I sketched out several concepts using Augmented Reality. We presented these concepts to participants to gain initial reactions and feedback as to what features and concepts might be practical.

Figure 3: Initial Provocations

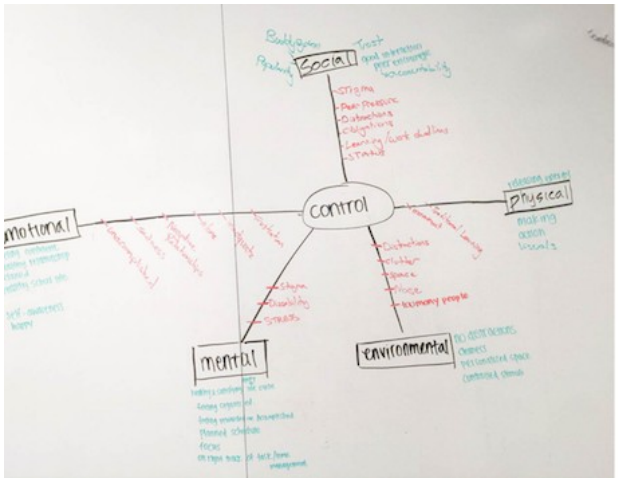
Figure 4: Initial Provocations Participant Output

Figure 5: Mapping (Divergence 2), Figure 6: Mapping: Control of user aspirations for a level of control through the day, and Figure 7: Control & Helpfulness mapping portrays the daily activities in relation to a simple four quadrant, with two semantic differential continuums (Control vs. No Control / Helpful vs. Harmful).

Mapping

We decided to broaden our user audience from just students with ADHD to all university students who struggle with time management and productivity. We used our previous findings and initial research to guide us in what to do next. We began by grouping key needs and values that our research participants had expressed. We discovered that the idea of control was extremely valuable to everyone we talked to. If users felt in control of their daily lives and were able to manipulate the way they plan and schedule, there was a greater sense of accomplishment and heightened emotion.

Figure 5: Mapping (Divergence 2)



Mapping: Control

This mapping exercise helped us understand what positive aspirations users want to have control over (Green) and what negative everyday influences might get in the way (Red).

Figure 6: Mapping: Control of user aspirations

Control & Helpfulness

We then organized daily activities, moments, and distractions on a chart. This was useful in identifying where pain points might arise during a normal day.

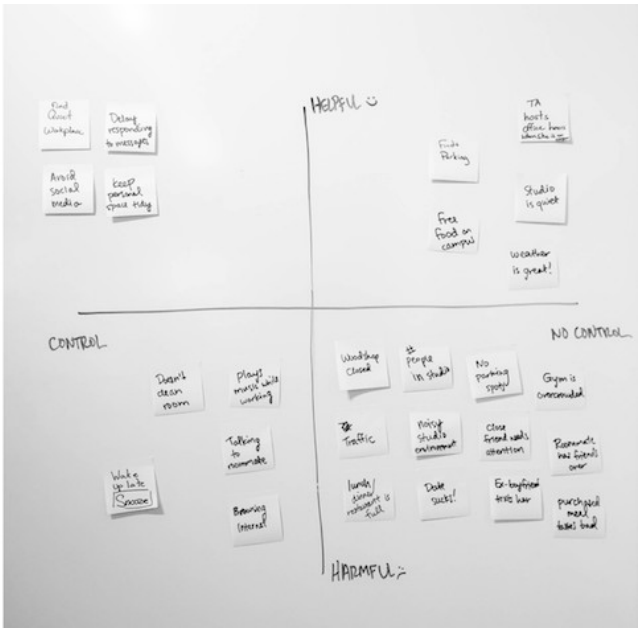


Figure 7: Control & Helpfulness

Figure 8: Journey Mapping is a natural extension of visually organizing and presenting a typical day with the purpose of finding the 'curve balls' or incidents that would easy affect an ADHD student from their intended regimen.

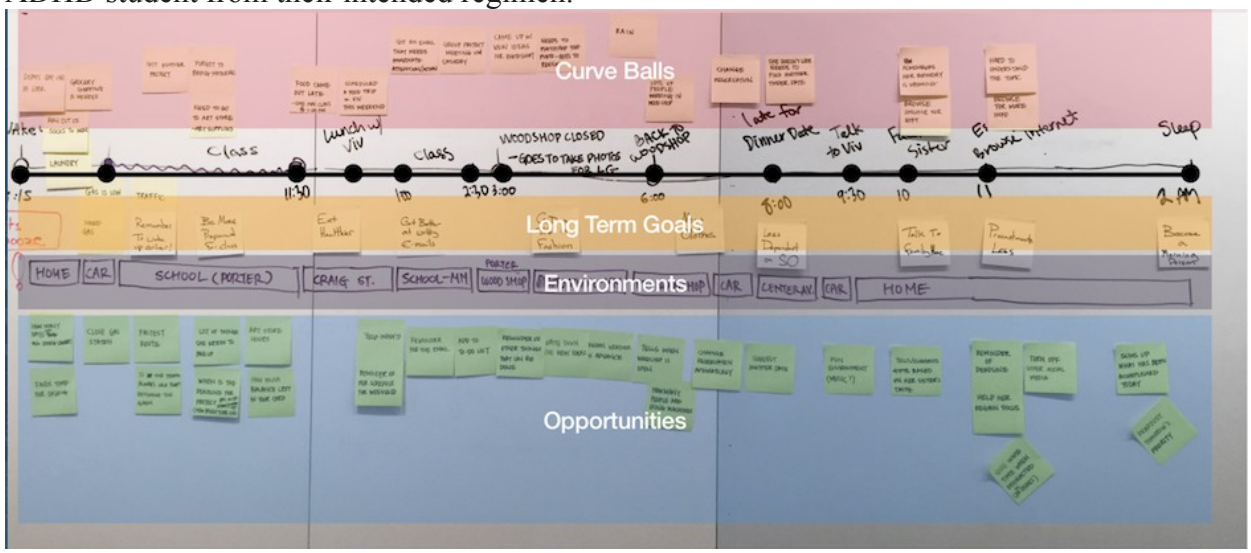


Figure 8: Journey Mapping

Figure 9: Drawing it Out converged on the cognitive specifics of how the participants would currently plan their day. Figure 10: Dynamic Scheduling asked them to move slightly out of their comfort zone and to re-imagine and learn a new method shown in Figure 11: Bullet Journaling and Figure 12: Not a Hit, reaction.

Drawing it Out

Kaleb instantly asked for a pen and paper and began to sketch out blocks that represented different events he had the following day. This method was no surprise to us, but some of the conversation that followed shed light as to why he prefers to draw it out. He mentioned that he tends to leave the sketched out paper on his desk and that the reason he writes down what he has to do is more about the ritual and thinking than using the actual paper to follow later in the day.

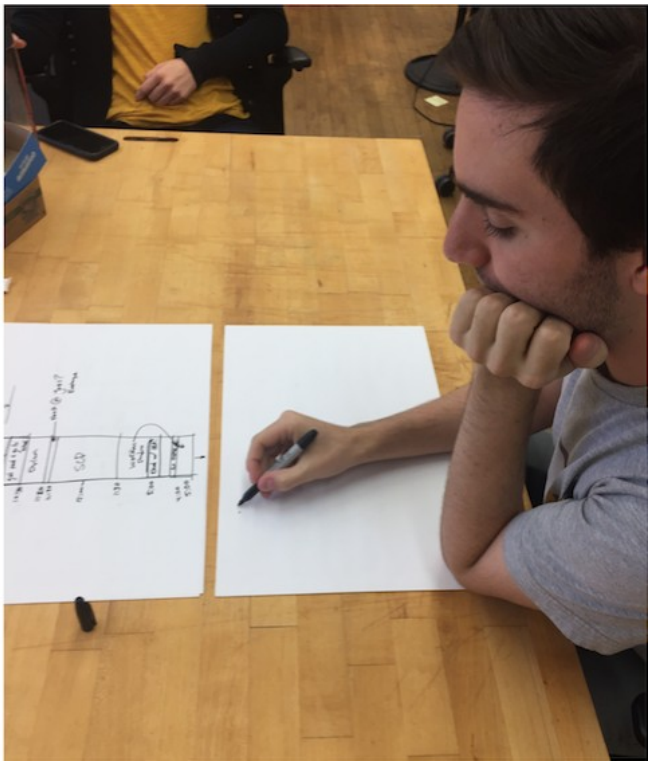
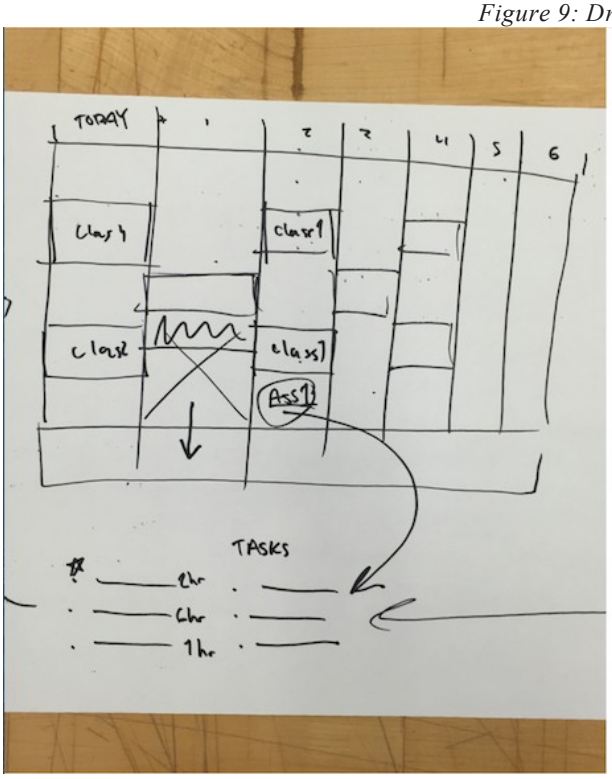


Figure 9: Drawing it Out



Dynamic Scheduling

We then asked him to draw out an ideal weekly calendar. We found Kaleb's week outline very interesting. He drew out two main areas, one was a more standard weekly calendar graph, the other was a list bank. He explained that his concrete daily activities would always live on the weekly chart but his ToDo's would stay in a constantly changing bank. He can create and delete tasks and also be able to control where to place the "event blocks" in his daily routine. He explained that if he wasn't able to complete one of the less important tasks, it would just automatically fill back into the todo bank.

Figure 10: Dynamic Scheduling

Bullet Journaling

We then had him learn about a daily panning technique called Bullet Journaling: a customizable and forgiving organization system. It can be your to-do list, sketchbook, notebook, and diary, but most likely, it will be all of the above. We wanted to use this technique because it focuses on making more dynamic todo lists, using icons and symbols. (example on the right)

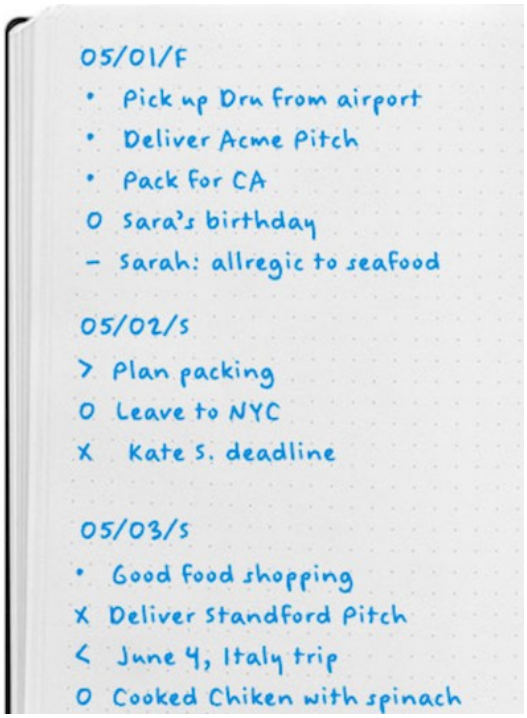
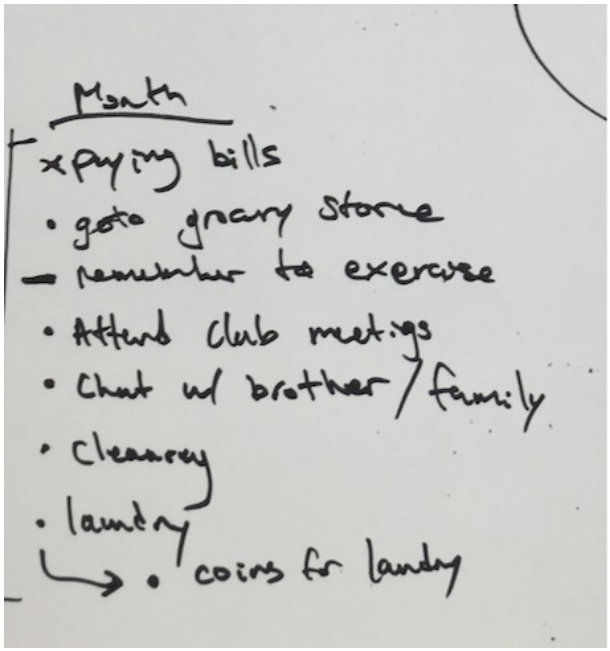


Figure 11: Bullet Journaling



Not a Hit

On the left is Kaleb's attempt at bullet journaling. His reactions were valuable, he mentioned that it would be hard to keep up with. He also typically likes to not put too much thought into each one of the things he has to do, with no concrete start or stop time.

