BRIDGING THE 3,000KM GAP

BUILDING RESILIENCE & AGILITY INTO SCITECH'S STATEWIDE TEAM TO MEET THE CHANGING NEEDS OF WA STUDENTS

A SERVICE DESIGN CASE-STUDY BY:

HANNAH BAYLISS

DARCY BURNS

SASKIA MORTIMORE

NINA TOMAS

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WE WOULD LIKE TO ACKNOWLEDGE THE WHADJUK NOONGAR PEOPLE, THE
TRADITIONAL CUSTODIANS OF THE LAND ON WHICH WE WORK AND LIVE. WE PAY OUR
RESPECT TO ABORIGINAL AND TORRES STRAIT ISLANDER PEOPLE, CULTURES AND TO
ELDERS PAST, PRESENT & EMERGING.

WE ALSO ACKNOWLEDGE THAT ABORIGINAL AND TORRES STRAIT ISLANDER PEOPLES
HOLD, MAINTAIN AND SHARE KNOWLEDGE OF THESE LANDS THROUGH ORAL TRADITION
WHICH HAS BEEN PRACTICED FOR THOUSANDS OF GENERATIONS.

01

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Over the course of this past year, our team have been working with Scitech to co-design changes for the organisation. We had a core team of four students studying a Postgraduate Diploma in Design Thinking and Service Innovation: Hannah Bayliss, Darcy Burns, Saskia Mortimore, and Nina Tomas. All of us came from a Graphic Design background, along with other disciplines such as Strategic Communications and Games Art & Design. This allowed us to feel comfortable when it came to creating visualisations of data and compiling large documents for clients. The focus of this diploma was to learn Service Design from a Design Thinking approach, in which we focused our efforts on working with Scitech. Throughout the process of this project, various other students have contributed when selecting the units from this diploma as their electives. In both semesters, we had a large group of students from diverse backgrounds of disciplines, cultures, and experiences to help with background research, data gathering and ideation (GRD503 Design Thinking Tools and GRD508 Innovation Development). Students that have directly contributed to the facilitation of this project through an elective include Muktar Abdi, Tashi Chedup, and Lizeth Castellanos. These students had diverse cultural and educational backgrounds, being well versed in their disciplines such as Web Communications, Business, and Sustainable Development.

We were presented with the problem of helping to take STEM to the community by expanding focus and positive impact on target audience segments, especially youth, females, indigenous persons, people in regional and remote Western Australia, and people in low socio-economic areas . This Postgraduate Diploma goes for one year, so we had to carefully plan out our process to address Scitech's problem, which often changed as we went. It was important that we managed the scope of what we could achieve in this timeframe. We spent semester one focusing our research on this initial problem. This included methods such as desk research, interviewing people from stakeholder groups we identified, various ideation activities to begin generating concepts that could potentially address the problem, and mapping their viability. By the end of the first semester, we had begun to form an understanding of the organisation and highlighted opportunities for growth within Scitech. At this point, we had begun to ideate concepts to address bringing STEM to all Western Australians.

Following our mid-year break, we came back into the second semester expecting to continue from where we left off. We were surprised to then find out about restructures to the internal workings of Scitech. Some teams that we were in contact with in the first semester had been dissolved or reshuffled to sit elsewhere in the organisation. Employee morale had been negatively impacted, and many had lost sight of the collective goal of the organisation. This meant that we had to refocus our project to help the teams working at Scitech to work together more efficiently. Understandably, the employees we co-designed with in semester two were struggling to adapt to organisational changes. We empathised with the employees, as we were also trying our best to adapt to such a sudden shift in focus for the project.

When working in this new project direction in semester two, we consistently prototyped our understanding of the organisational structure, teams, and communications channels, as well as ways to run co-design sessions with Scitech. Approximately every fortnight we ran hour-long co-design sessions with the employees, as they had valuable insights about their organisation that we could learn from and use to inform the development of concepts.

We once again also conducted interviews, with a focus on Scitech's employees. It was imperative to gain insights from people across the whole organisation to understand how their systems functioned. This helped us to find our new project direction: ways for teams in Scitech to communicate effectively and efficiently, which we narrowed to a manageable scope for us, using Statewide as a pilot.

We followed a service design approach when working on this project, which is a user-centred, co-creative, and multi-disciplinary approach to creating experiences and services that are desirable, feasible, and viable (Stickdorn & Schneider, 2011; Lewrick et al. 2020). There are multiple stages to a service design approach, which can look like this when factoring in design thinking (Friis Dam & Yu Siang, 2021): empathising, defining, ideating, prototyping, and testing. These are not linear, and it is possible to revisit different stages as needed throughout the process. Our plan for this year when working with Scitech was to complete our understanding, observing, defining, and start ideating by the end of semester one. Then, in semester two, we could finish ideating, and continue to prototype and test. With the sudden change of project focus halfway through, we found ourselves starting semester two back at those beginning stages again, working to understand the problem and defining it. In the limited timeframe of a year working with Scitech, this left less time than anticipated for ideating, prototyping, and testing. This further exemplifies how a service design approach can look in practice: not linear and revisiting various stages. This case-study will show our process in continuously working to understand the problem and defining it so that we knew what to focus our effort on. It will be split into two parts, detailing our work from Semester one

Figure 1: "Semester One Presentation"

to Semester two. There is a timeline on each page of this case study to help the reader to understand what part of the process they are reading about. We bounced between the stages of a service design approach as we adapted to the ever-changing nature of the project. In the short timeframe of a year, we made sure to keep the scope manageable to what we knew we could impact and proposed potential changes that could be made within Scitech in the future. In order to continue from this point and accurately address the problem, we propose that Scitech continues with a service design approach.

Figure 2: "Semester Two Presentation"

GLOSSARY

DEFINITIONS OF COMMON TERMS USED THROUGHOUT THIS CASE-STUDY

CO-DESIGN

Co-design is a participatory process that aims to involve those impacted by a problem in the process of designing outcomes that will meet their needs (Stickdorn & Schneider, 2011). It is based on the understanding that in order to generate services that are valuable and meaningful, we must design with people, not for people (Penin, 2018). Success of co-designing relies on using engagement tools that are tailored to the dynamic of the co-design team, working to create an environment where power is evenly distributed, and emphasis is placed on the value of lived experience (McKercher, 2020).

HUMAN-CENTRED DESIGN

Considering and empathising with the human beings that will be impacted by the creation and implementation of a design.

SERVICE DESIGN

Is a user-centred, co-creative, and multi-disciplinary approach to creating experiences and services that are desirable, feasible, and viable (Stickdorn & Schneider, 2011; Lewrick et al. 2020). There are multiple stages to a service design approach, which can look like this when factoring in design thinking (Friis Dam & Yu Siang, 2021): empathising, defining, ideating, prototyping, and testing. These are not linear, and it is possible to revisit different stages as needed throughout the process.

STATEWIDE

A team that provides customer-facing outreach experiences at Scitech are Statewide. They are comprised of managers, team leaders, technical officers, STEM Co-ordinators, and presenters. Statewide presenters travel across WA to deliver STEM experiences to students through interactive shows and workshops.

SCIENCE CENTRE

Located in West Perth, the Science Centre is a place for the public to visit and experience engaging exhibitions tailored to STEM. There are a range of permanent exhibitions, and the centre houses the largest Planetarium in the Southern Hemisphere. Here can be found the customer-facing staff at Scitech, including the in-centre presenters who actively engage with the public.

TROODE ST OFFICES

The offices for Scitech are located in a separate building in West Perth, approximately a 400m walk away from the Science Centre. Here can be found teams such as Statewide, Governance and Accounts, Partnership and Commercial, Customer Insights and Marketing, Branding and Marketing, Content, IT, and Workshop. Statewide presenters are not always located here, and are often out on the road in Scitech's vans.

02

INTRO-
DUCTION

WHO ARE WE?

We are a multidisciplinary service design team from Murdoch University, consisting of four postgraduate students, mentored by Erica Ormsby and Eko Pam. Our core design team is supported by a larger class of students, all from culturally and linguistically diverse backgrounds, who supported problem exploration and idea generation. This range of experience helped to inform understanding of the problem space from multiple contexts and frames of reference. Within the field of human-centred design, we know the importance of working in diverse teams with a wide range of world perspectives and experiences when tasked with exploring complex problems (Stickdorn & Schneider, 2011). The diversity of backgrounds contributed invaluable understanding to our team. We are proud to bring to the team a range of skills across the disciplines of Graphic Design, Web and UX Design, Strategic Communications, Game Design, Community Development, Teaching, Business, Sports Science and Health Science.

With an empathy driven approach and a focus on the importance of co-design we aimed to work alongside Scitech and the community to facilitate the development of innovative and effective outcomes that address the needs of the Stakeholders for this project.

WHO IS THE CLIENT?

Scitech is a not-for-profit organisation, established in Perth, Western Australia in 1987. For over 30 years, they have been focused on delivering experiences that inspire curiosity and engagement with STEM (Science, Technology, Engineering and Mathematics). Scitech is on a mission to "be a world leader in providing innovative and creative STEM programs that inspire, engage, and develop citizens for Western Australia's social well-being, economic prosperity and sustainability" (Scitech, 2018). Through their Science Centre, based in West Perth and their outreach programs that take the Scitech experience to the furthest corners of the State, Scitech can impact the lives of 500,000 members of the community every year. In addition to their community based educational programs, they play an important role in the support and training of 4,000 educators to promote the delivery of STEM in the classroom (Scitech, 2018). Research shows that 75% of the fastest growing occupations now require STEM skills and knowledge (Government of Western Australia, 2019). It is estimated that shifting just 1% of the workforce into STEM careers would add $57 billion to Australia's GDP over 20 years (Pwc, 2016). But without a stable and secure pipeline of STEM graduates entering the workforce, these economic benefits will not be achieved. Therefore, Scitech is focused on their role in empowering all Western Australians to be equipped with the 21st century skillsets needed now and for the future.
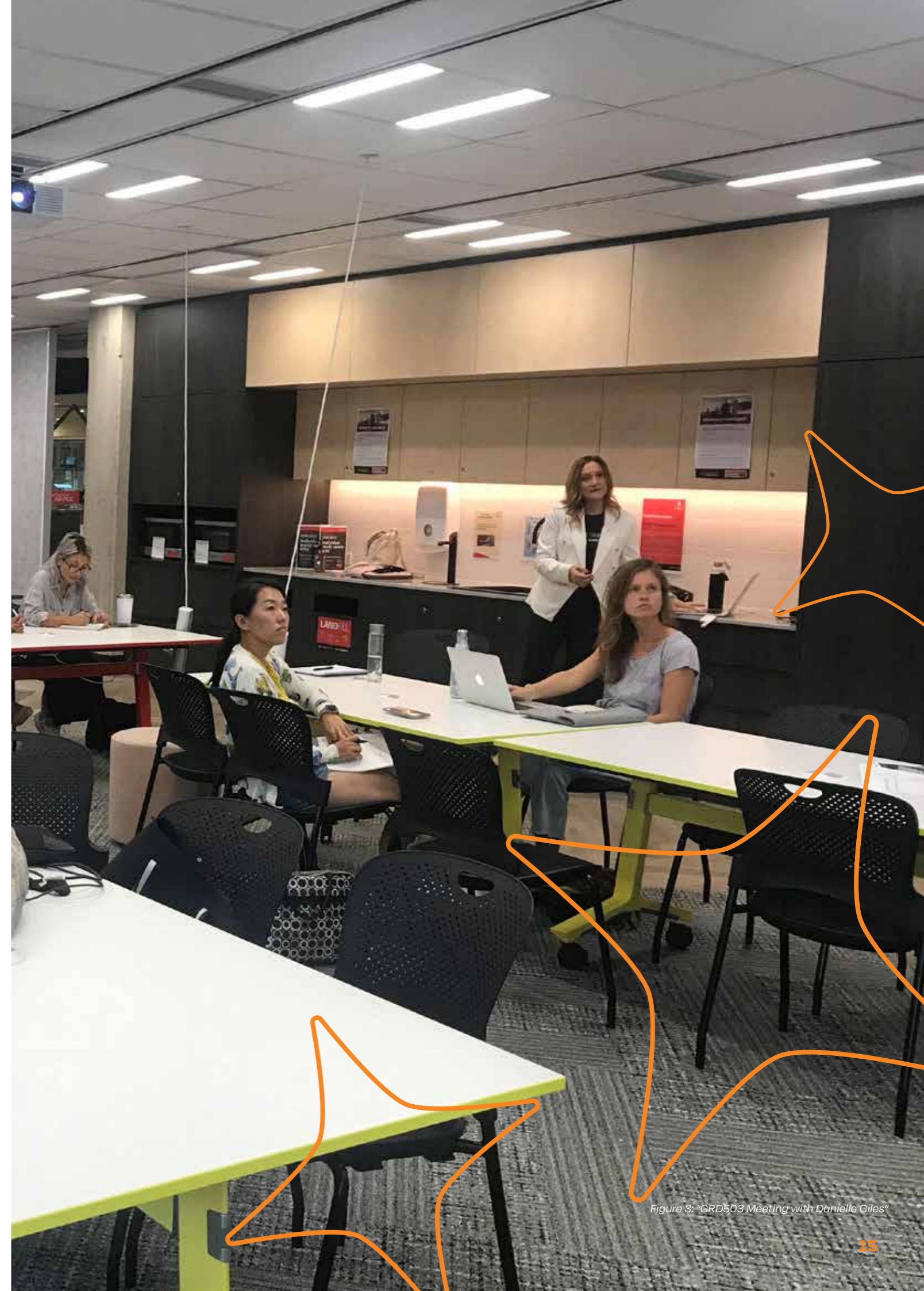
Figure 3: "GRD503 Meeting with Danielle Giles"

WHAT IS THE PROJECT?

In 2018, met with the changing face of STEM in the global economy, Scitech developed a New Scitech Strategy which outlines their new vision "to be a world leader in providing innovative and creative STEM programs that inspire, engage, and develop citizens for Western Australia's social well-being, economic prosperity and sustainability" (Scitech, 2018). This new vision is supported by 4 pillars which involve establishment of state-of-the-art science centres, targeted deeper reach beyond the centre, an informed public voice for STEM and the development of a highly connected STEM community.

Scitech approached our team to help them with their second objective of a targeted deeper reach beyond the centre, looking for a way to:

"EXPAND OUR FOCUS AND INCREASE OUR POSITIVE IMPACT ON TARGET AUDIENCE SEGMENTS, ESPECIALLY YOUTH, FEMALES, INDIGENOUS PERSONS, PEOPLE IN REGIONAL AND REMOTE WESTERN AUSTRALIA, AND PEOPLE IN LOW SOCIO-ECONOMIC AREAS." (SCITECH, 2018).

Scitech emphasised that the project is not a brand challenge or a sales funnel challenge. focused on driving visitation to the Discovery Centre but we concluded that, whilst not a primary focus, increased engagement with the Discovery Centre may be a result of the proposed design outcomes.

With a Service Design approach, our team will work alongside Scitech and identified stakeholders in two stages. In the first stage of the project (Semester One) we will understand, observe, and define the problem, and ideate potential outcomes. In the second stage of the project (Semester 2) we will prototype and test proposed outcomes for their implementation.
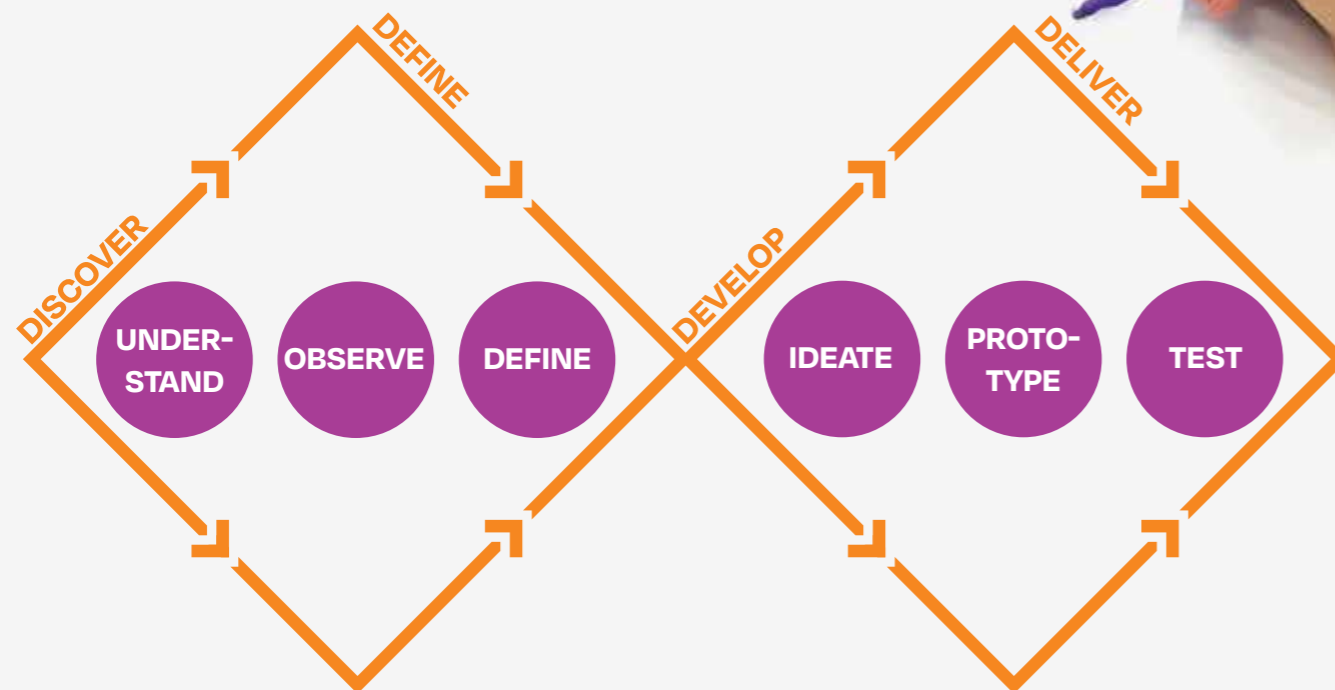
Service design process

Figure 4: "The Double Diamond"

WHY ARE WE DOING IT?

The future of industry in Western Australia is rapidly changing and it is estimated that 75% of future jobs will require the high levels of STEM literacy for us to innovate ways of understanding and dealing with the environmental and social challenges we are yet to face. Foundational numeracy and scientific proficiency is an important focus in the early years of schooling. In much of the same way that key literacy skills are a precursor to success in other disciplines such as HASS or performing arts, foundational numeracy and scientific skills are an essential preparation for the future study of physics, chemistry, biomedicine and much more.

The target segments that Scitech identified in their New Strategy face some of the largest barriers to engaging in STEM learning which has resulted in under-representation of these people in STEM careers (Government of Western Australia, 2019). For instance, female students from low socioeconomic areas and indigenous people are less likely to study STEM subjects at school. Only 16 percent of STEM qualified Australians are female with the number as low as 13 percent in career fields such as engineering (Government of Western Australia, 2019). This gender gap prevents productivity and overall growth via under-utilisation of minds and the valuable diversity of ideas and experiences that can be obtained with a diverse workforce to tackle the world's challenges and problems.

Indigenous people are also significantly under-represented in STEM learning and careers. For example, Indigenous people represent less than 1 percent of higher education engineering and science students (Government of Western Australia, 2019). Addressing the current lack of diversity in STEM related learning and participation is an important and valuable aspects of this proposal. We want all Western Australians to be empowered to participate in a STEM enabled future regardless of their gender, ethnicity, and cultural background.

All people have the right to access educational opportunities that will enable them to actively participate in their communities. We know that designing in a way

that considers, integrates, and celebrates the range of human diversity in users means that more people are included; design for one, and extend to many (The Centre for Inclusive Design, 2019). For instance, promoting a student-centric way of learning for children that allows them to develop the necessary skills to navigate their own learning, to explore and make choices that unlock their curiosity and potential. Highlighting the importance of educators and their deep knowledge of each student individually can be key in helping them guide them on their educational journey.

In a strong STEM culture people understand the importance of STEM. They see its relevance to their everyday lives and support close family and friends to participate in STEM learning that could be beneficial in their communities. STEM literacy allows people to make informed decision and participate in community engagement. This is increasingly vital as innovations rapidly change the world that we live in.

By increasing participation in STEM learning for communities that are currently falling behind, we all benefit from the richness of knowledge, experience, and expertise that informs the future of innovation and development in Western Australia. By working alongside Scitech and these stakeholders, we have the opportunity to innovate outcomes that will overcome barriers to access, contribute to shared ownership of learning experiences and empower these groups to become active contributors to the future of Western Australia.

In order for these outcomes to be achieved it is crucial to adopt a human-centred and holistic approach to service development and delivery. In taking a service design approach to this project, we see that internal operations of the organisation have a direct impact on learning outcomes. Scitech staff play a key role in the face to face engagement of students across the State, therefore it is essential that back-end processes of the organisation be aligned with the goals of front-end delivery.

WHO IS IT FOR?