Figure 12: Not a Hit

Figure 13: Workshop: Time & Productivity, Figure 14: The Activity, Figure 15: Insights are a Divergence that was necessary to test the team's findings against a more universal population. Limited to six ADHD participants, the team needed wanted to ensure a broad perspective was not lost by engaging 24 participants. This generative research method reinforced their initial

findings, but also helped galvanize specific themes and criteria for the design solution. Ironically, the divergence step, progressed to a convergence of design criteria.

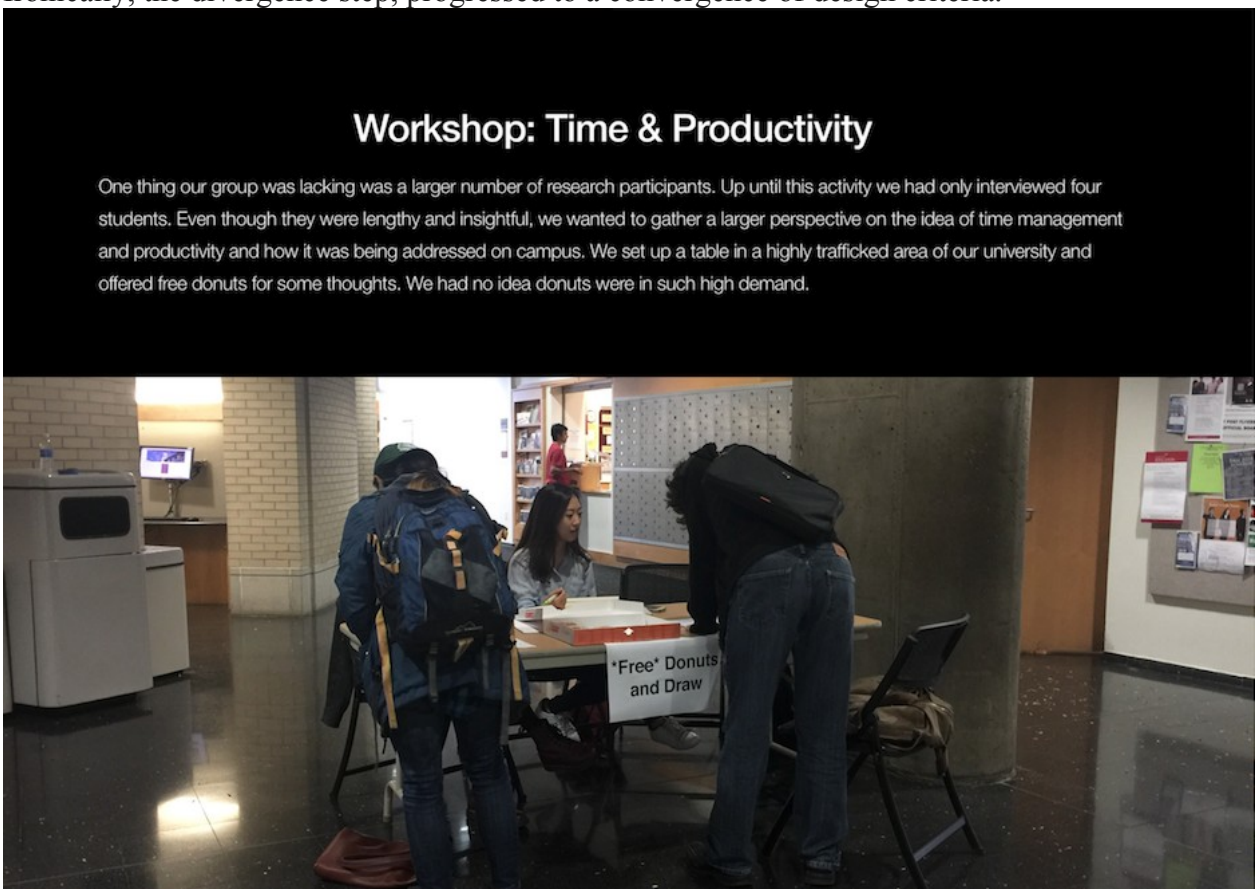


Figure 13: Workshop: Time & Productivity

Figure 16-21: User Category responses are a synthesis of the current workshop but were seen in some shape or form from earlier interviews and research. This part of the process was transformative towards key Themes that defined the tangible design concept. Highlighted themes that were expressed included: Removing Stimuli, Self-reflection, Feedback, Peer Support, Rewards, Motivation, Dynamic Scheduling, Prioritization, Health, and Physical Space. In realistic terms, one product may not be able to address all of these inclusively. So, a subsequent re-Mapping of an intended user's day was graphed to these high level themes to conceptualize which features and interactions may be best addressed with near-future technology. Figure 22: Mapping (of day to day Tasks and longer term Goals). Figure 23: Mapping (Tasks and Goal Relationships)

Environment / Mindfulness

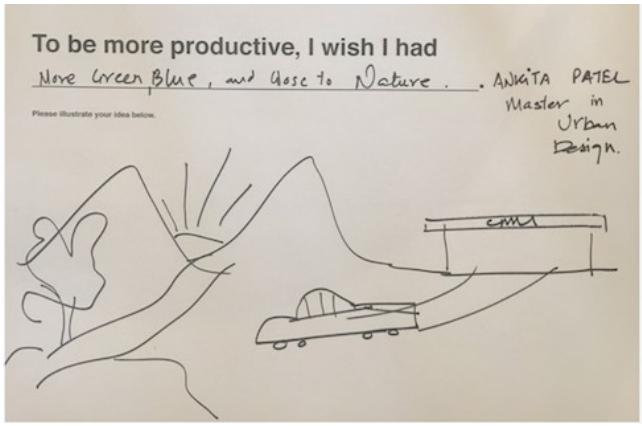
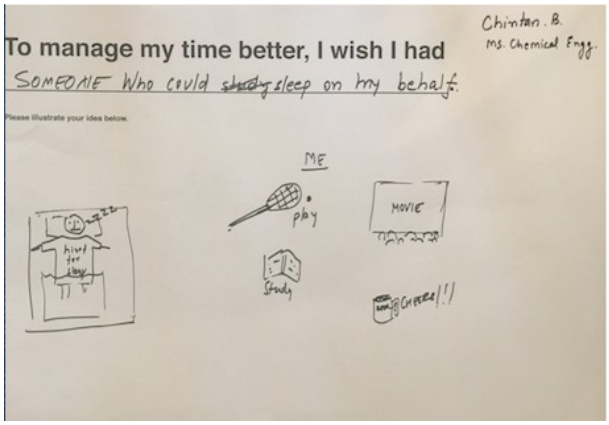


Figure 16: User Category Themes, Environment/Mindfulness



More time to focus on what I want

This participant mentioned that he wanted the boring tasks to be done for him (eveny having someone to sleep for him) but he still wanted to do his class and project work.

Figure 17: User Category Themes, More time to focus on what I want

Social Support / Health

This participant mentioned that she was extremely organized and uses Google Calendar frequently. She mentioned that she missed having an agenda like in her high school because there was a place to reflect on what she did on the weekend. Her agenda also served as her diary, something google calendar doesn't facilitate.

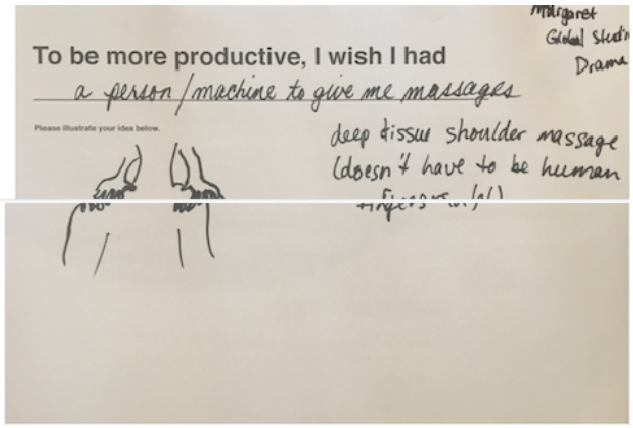
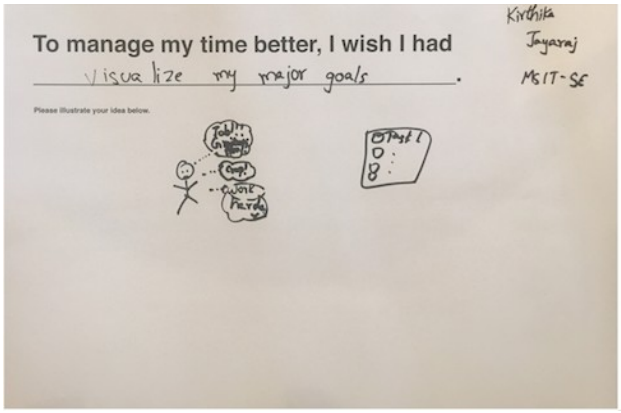


Figure 18: User Category Themes, Social Support/Health



Goals

This participant keeps three physical sticky notes on her computer and uses them for different lists. She has also begun using her stylus to write notes on her mobile phone, which she then screenshots.

Figure 19: User Category Themes, Goals

Dynamic Scheduling / Health / Eisenhower Matrix

This participant basically gave us the solution. He shared The Eisenhower Matrix: tasks are evaluated using the criteria important/unimportant and urgent/not urgent, and then placed in according quadrants. He also created a visual very similar to our prior participant, Kaleb.

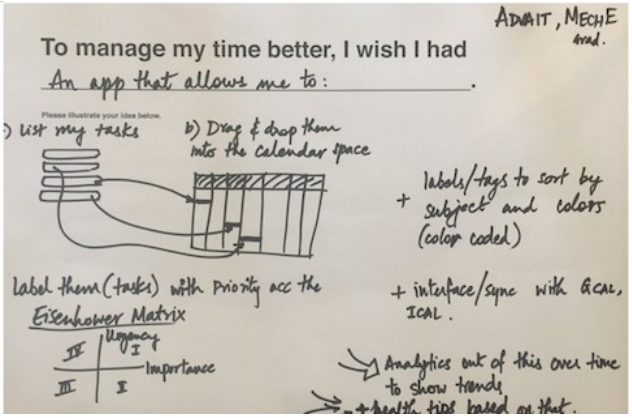


Figure 20: User Category Themes, Dynamic Scheduling

Mapping

We then went back to mapping out a person's day. This time we focused on a circular timeline with a rippling effect. The most inner circle illustrates the day to day tasks the person encounters. The blue notes describe larger long term goals or motivations the user might have. Their placement linearly stems from the smaller daily tasks.

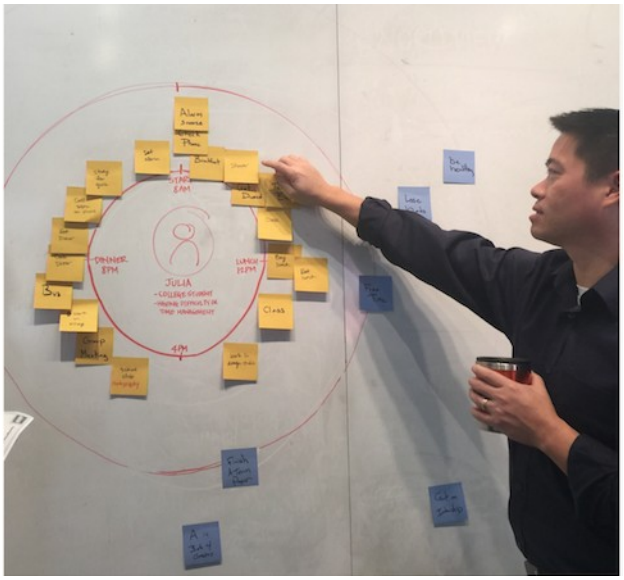


Figure 22: Mapping (of day to day Tasks and longer term Goals).