Scitech came to our team with an objective that focused on the target segments of youth, females, indigenous persons, people in regional and remote Western Australia, and people in low socio-economic areas. While this objective provided a strong starting point, it was important for us to investigate who this project had the ability to impact as well as who would in fact be interacting with the outcomes we are to propose. For this, we utilised brainstorming and stakeholder mapping to define our primary core stakeholders:

» Culturally and linguistically diverse students, Students from low socio-economic communities and Indigenous students
» Remote primary school teachers, metro primary school teachers, public school teachers and private school teachers
» SciTech customer insight team, SciTech content team, SciTech experience team, SciTech state-wide team and SciTech professional learning team
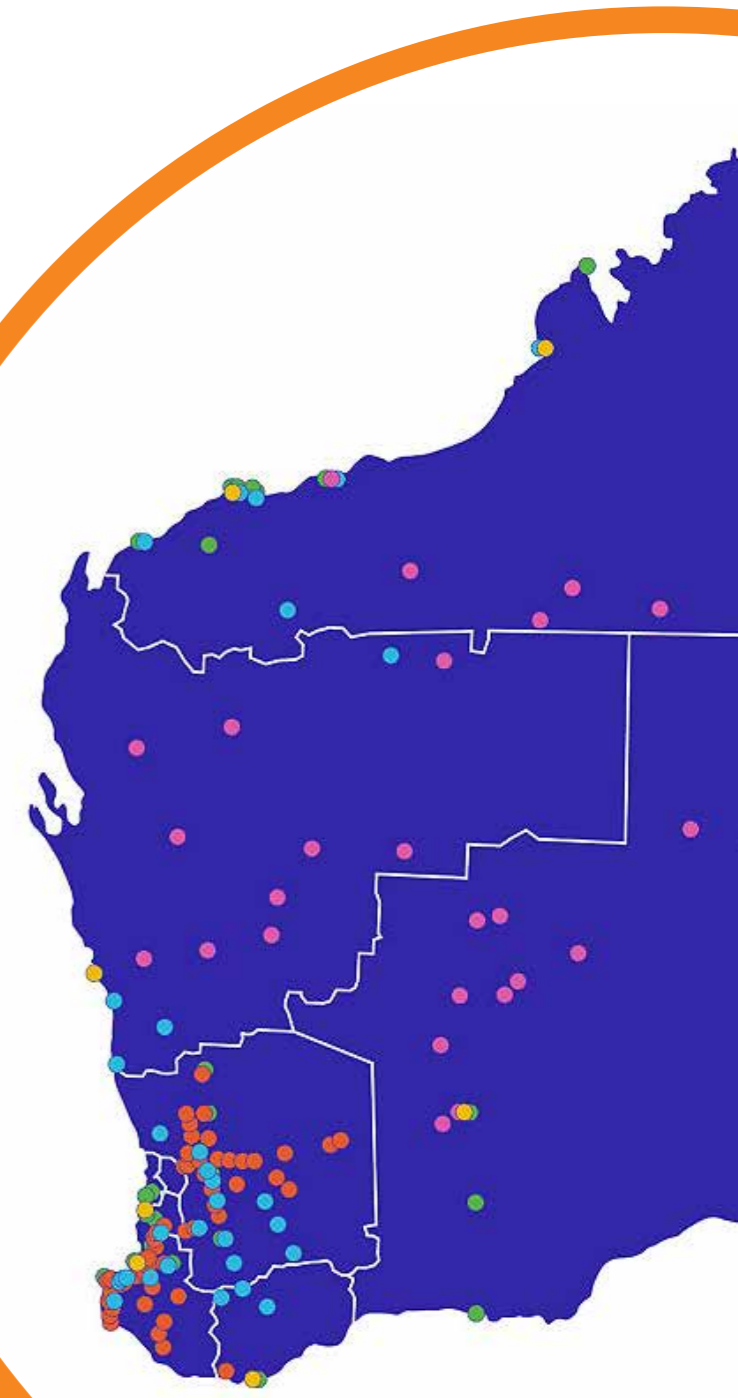
Figure 5: "Scitech Statewide Reach" retrieved from https://www.scitech.org.au/about/our-statewide-reach/

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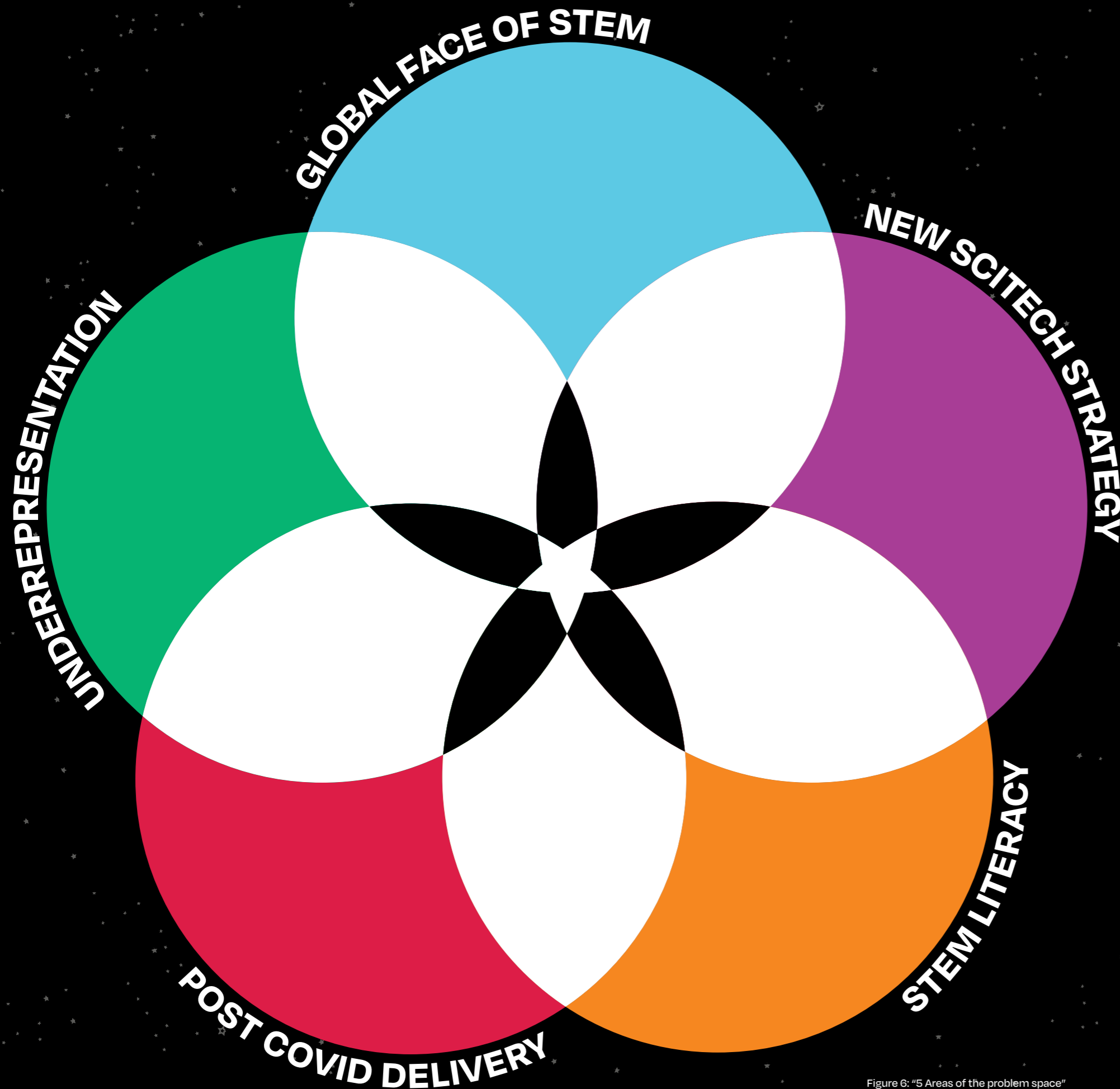
INITIAL PROBLEM

Figure 6: "5 Areas of the problem space"

Circle labels:
GLOBAL FACE OF STEM
NEW SCITECH STRATEGY
STEM LITERACY
POST COVID DELIVERY
UNDERREPRESENTATION

INITIAL PROBLEM STATEMENT

In early March of 2021, we met with Danielle Giles who introduced us to the initial problem statement.

"HOW MIGHT WE TAKE STEM TO THE COMMUNITY?"

This was explained further as a way to explore the second pillar of the New Scitech Strategy (2018).

TO '...EXPAND OUR FOCUS AND INCREASE OUR POSITIVE IMPACT ON TARGET AUDIENCE SEGMENTS, ESPECIALLY YOUTH, FEMALES, INDIGENOUS PERSONS, PEOPLE IN REGIONAL AND REMOTE WESTERN AUSTRALIA, AND PEOPLE IN LOW SOCIO-ECONOMIC AREAS.'

PROBLEM CONTEXT

In addition to the statement, Danielle also identified 5 areas that informed the context of the problem space

GLOBAL FACE OF STEM

The presentation included statistics regarding the role of STEM in industry, specifying that STEM skills are required in 75% of growing occupations. The statistics also showed that 44% of current jobs are impacted by digitisation and automation.
Equipping young people with the skills to succeed in future workplaces is a pressing concern for Scitech.

Figure 7: "Problem Statement"

UNDERREPRESENTATION

Other statistics included in the presentation showed that the rate of diverse STEM qualified Australians is worryingly low, with women making up only 16%, and Indigenous people making up less than 1%.
Scitech aims to increase their impact on these groups, and wants to know how their current approach can be expanded to achieve this.

STEM LITERACY

The presentation observes that many 15 year old's are falling behind in math's and science, along with Indigenous students are falling up to 2.5 years behind non-Indigenous students.

Giles brought up the concept of 'T-shaped people' in her presentation, which is integral to understanding Scitech's goals . A T-shaped person is someone is fully equipped to enter the workforce of the future, as well as navigate a rapidly changing world. They are exactly the type of person Scitech aims to create through their educational experiences.

The current state of STEM education within the curriculum is not enough to create T-shaped people, and the current statistics on STEM proficiency in these demographics show that the need to deliver these skills to young Australians is stronger than ever.

POST COVID-19 DELIVERY

It is difficult to overstate the impact that COVID-19 has had on all aspects of society. Scitech was not immune from this impact. Visitation to the science centre, their primary point of contact with the community, was rendered inaccessible during lockdown. In addition, incursions to school are hard to conduct when said schools have also been shut down.

However, this did not halt Scitech's efforts to bring STEM to the community. Scitech's website was put to use hosting content that the community could interact with from home.

Now that COVID-19 restrictions have been mostly lifted, Scitech is now left wondering how to proceed. Like many other organisations, Scitech has been made aware of alternative methods of delivery through the necessity of moving their operations online. The situation has also further revealed the limitations of the centre as the primary point of contact between Scitech and the community.

NEW SCITECH STRATEGY

In 2018, Scitech released the New Scitech Strategy. This document outlines Scitech's vision for the future, and what areas they want to target in order to achieve this. The main areas of interest are as follows:

» State of the art science centre(s)
» Targeted deeper reach beyond the centre
» Informed public voice for STEM
» Highly connected STEM community
» Business Growth and Sustainability

This document proved invaluable in understanding Scitech's proposed goals. However, the team was immediately curious as to how extensively this plan has influenced the way that Scitech operates, and this was not immediately clear upon preliminary research.

In-line with the New Scitech Strategy, Scitech underwent an internal restructure, introducing a number of new Teams. Giles explained that the Scitech Experience Team, with which we would be working, is relatively new. This means that our access to user data and feedback may be limited, and that it may take more time to build up rapport with these employees.

04

RESEARCH METHODS

RESEARCH STRATEGY

FOLLOWING THE PRESENTATION OF THE INITIAL PROBLEM, WE ENTERED THE DISCOVER PHASE OF DESIGN THINKING, WHICH INVOLVED OUR RESEARCH PROCESS. THE GOAL OF THIS PHASE WAS TO BETTER UNDERSTAND THE INITIAL PROBLEM IN CONTEXT, AS WELL AS FROM THE PERSPECTIVES OF THE PEOPLE AND COMMUNITIES IT IMPACTED.

RESEARCH TOOK THREE MAIN LINES OF ENQUIRY; A REVIEW OF LITERATURE, DESK RESEARCH AND USER RESEARCH. AS A FOUNDATION, A LITERATURE REVIEW WAS CONDUCTED INTO THE IMPORTANCE OF ETHNOGRAPHIC RESEARCH AND VISUALISATION IN THE PROCESS OF SERVICE INNOVATION. THIS AIMED TO GROUND OUR WORK AND PROCESSES IN THEORY AND GUIDE THE WAY IN WHICH WE GATHERED DATA AND PRESENTED OUR FINDINGS.

DESK OR BACKGROUND RESEARCH INTO THE PROBLEM SPACE ENABLED A GREATER CONTEXTUAL UNDERSTANDING OF THE PROBLEM WHICH WAS THEN SUPPORTED BY USER RESEARCH. THIS WAS CONDUCTED DIRECTLY WITH STAKEHOLDERS TO UNDERSTAND THEIR EXPERIENCE AND INTERACTIONS WITHIN THE PROBLEM SPACE FROM MULTIPLE FRAMES OF REFERENCE.

LITERATURE REVIEW:
DATA VISUALISATION AND RESEARCH METHODS FOR INNOVATION

This literature review to grounded our work and processes in theory and informed the way in which we gathered data and presented our findings. As service design and design thinking are approaches that are often unfamiliar to those outside of the field of design, it is important to provide a theoretical perspective to reiterate the importance of a user-centred, experience driven approach.

INTRODUCTION

Research is the process of collating, analysing, and interpreting data to better understand a phenomenon (Leedy & Ormrod, 2010). The research process is systematic and occurs within an established framework that provides researchers with an idea of what the research should contain, how to conduct the research and what kinds of inferences can be made based on the findings of the research (Williams, 2007). There are two main methods of conducting research: they are qualitative and quantitative (Williams, 2007). The researcher assumes the type of data required to answer the research question. For example, is numerical data needed or textual data? A third approach also exists called mixed methods which is the combination of both qualitative and quantitative data. This method is the least used out of the three due to its conflicting nature. Conducting this research, the researcher selects one of three methods to conduct the research (Strijker et al., 2020).

Quantitative research is linked with the positivist paradigm. It usually entails the collating and transforming data into numbers so that statistics can be calculated, and conclusions drawn. Quantitative research came about in 1250 A.D and was utilised by researchers who had the need to quantify data. Since then, quantitative research has become the predominant form of research method used in the western world (Moksha, 2013). Qualitative research is associated with the social constructivist paradigm which reinforced the socially constructed nature of reality. It involves the documenting, analysing, and attempting the find the deeper meaning and explanation of human behaviour and experience. It revolves around the complex

understandings of people's experiences and not in collected data which can be hypothesized to other groups of people (Kim, 2014). Mixed methods approach is defined as a combination of qualitative and quantitative research methods and concepts into a single study (Johnson & Onwuegbuzie, 2004). Mixed methodology today is a feasible complement to purist qualitative and quantitative research because its pluralistic nature allows researchers to increase both the scope and the depth of analysis (Collins et al., 2006).

Since the service business contributes heavily to national economic growth, the importance of service innovation has received significant attention in recent years (Cho et al., 2011). Innovation has been a key element for firm competitiveness. However, most of the pre-existing research focuses on innovation in the manufacturing industries or the technology sector (Tether, 2005). The importance of innovation has not been completely acknowledged in the service industry (Crevani et al., 2011). Driven by demanding yet intelligent customers, global competition and a rapidly changing market environment, many organisations look to find new ways to obtain and retain a competitive edge. The main source for this edge in service firms is customer satisfaction via superior customer value delivery, which contributes positively to increased purchase power (Roofthooft, 2010).

Service firms in the corporate industry approach design differently compared to those in-service design. Service designers follow design thinking and prioritise the experience of people. Design thinking is useful for tackling complex problems that are ill-defined/unknown

due to its understanding of the involved human needs, reframing of problems in human-centric ways, creating a range of ideas in ideation sessions, and having a hands-on approach during prototyping and testing (Dam & Siang, 2019). Comparing and contrasting between a "corporate" and a "design" approach to service innovation, Wroblewski (2005) mentions that the end goal for for-profit firms in a traditional business setting is based on the bottom line whereas in a service design setting, finding reward in quality solutions is the main objective. Therefore, Service innovation best thrives when it's not constrained by traditional barriers of researching.

Visualisation is a vital method of communication. Usually, visualisation entails translating complex forms of data or information into something more accessible and tangible. Humans are naturally primed to absorb visual language, and visualisation can often be more universal in practice than written language (Al-Kodmany, 2001). There is a long precedent for this line of reasoning, for example humans have used visual language to communicate long before written language existed. For a long time, visual language was the only way to preserve a story, memory or lesson that would survive past the lifespan of the person recording it, or even long past the lifespan of anyone alive who remembered it (Friendly, 2009). Scholarly sources about this topic as a general concept are rare; many papers talk about visualisation and visual communication within a specific context. According to Hepworth (2014), visual language has been used throughout history to assert power.

A universal approach to visual communication is hard to come by because of the disagreements about the fundamental definition of it. This is surprising since the field of visual language and linguistics has been a vibrant research field (Avgerinou & Pettersson, 2011; Erwig et al., 2017). However, this does not in any case render these sources useless. Many of the theories presented by these sources still apply to visual communication as a general concept, and many of the ideas about how visual communication functions, as well as its applications, overlap significantly. In addition, the wide variety of contexts in which aspects of visual language theory have been applied reinforces the idea of its overall significance.

A key context that visualisation is useful in is its ability to aid in making complex ideas easier to understand and share (IDEO, 2019). We use visualization as an effective way to communicate ideas, and we have been doing this since the dawn of human civilisation with the first cartography map being carved into stone 6000 years ago. (McCandless, 2010). Since then, we have seen the form of visualization turn into a widely recognised satellite image of street maps and Google earth. We saw visualizations increasingly become useful when the development of science was being applied in the Middle Ages. (McCandless, 2010). Visualization is a key component in 'Design Thinking', capturing ideas through visual sketches, photographs, animations, videography, cartoons, 2D and 3D Diagrams, role play, artefacts and more, where we can conceptualise these ideas and turn them into living experiences that are working in the real world. (Brown, 2021).

Tim Brown describes 'Design Thinking' as "a human-centred approach to innovation that draws from the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success" (Brown, 2021, pp. 1). The application of the designer's tool kit is used in domains such as healthcare, IT, business or to tackle wicked problems that many organisations and businesses face. (Kernbach & Nabergoj, 2019). Engineering utilises visualisation to process data, referring data visualization as "transforming figures and raw data into visual objects: points, bars, line plots and maps". (Sadiku et al., 2016). By combining user-friendly and aesthetically pleasing features, these visualizations make research and data analysis much quicker and are also a powerful communication tool. (Toco, 2018; Sadiku et al., 2016). According to Kernbach & Nabergoj (2019) visualization is fundamental in Design Thinking as it shares ideas, creates ordinary understanding, speeds up processes for efficient and faster innovation cycles and enables insights that lead to actions. A better understanding is necessary of the different forms of visuals, their use in phases, what principles they convey and how they affect cognitive, social, and emotional dimensions of the design thinking work. (Kernbach & Nabergoj, 2019).

The field of design has seen a progression away from

focus on product to a focus service and experience (Polaine et al., 2013). The formal emergence of design thinking as a human-centred, collaborative process for creating meaningful and purposeful design outcomes has given emphasis to the importance of research and discovery in the process of designing innovative services (Polaine et al., 2013). Humans are central to the design and delivery of such service experiences (Stickdorn & Schneider, 2011). The value of a service only comes to exist when a person decides to use it. This engagement marks a key difference between the essence of product design and experience design; rather than consumption, engagement with services requires the entering of a relationship between a person and an organisation providing the service (Polaine et al., 2013). Relationships are complex and require more personal understanding of context, values, needs, and everyday experiences. By this very nature, creation of services requires a deep understanding about the personal stories each service user brings to the relationship, meaning that it is essential that research for the creation of services should revolve around the very people they relate with (Stickdorn & Schneider, 2011; Polaine et al., 2013).

This literature review will be divided into 5 main chapters. The first chapter will look at comparing qualitative research methods, quantitative research methods, mixed methods approach, and looking at the reliability of mixed methods approach. The second chapter will look at the differences in approaches to innovation from a business first approach and a service design approach. This chapter will also examine the complexities of design thinking. The third chapter will look at the history and early utilisation of visual communication, modern uses of visual communication as well as analysing how visual communication overcomes traditional barriers of understanding. The fourth chapter will look at the 5 Stages involved in the design thinking process and examine each one as well as looking at how each of these stages use visualization activities and why design thinkers use them. Lastly the fifth chapter will explore the importance of user voice in research for service innovation. This will be done by examining the importance of storytelling in design. It will also focus on interviewing as a method for story collection. The purpose of this critical review is to provide the scholarly,

literary, and contextual commentary to support the perspectives, context, and approaches that the authors utilised when co-designing the service design project with SciTech.