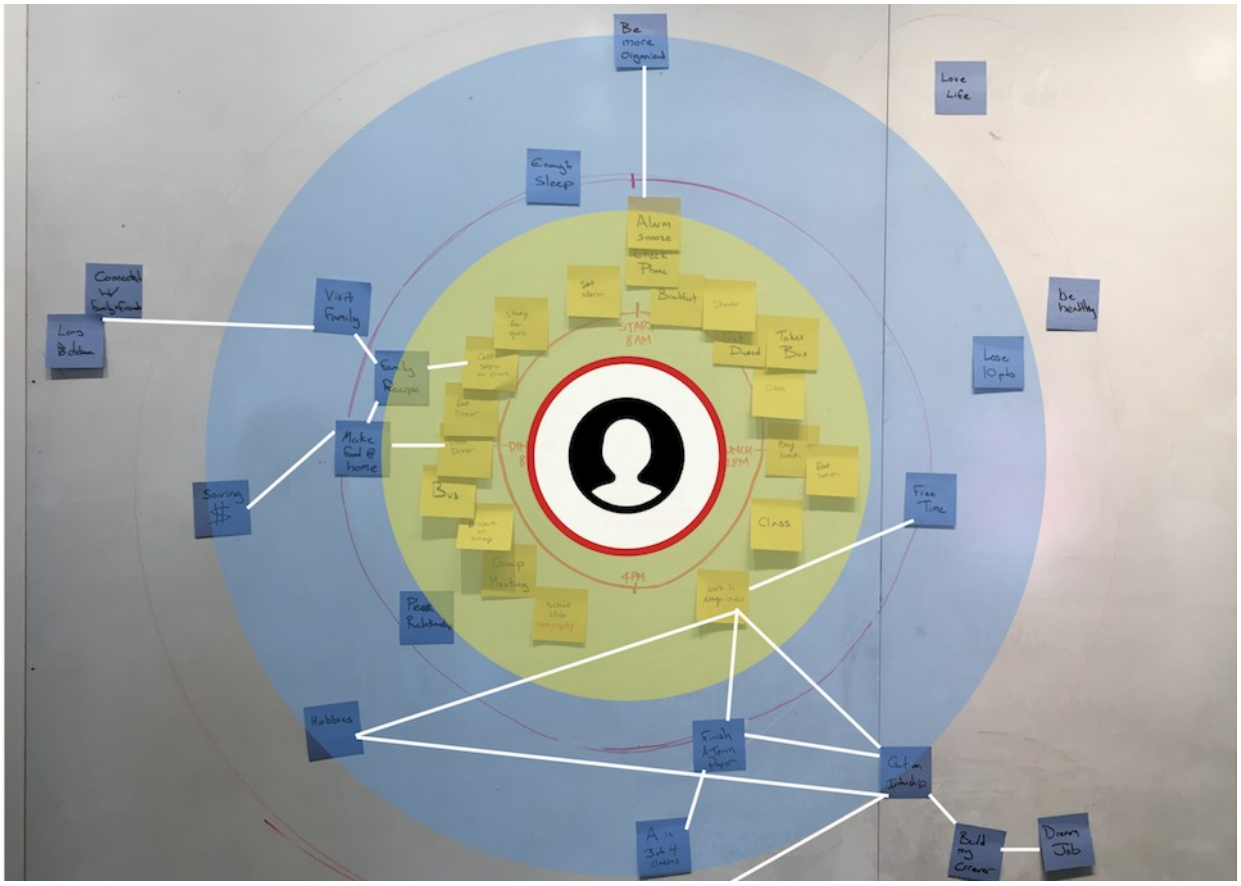


Figure 23: Mapping (Tasks and Goal Relationships)

Subsequent Figures are a focus and convergence towards a tangible mixed reality product design concept. Figure 24: Mapping of Design Concept Timeline Moment Features. An online survey

was distributed and in a short response time of less than three days, 25 respondents replied to what type of Ai, voice operated technology they used. Other questions revolved around familiarity and use of digital assistants or technology. This concurrent research enabled confidence in certain design proposals to use voice and gesture technology. Figure 25: Artificial Intelligence Tools You Use Chart.

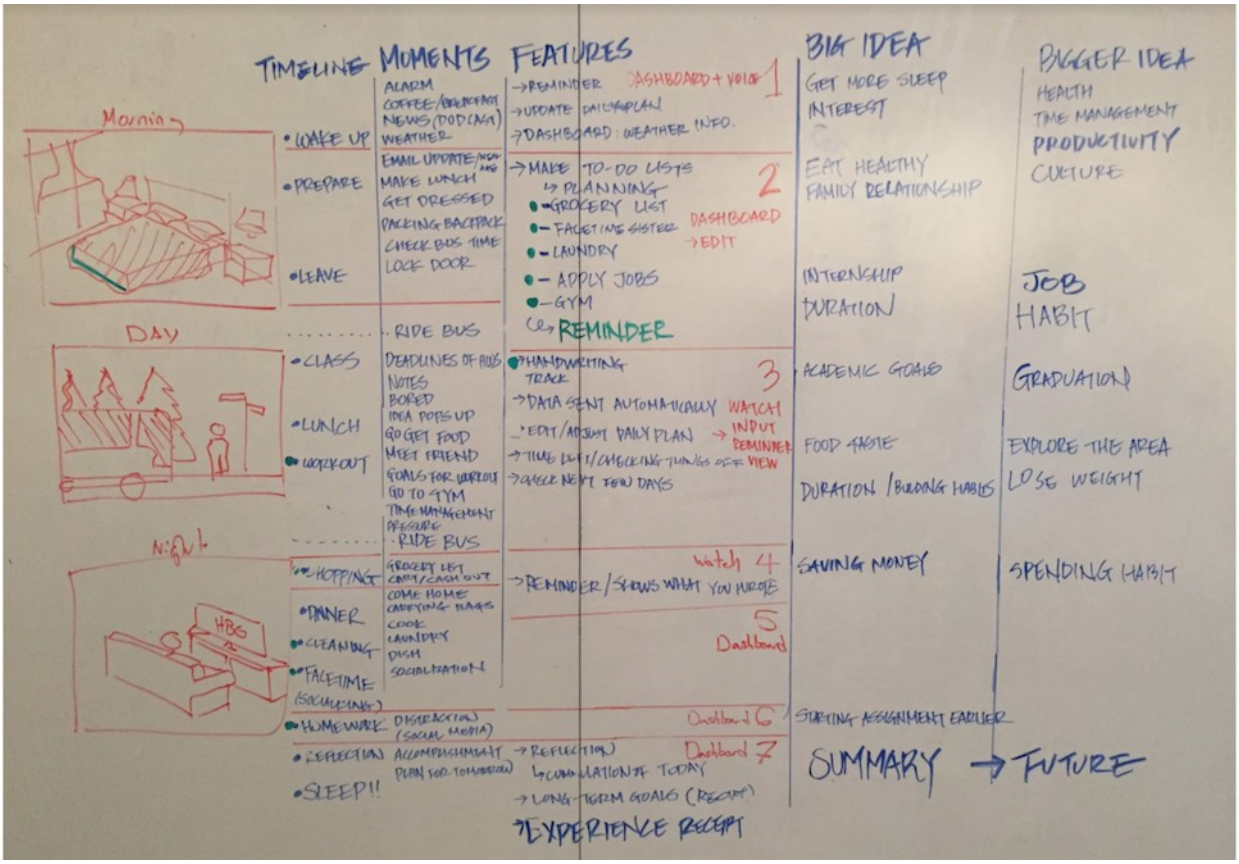


Figure 24: Mapping of Design Concept Timeline Moment Features

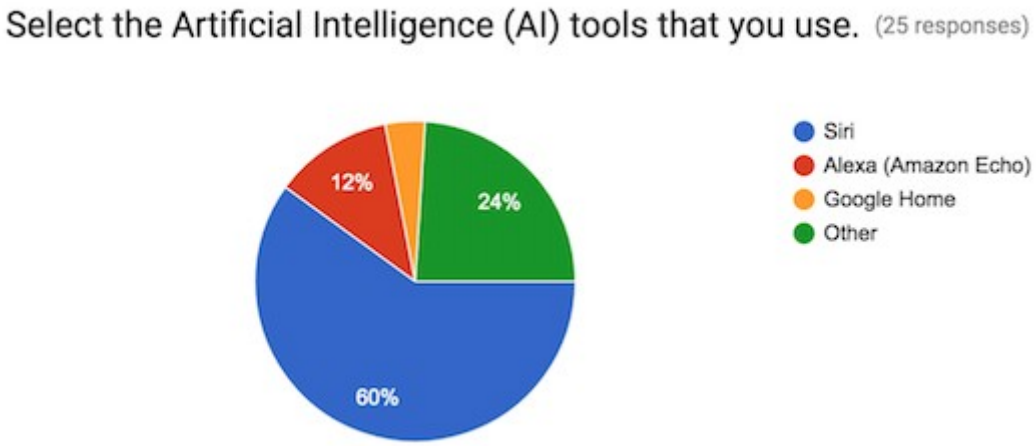


Figure 25: Artificial Intelligence Tools You Use Chart

Figure 26 through Figure 36 are the convergence of design ideas based directly from the extensive longitudinal multi-method research approaches. This point in the design process is quite fluid as the team is completely aligned in purpose because of their understanding of the user group's needs and mindset. Design decisions are relatively easy to determine because the team has a repertoire of knowledge and real life scenarios to draw upon. A rigorous, self-built research process allows confidence in design shape, form, and color based on the higher level themes and concepts.