CHAPTER 1: QUALITATIVE, QUANTITATIVE AND MIXED RESEARCH METHODOLOGIES: COMPARING THE THREE METHODS

QUALITATIVE RESEARCH APPROACH

Qualitative research is mostly interested in analysing subjective latent meaning of issues, practices, and events by collating non-standardised data and performing textural analysis on the texts and images rather than numbers and statistics (Flick, 2014). From this definition it appears that qualitative research is an overarching concept under which a wide range of issues may be placed, and it has both positive and negative stances. There are some advantages to using qualitative research. For example, it produces a robust description of participants feelings, thoughts and experiences and interprets the latent meanings of their responses (Denzin, 1989). Another benefit of using qualitative research is that it has a flexible structure as the framework can be designed and re-designed to a greater depth (Maxwell, 2012). Therefore, the deep level analysis of a problem can be produced by utilising qualitative research and therefore the participants have ample freedom to choose what appropriate for them (Denzin & Giardina, 2016). Qualitative research also has its fair share of limitations. First it sometime disregards the contextual sensitivities and emphasises more on meaning and experiences (Silverman, 2015). Second, policy deciders may give low priority and credibility to the results from a qualitative research due to its too subjective nature. Stakeholders use quantitative research when they need to. For example, if a policy maker needs to vote on a problem, they could not wait for a qualitative research study to be conducted as this would be time consuming. The legislator may want a quantitative research study

instead of a qualitative research despite qualitative research having the ability to highlight to the stakeholder what works and what does not as the qualitative research provides a robust abundance of hidden subjective latent information that numbers cannot reveal (Sallee & Flood, 2012)

QUANTITATIVE RESEARCH APPROACH

Quantitative research emphasises on the quantification of the collected data. A research method that relies heavily on numerical measurement of variable that exist in the social world (Becker et al., 2012). Additionally, Becker et al., (2012) identifies positivism as a nomothetic approach in which knowledge gained from empirical testing. However, interpretivism in qualitative research opposes the positivist approach when the researcher argues that interpretivism focuses on the study of individual cases and the meaning that derived from the knowledge. This seems to reinforce as mentioned previously that there is a 'paradigm war' that exists in the research world in which researchers are playing on different sides of the academic sphere (Weber, 2004). Advantages to using quantitative research is that the results of the study are likely to be inferentially generalised to the larger population because it involves a larger sample size of randomized participants (Carr, 1994). This results in the data analysis being less time consuming since it uses statistical software's such as SPPSS software (Connolly, 2007). Given the benefit of using quantitative research it does have its drawbacks. For example, the positivist research paradigm excludes the meaning of social phenomenon as well as failing to delve deeper into the underlying hidden latent meanings underneath the numbers (Morgan, 1998). Quantitative research when conducted in a highly controlled setting can miss the participants experiences and perspectives because there does not seem to be a direct connection between the researcher and the participants when conducting the research (Ary et al., 2018). As a result, the results gathering method becomes objective.

MIXED METHODS APPROACH

Mixed method approach is defined as research in which the researcher collects and analyses data, integrates the results and draws inferences using both qualitative and quantitative methodologies (Tashakkori & Creswell,

2007). Mixed methods research has come along away since the paradigm wars that involved qualitative purists vehemently opposing the quantitative purists leaving little room for an intersectional collaboration (Onwuegbuzie & Leech, 2005). Post paradigm- war resulted in the arrival of three major schools of thought, the purists, the situationists and the pragmatists (Madill & Gough, 2008). The pragmatists aim to focus on the similarities between qualitative and quantitative research rather than the differences. Mixed methods are still not universally accepted in the mainstream academic sphere but is often looked at as an appropriate way to gauge ideas on the grounds of empirical and practical accounts (Collins et al., 2006). In mixed research there are several ways of collecting data. The first one is conducting close-ended and open-ended surveys depending on weather it is for the quantitative portion of the research of the qualitative portion. The second method is conducting interviews with the participants. These two methods of gathering data can complement each other well and therefore increase the validity and reliability of the results (Zohrabi, 2013). Surveys are without a doubt one of the most effective methods of collecting quantitative data in research. Surveys can be constructed in three formats which are close -ended questionnaires that yield numerical data, open-ended questionnaires which yield textural data and lastly a combination of the first two methods culminating in a mixture of closed and open-ended surveys. (Acharya, 2010). Interviews are a popular method of collecting qualitative data. The purpose of an interview is for the researcher to gain firsthand information directly from the participants. The researchers pay attention to not only the verbal responses but the non-verbal communication responses that the participant exhibits (Knox & Burkard, 2009). There are two ways interviews can be conducted in a mixed methods research. The first is a person-to-person format and secondly a group interview format in which both methods are structured in a goal-oriented conversational format.

STRENGTHS AND LIMITATIONS OF MIXED METHODS RESEARCH

Optimally designed surveys have several advantages (Boynton & Greenhalgh, 2004). They are an extremely efficient form of collecting data on a large scale, they can

be administered simultaneously to many participants and the anonymity of the participants can be maintained on an elevated level which makes it easy to share the information (Jones et al., 2008). Survey questionnaire is also having their fair share of drawbacks. In some cases, the responses from the participants are inaccurate which can affect the overall validity and reliability of the research project, the return rate of surveys that are sent to participants via email or mail have been shown to slow and lastly some of the questions may cause confusion to the participant due to the wording of the questions not being clear enough (Bound et al., 2001). Interviewing as an instrument of qualitative research has several strengths in it use. Some of these strengths are: they are good at measuring attitude of a participant, they allow the researcher to use probes to elicit further detailed responses, they show to provide sufficient validity when it comes to interpretation, they have a very quick turnaround in response time if they are conducted over the phone, they have a high response rate and they give the researcher insight into nonverbal communication that the participants use such as facial expressions in response to a question and postural patterns (Zohrabi, 2013). Conducting interviews also comes with its fair share of drawbacks. Some of them are interpersonal interviewing can be time consuming and costly depending on the context your research, perceived anonymity of the participants could be low and lastly data analysis from interviews can be time consuming as you must transcribe the interviews before you can conduct a textual analysis (Johnson & Turner, 2003). Reliability of mixed methods approach
One of the key prerequisites of any research endeavour is considering the reliability of the results and findings. Reliability refers to the replicability of the results obtained from a research that is to what extent can the results be duplicated if the same research was conducted by either someone else or yourself (Roberts & Priest, 2006). Ensuring high reliability is achieved in quantitative research is much simpler since the data consist of numbers form. However, in qualitative research to achieve the same level of reliability is much more difficult. This is due to the data being in narrative and subjective form (Syed & Nelson, 2015). To standardise this outcome, instead of aiming to get identical results in a mixed research, as a research its more optimal to

focus on the dependability and consistency of the results gathered (Lincoln & Guba, 1985), This thought process aims to not obtain the same results but to agree either with yourself if your conducting intra-personal reliability testing or with another research during an inter-personal reliability testing, that based on the method of data collection and analysis the findings are consistent and dependable. Reliability can be examined through two specific lenses, external reliability, and internal reliability. External reliability refers to the ability for the researcher to duplicate the study and obtain identical or equivalent results to the initial research study. Internal reliability on the other hand refers to the consistency in the data collection and analysing process of a research project. Internal reliability can be achieved if a separate research conducts the same experiment and obtains similar or identical results as the original researcher (Nurani, 2008).

The last chapter discussed the origins and importance of qualitative research methods, quantitative research methods and mixed methods approach. Each method was compared against each other while touching on the importance of reliability of mixed methods approach. The aim of this chapter was highlighting each approach in a variety of contexts while primarily focusing on their application to research. In the next chapter we will examine the differences in approach to innovation by corporate sector firms compared to service designers. This chapter will also investigate the complexities of design thinking.

CHAPTER 2. COMPARING AND CONTRASTING DIFFERENT RESEARCH METHODS REQUIRED TO ACHIEVE SERVICE INNOVATION

BUSINESS ORIENTED APPROACH COMPARED TO SERVICE DESIGN APPROACH.

When looking at the differences between a "business-oriented approach" as supposed to a "design" approach to service innovation, Wroblewski (2005) highlights that

the reward structure in traditional business settings is based on corporate focus on the bottom line. This varies from a design structure finding reward in quality of solutions. To examine these profound differences between these two approaches playout in the real world, Liedtka & Ogilvie (2011) explored how business students and design students both conducted research into a hypothetical problem facing a leading consumer products firm. Leidtka and Ogilvie (2011) reinforced this difference methodology by highlighting that the business students would start by researching social, technological, environmental, and political trends in the marketplace, read analyst reports, interview industry experts, and benchmark leading retailers and competitors. From here they would recommend a set of strategies with ROI (return on investment) and NPV (net present value) calculations, then deliver a PowerPoint presentation (Liedtka & Ogilvie, 2011). Something to note here in the research practice of business students is that there is a heavy reliance on quantitative measures. Wroblewski (2005) explains that in a business approach to addressing problem-solving, it is more definitive and relies on proof through equations. Their approach is validated through what stakeholders say, and supported by market analysis (Wroblewski, 2005). Business oriented professionals are focused on the results of stakeholder activities and find that their product development phase can begin once their research is complete (Wroblewski, 2005).

Before it can be understood how people in the design world approach research for a problem, it is important to understand the design thinking process. There are five stages involved in the design thinking process. They are empathise, define, ideate, prototype, and test (Dam & Siang, 2021). The first stage, empathise, requires empathy to understand the problem at hand and involves research methods such as consulting experts, observing, engaging, and empathising with stakeholders, and immersion into the physical environment (Friis Dam & Yu Siang, 2021). Gasparini & Chasanidou (2016) notes key research methods when empathising is using personas, surveys, direct feedback, and focus groups. The define stage involves compiling the information previously gathered, and synthesis of observations to define the core problems (Friis Dam & Yu Siang, 2021). Research

methods that are used during the define stage include brainstorming, surveys, co-design, interviews, workshops, customer journey maps, design scenarios, and focus groups (Gasparini & Chasanidou, 2016). Following to the ideate phase, Dam & Siang (2021) explain that now the designers can begin generating ideas. Gasparini & Chasanidou (2016) list the research methods involved in this phase. They involve using survey, co-design, interviews, workshops, observations, focus groups, and personas. Then comes the creation of inexpensive, scaled down versions of problem ideas, supported by research methods such as prototyping, co-design, stakeholder maps, workshops, and scenarios (Gasparini & Chasanidou, 2016). Lastly, the testing phase is where there is rigorous testing of the best prototype solutions during the previous phase (Dam & Siang, 2021). Research methods involved at this point include design scenarios, storyboards, co-designing, prototyping, workshops, focus groups, and stakeholder maps (Gasparini & Chasanidou, 2016).

The main takeaway from the entire design thinking process is that unlike a business approach, it is not a definitive linear approach. Instead, the process is iterative, and designers will consistently research throughout the entire process and simultaneously re-visit the distinct phases involved. The authors who are part of Murdoch universities design Team have spent the first semester of the SciTech co-design project working through the empathise, define, and ideate phases. Throughout the course of the semester, they have been travelling back and forth between stages, as each stage is an opportunity to learn more information. For example, when the Design Team began to ideate and generate ideas for SciTech's problem, they realised that they did not know enough about it to generate effective "solutions" therefore resulting in them having to find out more information by conducting qualitative interviewees of key stakeholders.

THE COMPLEXITIES OF DESIGN THINKING
Various sources within the pre-existing have discussed how issues can arise when design thinking is adopted by organisations to innovate services. For example, Mootee (2013 pp.16) proposes that applied design thinking is strategic innovation. He goes on to explain

that innovation is more than simply planning of new products, services, brand extensions, technological inventions, or novelties, but is instead about imagining, organising, mobilising, and competing in new ways. Mootee (2013 pp. 59) further details that more than 80% of business management tools, systems, and techniques are for value-capture efforts, rather than value-creation. According to Ersoy (2018) design thinking has been misused by organisations in recent years, and as a result has led to mediocre and expensive design solutions. The fast-paced environment of traditional businesses looks for immediate proof of results. Ersoy (2018) mentions that in design thinking, expectations should be pushed to want more, but when it is adopted by businesses, they can settle into thinking "this is good enough". Research methods such as co-design and collaboration are a highly valued asset to a design thinking process because it gets multiple experts working together on one common goal. Ersoy (2018) finds that organisations can run into problems while attempting to do this due to design skills and problem-solving evaporating when there are too many people involved in the process at once. Being able to co-design with a range of people is also time-consuming. Sessions of group brainstorming, and co-design can fail because everyone's minds are limited to what they know at that point. With deeper exploration leads to a greater chance for a well-designed experience (Ersoy, 2018). As mentioned by Kueh (2019), there is a great need to insert the "thinking" back into design thinking. Thinking as a concept is the in-depth understanding of design while practising design. Kueh (2019) mentions that thinking initially had a strong tie with both academic conceptual research and industrial production advancement but now been adopted by organisations and has subsequently lost its initial value and touch with this new mantra of a "designedly way of knowing" becoming the new norm. This mantra reinforces today's attitude towards solving issues which is creating clear and fast steps to solve the issue at hand.

When trying to use research methods from design thinking, organisations can face problems when adjusting. For example, Carlgren et al., (2016) looked at five large firms and their use of design thinking. They identified seven types of challenges. The first one being "Misfit with Existing Processes and Structures." When

using design thinking, it was perceived as resource-intense and front-end heavy, thus difficult to prioritise. The iterative work and encouraged deviations from the initial problem definition was contradictory to the logic of the linear mainstream processes (Carlgren et al., 2016). Carlgren et al. (2016) also encountered the problem that resulting ideas and concepts were difficult to implement. The insights that were gained through user studies and expanding problem definitions led to concepts that blew outside the scope of future products described in their product planning/conflicted with it (Carlgren et al., 2016). The third problem was that the value of design thinking was difficult to prove. This led to pressure to obtain quick results to justify using design thinking, and the difficulty to measure the outcome of the design thinking activities was hard for industries that measured value with ROI (Carlgren et al., 2016). The fourth issue the firms experienced was that design thinking principles and mindsets clashed with business culture. Design thinking's use of rapid testing of hypotheses and failing frequently to learn was hard for organisations with aversion to risks (Carlgren et al., 2016). The problem of threatened power dynamics was also present. Professionals felt threatened by design thinkers coming into their areas of expertise and questioning the functioning of organisational processes (Carlgren et al., 2016). The sixth challenge that Carlgren's et al. (2016) identifies was that the skills were hard to acquire. Research methods that are most valuable to design thinking are visualisation and qualitative user research, but firms reported finding it difficult to learn and overwhelming. It was hard to find the right people to recruit for the design thinking teams. The last issue that the firms faced was the difference in communication style (Carlgren et al., 2016). It was difficult for the firms to present and argue based on subjective data and human-oriented values, along with use of visual representations to explain ideas. These are challenges that can be overcome but requires a transformation in business culture. It is important that the design thinking process is not rushed, and all research methods are carried out to arrive at an experience designed to fit the appropriate stakeholders.

The last chapter discussed the differences in approach to innovation by business-oriented organisations and design-oriented organisations. The chapter also looked

at the complexities of design thinking and how business-oriented organisations need to reconsider how they approach their design thinking if they want to mitigate some of the barriers to success. The aim of this chapter was to compare different research methods into service design from a business first mindset and a service design mindset. In the next chapter we will examine visual communication and its evolution from traditional methods of approach to modern contemporary approaches. This chapter will also investigate how visual communications can overcome traditional barriers to understanding.

CHAPTER 3. THE PRECEDENT AND LEGACY OF VISUAL COMMUNICATION

THE EARLY TRADITIONAL UTILISATION OF VISUAL COMMUNICATION

Visual communication has been used throughout human history, in many different forms. Written language is a new development of humanity, and even more recent is elevated levels of literacy across the general population. It was therefore necessary for information to be transferred in a way that could be understood easily. This usually came in the form of items or imagery that offered context clues or induced certain associations in the viewer. One example is the use of crowns by monarchs. Within the context of medieval England, for example, a crown instantly conveyed a substantial amount of information about the person wearing it. This person is powerful, this person has a direct line to God, this person is rich, this person should not be approached or offended under threat of death, etc. All this information could be gleaned through the presence of a single object and is still used today to induce certain emotions in the viewer (Hepworth, 2014). Another example of visual communication from this time is the use of stained-glass windows in churches. Many barriers faced church attendees attempting to read scripture in the past. Many were illiterate, and even if they were able to read their own language, the Catholic bible and the sermons given by Catholic priests were in Latin. Even if this barrier was

removed, reading comprehension was not a common skill. Therefore, stained-glass windows provided a way for these church attendees to understand at least some of the stories found in scripture. This was also a way to encourage the viewer to feel certain emotions about the events being portrayed. Aside from just the provocative imagery portrayed by the stained-glass, the sight of the sunlight shining through the beautiful, coloured glass was intended to inspire awe and reverence within the viewer. These emotions could not be otherwise induced by hearing the same story droned in a language one does not speak (Allen, 2012). These methods were often used with vague intentions. However, it was taken for granted that any individual who looked upon a crown or stained-glass window would have the context to react in the desired manner. This means that these methods of communication may have lost some or all their significance should someone without this context see them (Hepworth 2014). This is also reflective of the disconnect between those creating the images and those viewing them. The creators could not even imagine that someone would not share their context, and so did not account for this contingency. This was, in their own time, a fair choice to make. They were unlikely to interact with anyone not of their own status, race, religion, etc. There did not exactly exist a need to tailor visuals to a highly specific audience, especially one outside their own homogenous cultural context (Dyer, 1982).

MODERN CONTEMPORARY USES OF VISUAL COMMUNICATION

The reasons that visual communication is utilised in modern times are far more varied and intentional. The most prominent way that most individuals are communicated with visually in the modern era is advertising. Advertising is prominent in most channels of communication that modern humans have; print media such as newspapers, digital media such as television and websites, social media platforms, and many more (Bulmer & Buchanan; Oliver, 2006). This also means that there is a substantial number of sources concerning visual language in advertising. Therefore, it is fair to use advertising practices as an example of how visual communication is utilised in modern times. Advertising marked significant changes in the way humans communicated. It was the advent of widely

circulated printed media, especially newspapers, that advertising began to change from a simple form of communication to its own overly complex ecosystem. In the beginning, visual aspects of advertising were small and simple; only meant to draw the eye of the viewer to the accompanying text (Dyer, 1982). It was often formal and to the point, until the rise of advertising agencies, and bans on illustrations and typographical restrictions being lifted. With particular focus on advertisements used by soap and detergent merchants, the illustrations commissioned by A & F Pears, for example, often depicted women, children, and mother and child pairs, partaking in baths or other household chores. The advert was attention-grabbing on its own, but it also put the product into a scenario their target consumer, homemakers, could recognise. The ad created an instant connection between the target consumer's own life and habits and the product itself (Erwig et al., 2017). These methods only became more refined by the 20th century. Adverts began to encourage insecurity and self-judgement within the viewer, asserting that the only way they could hope to mend their personal flaws was to invest in a certain product (Dyer, 1982). This is further reinforced by Hepburn (2014) who highlights the idea of the function of visual communication artefacts. She argues that these seek to change and produce certain emotions and behaviour in the viewer. In the context of a crown or stained-glass window, the intended message was designed to impact viewers of an overly broad shared-context - such as country of origin. In the case of advertising, advertisers reached a point where they were able to use tools such as social psychology to target specific segments of society, and in the process evoke specific emotions or behaviours out of there intended target audiences (Dyer, 1982).

HOW VISUAL COMMUNICATION CAN OVERCOME TRADITIONAL BARRIERS TO UNDERSTANDING

Visualisation can facilitate the transfer of ideas between individuals of different areas of expertise or study. Different areas of study all contain their own language, with complex vocabulary and concepts. This nuance can be difficult to convey to anyone who has not spent years steeped in a specific area of expertise. For example, most individuals in the service design industry know

words such as prototyping, conceptualisation, ideation, etc., as well as what those words mean, the context in which they are used, and the impact of these practices. This vocabulary, however, can mean little to nothing, to an individual outside of this industry (Engbretsen & Kennedy, 2020). This is significant, as service design is usually outsourced to a design firm since the client facing the design problem may not specialise in this area. Once the design firm has identified what needs to be changed to address the design problem, they must then inform the client. It is vital for the client to understand the significance of the ideas being presented. As mentioned by Hepworth (2014, p.228), "A crown is only awe inspiring to people who are both aware of its importance in a given tradition and have a meaningful connection with that tradition". A client may not have the context needed to make sense of design theory. Therefore, visualisation, if used effectively, can make design theory tangible to the client, as well as convince them of its value and potential impact on their design problem. It is important that, if visualisation is being used with a specific individual or group in mind, the context of that group or individual is considered. Language and meaning do not exist in a vacuum. A designer cannot simply create an image based solely on their own context and understanding and expect every single viewer to instantly comprehend the intended meaning. At best, the communication will simply fail. At worst, the designer could cause great harm or offence to a community (Bederson & Shneiderman 2003). This can partly be attributed to the highly subjective nature of visual analysis. According to Hepburn (2014), the bias of individual historians, whether they are aware of this bias or not, colours their final conclusions significantly. Hepburn (2014) also argues that the power of visual language comes from a pre-existing shared context between the viewer and the creator. While this may seem to weaken the power of visual communication, in certain contexts this can be considered a strength. If an individual understands the context of people they are trying to communicate with, they may be able to communicate concepts or ideas even more effectively. This has been proven in the context of advertising, with advertisers able to target specific groups and their specific insecurities to create consumers (Dyer 1982). Using methods of visualisation or aspects of visual language that are familiar to the ning

viewer can help to convey the full significance of the message in ways the creator's own context could not.

The last chapter discussed the evolutionary history of visual communication and more specifically focusing on the differences in approaches to visual communication from a traditional point of view as supposed to modern contemporary points of view. The chapter also looked at how visual communication can overcome traditional barriers of understanding to success. The aim of this chapter was to examine how visual communication has evolved over time and how different industries and fields approach and utilise visual communication differently to achieve a specific goal. In the next chapter we will examine the importance of visualisation methods in design thinking. This chapter will also investigate why we need visualisation in service design to achieve innovation.

CHAPTER 4. AN EXAMINATION OF THE IMPORTANCE OF VISUALISATION METHODS AND PRACTICES IN DESIGN THINKING AND SERVICE DESIGN FOR ACHIEVING INNOVATION

EMPATHISE PHASE

According to Kernbach & Nabergoj (2019, p.3) describes the main function of the empathise phase for the Design Thinking team is to "observe, engage and immerse" with the user and their experience. At the core of this stage, it is to identify the right users and stakeholders, uncovering their needs and discovering their emotions by conducting exercises, which guides innovation efforts.. (Kernbach & Nabergoj, 2019; Gibbons, 2018). To identify the right users, one key exercise that occurs is the identification and mind mapping stakeholders and using this information to create a 'stakeholder map'. These are produced to understand the different users, the diverse

groups, and how they are connected and in what system they operate. We can establish the relationships between stakeholders, their needs and requirements which are visualized as a conceptual diagram, positioning who are most affected closer to the middle of the page, supplying us additional meaning using space. These are created by hand and are replicated easily on a computer software system. Kernbach & Nabergoj (2019) concludes that it is important for the Design Thinking team to visualize the user and the stakeholders, to make the context that is tangible and clarified, however not prematurely commit to a tangible solution design. Kernbach &Nabergoj (2019) identified how visualization makes concepts more concrete and manageable. Having stakeholder maps visualized is useful for other team members, board members, employees, stakeholders, users etc, who can "see" the relationships, identify missing links, and discover the core issues of the organisation where feedback and co-design can occur. An example is sketching up a stakeholder map on paper, it allows for easy modification and additions, and it is collaborative. Rapid changes are facilitated, emerging the ideas and options.

Other exercises that are conducted in this phase are "empathy mapping". These are efficient tool to understand user's behaviour, attitude, along with visually communicate their feelings. (Browne, 2020; Gibbons, 2018). We can develop a deep understanding of the users, revealing holes in existing data research. We can establish a common ground among team members and prioritise the needs of the users when developing the project. These are conducted at the beginning of a project and should be revised as research continues. (Gibbons, 2018).

DEFINE PHASE

According to Kernbach &Nabergoj (2019) the define phase is, where we unpack and synthesize our findings into needs and insights, this is to find a scope and the unique, relevant design challenge. This includes developing a rich understanding of the user and create an actionable problem statement, also known as "point of view" (POV). The POV is a literary device used in writing that indicates the perspective of which a narrative is told. A professionally written POV is a guiding statement

that frames the problem, captures the needs and insights of the user, influences the team and acts as a reference for innovative ideas. Templates such as a "Venn diagram", or a "Matrix diagram" help synthesize research allowing us to analyse the issue. (Pollastri, 2012, p. 27-28). The dimensions of these templates derive from the data about the users and are used at a large scale with post-it notes to make necessary changes until it is digitized. The main function of the define stage is to synthesise findings into needs and insights, to be able to find the overall scope of the design challenge. What is represented are the interviewed and observed users, organised in two dimensions: Time of Diagnosis and type of coping activity. (Kernbach & Nabergoj, 2019; Pollastri, 2012). It is visualised using a 2 by 2 matrix or Venn diagram template to then be digitized on the computer. Other tools used by design thinkers in this stage are "Personas", that help give faces and personalities to the customers, "Mind Maps" and "Customer Journey Maps" that allow us to understand the deeply rooted issues, "Mood Boards" and "Visual Stimuli's" to create an identity for the project. (Toco, 2018).

IDEATE PHASE

The main function of this phase is to generate ideas and explore wide solution spaces and focus on the diversity of concepts before evaluating and choosing an idea. This phase represents the transition from identifying problems to exploring solutions for users. This phase allows design thinkers to rely on simple visualization that will create impactful designs such as visual metaphors. (Kernbach & Nabergoj, 2019; Pollastri, 2012; Grochowska, 2015). These metaphors offer advantages such as they convey insights about the represented information through key characteristics. The main functions of ideate are enabling free visualization of ideas and concepts that can develop a solution to the problem, and these are done through activities like "Multiple Universe" and "Crazy 8's". It represents the spectrum of ideas that have been generated by all team members, to find the best solution. (Kelcher, 2021). They are conceptualised with metaphoric hand drawings and post-it-notes on a poster or whiteboard before it becomes digitized. The range of visual metaphors is vast, especially when the Design Thinking team is large and diverse with people from diverse backgrounds. Ideation prompts emotional

responses from the audience and are remembered better. (Kernbach & Nabergoj, 2019). In many cases, these concepts of rough low fidelity drawings can be left as they are and not be digitized to show the stakeholders the progress of the Design Team. In this phase, many ideas end up converging and turning into concepts that can be used by the organisation or business with the original problem.

PROTOTYPE PHASE

The main function of the prototype phase is to translate ideas from the ideate phase, into the physical world and create something tangible and real. Creating them in the early phase should be rough and rapid. They are the most successful when users can interact with them, allowing an opportunity to see how it works. (Pollastri, 2012). They help to further gain empathy, explore, and test ideas, get inspiration to develop designs, start conversations. (Kernbach & Nabergoj, 2019), open a dialogue when a disagreement arises, allowing failure to happen quickly and cheaply. (Brown, 2021). Prototypes are distinguished between low fidelity and high fidelity. (IDEO, 2019; Tufte et al., 2013). Low fidelity is recognised as sketching and drawings while high fidelity is objects and role play. The results of a low fidelity prototype are a "Customer Journey Map," a "Storyboard" or concrete sketches which shows the process of the user. It is important to have rough and rapid sketches that signify "work in process" and "low perceived readiness" to invite ample modification and feedback. (Kernbach & Nabergoj, 2019). Here we allow people to engage with the prototypes to test out the ideas. We can receive customer feedback and experience which can either be the finished result or used to improve the design. (Pollastri, 2012). What is represented is the customer journey, and the phases of each touchpoint and interaction, their emotions along the way. It is visualized with concrete and metaphoric hand drawings on paper.

TEST PHASE

The "test" phase is for refinement of the proposed solution by putting the prototype to use by the users, customers or even employees, testing them to refine the design. By testing and refining these prototypes, design thinking teams learn more about the user and might even refine the original problem statement (POV) that

was created earlier in the project. (Kernbach & Nabergoj, 2019; Leifer & Meinel, 2019). Design Thinking teams are required to test their prototypes early to learning from their experience that can refine the design for the new prototype. (Grochowska, 2015). This phase requires prototyping and testing to occur rapidly, to fail early and cheaply. (IDEO, 2019). Testing organises the feedback into four pre-defined categories such as what works, what does not work, what improvements can be made and what innovative ideas have formed?

WHY DO WE NEED VISUALIZATION?

Visualization has the power to quickly generate a tangible output by sketching, allowing an emotional response to occur by the audience, and make it easier for them to give feedback as these prototypes are the signals for "work in progress". (Kernbach & Nabergoj, 2019). The beauty of data visualization is that it gives context to numbers and establishing a relationship between them. (Rosling, 2006). Today in our digitized world, data is the new oil; it is all around us to be mined and sold off for profit. (McCandless, 2010). We need to imagine a landscape of this information as we are told the numbers, but we do not see the relationships, so we turn numbers into a landscape. In the TED Talk by David McCandels he quotes "If you are navigating a dense jungle of data and information, it is a relief to see visualization as it feels like a clearing" (McCandels, 2010. 9.03min).

The use of visualization in design thinking is fundamental as it helps to share and communicate ideas, create mutual understanding, speeds up the process for more and faster innovation cycles, and enables insights leading to actions that achieve innovation. (Kernbach & Nabergoj, 2019). Our eyes are exquisitely sensitive to patterns and colours, it is like speaking two languages as your eyes look and interprets the information through your perception. We utilise data visualization to squeeze an enormous amount of information into something visual and understandable. It provides solutions by allowing people to see the enormous amounts of data that is gathered efficiently. (McCandless, 2010).

The last chapter looked at the visualization methods and the 5 stages involved in achieving innovation. These stages consist of empathize, define, Ideate, Prototype, and Test. The chapter also examined how these stages of the design thinking process use visualization activities and why design thinkers use them. The aim of this chapter was to examine the importance each phase in contributing to optimal innovation as well as discussing the key role visualisation plays in service design. In the next and concluding chapter, we will discuss the importance of user voice in research for service innovation.

CHAPTER 5. THE POWER OF STORIES TO DRIVE SERVICE INNOVATION

IMPORTANCE OF STORYTELLING IN DESIGN

Connelly & Clandinin (1990, p.2) said that "humans are organisms who, individually and collectively, lead storied lives". Stories, like experiences, reflect exchanges and encounters between people, objects, and environments over a period (Brun, 2017; Quesenbery & Brooks, 2010). The act of telling a story seeks to make meaning of these experiences (Celikogin et al., 2020; Bleakley, 2005) and have this meaning understood by others (Brun, 2017). Whether spoken, written, or visually articulated, the environment in which storytelling occurs impacts the process of producing knowledge through the sharing of experience (Hampshire et al., 2014). For this reason, stories are subjective; the storyteller cannot describe every minute detail of their experience, so it is up to the audience to interpret the blank spaces (Quesenbery & Brooks, 2010). The aural or written mode of sharing these experiences relies heavily on the use of language and narrative structures which help to organise the structure and order of a story over time through the idea of narrative arc (Celikogin et al., 2020). A narrative arc divides a story into the exposition, rising action, climax, falling action and denouement, and provides an expectation that there will be changes in tension and emotion that reflect the experience of the storyteller (Lupton, 2017). Therefore, depending on the experience and expectation of the storyteller and listener, the

exchange that occurs when a story is told results in the co-creation of shared knowledge and understanding. This gives rise to the possibility that the same story may generate different meanings depending on the context of these two parties (Hampshire et al., 2014; Parrish, 2006).

Stories provide a valuable contribution to the field of service design as tools to better understand user experience (Quesenbery & Brooks, 2010). The process of actively listening is a crucial step in the exercising of empathy which allows a designer to understand the actions, needs and desires of users, and how they interact with services from the user's perspective (Carmel-Gilfilen & Portillo, 2015; Parrish, 2006). While quantitative or 'big data' may provide statistical insights into patterns of interactions with services, stories provide the 'thick data' or qualitative insight as to 'why' such interactions occur (Bleakley, 2005). They provide understanding of the social, political, environmental, and cultural context in which users engage with services. Stories and experiences are both context specific therefore understanding the conditions in which users experience or would like to experience a service can result in design of delightful service interactions (Brun, 2017). In addition to context, stories provide powerful insight into the values, beliefs, and motivations of their tellers (Quesenbery & Brooks, 2010). Most often with a foundation in cultural context, stories give insight into why a user engages with a service by going beyond temporal events and connecting action to motivation. Understanding motivations is key to creating services that have value for users in meeting their needs and desires (Stickdorn & Schneider, 2011; Polaine et al., 2013). The process of engaging users in storytelling in research for service design can help to empower them to be active participants in the design of services, otherwise known as the process of co-design (Stickdorn & Schneider, 2011). Service design is a field that aims to design with, not for, users, so it only makes sense to employ storytelling to "research with, not on, people" (Bleakley, 2005, p. 535).

INTERVIEWING AS A METHOD FOR STORY COLLECTION

In the field of service design, the goal of research with stakeholders is to understand their experience, values,

and beliefs, needs and desires to create services and experiences which provide value and meaning (Stickdorn & Schneider, 2011). This research may be conducted in several ways to generate both quantitative and qualitative data. Quantitative methods commonly include a landscape analysis of secondary data including prior research, reports or papers, existing market, and behavioural research, as well as tools like surveys (Penin, 2018). Research for service innovation places emphasis on more qualitative and ethnographic research methods due to their focus on the lived experience of participants (Wilson, 2014).

In a review of key service design literature, Segelström (2013) reports that interviewing is a key method used to conduct qualitative research with users. Interviews encourage sharing of stories and experiences and provide the opportunity for researchers to listen in for deeper contextual meanings which can provide useful insights for developing services that seamlessly meet the needs of stakeholders (Quesenbery & Brooks, 2010). It is important to note that interviews occur in a context that is typically unnatural for the participant due to their staged nature. This means that researchers must consider that stories offered in the interviewing process have the potential to be performative due to a participant's response to the context of the interview (Csordas et al., 2009).

Adopting more loosely structured, casual interview techniques is a way to make participants feel more at ease and safe in sharing their perspectives (Wilson, 2014). This style of interviewing is known as a semi-structured interview and involves the use of closed questions that allow the researcher to establish a topic or experience, supported by open-ended exploratory questions that are used to elicit detail about individual experiences and interactions relating to the topic (Csordas et al., 2009). It is important for gathering rich information that the interviewer speaks as little as possible to create space and time for the participant to share stories (Wilson, 2014). Beyond asking initial questions, the interviewer may use gentle interventions and neutral prompts in the form of gestures or verbal cues to encourage a participant when they become stuck or unsure how to continue (Crouch & Pearce,

2012). This technique, known as probing (Given, 2008), requires active listening by the interviewer who can prompt the participant for clarification or elaboration. This may be through paraphrasing, physical and verbal signs of encouragement like nodding, smiling, or 'hmm'ing, or by further succinct questions like "can you tell me more about that?" (Given, 2008; Crouch & Pearce, 2012). All questions and probes should be non-leading to not put words, ideas, or statements into the participant's mouth or to give cues to the types of information or experiences the participant may think is required of them (Crouch & Pearce, 2012; Wilson, 2014). The interviewer should remain as neutral but encouraging as possible, pushing aside their own beliefs and opinions to create an unbiased space for the sharing of stories and insights (Clandinin & Connelley, 2000).

Conducting interviews in an environment that is familiar, comfortable, and non-threatening for the participant further promotes open conversation and helps to build empathy by understanding the participant's world (Penin, 2018). In this way, stories can be supported by observation of the participant's space, generating richer insights into behaviours, motivations, and relationships. Benefits of interviewing in this setting can also include access to personal items and objects which can be used to prompt stories, memories, and interactions (Wilson, 2014). Introduction of such interview aids is an important adaptation that may cater to the needs of some participants and help to generate richer data when there may be communication difficulties due to perception of safety in disclosure or cognitive need for assistance (Fearon, 2019). Fearon (2019) suggests that adapting interview techniques to support participant engagement helps to shift power from interviewer to interviewee which is supported by Segelström's (2013) observation that research methods and tools should be tweaked and adapted depending on the context in which they are applied.

Hampshire et al., (2012) noted that the sharing of a story results in knowledge and understanding that is co-created between teller and listener. It is important draw attention to the fact that stories must be interpreted by an interviewer to understand not only what was said but how the cultural context, values, beliefs, and opinions of the storyteller shape what was shared or, sometimes more importantly, what was not shared (Crouch & Pearce, 2012). Owen and Westoby (2012) refer to this as creating understanding by examining text, sub-text, and context. Denscombe (2014, p.190) introduces the "interviewer effect" to think about the impact that the interviewer's own identity (age, sex, ethnicity, position, or religious beliefs) has on how comfortable a participant feels in sharing details or areas of their story. In addition, Clandinin and Connelley (2000, p.45) discuss the importance of being "autobiographically conscious". When co-creating knowledge and understanding with storytellers. They highlight that the way we make meaning of information is informed by our own lived experiences, context, values, and beliefs, specifying that as researchers and designers, it is crucial to question whether understanding and knowledge is reflective of what the participant knows to be true or their own personal perspectives. Segelström's (2013) research with practising service designers highlighted difficulties relating to the interpretation of interview stories. They found that it was difficult to include clients in the interviewing process because they did not have the reflective skills required to remain autobiographically conscious or understand the interplay of text, sub-text, and context, considering their interpretation of stories to reflect a participant's true lived experience. This highlights the need to synthesise insights gained from stories and visualise them to create shared understanding for participant, interviewer/design team, and all other stakeholders. It is only when the insights gained from participant stories are reflective of their true lived experience that they are useful to informing service innovation (Polaine et al., 2013). If not, designed service experiences will fail to meet the expectations and needs of stakeholders.

CONCLUSION

In conclusion this critical literature review examined several key research areas that influenced our work working with SciTech in co-designing a service design project. We narrowed our scope to 5 key areas that were covered critically. The first chapter examined the different research methodologies that exist in academia. These methodologies covered quantitative, qualitative, and mixed methods. Comparing and contrasting these methods to illustrate their use in service design innovation. The second chapter covered the differences in approaches to innovation specifically from a business-oriented nature as supposed to a service design nature. This chapter also covered the complexities of design thinking. The third chapter discussed the history and early utilisation of visual communications compared to modern uses of visual communications. This chapter also analysed how visual communication can overcome traditional barriers of understanding. The fourth chapter looked at the 5 stages involved in the design thinking process and examined each stage critically as well as looking into how each state uses visualisation activities. Lastly the fifth chapter discussed the importance of user voice in research for service innovation. This was further examined by focusing on storytelling in design as well as interviewing as a method for story collection.

The purpose of focusing in on these 5 key themes was intentional as it provided the scholarly background and foundational knowledge for how we were going to approach the co-design project with SciTech. Key areas such as visualisation and research methods reinforce the important roles, they each play in ensuring due diligence is undertaken when working with a client in attempting to "solve" a problem. The research conducted within this review has strong implications for service designers, for-profit organisations who aim to "solve" a wicked problem as well as design thinkers who are currently working with clients in a co-design format.

DESK RESEARCH

SCITECH

Research into Scitech was crucial to understand the company from both internal and external perspectives.

Exploration was conducted into their mission and values which drive commitment and interest in the project. This was achieved through analysis of Annual Reports, Business Plans, the New Scitech Strategy and a review of the website. From our external position, we had the opportunity to explore Scitech's service offerings from an outside perspective.

This was achieved through a review of the website and social media pages while keeping the actions and needs of key users in mind. In addition, we analysed a number of Customer Insight reports to understand the relationship between Scitech and its key user groups.

A BRIEF OVERVIEW:

Scitech is a not-for-profit organisation, established in Perth, Western Australia in 1987. For over 30 years, they have been focused on delivering experiences that inspire curiosity and engagement with STEM (Science, Technology, Engineering and Mathematics). Scitech is on a mission to "be a world leader in providing innovative and creative STEM programs that inspire, engage and develop citizens for Western Australia's social well-being, economic prosperity and sustainability"(Scitech, 2018). Through their Science Centre, based in West Perth and their outreach programs that take the Scitech experience to the furthest corners of the State, Scitech is able to impact the lives of 500,000 members of the community every year. In addition to their community based educational programs, they play an important role in the support and training of 4,000 educators to promote the delivery of STEM in the classroom (Scitech, 2018).

FUNDING AND PARTNERSHIPS

Scitech partners with a number of stakeholders across government, corporate industry and community groups to fund and deliver services across WA.

Primary Partner:
State Government of Western Australia Department of Jobs, Tourism, Science and Innovation

Corporate Partners:

» Alcoa
» BDO
» BHP
» Chevron Australia
» Fluor
» Mitsui Iron Ore Development
» Perth Airport
» Rio Tinto
» Santos
» Shell
» WESCEF
» Western Power
» Woodside

Funding from corporate partners enables delivery of locationally specific programs around WA. These include the Lighthouse Maths Program, Champions of Maths, as well as support for Statewide outreach tours to regional and remote areas. These funding partners accounted for $2,665,181 of revenue in 2020.