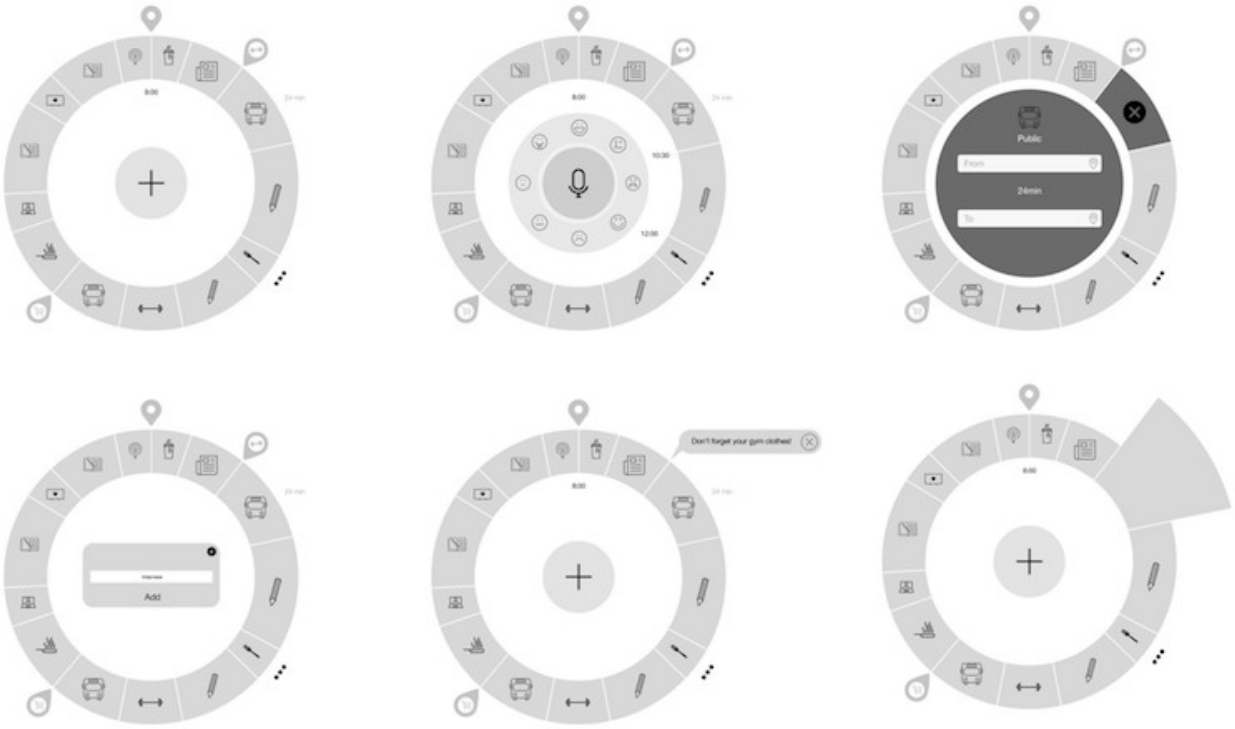


Figure 26: Interface menu concept

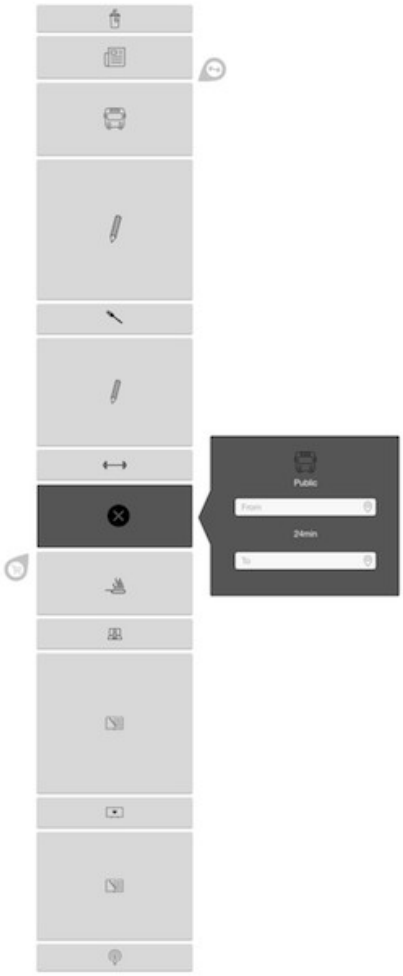


Figure 27: Interface concept wrist arrangement and hierarchy

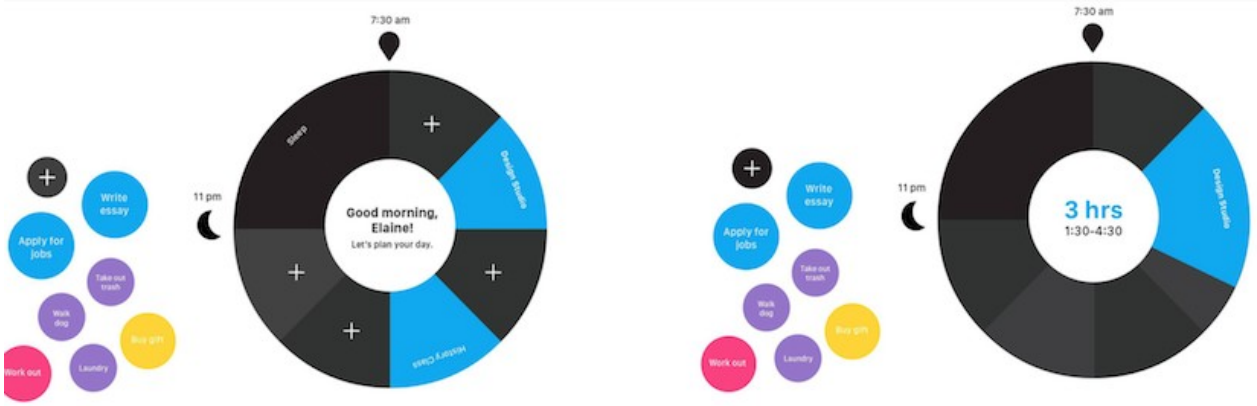


Figure 28: Interface concept daily time screen shots

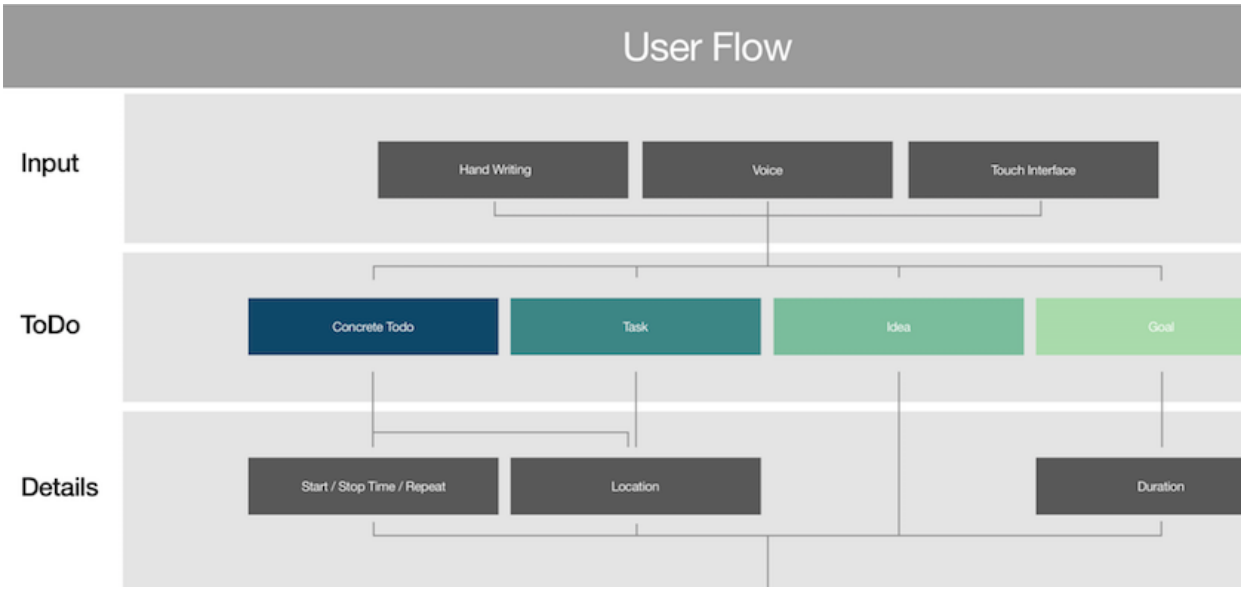


Figure 29: UX/IxD User Flow

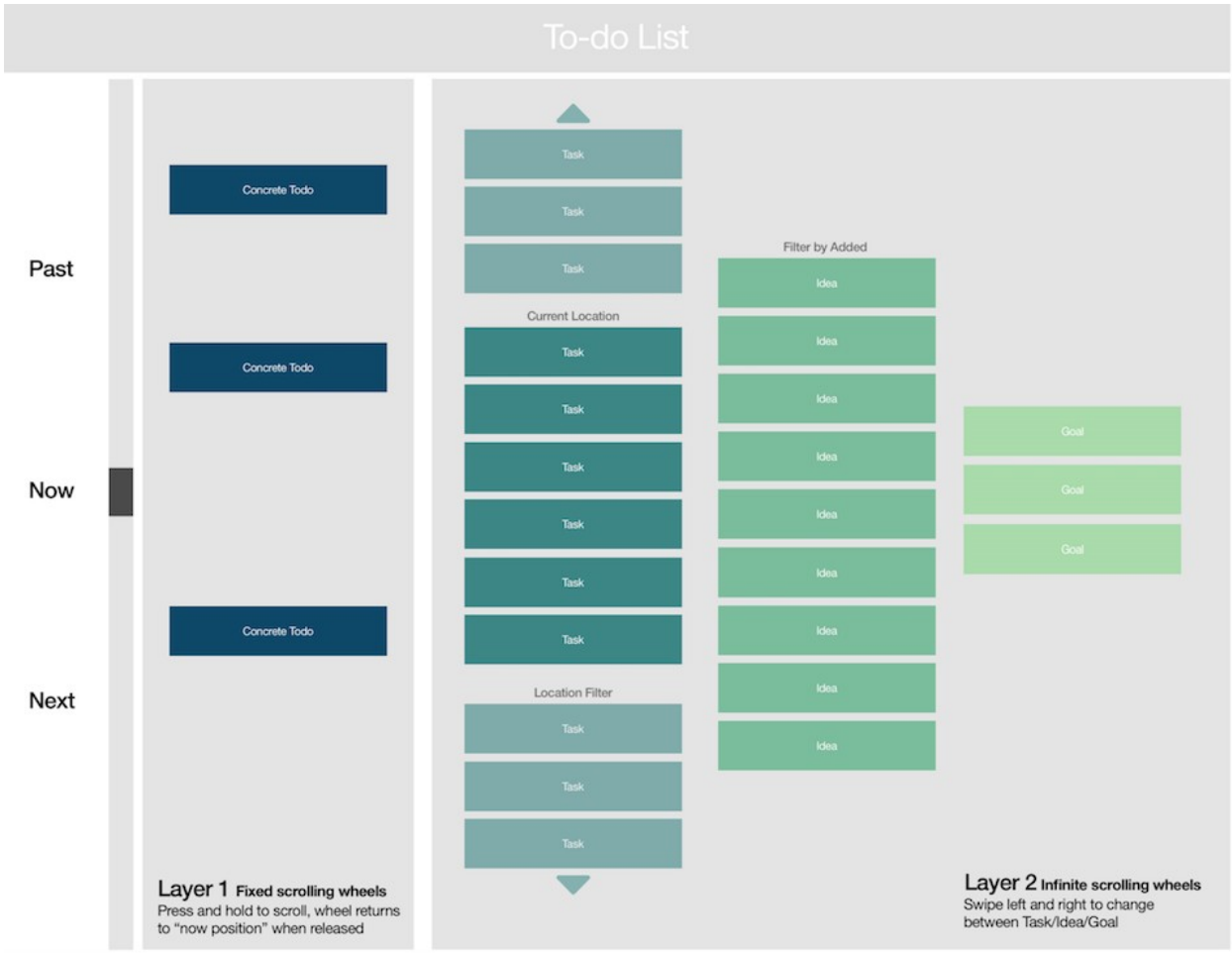


Figure 30: Interface To-do List Concept

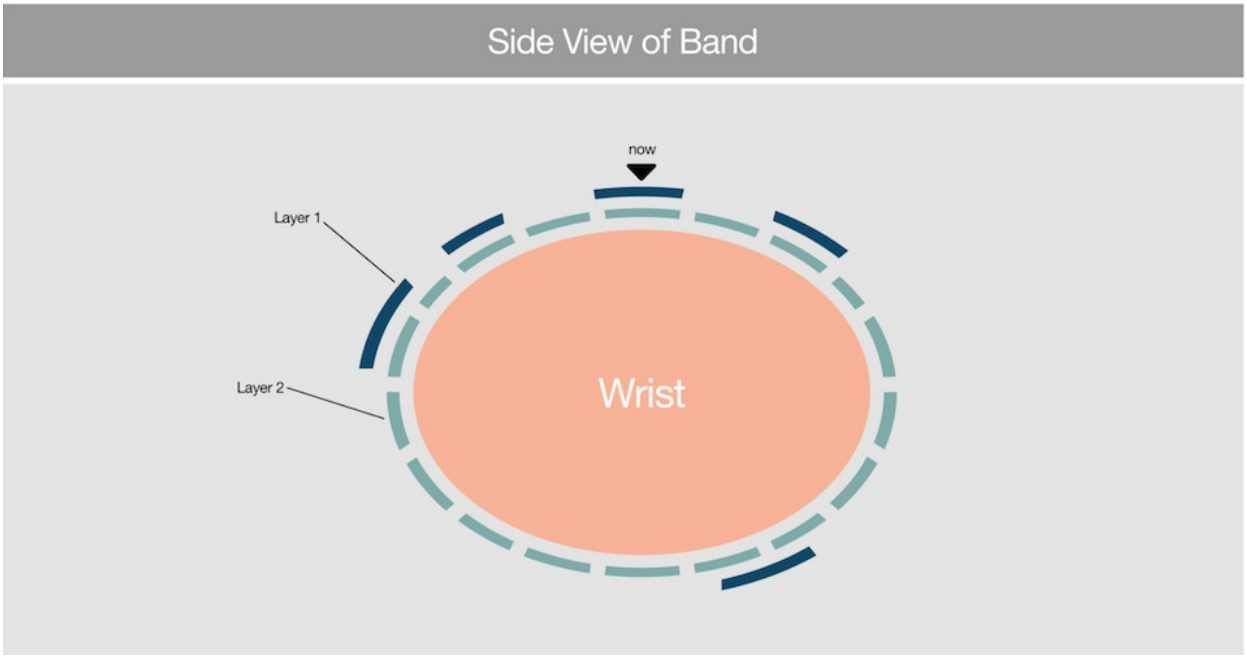


Figure 31: Mixed reality cross-section placement and interface diagram

Figure 32: Mixed Reality screen examples

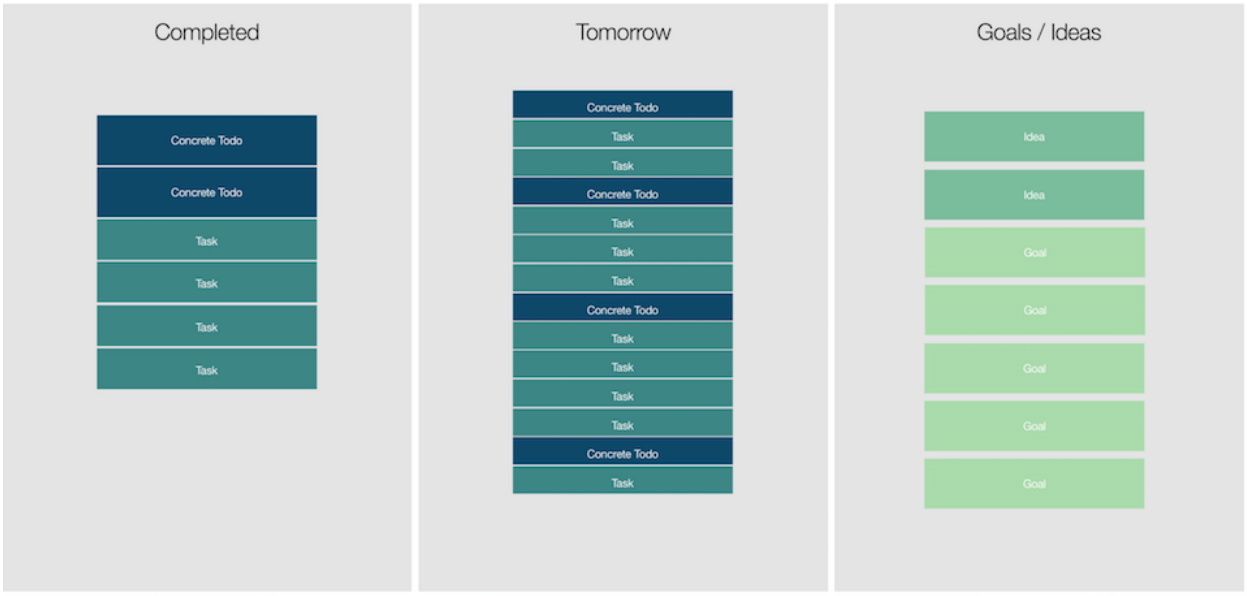


Figure 33: Interface Menu Options

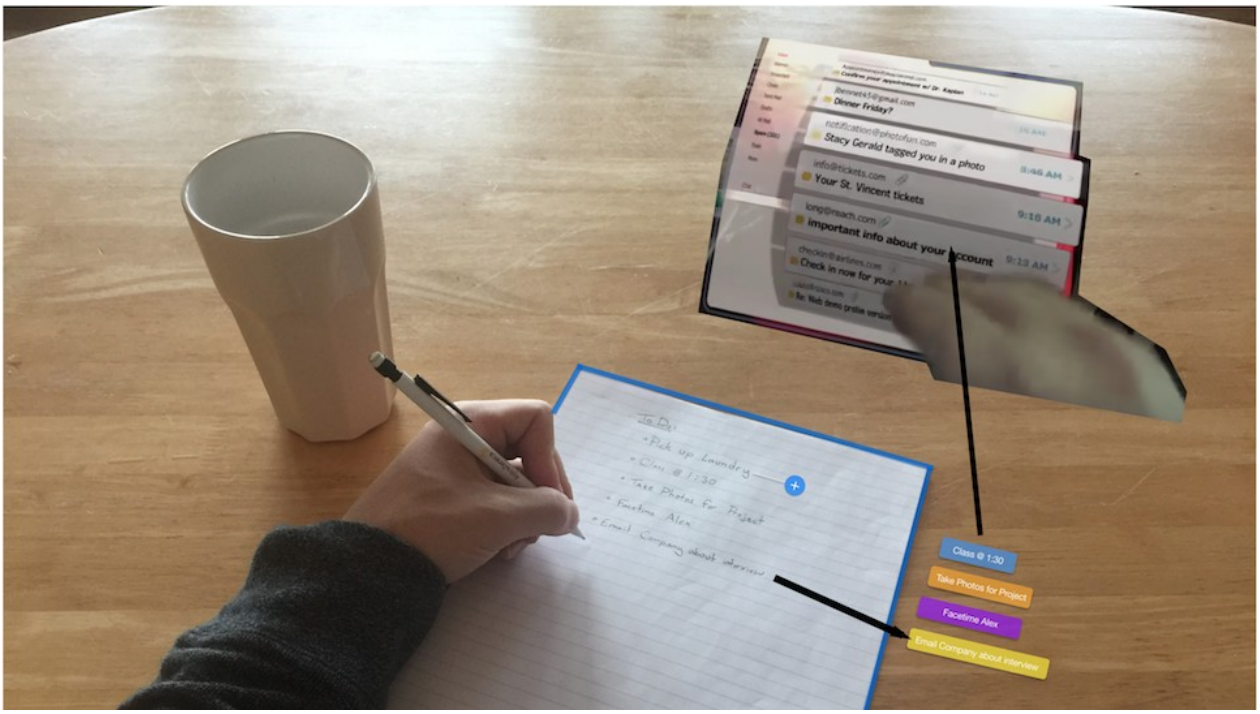


Figure 34: In-AR glasses view concept

Figure 35: AR Mixed Reality Design Concept 1

Figure 36: AR Mixed Reality Design Concept 2

Each team develops a video sketch demonstrating the future reality intended by the product, system, and/or service. Team compass video is necessary to view the extent of the new product interface and application of mixed augmented reality for enabling ADHD users. The true testiment of this project, is that the design concept they proposed could be transferred to the general population, alternate industries, and other environments to be universally helpful.

https://vimeo.com/194847651

Team Compass: Katherine Apostolou, Elaine Choi, Gabriel Mitchell

This is relatively typical of the range and depth of research processes conducted in the UX Design Course Studio. However each team and project is highly unique in relation to the subject matter chosen, participants, and and overall context. This short paper will only describe the highlights of the other two project examples to show the differences in high level conceptual human behavior categorizations.

Team Fika: Introduction-Exchange

The initial problem space this team was interested in helping started with immigrant refugees. Similar to Team Compass and the remit of the course, it is necessary to have first-person access and interaction with the primary constituents you are trying to understand and ultimately help. After several weeks of attempting to gain access to this at-risk population, it was deemed too difficult with the resources available. The team pivoted to exploring the practical and emotional needs of international students and scholars. As a newcomers, they saw potential in individuals being and becoming part of a dynamic community. Some of the early literature research on refugees paralleled similar findings of loneliness and overcoming initial social barriers. It was noted that there can be hundreds or thousands of people in your immediate vicinity, but an overwhelming feeling of loneliness still prevails. This incredibly human and emotional aspect of the project was the focus of the future solution; a significant amount of existing tools and processes are available to address practical logistics of moving and initial transition. The Fika converged their primary problem statement as: How can we help international students meet people who are willing to share culture and conversation? The follow up and deeper question to their goals was: How can we help newcomers meet people and get to know people who are willing to share their culture and community, and form deeper connections?

Capitalizing on various other tools not directly related to transitioning expatriates into a community was investigated. Divergent research on dating apps, personality quizzes, corporate or employee on-boarding processes, and many other resources were reviewed. Design criteria converged to particular elements that would enable a low-barrier to entry for an in-person even and allow people to be themselves while connecting related interests. Three desired criteria in combination showed the greatest promise at initiating personal connections: proximity, spontaneity, and shared interests. The term fika, is a Swedish institution for sharing coffee or taking a break from the workplace while meeting with colleagues and friends. This team saw the newcomers as growing the cultural richness and intelligence of the city by bridging the segmented gaps. One of their primary research source was partnering with Pittsburgh Regional International Student Ministry, PRISM organizers. One of the primary means of getting expatriates comfortable in their new environment is through conversational English. Their mission was very much in line with team Fika's goals. Through various converging and diverging research methods, 10 interviews, interviews and research collaboration with three PRISM organizers, surveys with 32 respondents, and literature reviews led to several

generative research methods. The generative make tool was introduced at a PRISM dinner in a group setting for four people. The following figures represent the research method and tools to create a conversation with the researchers and themselves. Figure 37: Example Generative Research Self-

List of Transition, Figure 38: Time Relation to Transition, Figure 39: Open-ended question response.

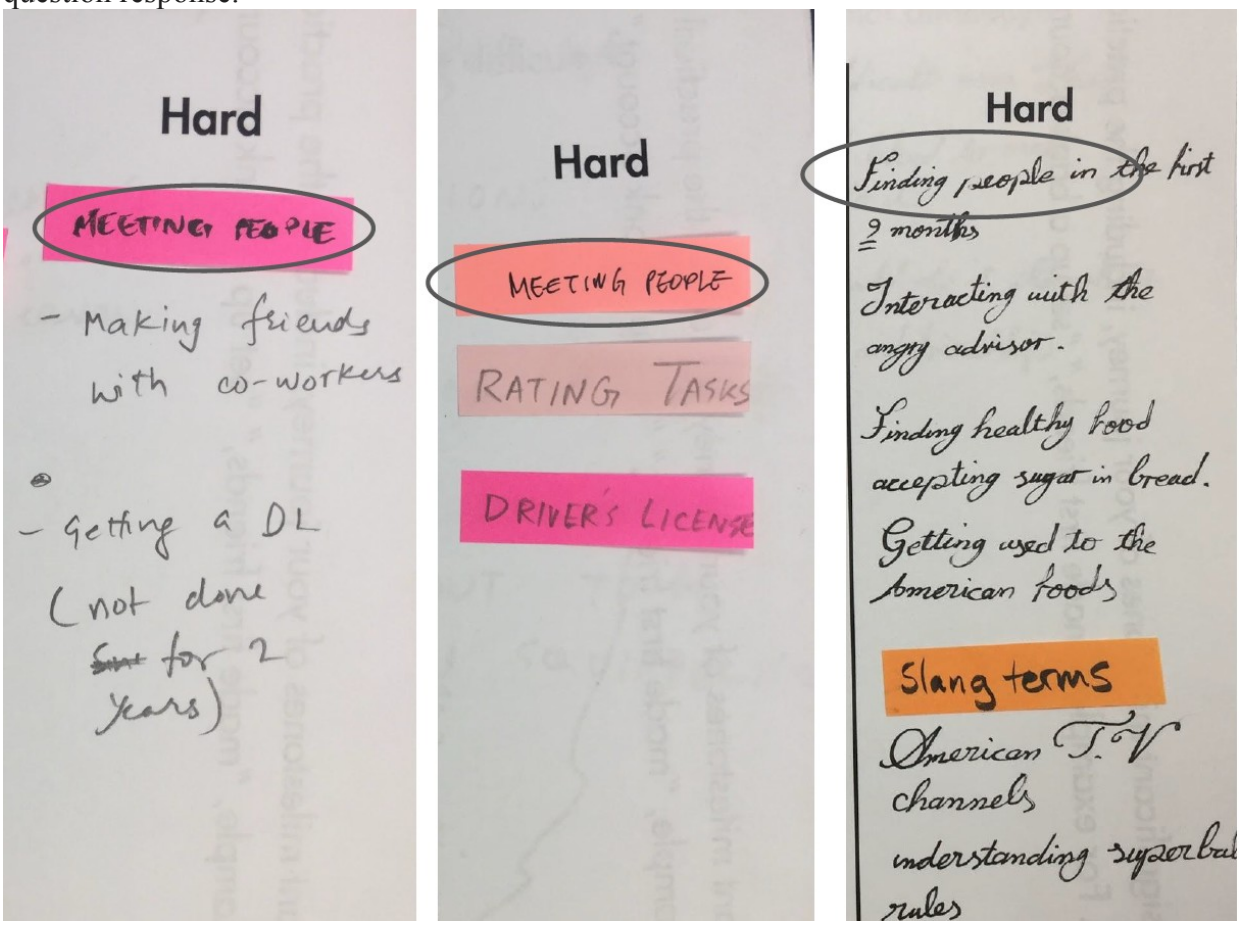


Figure 37: Example Generative Research Self-List of Transition

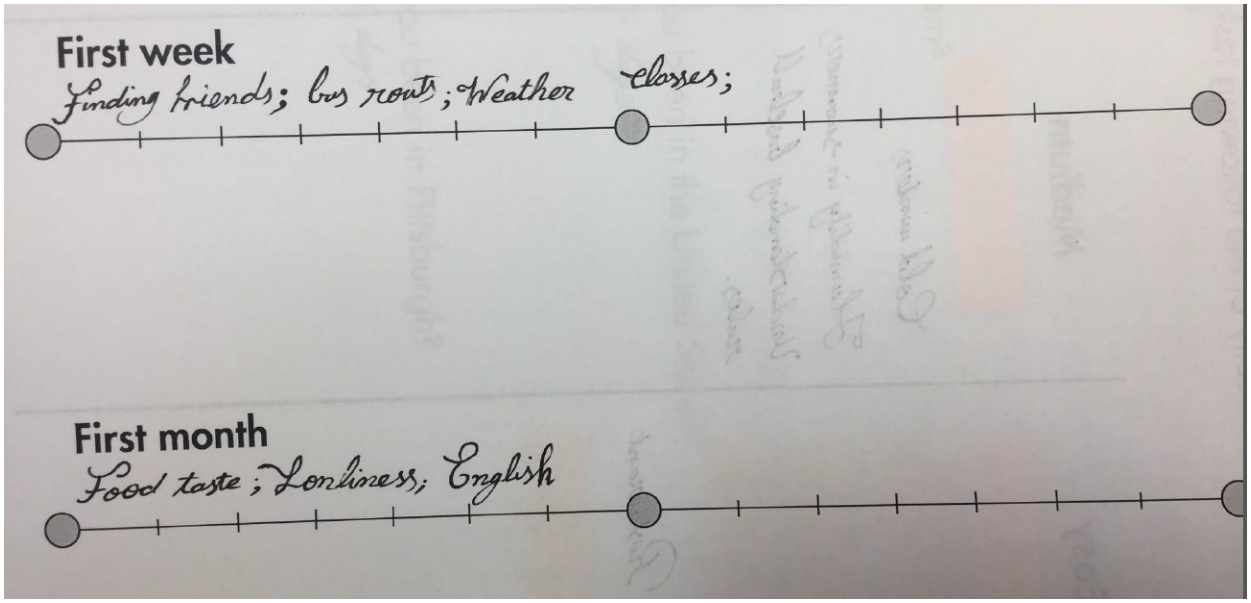


Figure 38: Time Relation to Transition

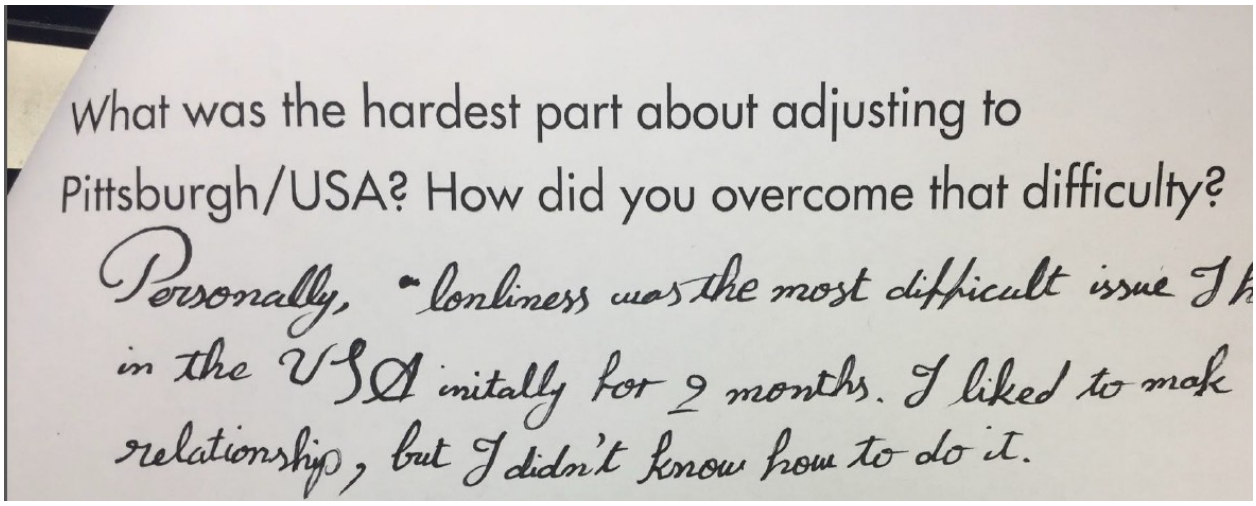


Figure 39: Open-ended question response

From this research, the team visualized the common points made by this generative research and prior behavioral research methods. A form of self-reflective map acted as a process journey map shown in Figure 40: Process Journey Map. The design criteria and human centered design had come full circle and was quite self-evident in this project. The convergence and synthesis showed that: meeting people and overcoming loneliness are the hardest parts; people build strongest bonds through shared interests, exploring a city enables a person to feel comfortable and gain a sense of belonging. However, Fika's and the class remit was to imagine what type of technology would improve and enable higher level goals to be accomplished. The team imagined technology as a starting point for solving some of the initial hurdles of the transition journey, but wisely not an entire, competing social app or system. By developing a specific app and video capture device for people and organizations dedicated to this type of work, Team Fika proposed using technology as the ice breaker, rather than a perpetual social connection tool. Figure 41: Example App and Key Features describe the simplicity of the technology. This simplicity was intended to be the digital handshake or introduction. The subsequent in-person meeting would then allow the primary topics of building bonds through shared interests, exploring the city in relation to a self-elected interests, and beginning to overcome seemingly high barriers to connecting with people in meaningful ways.