Figure 8: "Scitech website landing page"

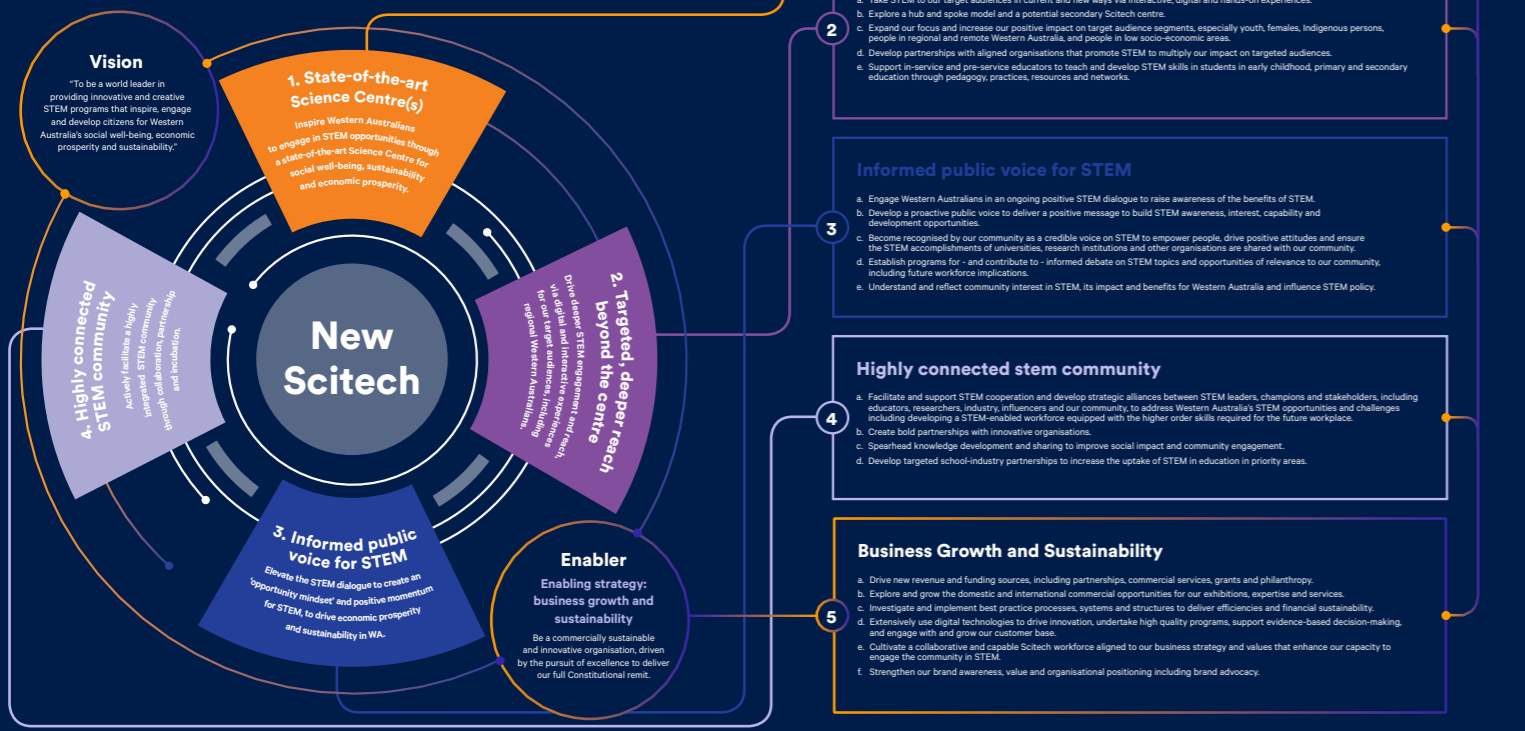## We have developed a bold strategy to achieve our New Vision

Vision
"To be a world leader in providing innovative and creative STEM programs that inspire, engage and develop citizens for Western Australia's social well-being, economic prosperity and sustainability."

New Scitech

1. State-of-the-art Science Centre(s)
Inspire Western Australians to engage in STEM opportunities through a state-of-the-art Science Centre for social well-being, sustainability and economic prosperity.

2. Targeted, deeper reach beyond the centre
Drive deeper STEM engagement and reach via digital and interactive experiences for our target audiences, including regional Western Australians.

3. Informed public voice for STEM
Elevate the STEM dialogue to create an 'opportunity mindset' and positive momentum for STEM, to drive economic prosperity and sustainability in WA.

4. Highly connected STEM community
Actively facilitate a highly connected STEM community, underpinned by knowledge development, collaboration, partnership, and inclusion.

Enabler
Enabling strategy: business growth and sustainability
Be a commercially sustainable and innovative organisation, driven by the pursuit of excellence to deliver our full Constitutional remit.

State of the art science centre(s)
a. Develop an accessible, innovative, signature science centre that lifts visitation and engagement, which appeals to all Western Australians.
b. Offer dynamic in-centre experiences that deliver deep, immersive engagement for all visitors, regardless of age, that support the uptake of STEM and evolve with the community's changing needs, values and expectations.
c. Showcase the best of Western Australia, and worldwide STEM and innovations through collaboration with leading STEM-related organisations.
d. Be a trusted place that introduces our community to new technological solutions and broadens the potential use of these solutions.

Targeted deeper reach beyond the centre
a. Take STEM to our target audiences in current and new ways via interactive, digital and hands-on experiences.
b. Explore a hub and spoke model and a potential secondary Scitech centre.
c. Expand our focus and increase our positive impact on target audience segments, especially youth, females, Indigenous persons, people in regional and remote Western Australia, and people in low socio-economic areas.
d. Develop partnerships with aligned organisations that promote STEM to multiply our impact on targeted audiences.
e. Support in-service and pre-service educators to teach and develop STEM skills in students in early childhood, primary and secondary education through pedagogy, practices, resources and networks.

Informed public voice for STEM
a. Engage Western Australians in an ongoing positive STEM dialogue to raise awareness of the benefits of STEM.
b. Develop a proactive public voice to deliver a positive message to build STEM awareness, interest, capability and development opportunities.
c. Become recognised by our community as a credible voice on STEM to empower people, drive positive attitudes and ensure the STEM accomplishments of universities, research institutions and other organisations are shared with our community.
d. Establish programs for - and contribute to - informed debate on STEM topics and opportunities of relevance to our community, including future workforce implications.
e. Understand and reflect community interest in STEM, its impact and benefits for Western Australia and influence STEM policy.

Highly connected stem community
a. Facilitate and support STEM cooperation and develop strategic alliances between STEM leaders, champions and stakeholders, including educators, researchers, industry, influencers and our community, to address Western Australia's STEM opportunities and challenges including developing a STEM-enabled workforce equipped with the higher order skills required for the future workplace.
b. Create bold partnerships with innovative organisations.
c. Spearhead knowledge development and sharing to improve social impact and community engagement.
d. Develop targeted school-industry partnerships to increase the uptake of STEM in education in priority areas.

Business Growth and Sustainability
a. Drive new revenue and funding sources, including partnerships, commercial services, grants and philanthropy.
b. Explore and grow the domestic and international commercial opportunities for our exhibitions, expertise and services.
c. Investigate and implement best practice processes, systems and structures to deliver efficiencies and financial sustainability.
d. Extensively use digital technologies to drive innovation, undertake high quality programs, support evidence-based decision-making, and engage with and grow our customer base.
e. Cultivate a collaborative and capable Scitech workforce aligned to our business strategy and values that enhance our capacity to engage the community in STEM.
f. Strengthen our brand awareness, value and organisational positioning including brand advocacy.

Figure 9: "New Scitech Strategy" retrieved from https://www.scitech.org.au/about/reports-financials/

THE NEW SCITECH STRATEGY

In 2018, Scitech presented a new strategic vision for equipping all Western Australians with the 21st century skills needed now and for the future (Scitech, 2018); The New Scitech Strategy. This plan outlines four pillars that support this vision:

» State-of-the-art Science Centre(s)
» Targeted deeper reach beyond the centre
» Informed public voice for stem
» Highly connected stem community

This strategy is to be enabled and supported by business growth and sustainability.

Whilst our initial problem statement draws directly from the second pillar of targeted deeper reach, it was important to understand the context and environment that the project had to support rather than hinder.

SERVICE OFFERINGS

Scitech offers a range of services through three primary modes of delivery; direct engagement at the Science Centre, Outreach experiences, and online engagement through social media.

Science Centre:
The Science centre, located in West Perth, provides STEM based exhibitions available to be experienced by the general public, schools and community groups. Currently, the centre hosts a range of permanent exhibitions, supported by the Rio Tinto Tinkering Space, The Earth Matters Exhibition, shows in the Chevron Science Theatre, the Science Lab and the Southern Hemisphere's largest Planetarium.

Outreach:
Yearly, Scitech visits 493 schools, engages with 160,000 students, and drives 112,000km on 18 Statewide Outreach tours. They deliver school based programs for Early Childhood, Primary and Secondary Schools as well

as specialised programs for educators and Indigenous students, visiting every school across WA at least once every three years.

In addition, they also offer DIY Kits which provide a term's worth of curriculum aligned lessons to deliver in the classroom, accompanied by all consumables and equipment required for implementation.

Online Content:
Scitech offer a number of online resources to extend learning beyond the centre. A range of video content is supplied through Youtube and Facebook, providing guidance to conduct activities and experiments at home. Scitech also deliver three podcast series, Particle, Wonder Kids, and The Audio Guide to the Galaxy, accessed through all podcast providers.

The Particle Podcast is also supported by an online blog, aimed at readers over 18 years of age. Their Facebook page provides the link between all of the online resources and the activities/programs in the centre. The Instagram page supports content shared on this platform.

Whilst Social Media pages draw direct attention to specific content through the blog style of posting, it takes more effort to navigate past the landing page of the Scitech website to access 'at home' content.

STEM

WHAT IS STEM?

The Australian Department of Education, 2021, defines STEM as

"AN APPROACH TO LEARNING AND DEVELOPMENT THAT INTEGRATES THE AREAS OF SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS"

Through STEM, students develop key skills including:

» Problem solving
» Creativity
» Critical analysis
» Teamwork
» Independent thinking
» Initiative
» Communication
» Digital literacy

They also present STEM as valuable in terms of responding to automation shrinking roles in trade-based industries, and in preparing students to fill emerging roles within the STEM industry. The Department of Industry, Science, Energy and Resources (2021) defines the value of STEM strictly in relation to how it can increase Australia's stake in the global economy, and what innovations in STEM can bring to public infrastructure. In a similar vein, Scitech (2021), as an organisation, views STEM as '...the driving force behind growth, innovation and change in humanity's future'.

It is important to note that this definition of STEM is not recognised by all organisations in the industry, especially those in education. There has been a longstanding push for integration of The Arts into STEM, transforming the acronym into STEAM (Khine & Areepattamannil, 2019).

Approaching traditional STEM fields through the lens of creativity is said to increase capability to comprehend complex ideas, increase capacity for innovative problem solving and provide context and application for isolated STEM ideas (Gibson & Ewing, 2020). The Arts provide the understanding of the environment and people that influence and are impacted by STEM.

WHY IS IT IMPORTANT?

The global economy is changing; current jobs are disappearing due to automation, updated and new technology, while new jobs are emerging every day because of these technological advancements. The continual advancement in technology is also changing the way students learn, connect and interact every day. Skills developed through STEM by students will provide them with the foundations to succeed at school and beyond, in the work force.

There is a high demand for STEM skills and qualifications by employers, and this will continue to grow in the future. Currently, 75% of jobs in the fastest growing industries all require workers to have STEM skills. The Australian work force needs people to adapt to the changing face of the workforce (Government of Western Australia, 2019).

HOW IS THE JOB MARKET CHANGING?
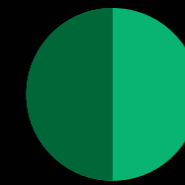
50%
Of current jobs with skill shortages are in STEM fields.

EMPLOYERS EXPECT THEIR NEEDS FOR STEM PROFESSIONALS TO INCREASE IN THE NEXT 5 - 10 YEARS.
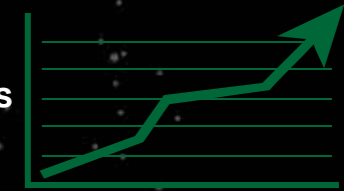
49% University Graduates
53% VET Graduates

IN THE NEXT 5 YEARS

It is predicted that demand will rise for:

14%
Professional, scientific and technical services

20%
Health Care
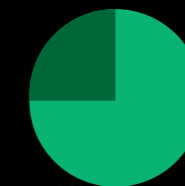
75%
Of all new jobs will require skills in STEM.

90%
Of jobs will need digital skills in the next 2 to 5 years.

WHY IS THIS URGENT

1/3
One third of 15 year olds do not have STEM skills that employers want.
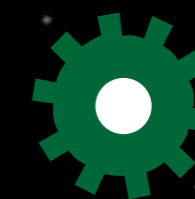
58%
Of current students under 25 are studying jobs that will be radically changed by automation

Figure 10: "STEM job market"

PARTICIPATION IN STEM

The Department of Education research (2021) has shown that in Year 5 and 6, girls' perception of STEM subjects and STEM based learning begins to change. Girls tend to:

» Lose confidence
» Believe that STEM is something only boys do well in
» Not an area a girl can excel in

These perceptions continue to grow throughout school and into career choices after graduation. There are many myths and misconceptions in society about what girls do, and don't do well in. This is reinforced by the under-representation of girls in STEM related jobs.

To meet the needs of a dynamic workforce centered on innovation and creativity, girls represent a unique perspective and untapped talent. All young people need to be learning STEM skills and qualifications to ensure Australia's competitiveness on the worlds stage.

It is urged that schools empower girls from a young age, challenging myths and misconceptions, and showing them that STEM can help change the world.
Girls feel less confident when studying STEM courses, however they perform at the same level as their male peers, and often even surpass them. However, only 7% of girls study the most challenging mathematics subject. There is 1 girl to every 3 boys studying Physics, and 1 girl to every 2 boys studying mathematics (Department of Education, 2021).

Indigenous participation in STEM education and industry is also an area that requires attention. There is evidence of increasing uptake of STEM in secondary education for Aboriginal and Torres Strait Islander students, and whilst this does follow through to tertiary enrolments, the completion rate of these enrolments drops significantly. These facts indicate there is still much work to be done before equal representation can be seen in STEM participation for Indigenous Australians (Department of Education and Training, 2015).

Participation needs to be supported by the implementation of culturally relevant, sensitive teaching pedagogies that integrate indigenous knowledge, develop more relevant methods for communication and assessment, and engage broader communities in the educational environment.

Figure 11: "CSIRO's Indigenous STEM Education Project" retrieved from https://www.csiro.au/

KEY FINDINGS

» **Uncertainty and differing opinions about the nature and definition of STEM make it difficult to come up with a shared vision for its importance**
» **The skills provided by STEM are crucial for building capacity of future generations to adapt and respond to global challenges**
» **Women and Indigenous communities face barriers to engagement that must be addressed to encourage participation and greater knowledge of the future workforce**

DELIVERY OF STEM IN CURRICULUM

The Western Australian Curriculum and Assessment Outline sets out the curriculum for children from Kindergarten to Year 10. STEM knowledge and skills are embedded across multiple disciplines.

In year 11 and 12, students work towards gaining their Western Australian Certificate of Education (WACE), choosing either academic or vocational pathway. There are a range of STEM related courses that children can access.

SCIENCE

The S stands for science which children from Pre-primary to Year 10 are required to study.

TECHNOLOGY

The T stands for Technologies, and it is an important part of the Western Australian Curriculum. It allows students to study the following:

- » Engineering principles and systems
- » Food and fibre production
- » Food specialisations
- » Materials and technologies specialisations

ENGINEERING

The E stands for Engineering. Engineering principles can be integrated into science, technologies, and mathematics learning programs.

MATHS

The M represents Mathematics which all students from Pre-primary to year 10 are required to study. (Australian Curriculum Council, 2020)

STEM IN HIGHER EDUCATION

Some of the emerging careers in STEM fields are:

- » Environmental studies
- » Other natural and physical sciences
- » Fisheries studies
- » Engineering related technologies
- » Information technology
- » Earth sciences
- » Forestry studies
- » Biological sciences
- » Agriculture, horticulture, and viticulture

Employer demand for graduates with these qualifications and skills is on the rise and will continue to increase as job roles diversify. However, larger proportion of students are not studying STEM subjects or considering STEM related careers.

Alarmingly, 60% of students are studying for jobs that will not exist or that will be radically affected by automation in the next 10 to 15years.

Figure 12: "Students and STEM"

IN THE FUTURE YOUNG PEOPLE WILL NEED TO:

- » BE ACTIVE PROBLEM SOLVERS
- » BE COMMUNICATORS OF IDEAS
- » HAVE A MORE ENTREPRENEURIAL MINDSET
- » HAVE A DEDICATION TO LIFELONG LEARNING

DELIVERY OF EDUCATION EXPERIENCES

DIFFERENCE BETWEEN REMOTE & LOCAL

When examining the factors that either hindered or supported learning in remote and metro settings, we identified locational barriers, as well as access to technology and resources, as the primary source of disparity between these communities.

LOCAL (METRO)	REMOTE (REGIONAL & ISOLATED)
» Travel & access to Scitech via parents or school excursions are largely manageable	» Travel to Scitech centres is difficult - big time + cost investment
» Travel to school via Scitech's outreach team more manageable	» Scitech outreach incursions are limited - regional schools are only visited every 3 years, and incursions are limited in content and time. There is also no way to measure audience experience
» Access to technology and the internet is common - distance learning options are available	» Access to technology and the internet more limited in some areas - distance learning options may not be viable

IMPORTANCE OF CULTURAL AWARENESS & SENSITIVITY

The lack of diversity within STEM industries implies a lack of consideration for the needs of anyone in a currently, underrepresented group. The focus of research regarding participation in STEM-based studies, and by extension organisations such as Scitech, is on current participants. Precedent studies into the underlying reasons that ethnically, culturally, linguistically, or otherwise diverse individuals do not participate in STEM do exist, but they are rare, and do not take place in Australia.

It is rarer that the responsibility is not placed upon these communities to assimilate into a dominant culture, and set of standards in order to access STEM learning experiences. Many STEM initiatives are designed without the input of diverse communities and cultures. This can result in the people designing these initiatives to make assumptions about what the 'ideal' participant looks like, and in doing so, unconsciously exclude anyone who does not fit this archetype.

In a 2014 study conducted in the United Kingdom by Emily Dawson, observed were many instances in which people of a low-income and diverse background were made to feel inferior or excluded from the learning experiences they interacted with. Dawson describes an occurrence where a group of Muslim Somali immigrant women were denied patience, time and the opportunity to learn and engage with science, as the staff member assigned to work with them was only trained to interact with young, fluent English-speaking school students, with a good foundation of scientific concepts (p.995-996).

In addition, there are many reasons that members of diverse communities can be repelled by the idea of STEM and STEM learning institutions before they even walk through the doors (Dawson, 2014). Common is the belief that various aspects of identity inherently disqualified individuals from STEM learning and STEM learning institutions. Culture, level of background knowledge, behaviours, and even dress style, are considered barriers to fitting the 'ideal' participant archetype for STEM learning environments (p.990).

It must be noted that embracing unique cultural knowledge and contexts has the potential to enrich STEM experiences. Dawson notes, a group of Sierra Leonean women began singing and dancing together upon spotting a bird in which this ceremonial practice was associated with (p.998-999). In another instance, a Latin-American father, who had previously failed to help his daughters due to an inaccessible English-language only activity, used his own memories and knowledge of the flora and fauna of Colombia to educate his daughters upon seeing such specimens (p.991). These examples show the power that including aspects of different cultures into STEM learning can not only allow participants to engage with STEM on familiar ground, but also facilitate connections between community members, peers, and families.

Despite the insights that this study provides, it is important to remember that findings are context specific. The dominant cultural standards of Australia are unique from the context of this study in many ways. The study was also conducted with immigrant participants, who cannot be a substitute for Australia's First Nations people but may be able to establish an understanding of immigrants within Australia. The drought of precedent studies into the relationship between diverse communities and STEM participation in an Australian context, however, speaks volumes by itself.

It is the responsibility of facilitators of STEM learning and education, to make steps to include communities outside the dominant culture, and the first step to achieving this is as simple as including these communities in the creation of inclusive learning experiences. These communities know how to make learning environments comfortable and accessible for themselves. Valuing such knowledge is a vital element in engaging in effective work with communities (Ife, 2010) and this knowledge should not be undervalued. Affording these communities, the voice and respect they deserve in spaces where they can effect real change is vital for Scitech to expand their cultural competency as they move into the future, whilst allowing communities to feel valued and respected by the wider publics, the dominant culture.

Figure 14: "Teacher & Student" retrieved from https:// www.scitech.org.au/pro-dev/making- makers-the-design-and-engineering-process/

CATERING TO NEEDS OF LEARNER

As this project requires many groups in many different contexts to be taken into consideration, it stands to reason that each of these groups have different requirements for making STEM learning accessible.

As an example, one of the stakeholders we interviewed, a rural primary school teacher, recalled a Scitech incursion visit that her students participated in. She told us that her students were completely unengaged throughout the visit. She attributed this to the fact that her students were simply not equipped with the precedent scientific knowledge to understand what was going on, and that the way the show was being presented did not suit the hands-on learning style of these students. She was forced to step in in order to bridge the gap in understanding between the outreach team and her students in order for the children to get any value out of the experience.

Another stakeholder, an educator that works with Indigenous communities, told us about his experiences teaching Indigenous students. Indigenous students simply do not respond to the same teaching methods that non-indigenous students do, and so the educator must create a link between the student and things that are valuable to them, such as the environment around these students as indigenous cultures are deeply connected to the land and have an underlying respect for flora and fauna. This cultural knowledge and understanding needs to be understood and implemented to make an impact on these children.

Different accommodations are needed for different communities to ensure that they are able to fully benefit from STEM skills and learning experiences. Whether someone is from a low-income background, from a community outside the dominant culture, or experiences a physical, mental or developmental disability, it is not their responsibility to overcome any gaps in understanding or access to engage successfully with STEM.

The above examples are not failures of the educators or of the students. Everyone should have the opportunity to engage with STEM learning, regardless of their context. It is the responsibility of the education provider to ensure the proper accommodations are in place to make this a reality. This is achievable through robust and in-depth research and user-experience testing.

PRECEDENCE STUDIES

IT IS IMPORTANT TO LOOK BEYOND THE SCOPE OF SCITECH AND EXAMINE THE IMPACT THAT OTHER ORGANISATIONS WERE HAVING WITHIN THE PROBLEM SPACE. ASSESSING STRATEGIES THAT HAVE BEEN EFFECTIVE AS WELL AS THOSE THAT NEED IMPROVEMENT IS HELPFUL WHEN IDENTIFYING AND RE-FRAMING OPPORTUNITIES FOR THIS PROJECT. IT SHOULD BE NOTED THAT THESE PROGRAMS ARE CONTEXT SPECIFIC AND THEREFORE SUCCESSFUL OUTCOMES CAN NOT BE CONSIDERED DIRECTLY TRANSFERABLE ACROSS CONTEXTS. RESEARCH LOOKED INTO PROGRAMS ENGAGING WITH INDIGENOUS COMMUNITIES, AS WELL AS THOSE DELIVERING LEARNING IN AN ALTERNATIVE WAY.

THE POLLY FARMER FOUNDATION
https://pff.com.au/

The Polly Farmer Foundation was established in 1994 with a vision to empower Indigenous students through education to pursue their aspirations at school and beyond. Through the delivery of STEM focused after school programs for both primary and secondary students, the foundation develops sustained academic engagement and supports the transition into post-school pathways. Programs are delivered across 35 locations across Western Australia from Esperance to Kununara and offer participants opportunities to engage with offsite learning experiences across the state.

Program Offerings:

» Learning Clubs (primary School)
» Stem Centres (primary school
» Follow the Dream (Secondary school)

Key features:

» Sucess of programs relies on training of educators to deliver program with the flexibility to adapt content to meet the needs of their community of learners; educators are the link between curriculum and culture
» Emphasis on the importance of cultural enrichment in the learning environment means time is dedicated for a yarn and sharing of cultural knowledge
» Provision of healthy snacks to fuel children to participate
» Funding to train educators at a central location before sending them back to their communities means that students are able to gain value and access without having to travel
» Facilitation of programs at schools means that students don't require use of personal resources
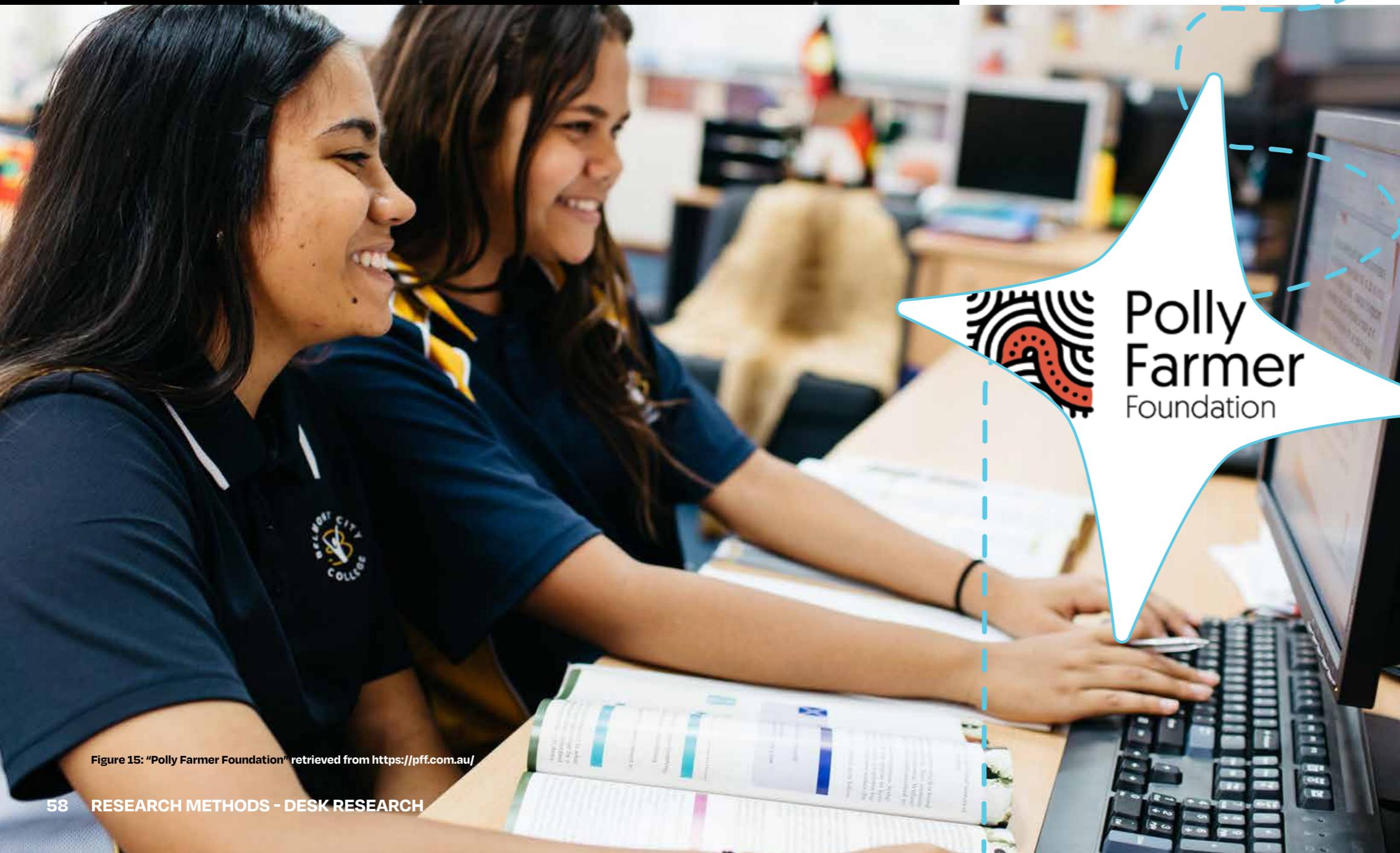
Figure 15: "Polly Farmer Foundation" retrieved from https://pff.com.au/

CSIRO TWO WAY SCIENCE PROGRAM

https://www.csiro.au/en/education/Programs/
Indigenous-STEM-Education-Project/Science-Pathways-
for-Indigenous-Communities

The CSIRO Two Way Science Program is part of the larger Indigenous STEM Education program. It is implemented with remote communities in Western Australia and the Northern Territory. The program aims to facilitate community participation in learning to build ownership and empower communities to support learning of their children. With this approach, the program encourages development of relationships and sense of cultural identity.

KEY FEATURES:

» **Partnership between educators and Indigenous communities to link Indigenous knowledge to the curriculum**
» **Establishes the importance of learning on country before linking to classroom learning**
» **Increased confidence of teachers to deliver Science learning as well as understanding of Indigenous knowledge**
» **Strengthened connections between teachers, schools, families and broader community groups**
» **Holistic approach to including community in the process of education**

FORM CREATIVE SCHOOLS

https://creative-schools-stage.webflow.io/
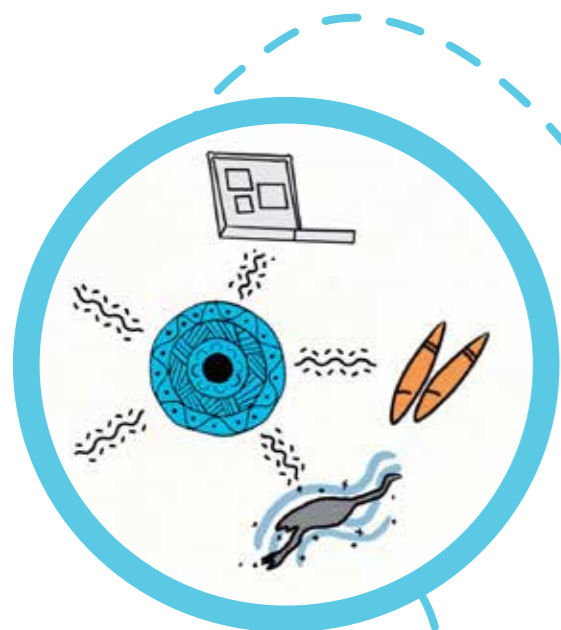
The Creative Schools Program was developed by Form with partnership with Culture and Creativity in Education with an aim to inspire creative collaboration to empower children to learn in creative ways. The program revolves around developing partnerships between teachers and creative practitioners who work together across a school year to learn, develop an innovate an approach to teaching an area of the curriculum (one of these being STEM) in order to engage students who may struggle to learn or even be in the class room (particularly common in low socioeconomic and culturally diverse communities). These programs are available for both primary and high school students.

KEY FEATURES:

» **Utilising creativity can help to make curriculum more engaging and manageable for all learners**
» **Development of creative partnerships helps to link curriculum learning to external contexts and opportunities which strengthens understanding of content**
» **Education is most effective when learners are involved in it's creation and direction**
» **Changing the context of learning helps to break stigma and reluctance to engage based on past experiences in education systems**
» **Acknowledges the importance of diversity in the approach to learning and innovating**
» **Content of programs is developed to reflect the interests and needs of the learners and teachers meaning**

CURTIN STEM OUTREACH

https://scieng.curtin.edu.au/about-us/outreach/

The Curtin STEM Outreach program aims to increase interest in fields of Science and Engineering through engaging workshops, programs, camps and competitions. They are dedicated to creating opportunities for engagement between future students and educators to generate excitement about the possibilities of STEM in higher education and industry

KEY FEATURES:

» Emphasis on building aspirations of the community
» Engage with high school students to support them into STEM in higher education
» Strong focus on young women and indigenous communities who are under represented in STEM
» Understanding style of communication as the key to engaging these groups
» Drive to link programs with innovative and exciting careers in the community to create understanding about how culture shapes the applications of STEM

KEY FINDINGS

» **SUCCESSFUL PROGRAMS PLACED STRONG VALUE ON THE IMPORTANCE OF CULTURAL KNOWLEDGE AND LEARNING.**

» **CHANGING THE CONTEXT OF EDUCATION DELIVERY CAN PROVIDE MORE ENGAGING LEARNING EXPERIENCES WHICH ARE ACCESSIBLE FOR A GREATER RANGE OF STUDENTS**

» **LINKING TO COMMUNITIES AND CULTURAL CONTEXTS ALLOWS STUDENTS TO MAKE LEARNING MORE MEANINGFUL TO THEIR EVERYDAY EXPERIENCES**

» **COMMON FUNDING PARTNERS ACROSS PROGRAMS MAY GIVE RISE TO THE OPPORTUNITY TO COLLABORATE OR PARTNER TO SUPPORT LEARNING AND EDUCATIONAL OPPORTUNITIES**

USER RESEARCH

WHO ARE THE ACTORS?

Determining the core actors involved in this project developed over the course of the semester. Initially going with the people outlined in the problem given to us by SciTech, we went from women, First Nations people, remote and regional, and low socioeconomic status people to considering everyone else that has the capacity to affect the project. At this point in the project, we kept the scope broad to understand everyone that could have an influence in the project outcomes.

In this core actors map features primary, secondary, and tertiary actors. This map highlights the main stakeholders that will be focused on in this project in order of relevance across the groups. Primary actors include examples such as "SciTech Outreach Team" and "Remote Primary School Teachers" because they are most directly impacted, whereas tertiary actors' feature the "State Government" because they have a presence that isn't as directly impacted by the project. From the creation of the core actors map, we could then create an informed strategy when identifying who we needed to interview.

FEDERAL GOVERNMENT

SCITECH BOARD MEMBERS

DEPARTMENT OF COMMUNITIES

PRIMARY CORE ACTORS

TERTIARY ACTORS

INDIGENOUS FAMILIES

STUDENTS WITH DISABILITIES

METRO HIGHSCHOOL TEACHERS

SCITECH OUTREACH TEAM

FAMILIES OF STUDENTS WITH DISABILITY

REMOTE PRIMARY SCHOOL TEACHERS

LOCAL STEM INDUSTRIES/ PARTNERS

CULTURALLY/ LINGUISTICALLY DIVERSE FAMILIES

CULTURALLY/ LINGUISTICALLY DIVERSE STUDENTS

METRO PRIMARY SCHOOL TEACHERS

INDIGENOUS STUDENTS

COMMUNITY CENTRES/GROUPS

SCITECH FUNDING PARTNERS

PRINCIPALS

FAMILIES AND STUDENTS FROM LOW-SOCIO ECONOMIC COMMUNITIES

PUBLIC SCHOOL TEACHERS

SCITECH EXPERIENCE TEAM

SCITECH CONTENT TEAM

CULTURAL CENTRES AND ADVOSORS

STATE GOVERNMENT

REMOTE HIGHSCHOOL TEACHERS

INDIGENOUS COMMUNITY GROUPS AND ADVISORS

EARLY CHILDHOOD EDUCATORS

PRIVATE SCHOOL TEACHERS

DEPARTMENT OF EDUCATION

OTHER SCITECH TEAMS

SECONDARY ACTORS

OTHER EDUCATION PROVIDERS

Other Scitech Teams Include:
educators
customer experience
manufacturing
product
maintenance

INTERVIEW STRATEGY

After identifying our primary stakeholders and core actors, a list of questions was developed to ask each group.

More specific questions were then created to target stakeholder roles, especially with internal stakeholders of SciTech. This allowed us to find out information about the dynamics and relationships within the internal teams.

Questions for groups outside of Scitech were related to their relationship and knowledge of the organisation, particularly if they have ever encountered Scitech outside of the centre, what they think Scitech offers, their relationship with STEM, and STEM learning/teaching.

Our interviews were conducted face to face, over the phone and online through Zoom, and took several weeks to complete due to the scope of the project. We found that face to face interviews were the most insightful due to the ability to analyse body language, interactions with environments, and the ability to build report upon more casual introductions and commencement of interview sessions. Phone and Zoom interviews posed restrictions with technological difficulties, less openness to sharing due to their more formalised nature, and the lack of non-verbal communication. The process of transcribing interviews proved more time consuming than anticipates, extending the process by two or three weeks.

Analysis of raw interview data for themes, commonalities, key quotes, and insights provided a basis for further understanding through creation of empathy maps, story-worlds, and development of initial personas.

QUESTIONS FOR SCITECH

» What is your role at Scitech?
» What teams do you engage with?
» How has the new strategy informed the way you work at Scitech?
» How do you think the role of Scitech will change in the next decade?
» What do you think Scitech does well?
» What do you think Scitech could improve on?
» How effective do you think Scitech are at delivering STEM learning experiences?
» How does Scitech cater to diversity?
» What demographic of people do you think Scitech have the most impact on?
» How do you manage feedback?
» How is feedback implemented at Scitech?

QUESTIONS FOR STUDENTS

» Have you heard of STEM? Can you tell me what it means to you?
» What is your favourite way to learn at school?
» What's your favourite thing about school?
» Do you use any technology or equipment to help you learn?
» What do you want to be when you grow up? How could you use STEM when doing this?
» Are you studying any STEM subjects? Is so, which ones?
» What are the challenged you face when learning in a school setting?
» Have you ever been to or heard of Scitech? What do they do?
» Has Scitech ever come to your school? What was your favourite part of their visit?
» Have you been to Scitech centre? What was your experience?
» What does your homework routine look like?

» » Do your parents/caregivers help you with your homework?

QUESTIONS FOR PARENTS/CAREGIVERS

» Has Scitech come to your child's school before? If so, when was the last time? What was this process like for you?
» Have you taken your child to Scitech before, and if not, are there any barriers for you to access Scitech?
» Do you think that you have a good understanding of the current education system?
» Are you aware of what STEM is?
» Does STEM have any relevancy in your life?
» Do you feel supported throughout the education of your child?
» What is your perceived role in the education of your child, and what does your involvement in your child's education look like?
» What resources does your child have access to at home?
» Do you feel that the individual needs of your child are accommodated within their educational experience?

INTERVIEW STRATEGY

ANALYSING THEMES

3.

Collating the information and compiling common themes from our interviews for the Empathy Maps.

QUESTION GENERATION

1.

Creating targeted, open ended questions while eliminating bias. Related to stakeholders' roles, dynamics, thoughts, and feelings.

IDENTIFYING FURTHER PARTICIPANTS

5.

Who else will have valuable insights for the project? Organising interviews with actors who were recommended to us.

INTERVIEW ORGANISATION

2.

Organising consent forms. In person, over the phone and on zoom. Conducting 30 minute interviews.

DETERMINING GAPS

4.

Analysing if qualitative data has gaps. Determining relevant questions and re-writing others from a different perspective.

STAKEHOLDER MAPS

After being able to better understand the people involved in the project and how they interact, research allowed us to create a stakeholder map. A stakeholder map differs from a core actor map in that it shows the value exchanges between the stakeholders. Through interviewing and desk research, we began to see the channels of exchange between actors more clearly. In our stakeholder map, the white circles signify a group of stakeholders, whereas the smaller black circles represent the specific individual stakeholders. They are linked between one another with lines of four colours found

in the key. "Cultural knowledge" indicates the exchange of information relating to one's cultural background. It can be noted that there are lacking connections for cultural knowledge to be channelled back to educational knowledge providers. "Educational knowledge" relates to the transfer of educational experiences, such as a teacher to a student. "Funding" shows how stakeholders are provided with money to facilitate their services. "Influence" indicates the link of personal vested interest between stakeholders. suggests other projects to move on to as well as Scitech Incursions that could support areas of learning.

KEY INSIGHTS

» Closer examination of the exchange of educational knowledge revealed that it is a one-way transfer from Educators and Scitech to Students. This sparked questions into what could be considered as educational knowledge and if there was capacity for students to play a role in educating Educators and Scitech about their own knowledge and interpretations of the world.

» The exchange of cultural knowledge is concentrated between Students, Parents and their communities with little to no exchange occurring with Scitech and the broader schooling system. To create a shared understanding of cultural knowledge, needs and experiences, this exchange needs to be promoted and supported within the whole system.
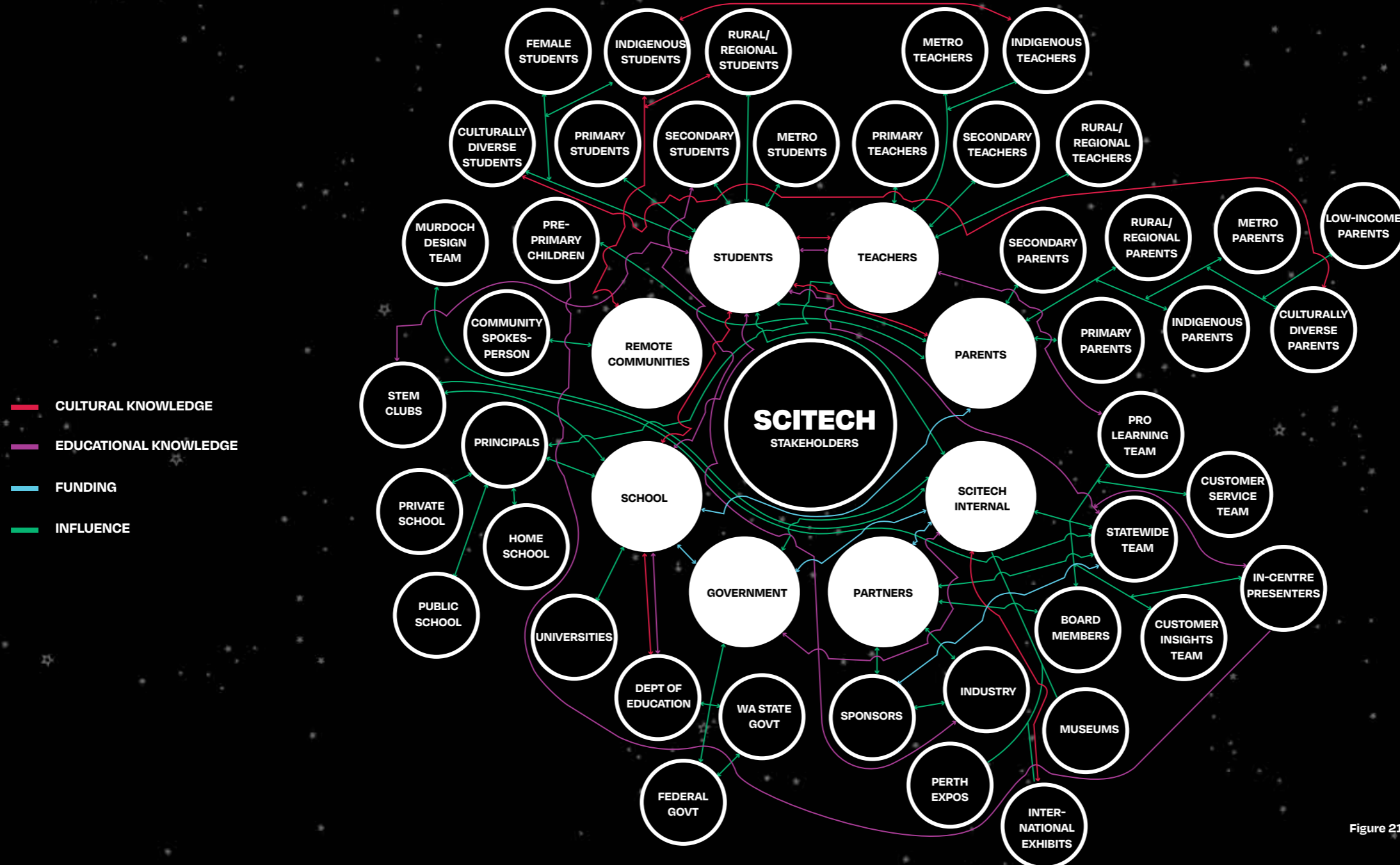
Figure 21: "Stakeholder Map"