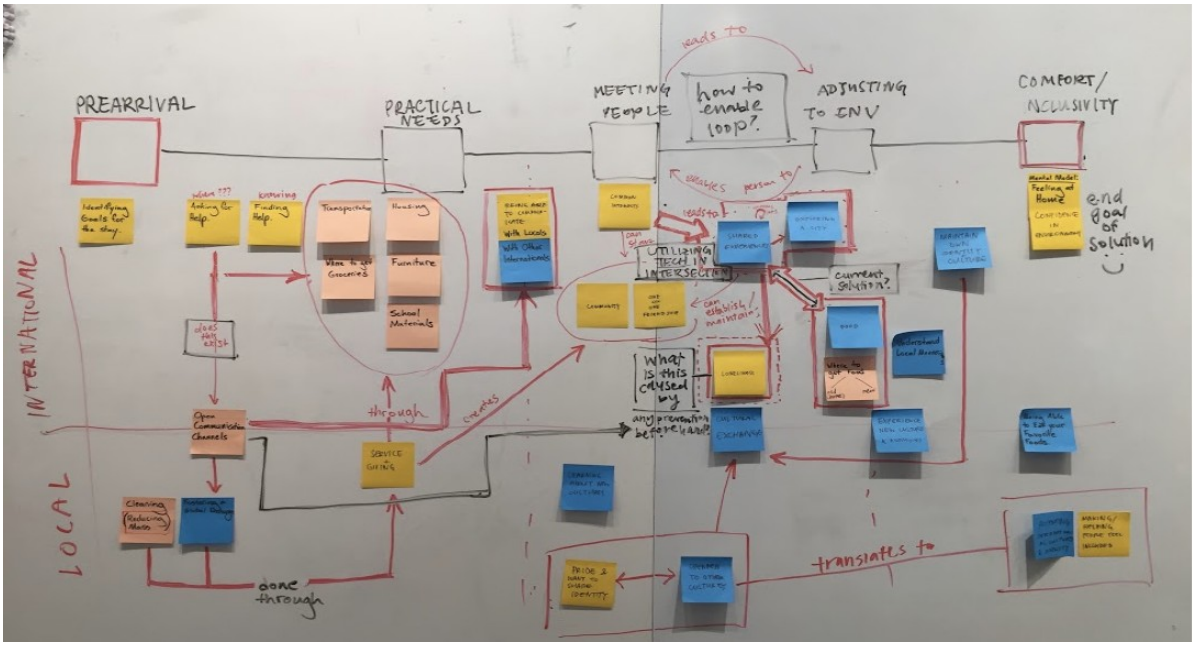


Figure 40: Process Journey Map

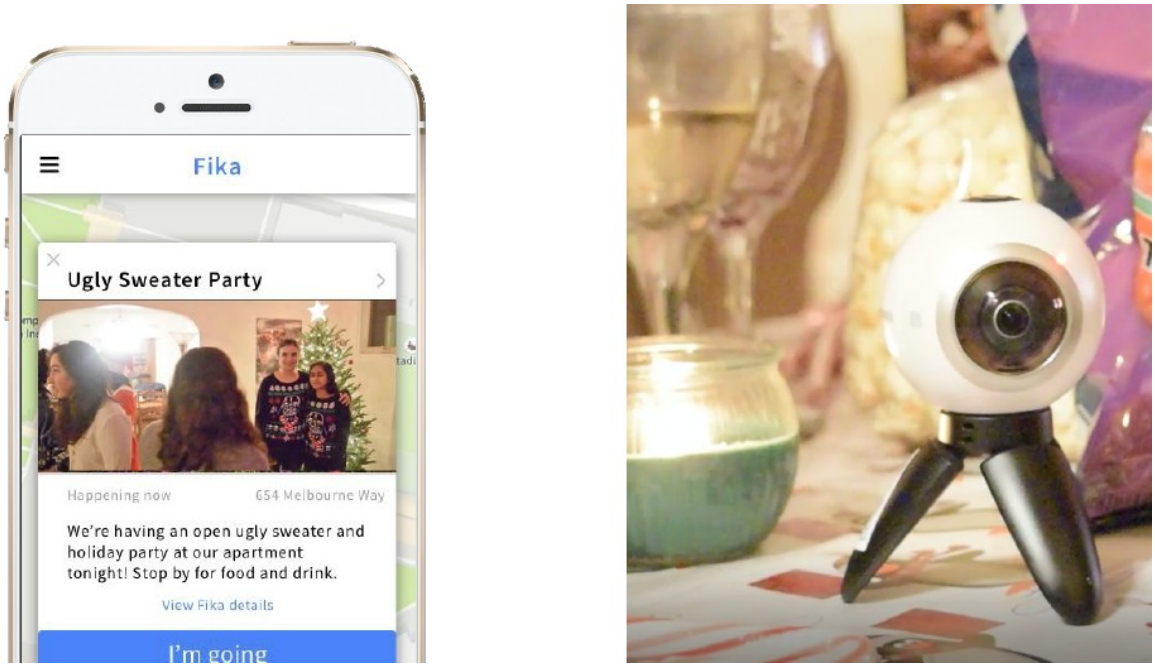


Figure 41: Example App and Key Features

Users can see fikas around them, viewing 360 video of events, click I'm attending, and the host can find them through AR to greet them and introduce them. You can add people you meet for further more meaningful interactions.

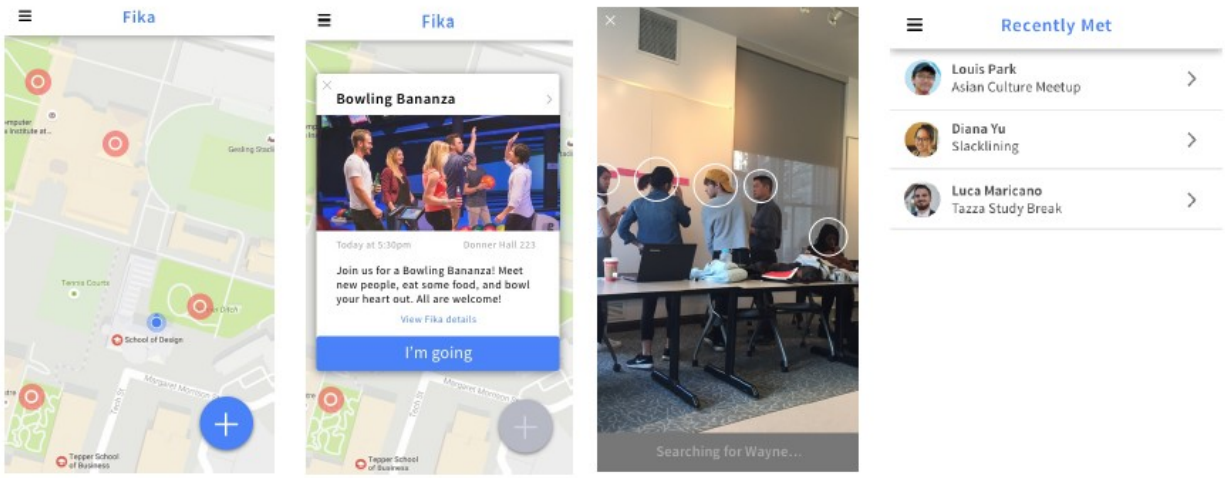


Figure 41: Example App and Key Features

https://vimeo.com/195508250

Team Fika: Leah Anton, Linna Griin, Emily Su

Team Claro: Co-Dependency

Team Claro began with a general interest in how AR, IoT, and telematics technologies could impact the medical industry. After exploring several different problems spaces within the medical area, they saw significant opportunities in the Emergency Medical Service first-responder system. This case shows why extensive interviews with the range of stakeholders was necessary. Figure 42: Stakeholder Map provides a glimpse into the complexity of the system and how many people are part of the situation. However, as the project research continued, they saw each connection or relationship between the stakeholders as moments for improvement. These improvements may be creating the right link or connection; another improvement may be decreasing the time gap between connection; but one of the most main areas for opportunity seemed to be the fidelity of information and communication. Figure 43: Concept Map of EMR Connection shows the overall current state of Emergency Medical Responder, EMR relationships. Team Claro stated their opportunity statement as: We aim to enable a person with an emergency to connect with the emergency service system faster and more effectively, and enable a better connection with the responder for improved assistance. Primary research participants included Emergency Management coordinator, Patient Care coordinator for medics, city and campus police, EMS physician, EMS researcher, 911 dispatch, campus environmental health and safety coordinators, two local EMS units, and several emergency callers.