LIVED EXPERIENCE —— CONTENT —— BUDGET —— INSIGHTS ——
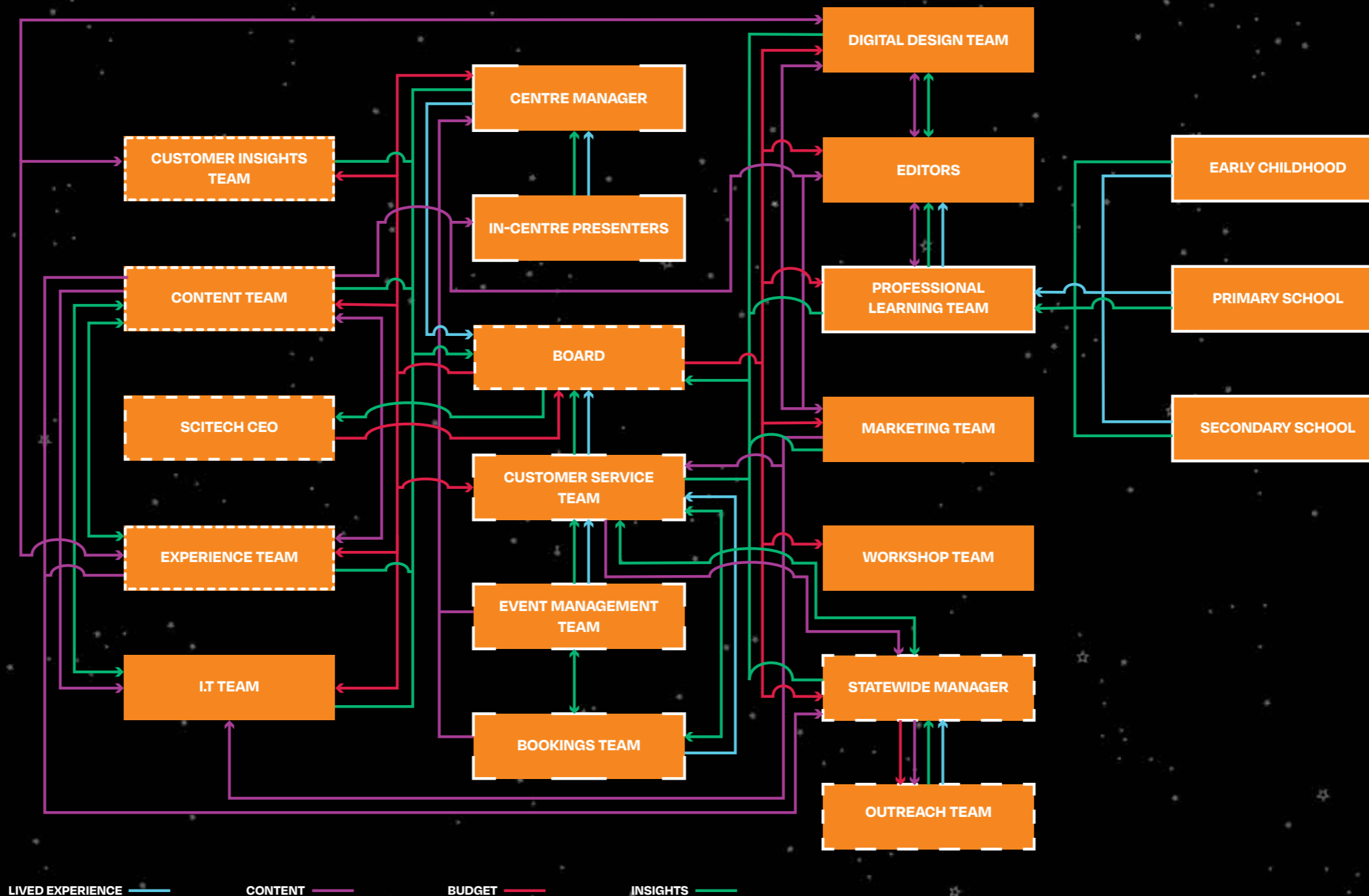
Figure 22: "Scitech Stakeholder Map"

INTERNAL SCITECH STAKEHOLDER MAPS

Our interviewing of employees from various teams at Scitech allowed us to grasp an understanding of the inner workings and functioning of the teams together. From this we gained valuable insight into Scitech internally and identified opportunities to, improve the functioning of the teams together.

The key pertaining to this internal map includes lived experience, content, budget, and insights. "Lived experience" relates to each individual team member's personal background experience informing what they bring to SciTech. "Content" is the transfer of physical or digital assets between teams. "Budget" shows which stakeholders are receiving funding from other stakeholders. "Insights" relates to the communication of new relevant information between stakeholders.

KEY INSIGHTS

» The Professional Learning Team and Outreach presenters have valuable insights and experiences to share relating to their direct engagement with core actors.

» There is an opportunity to increase the sharing of insights and lived experiences between all teams to better inform future design and delivery of programs.

PERSONAS

Personas are fictional representations of the core groups of people we have interviewed throughout the semester, as well as people we hope to interview in the next half of the project. The creation of personas allows us to better understand and empathise with the people that we are designing for by considering their context, needs, values and motivations. There are five core groups of personas that we have created: students, teachers, parents, SciTech staff, and education. These persona groups were informed by the identification of the core actors. The creation of personas allowed us to continue ethnographic research and further refine our understanding of the challenges these people face. These personas were revisited throughout the project to aid in keeping a human-centred focus and guide decision making.
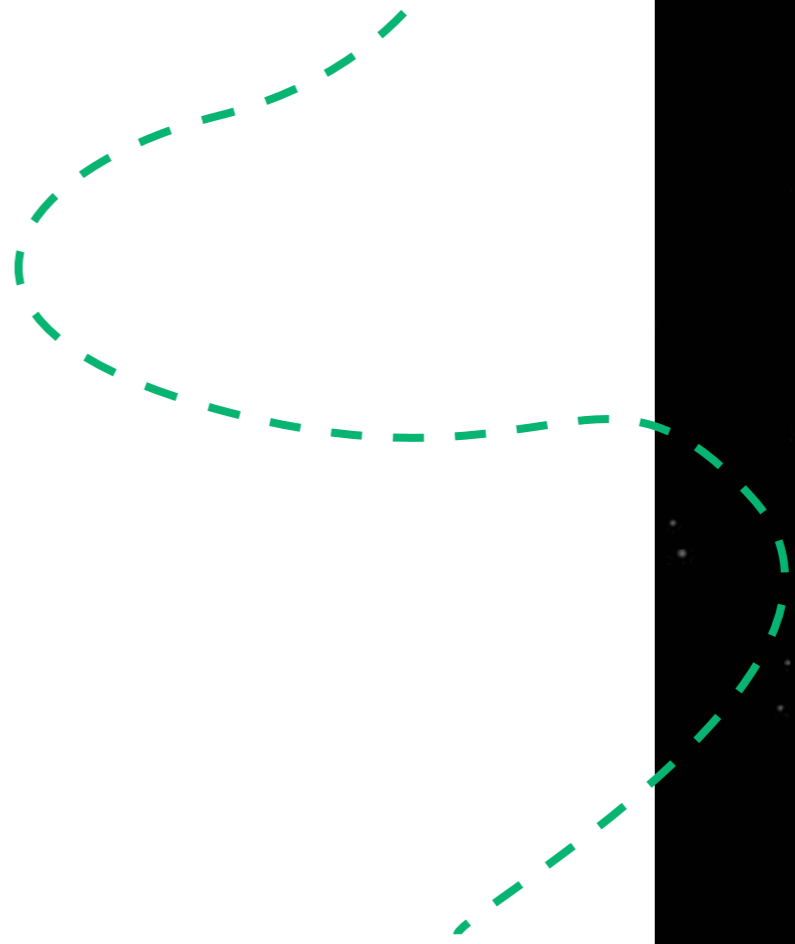
FAYE WAGNER

REMOTE PARENT

AGE
38 yrs old

PROFESSION
Vitage Cellar Hand

BIOGRAPHY
Faye is a working parent in the rural town of Bridgetown, WA. She and her partner have 3 energetic, primary school-aged kids to wrangle on any given day. While she loves the lifestyle of their quiet community, she feels that the south-west is lacking in resources to really engage the kids. She worries for the future, and whether their rural home will be able to provide the kids with career oppurtunities when they're older. Jobs in regional areas become more illusive every year, and Faye wonders if her children will have the drive or the resources to get an increasingly necessary university education. Faye and her partner have no idea how to support their children in this regard at all!

All in all, Faye wants her kids to have all the tools they need to suc-ceed in a world that is very different from the one she grew up in, and is still constantly changing.

INTERESTS
» Hiking
» Tennis
» Basketball
» Gaming
» Listening to True crime podcasts
» Watching documentaries
» Socialising

VALUES
» Working hard to earn success
» Life-long learning & growth
» Strong familial bonds
» Ensuring a viable future for future generations
» Financial stability

ASPIRATIONS
» Prepare her kids for a stable and successful future
» Enrich the experiences of the local community
» Continue to learn & grow

BRANDS

Microsoft TRUECRIME

NATIONAL GEOGRAPHIC Spotify

NEEDS
» Emotional support from partner
» Strong relationship with children
» Strong relationship with community
» More ways to help children succeed
» Ways to be involved with children's education

POWERS
» Strong presence and influence in the local community
» Influence over her children
» Respected by co-workers
» Strong opinions, beliefs and convictions

BEHAVIOURS
» Regular socialisation with other parents, co-workers and community members
» Participates in local sports events
» Spends weekends with children
» Volunteers for school and community events regularly

TECH
IT & INTERNET

SOFTWARE

MOBILE APPS

SOCIAL NETWORKS

Figure 23: "Remote Parent Persona"

ANJALI KAUL

METRO PRIMARY SCHOOL PARENT

AGE
26 yrs old

PROFESSION
Stay at Home Mother

BIOGRAPHY
Anjali moved to Perth, WA with her husband from India in 2017. They live in Mirabooka with their 9 year old daughter and 3 year old son. Anjali's husband works at a data storage company in the city whilst she stays home to look after their youngest child and their home. Whilst Anjali doesn't have any close family to help her with the children, she has made friends with other mothers at Mirabooka Primary School where her daughter goes to school who provide her with social support. These relationships have been of great help to Anjali as navigating the Australian schooling system has been difficult and she wants the best educational outcomes for her children.

INTERESTS
»Gardening and cooking
»Watching Bollywood movies to stay connected to home
»Loves to see her kids achieving

VALUES
»Family traditions and cuture
»Spending quality time with family
»Taking a nurturing role
»Selflessness

ASPIRATIONS
»Establish strong roots in Australia
»Wants her children to be successful in well-paying jobs
»Gain casual employment when her son starts school

BRANDS

NEEDS
» To feel accepted and welcomed in her community
» To better understand what her daughter is learning at school
» Assistance and support to understand the schooling system
» A sense of purpose in bringing up her children

POWERS
» Power over her children's activities
» Has a voice amongst her friends
» Opportunity to shape learning of her children at home
» Power to instil in her children the importance of history and culture as foundations for identity

BEHAVIOURS
»Daily before and after school run
»Spends weekends with family and attends church
»Weekly dinner with her husband's work friend
»Spends at local businesses and Amazon
»Facetimes family back in India weekly

TECH
IT & INTERNET

SOFTWARE

MOBILE APPS

SOCIAL NETWORKS

Figure 24: "Metro Parent Persona"

TYLER GUILFOY

STUDENT

AGE
9 yrs old
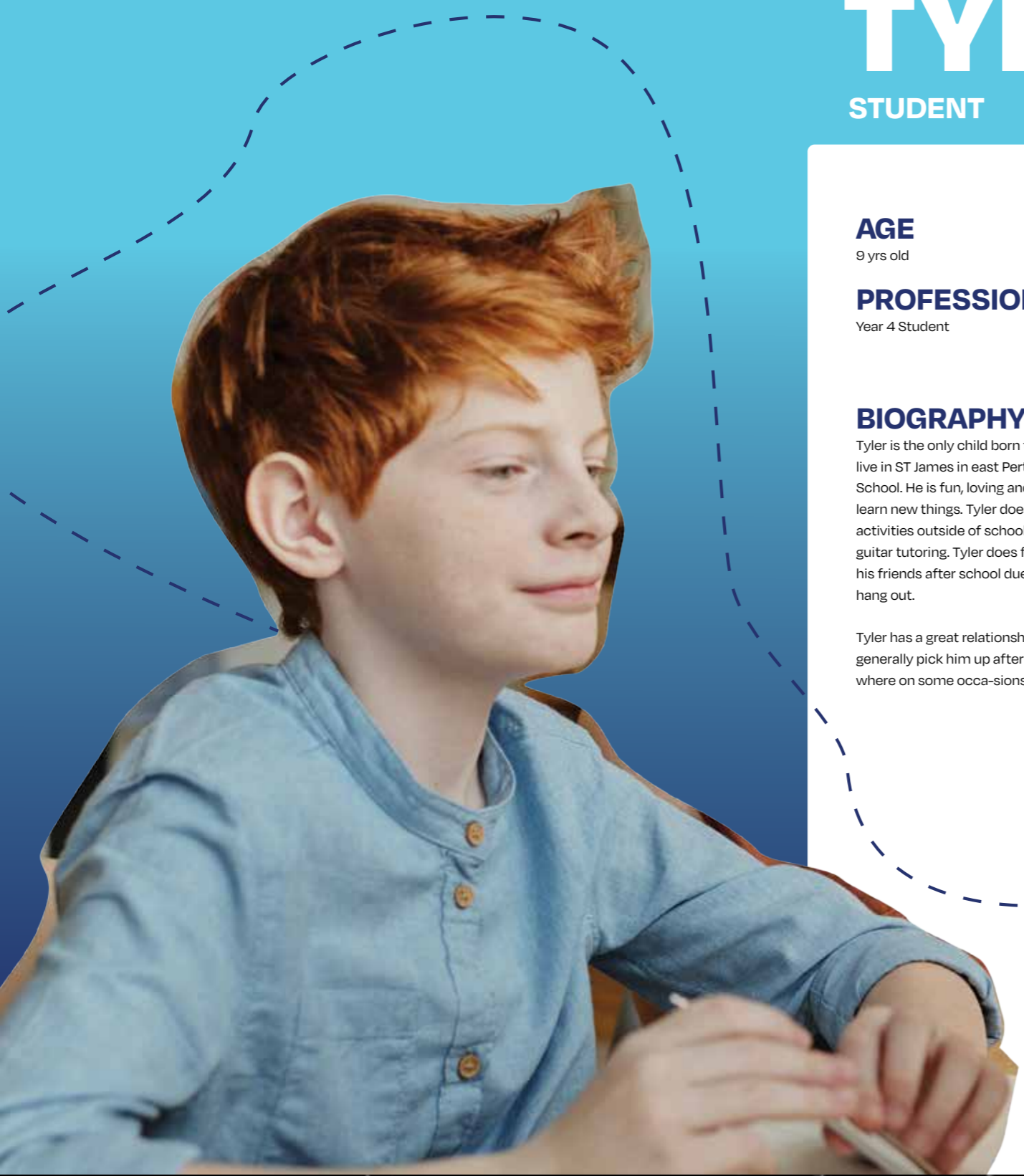
PROFESSION
Year 4 Student

BIOGRAPHY

Tyler is the only child born to a very hardworking parents. They live in ST James in east Perth. Tyler attends Kent Primary School. He is fun, loving and adventurous who doesn't fear to learn new things. Tyler does many extra curricular subjects and activities outside of school such as after school sports and guitar tutoring. Tyler does feel sad when he can't see some of his friends after school due to his activites and can't always hang out.

Tyler has a great relationship with his grandparents who generally pick him up after school, and after his extra activities, where on some occa-sions they take him out for icecream.

INTERESTS
» Football and Swimming, along with attending training classes on the weekend
» Singing and Drawing
» Watching content about aircrafts
» Spending time with friends at school

VALUES
» Loves animals, particularly his dog Oscar
» His Ipad
» His friends and family

ASPIRATIONS
» Either to be a professional football player;
» or an aircraft pilot

BRANDS

FREMANTLE DOCKERS

FORTNITE

NEEDS
» Support from parents to bring out his potential areas of interest
» Needs help and encouragement with difficult math homework rather than being pushed to complete it by his parents

POWERS
» Tyler believes that his education is important in becoming a pilot if he cannot be a professional football player
» Understands navigation and cartography well
» Excellent with georgraphy and orientation

BEHAVIOURS
» Goes to school every day
» Will ariive home to complete his homework and watch aircraft videos by his favourite YouTuber
» Plays sports after school and on the weekends
» Goes over to his friends place every few days after school

TECH
IT & INTERNET

SOFTWARE

MOBILE APPS

SOCIAL NETWORKS

Figure 25: "Metro Primary School Student Persona"

ESTHER MAVUTULA

PRIMARY SCHOOL METRO STUDENT

AGE
8 yrs old

PROFESSION
Year 4 Student

BIOGRAPHY
Esther is student at a public primary school in the Langford area of Perth. She is the daughter of second-generation Nigerian immigrants, who have always been adamant about preserving their attachment to their parent's home and culture. This has manifested in a lot of ways; Esther can speak English and French fluently, as well as some creole, for example. This hasn't prevented Esther from feeling somewhat exclude, howev-er. While she isn't the only student from a diverse background, it feels like a lot of areas are full of people that don't look or think the way she does. Esther wonders if her perspective and ideas will ever be valued in the same way as her classmates, and if she will ever have the op-purtunity to effect the future. Esther also tends to have trouble focusing in class. The things her teacher says don't tend to stick, unless she's talking about something Esther is deeply interested in. Esther worries that she's falling behind her classmates, and doesn't understand why.

INTERESTS
» Nature
» Biology
» Watching nature documentaries
» Zoology
» Netball
» Playing with her dog

VALUES
» Creativity
» Time to relax
» Stability
» Strong community
» Strong familial bonds
» Hard work

ASPIRATIONS
» Work with animals
» Learn about how the world works
» Help to reduce waste, polution, etc.
» Make a real difference in the world

BRANDS

NEEDS
» Emotional support from family
» Validation from peers
» Constantly mental stimulation
» Extra learning support and accomodations from school

POWERS
» Well-liked by peers
» Strong recall for subjects of interestStrong sense of justice »
» Endless curiosity
» Emotional resilienceSocialable personality

BEHAVIOURS
» Frequent socialisation with friends and classmates
» Weekly bonding with parents and extended family

TECH
IT & INTERNET

SOFTWARE

MOBILE APPS

SOCIAL NETWORKS

Figure 26 "Metro Primary School Student Persona"

DANIELSTUART

SECONDARY RURAL STUDENT

AGE
16 Years Old

PROFESSION
Secondary Student, Part-time retail assistant

BIOGRAPHY
Daniel has lived in the small southwest town of Pemberton all of his life, just like his parents before him. He attends the local district highschool, along with his siblings. Daniel sees the way the town, and the southwest in general, has changed just in the last few years; timber mills and coal mines that have guaranteed employment for generations suddenly shutting down. Longer and longer trips for his mum, back and forth to a much bigger city, every single day, to put food on the table. He has some security, as least. His grandfather and uncle are tradesmen, and Daniel is pretty much guaranteed a place with them once he's old enough. He's told by people who don't seem to get it that his grades mean he's got more to offer than laying bricks, whatever that may mean. He doesn't really care about some nebulous 'greater' future he can't see. He cares about being able to support himself as soon as possible, to take some burden off of his mum as soon as possible.

INTERESTS
» Club Football
» Gaming
» Fiction writing
» Hiking
» Coding

VALUES
» Strong familial bonds
» Strong community bonds
» Adaptability
» Selflessness
» Emotional resilience

ASPIRATIONS
» Earn stable income
» Become self-sufficient
» Be comfortable
» Help support his mother & siblings

NEEDS
» Emotional support from family
» Outlets for creativity
» Economic support
» Educational support
» More free time

POWERS
» Popular among peers
» Liked by community
» Good rapor with teachers
» Independent

BEHAVIOURS
» Volunteers during community events
» Works part-time locally
» Socialises with peers outside of school regularly
» Active in local community

BRANDS
JB HI-FI
EVERLAST
b
AFL

TECH
IT & INTERNET

SOFTWARE

MOBILE APPS

SOCIAL NETWORKS

Figure 27: "Rural Secondary School Student Persona"

SHANAE WHITE
REMOTE PRIMARY SCOOL STUDENT

AGE
8 yrs old

PROFESSION
Year 3 student at Roebourne District High School

BIOGRAPHY
Shanae belongs to the Ngarluma people; the traditional owners of the land that the town of Roebourne sits on. She grew up in this area with an older brother and a younger sister. Shanae attends Roebourne District High School frequently, only missing days when her family are on country for important culturally significant events. At school, she loves to participate in art, sport, and especially loves when she gets to bring in something special to her to share for 'show and tell'. At the moment, her class is learning to use the computers for maths which is very exciting as she doesn't have a computer at home. After school, Shanae doesn't have much time for homework as she spends the time running around with her friends. On the weekend, she spends time with her mother and aunties who are teaching her to paint and weave at the Ganalili Centre.