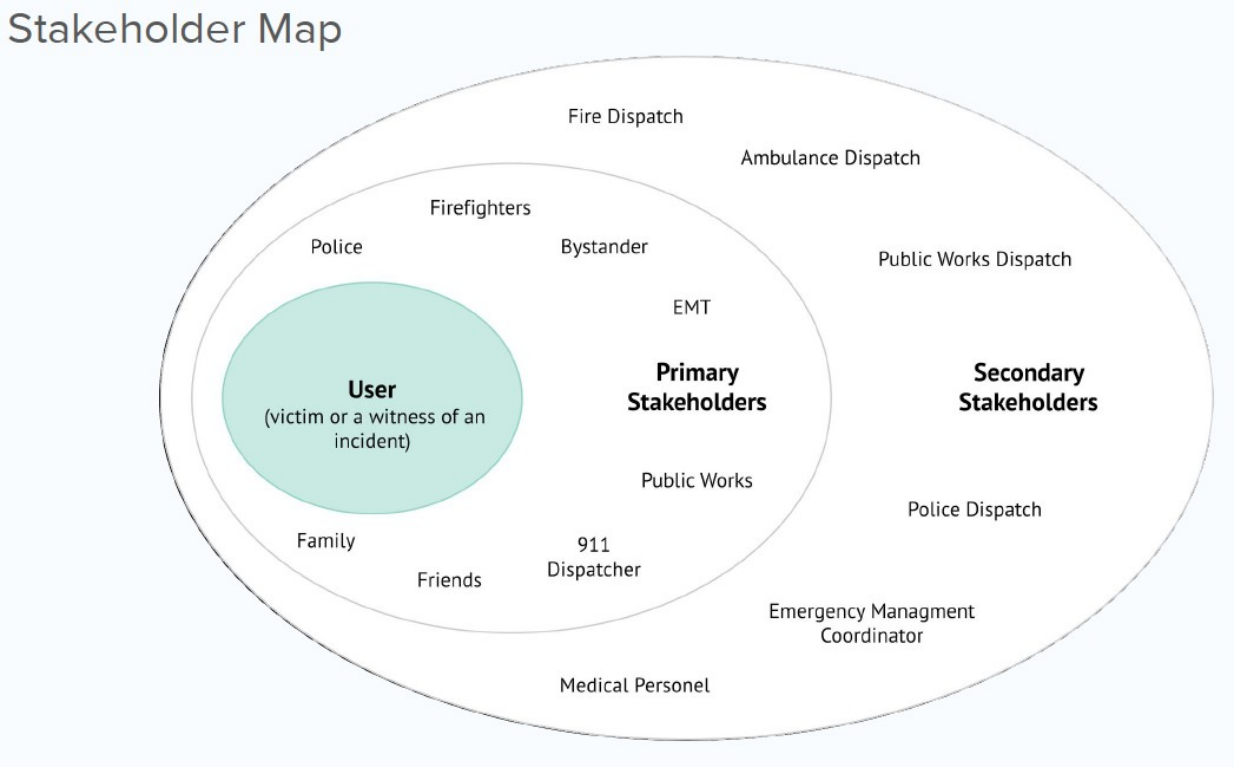


Figure 42: Claro Stakeholder Map

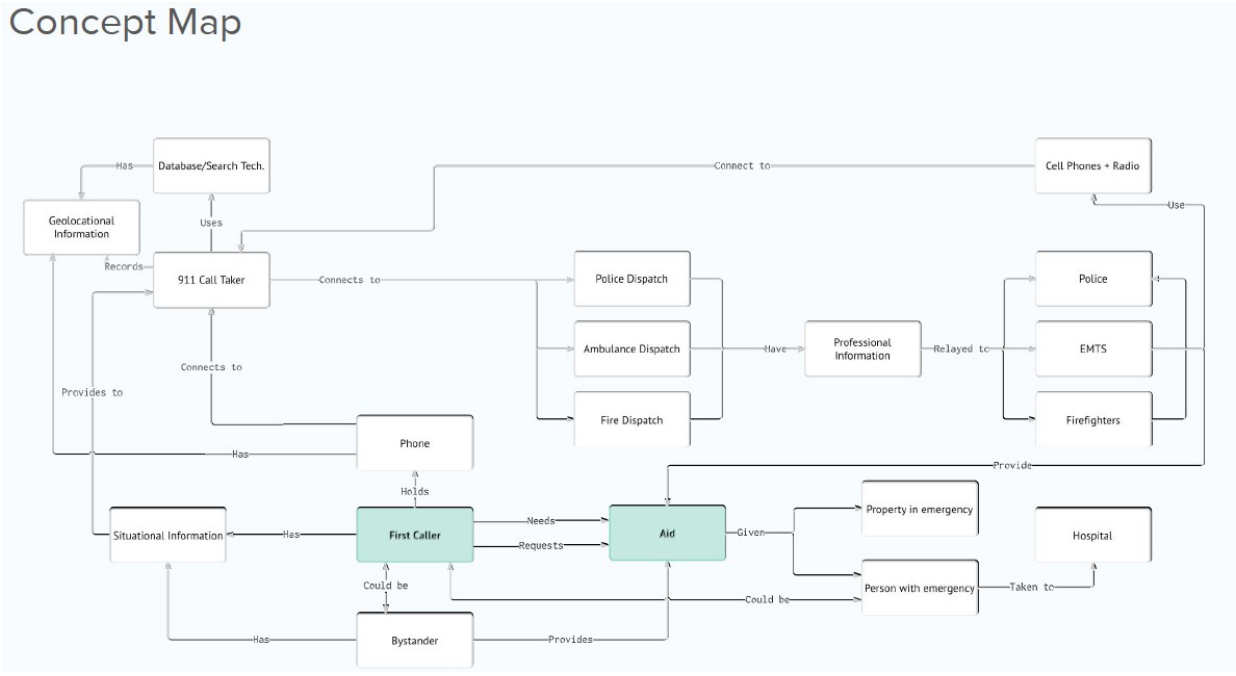


Figure 43: Concept Map of EMR Relationships

Through the research, multiple visual representations were essential to understand the various complexities and dynamics. Two generative research tools asking first-responders and 911 callers to map their experience, culminated into the following converging diagrams.

Figure 44: Refined Stakeholder Map and Figure 45: Timeline Map portrays the multitude of actors involved. And once the detail of the relationships and interactions were discerned, a scenario of what is occurring is visualized in Figure 46: 01 Lack of Accurate Information Stage, Figure 47: 02 Dependent Transfer Points Stage, and Figure 48: 03 Delays Stage.

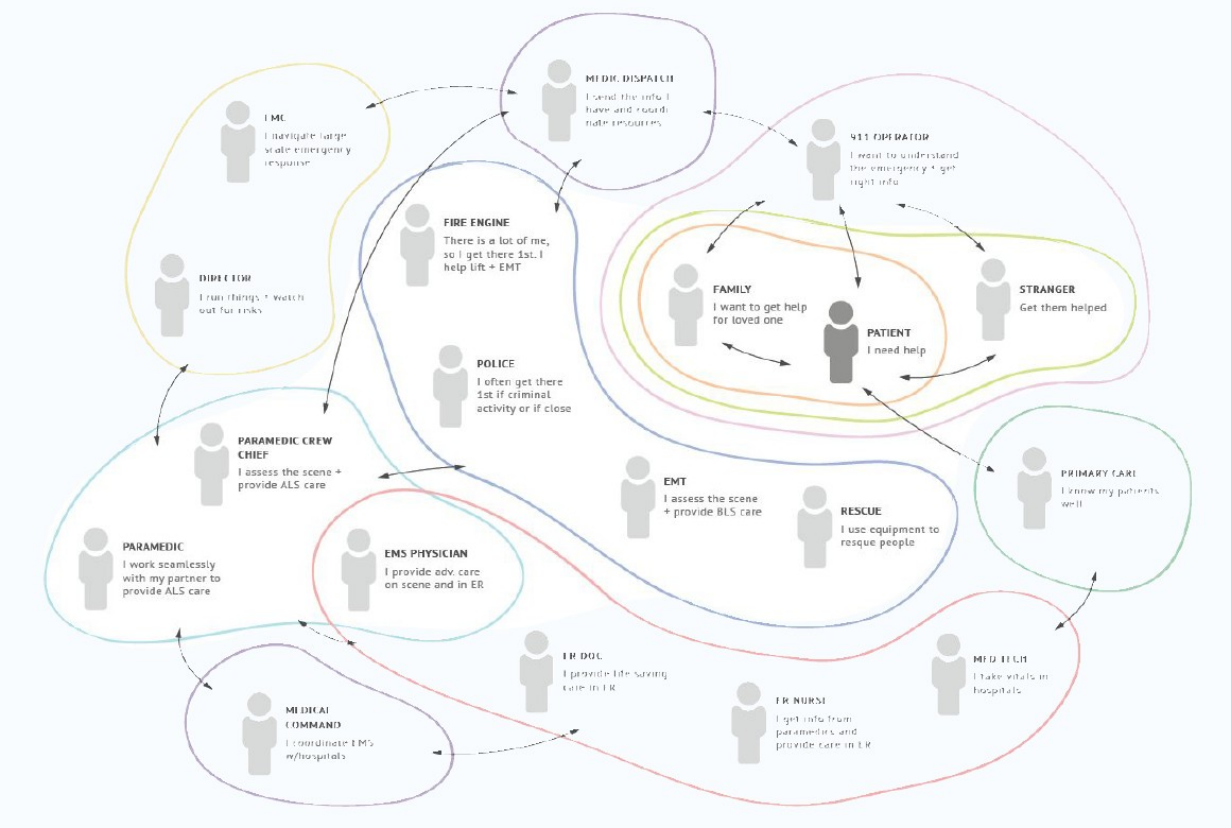


Figure 44: Refined Claro Stakeholder Map

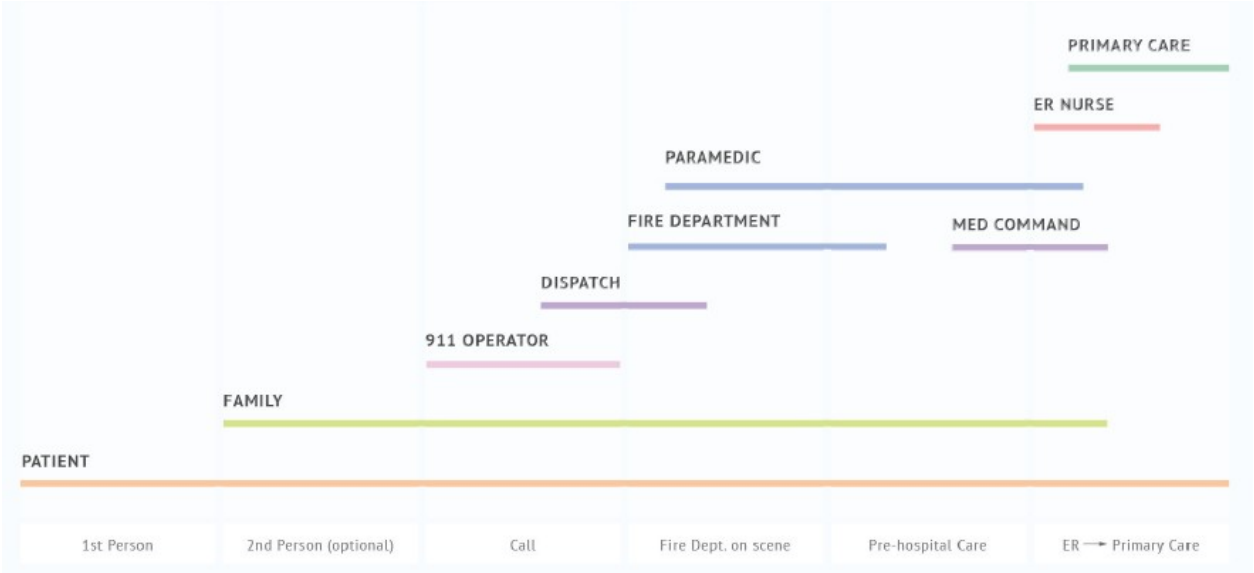


Figure 45: Timeline Map

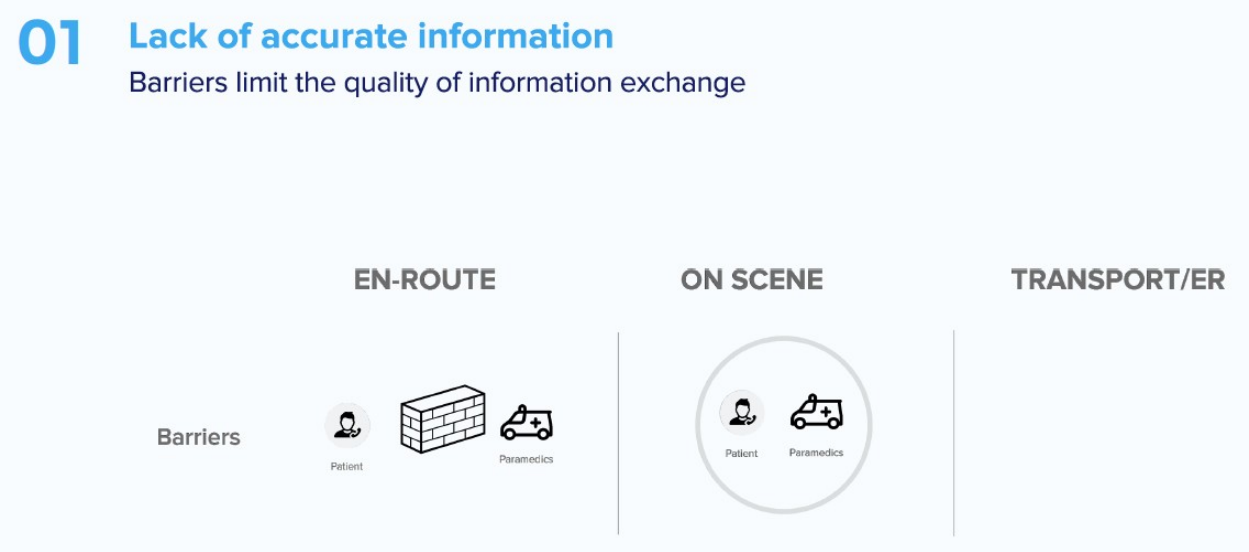


Figure 46: 01 Lack of Accurate Information Stage

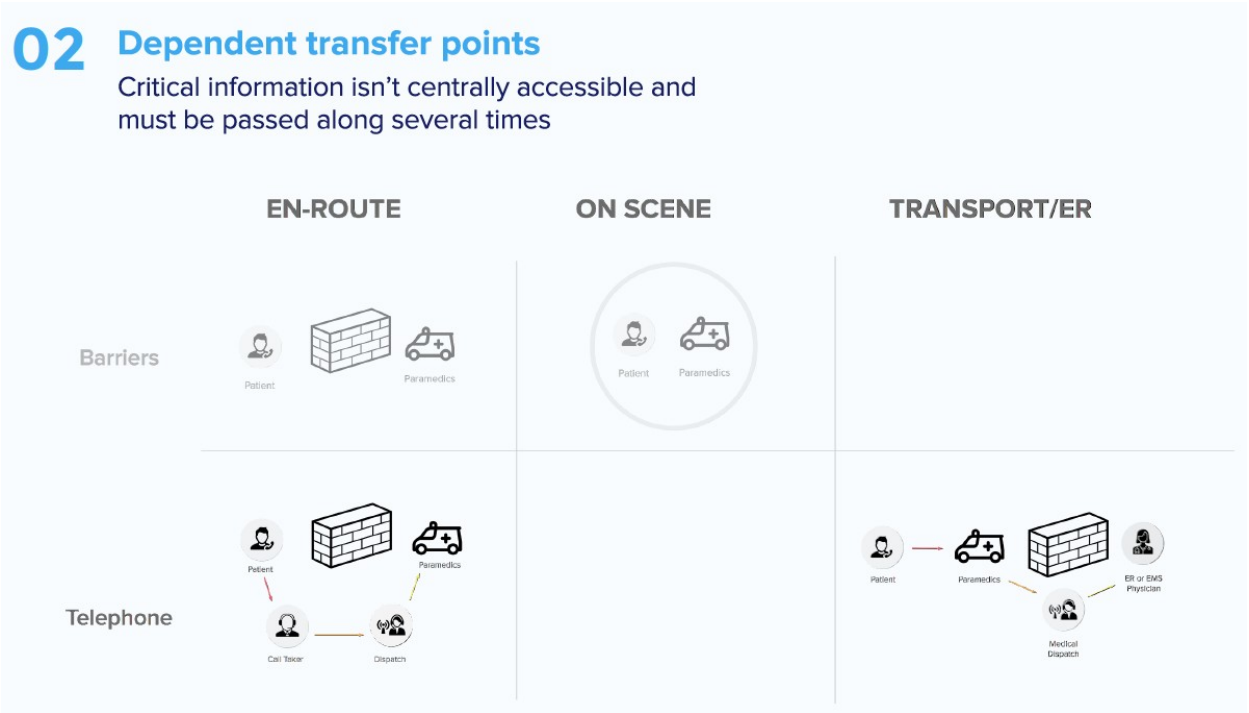


Figure 47: 02 Dependent Transfer Points Stage

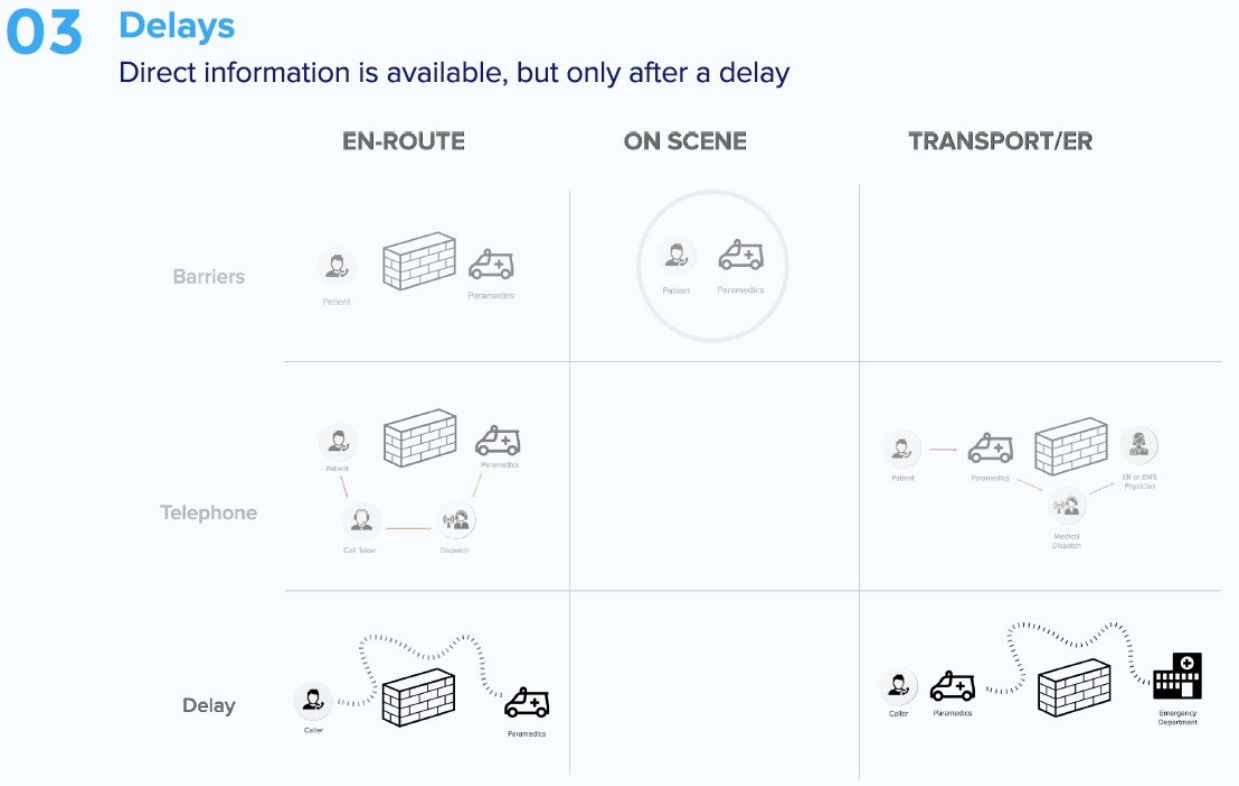


Figure 48: 03 Delays Stage

From viewing these illustrations and synthesizing all of the stakeholder responses, the team had to reimagine the human and technological options available. This high level concept is represented in Figure 49: Claro Concept Map Solution. The key insights from the ethnographic research drives the solution, the overall system architecture, and end-product interactions.

Ethnographic research attempts to glimpse into a particular segment of a population's culture - be it professional, family, education or some other environment or context. It is the designer's role and responsibility to discern the unseen and unsaid through creative processes and methods. Figure 50: Team Claro Synthesis shows a room and space dedicated to understanding this particular problem space. A space requiring photographs of people in situ, quotes and saying of the stakeholders transcribed and place and replaced according to the analysis and team discussions, re-worked conceptual maps and diagrams, and other data that takes up physical space so that a team can be literally on the same page at the same time to discuss, argue, and fight for the constituents they chose to help.

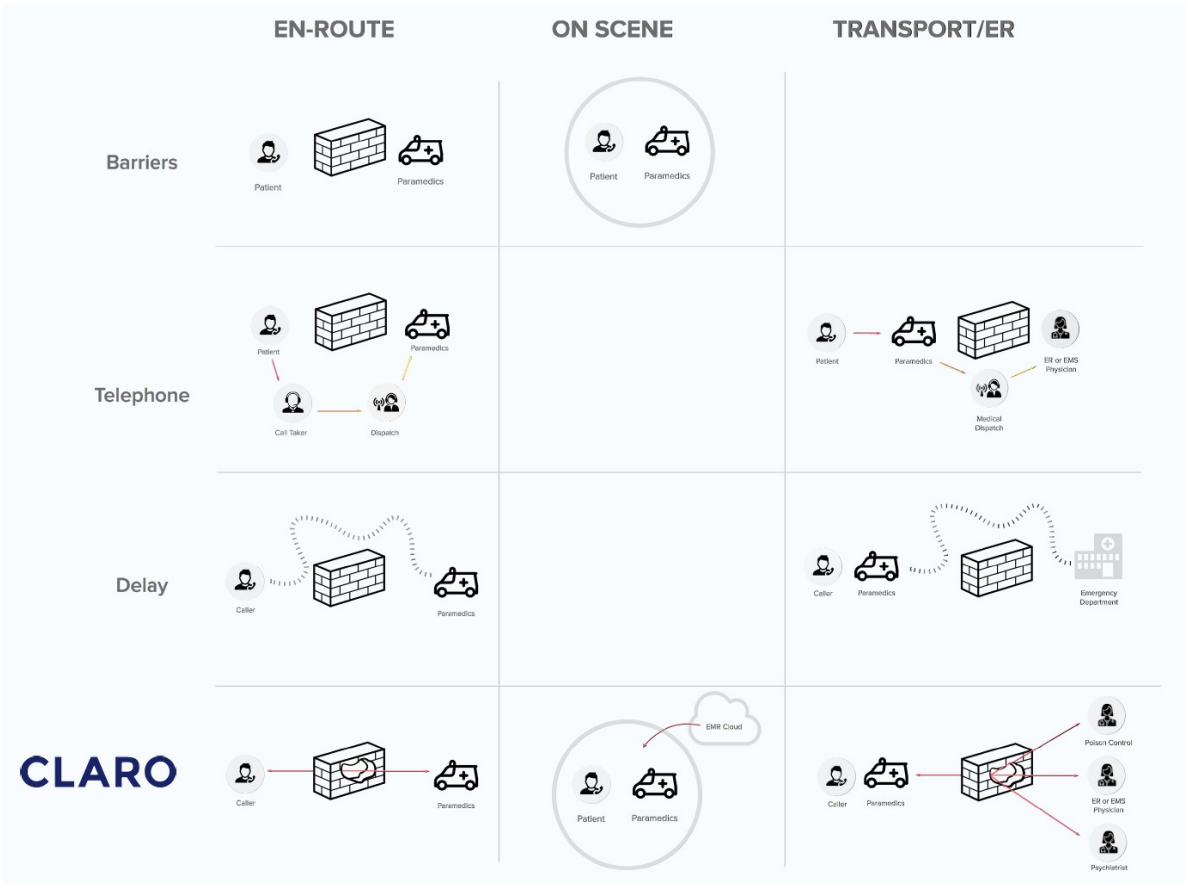


Figure 49: Claro Concept Map Solution

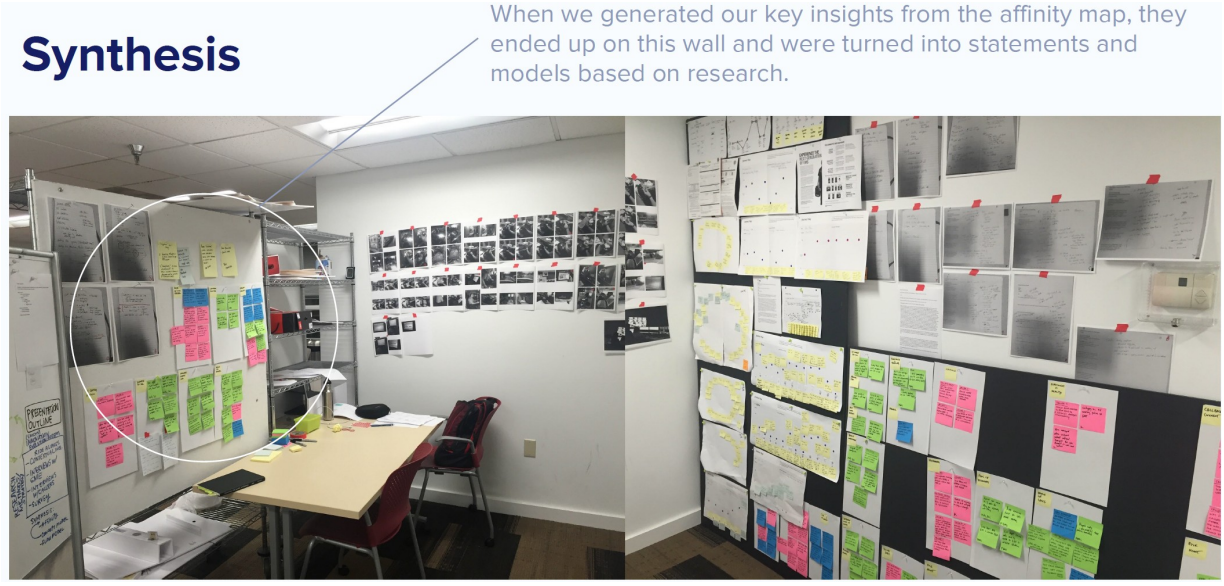


Figure 50: Team Claro Synthesis

VIDEO LINK:
https://vimeo.com/231618672 Aaron Kurth
Alisa Le Gena Hong

Conclusion

The three project team solutions provide examples of how human sciences and appropriate user centered design delivers insights on people and their collective emotions to guide a system. By understanding the contextual norms and behaviors of participants, each group was able to focus on core unmet needs and artfully design solutions that connect to existing behaviors while also foster new ones.

Specifically for Team Compass, the research guided the team to develop a personal, wearable and AR device that would be part of a larger personal life management system. The priority for design is pointed directly towards a single, primary individual. Similar to a health fitness tracking device like a fitbit, this device would be categorized as a self-election for personal improvement. Whereas team Fika's system purpose is to build a method for connecting people to people through simple and low-barrier of entry interface that capitalizes on physical proximity.
The priority design in facilitating a connection of people and how they relate to the world. Lastly, team Claro purpose is a professional, critical emergency system that connects all the relevant parties through the highest communication fidelity possible. The priority design creating security, awareness and better connection to care.

Overall, uncovering the human emotions became a driver for each team's opportunity so the technology solutions enhanced human behavior and interactions.

Authors Biographies

Wayne C. Chung is an Associate Professor and Product Design Program Chair in the School of Design. Chung's research and work spans medical systems and devices, robot design, consumer, and industrial products. He teaches first-year Design Studio, Advanced ID studio: Product and Systems, How Things are Made, Applied Research Methods, UX Design Tools, and co-teaches Bio Medical Engineering.

Chung utilizes design research methods and develops new processes to understand the person in context. This essential approach enables insight and appropriate innovation within a world of complexity. Material, aesthetics, fit, and other user experience variables can only be designed once the problem is appropriately framed and considered relative to the human, artifact, and environment context.

Chung holds a BFA with Honors in Industrial Design with a minor in Business Management from Carnegie Mellon University and a Masters of Industrial Design from the University of the Arts. from Carnegie Mellon University and a Masters of Industrial Design from the University of the Arts.

Carly Burton is a design research and strategy consultant. Working at the intersection of human sciences and technologies, she brings an empathic, curious, critical mindset to understanding people and developing new solutions and strategies. She is particularly interested in shaping new protocols and practices as it relates to the design, development and application of Artificial Intelligence and Intelligent Products. In her role, she is also involved in growing Cognizant’s Digital practice, shaping services, capabilities, and delivery across its global network.

Prior to moving into this role, Carly was the Global Experience Strategy Director responsible for the global Collaboratory experience and network. During this time, she also worked on digital transformation engagements with clients, leading multi-disciplinary teams on the identification and implementation of digital strategies. She was also previously the N.A. Director, Product Realization for Cognizant Digital Works focused on bringing products from idea-to-market. In this role, she managed and lead the design process for mulit-disciplinary teams and was responsible for insights, foresight and product requirements definition.