INTERESTS
» Art and painting
» Spending time with friends
» Learning from her family
» Playing sport after school

VALUES
»Time spent outside
»Spending time on country with her family
»Playing with her friends after school

ASPIRATIONS
» Wants to be an artist just like her Aunties but also wants to play sport forever!

BRANDS

GANALILI CENTRE

AFL

NEEDS
»To support her learning Shanae needs her teacher to develop a strong relationship with her family
»Time to complete homework tasks in class to aid her learning
»Morning snack at school to ensure she starts the day energised
»Space and time for cultural learning and exchange
»Tasks catered to her level of understanding and her interests

POWERS
»Power to share her thoughts with friends during show and tell at school
»Responsibility to help look after her younger sister
»Power to carry on the stories of the Ngarluma people which will be passed down to her
»Power to care for country

BEHAVIOURS
» Plays sport most days after school
» Spends weekends making art at the Ganalili Centre
» Monthly trips onto country
» Most of her belongings are passed on from other family members

TECH
IT & INTERNET

SOFTWARE

MOBILE APPS

SOCIAL NETWORKS

Figure 28: "Remote Primary School Student Persona"

ANNA CARROLL

PRINCIPAL AT KOONDOOLA PRIMARY SCHOOL

AGE
48 years old

PROFESSION
Principal at Koondoola Primary School

BIOGRAPHY
Anna lives in Karrinyup, WA with her husband and two 18 and 22 year old children. She has been a primary school teacher for 24 years, working across a number of public school in both metro and regional areas with a diverse range of students. From her vast experience in a variety of school communities and personal experience in the importance of maintaining cultural identity (Anna's family moved to Australia from Indonesia when she was in primary school), Anna understands the importance of celebrating diversity and providing space and support for children and their families to inspire confident, resilient, and successful learners. Anna became the Principal at Koondoola Primary School which is one of the State's most culturally diverse educational communities, in 2015. She is passionate about her role in supporting learning at this venue and is honoured to be able to assist families in their transition to life in Australia through the school's community programs and engaging, supportive environment.

INTERESTS
» Coast walks with her husband and their dog
» Learning about the experiences of her students
» Emmerging teaching theories

VALUES
» Learning as a tool to unlock opportunities
» Importance of celebrating diversity
» Equal and equitable access to education for all members of the schooling community, including families
» Sharing of cultural knowledge

ASPIRATIONS
» Hopes to one day mentor other Principals around the state about the importance of building strong relationships in schooling environments

BRANDS

Microsoft   fitbit

perth now

GREENPEACE

NEEDS
» To feel supported by her family as her job can be stressful
» To be surrounded by a group of likeminded staff who share the same vision
» Funding to provide educational experiences for students with limited resources

POWERS
»Spark excitement in students
»Sharing of knowledge, experience and expertise to schools
»Provides access to resources and inspiration to peers working in education
»Sharing insight and feedback amongst team

BEHAVIOURS
» Prioritises time to actively engage in classroom environments
» Attends P&C meetings and school meetings to understand the needs of the community»Collaborates with festivals, fairs and carnivals.
» Fornightly dinners with her extended family
» Supports local businesses and spends most of her money to benefit her family

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Figure 29: "Metro Primary School Principal Persona"

LAUREN HILL

SCITECH STATEWIDE PRESENTER

AGE
27 yrs old

PROFESSION
Scitech Statewide Presenter

BIOGRAPHY
Lauren grew up outside of Perth, in the south-west regions near Albany. Growing up in a small town, Lauren grew accustomed to town life and developed a strong sense of community and social responsibility. During her studies in the city, Studying for a bachelor of education at ECU, Lauren managed to score a job in Scitech as a part-time worker. Over time, Lauren grew to love her work and the children she was interacting with and wanted to make more of a difference when teaching children the STEM skills they need. Hearing about Scitechs on road tours through the state, Lauren wanted to join the team to teach and influence children growing up in rural communities, giving to these kids due to understanding the realities and difficulties of education in rural communities.

INTERESTS
»Teaching and education,
»Loves drama and theatrics and using these skills while she works
»Blogging travel experiences
»Drinking tea

VALUES
»Providing a thrilling learning experience,
»Improving how kids learn and how to change and update education in remote locations
»Values STEM skills, creativity, knowledge and passion

ASPIRATIONS
»Wants to continue working as an educator and reach all communities in WA.
»Wants to get involved with expanding tours, creating online platforms and collaborating with communities and schools.
»Wants to create an impact on Indigenous communities and improve education facilities and inspire kids.

BRANDS

Kathmandu®

URBAN :LIST

T2

NEEDS
» Support from peers and family when away from home for long periods of time
» To have the space to share experiences and get feedback
» To have her voice and opinion heard in the workplace to help improve quality of program delivery
»Opportunity to use and expand disciplinary skills

POWERS
»Spark excitement in students
»Sharing of knowledge, experience and expertise to schools
»Provides access to resources and inspiration to peers working in education
»Sharing insight and feedback amongst team

BEHAVIOURS
»Works away on the road as a Scitech educator completing tours around Western Australia.
»Weekly meetings to make sure tours are run smoothly.
»Collaborates with festivals, fairs and carnivals.
»Supports local businesses where ever tour stops.

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Figure 30: "Scitech Statewide Presenter Persona"

KEITH HOFFMAN

SCITECH PARTNER

AGE
42 years

PROFESSION
Scitech Partner

BIOGRAPHY
Keith as been a partner on Scitech's board for 14 years and counting. He has watched the organisation change a lot over his time there. However, the goverment's recent push for Scitech to become an essential part of pre-paring WA's future generations for STEM careers, he wonders if Scitech has changed enough to rise to the occasion. Keith honestly can't figure out what appeals to children these days, and he doesn't know how to get a hold of someone who can. Not to mention, they're saying they want to target older people, which honestly, Keith doesn't feel Scitech is equipped for.Keith wants to make a tangible impact on Scitech's method of operations to ensure the organisation can meet expectations and survive into the future. He just feels so detached from the goings on of the rest of the company, and doesn't know to start addressing the gaps in his knowledge.

INTERESTS
» Jogging
» Hiking
» Reading
» Travelling
» Fishing
» Chess

VALUES
» Dedication to profession
» Perserverance
» Objective reasoning
» Social capitol
» Adaptibility

ASPIRATIONS
» Become a key contributor in Scitech's evolution as an organisation
» Watch Scitech become an intergral part of STEM education in WA

BRANDS

TESLA

AD
ARCHITECTURAL DIGEST

NEEDS
» Access to communities outside own experience
» Direct line of communication with other areas of organisation
» Access to educators & educational recources

POWERS
» Influence over colleagues
» Respected by peers within organisation
» Has a say in discisions within organisation

BEHAVIOURS
» Withdrawn from local community
» WorkaholicSocialises with select social group on semi-regular basis
» Keeps interactions at work within own department

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Figure 31: "Scitech Partner Persona"

GRACE WESLAND

DEPARTMENT OF EDUCATION
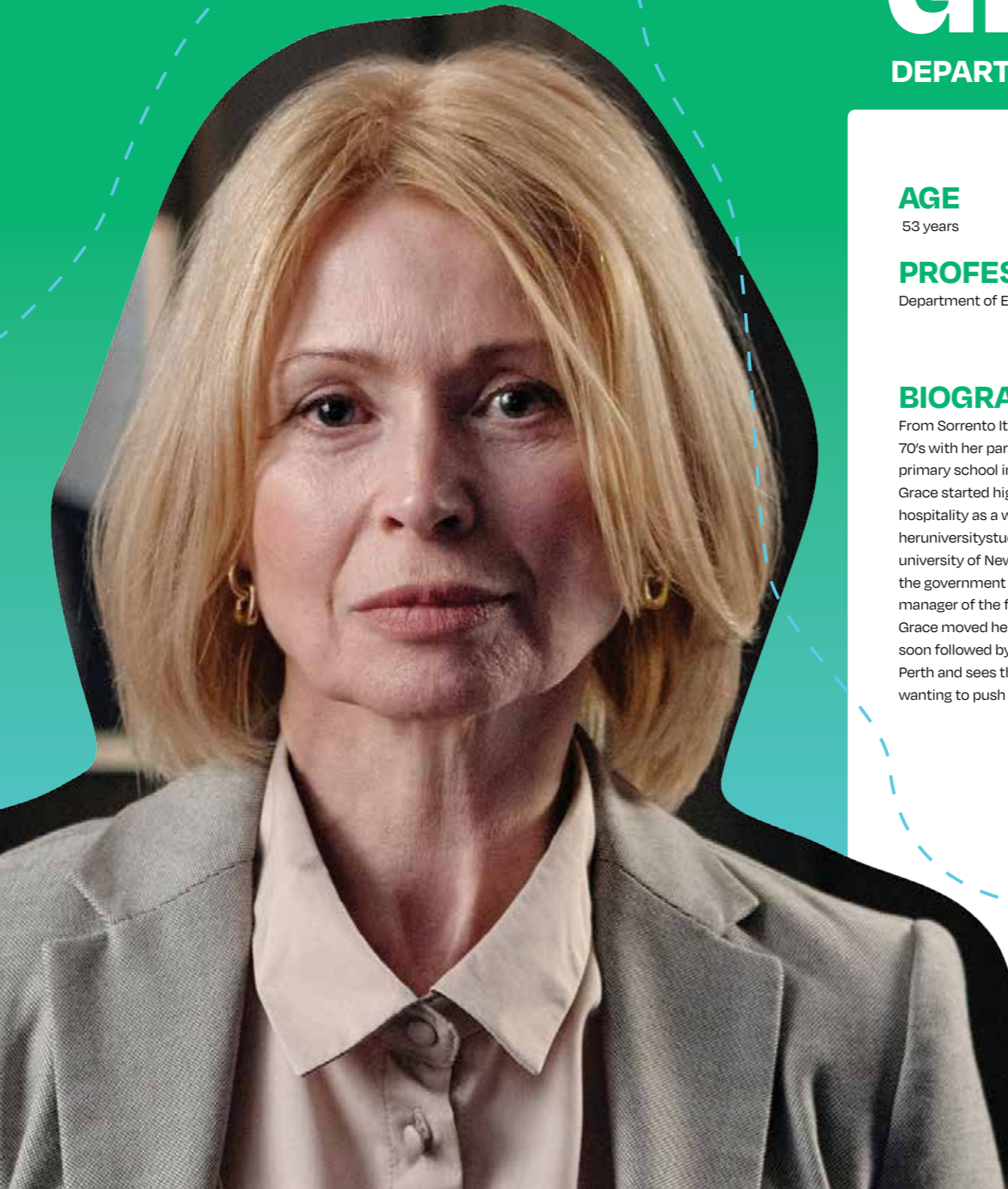
AGE
53 years

PROFESSION
Department of Education Funding Manager

BIOGRAPHY
From Sorrento Italy, Grace migrated to Australia in the early 70's with her parents to run a market garden. Grace attended primary school in NSW with little english knowledge. Once Grace started highschool she soon started working in hospitality as a which she stayed in throughout heruniversitystudies. Grace went on to study finance at the university of New South Wales. After many years working for the government in NSW, Grace was offered a position as manager of the finance and funding department in Perth, WA. Grace moved her small family of one daughter over, and was soon followed by her parents. Grace lives in the Metro region of Perth and sees the importance of education for public schools, wanting to push for equality of rescources throughout WA.

INTERESTS
» Enjoys reading crime novels
» Watching drama films
» Listening to a wide range of podcast genres
» Spending time with her daughter and her partner
» Staying active by walking and kick boxing

VALUES
» Quality time with family and friends
» Individual indipendence
» Passionate about empowering others to strive for the best
» Frustrated when individuals are being oppressed, when the system doesn't help everyone

ASPIRATIONS
» Wants to be a fully capable single mother, but loves and wants to spend her life with her current partner
» To be a Grandmother one day
» To be a leading employee and co-worker, striving for the best.
» To travel in her retirement

BRANDS

OROTON

NEEDS
» To occupy time with work and interests
» Interested in learning new skills to develop
» Relies on acceptance and social interactions with friends, family and colleagues
» Exceeding to be the best and change education for the better

POWERS
»Big influence in the decision of where and how much government funding will go towards
» Able to work and communicate with multiple groups in the education department
» Strong ties to the community
» Enforcing initiatives

BEHAVIOURS
» Extreemely organised
» Busy schedule, preoccupied with work and family commitments
» Great at budgeting
» Insists on taking her daughter out once a week for family time

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Figure 32: "Education Department Partner Persona"

SARA WILSON

HIGH SCHOOL METRO TEACHER

AGE
35 yrs old

PROFESSION
High School Mathematics Teache

BIOGRAPHY
Sara works as a maths teacher in a public high school. The area where her school is located is a majority middle-class affair, with reasonable access to resources. What Sara lacks in a way to fully engage her students. They're usually bored out of their skulls, and the drab textbooks and complex con-cepts seem to ensure all the infomation she she imparts bounces right off her students. Look, she gets it; they're all tired, they have so much work from other subjects already, they're all too aware of the world seemingly burning down around them. Sara isn't immune to burnout or stress herself. However, this situation is far from the active learning environment she always dreamed of creating when she chose this career. She wonders how she can get her students to enage with her content, as well as undo their apparent apathy.

INTERESTS
» Mathematics
» Watching trash TV to turn her brain off just a little
» Cooking
» Philosophy

VALUES
» Passion & Motivation
» Optimism
» Environments that foster creative thinking
» Innovative teaching strategies

ASPIRATIONS
» Make students excited about learning
» Prepare students for future
» Engage students with teaching materials
» Make a tangible impact on working/teaching environment

NEEDS
» An engaging teaching method
» Resources that engage students
» Support from school board, parents and peers
» Perspective from students

POWERS
» Liked by co-workers and parents
» A Contact with peers in other learning institutions
» Good rapor with students
» Access to further education resources
» Likable demeanor
» Hightly motivated

BEHAVIOURS
» Socialises with peers and co-workers regularly
» Completes teaching workshops regularly
» Engages with students to better understand their learning style
» Tutors struggling students regularly
Provides extra learning resources when needed

BRANDS

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Figure 33: "Metro High School Teacher Persona"

AMANDA VUONG

METRO PRIMARY SCHOOL TEACHER

AGE
35 yrs old

PROFESSION
Metro Primary school teacher specialising in year 3 to 6.

BIOGRAPHY
Born in Fremantle, Western Australia, Amanda attended Christ the King primary school and John CurtinCollege of the Arts. Amanda loves the arts, however she was never skilled at any of the subjects and wanted to find a role in teaching due to her love for working with children. She attended UWA and recieved a Bachelor of Education. Her part-time work throughout highschool was babysitting, which translated during her studies along with working in hospitality on the cappuccino strip.

Amanda is ambitious, constantly helping her partner with his business and striving to improve themselves personally and their situation every day. Amanda loves joining groups and projects, and she is involved with the council. Amanda and her husband have a son and lives very com-fortably in Fremantle where she grew up.

INTERESTS
» Spendng time with family
» Enjoys cooking
» Watches Drama, and comedy TV shows
» Exercising

VALUES
» Loves her family
» To be a good and influential teacher
» Feels satisfied when a job is done well
» Learning new skills and learning in unique ways

ASPIRATIONS
» Wants to be a role model teacher
» Would love to continue to study and complete a masters degree
» Inspire her kids to strive for careers they love

BRANDS

lovingearth

TIME

WITCHERY

NEEDS
» To create a better work and life balance
» Getting respect and attention from her students
» To provide fun and engaging learning experiences
» Create a safe environement

POWERS
» Does not have too much power within the school
» Has all the power within the class room, makes her own rules
» Able to advocate for different learning experiences

BEHAVIOURS
» Reads and researches during the day
» Busy with family life, helping out with her partners business
» Little social time, always running around for the kids
» Attends council meetings

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Figure 34: "Metro Primary School Teacher Persona"

ADAM LOCKYER

REMOTE PRIMARY SCHOOL TEACHER

AGE
31 yrs old

PROFESSION
Primary School Teacher @ Geraldton Primary School, currently teaching year 4 students

BIOGRAPHY
Adam grew up in the Northern Suburbs of Perth in a footy crazy family. After he finished highschool, having not loved the academic side of things, he took up a trade and continued to coach junior footy on the weekends, following the team around the state for their matches. After realising the importance of his mentoring role on the live's of his team, Adam decided to study Primary School Teaching at ECU. He was offered a position at Geraldton Primary School when he graduated on 2019 which he jumped at, remembering how much he loved the relaxed vibe of the town during one of his footy trips. Outside of work, Adam loves to get down to the beach for a surf, head away on weekend 4WD trips and get back down to Perth once a month to visit his family. To build his connection to the town, Adam also took up junior footy coaching for the local team which has been a great way for him to make friends and engage with the community outside of school.

INTERESTS
» Loves playing cricket, footy and going out for a surf
» Coaches at the local footy club
» Consumes most news through social media platforms

VALUES
» Education and the importance of mentorship
» Being flexible and understanding to cater for his diverse class of students
» Bringing nature into the classroom and vice versa

ASPIRATIONS
» Inspire independent, brave and passionate learners
» Help children to realise their potential
» Inspired by work of the Graham Polly Farmer Foundation.

BRANDS

NEEDS
» To feel supported by colleagues to provide meaningful educational experiences to a challenging group of students
» More resources to engage his class and get them excited about learning
» Strong social structures to support him through what can be a stressful job
» Open communication with families which he ttries to bolster through community involvement

POWERS
» Power to influence learning and engagement of his class
» Power to engage with colleagues to develop a supportive school environment
» Power to engage parents and help them to become more involved educators of their child

BEHAVIOURS
» Spends time after school one day a week to help students who need access to technology at school for their homework
» Makes class time for children to share things they have learnt/experiences outside of the classroom
» Tries to run class outside at least once a week
» Spends spare time playing sport, surfing and watching Netflix

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Figure 35: "Remote Primary School Teacher Persona"

HANNAH TOWNSEND

HIGH SCHOOL TEACHER

AGE
25 yrs old

PROFESSION
Secondary Science Teacher specialising in Chemistry for upper school students. Teaches 12-18 yr olds at Karratha Senior High School

BIOGRAPHY
Hannah grew up in the northern suburbs of Perth, WA with a single mother and two older brothers. As a child and adolescent she was a member of the local netball club and played every weekend. She studied a Bachelor of Education (High School Teaching) at Curtin, graduating in 2019. She wanted to be a teacher after experiencing the profound impact her own teachers had on her learning. Hannah moved to Karratha in early 2020 with her partner who works at one of the local primary schools as they wanted an adventure. She is a member of the local netball club, plays waterpolo with colleagues/friends from work and spends weekends exploring with her partner in their 4WD. At school, Hannah takes pride in mentoring her students outside of the classroom and is passionate about using interactive techniques to make Science more engaging.

INTERESTS
» Netball and waterpolo
» Exploring nature
» Listens to self-help podcasts
» Consumes news through Facebook, local newspaper and school newsletter
» Watches crime documentaries

VALUES
» Providing opportunities and safety for her students
» Inspiring her students to build meaningful futures
» Spending time in nature
» Providing opportunities for disadvantaged/marginalised students

ASPIRATIONS
» Wants to inspire creative, passionate and critical thinkers
» Continue her own learning
» Inspired by those doing work in Indigenous communities

BRANDS

 YETI
bundarra

NEEDS
» Emotional support from partner
» Freedom to be innovative at work
» Feel fulfilled and appreciated
» More resources/development to create more engaging learning opportunities

POWERS
» Influence over her students and fellow colleagues
» Access to further education resources
» Advocating for her students to authority figures in school
» Engaging in meaningful ways
» Teaching/mentoring role with other Science teachers

BEHAVIOURS
» Monthly Zoom session with Perth-based mentor
» Plays netball and waterpolo in Karratha and Dampier
» Supports Indigenous and local business
» Spends weekends away from home

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Figure 36: "Remote High School Teacher Persona"

EMPATHY MAPS

An empathy map is an exploratory tool we used to build empathy with our core actors by helping us to understand their feelings, experiences and actions. Empathy maps allowed us to gain valuable insights into the people that we interviewed. Based on insights gathered during interviews, we could map out what these groups of people were seeing, hearing, feeling, doing, saying, and thinking in relation to our questions. Empathy maps were created to understand the experiences of students, teachers, Scitech, and parents. From this, we learnt about the different groups' opinions on STEM, teaching of the school curriculum, and experiences with SciTech. Gathering insights into the experiences of these core actors helped guide our research into understanding their behaviours and needs, which further informed our understanding of Scitech's problem.

Creation of empathy maps allowed us to identify key themes and valuable insights that informed the direction of the project. Here we have summarised our key findings.

PRIMARY SCHOOL TEACHERS

» Hard to pair the unstructured nature of STEM with the structured nature of classes and reporting.

STEM being a multidisciplinary approach to learning that incorporates different subjects and learning areas can make it difficult to synchronise it with the school curriculum. The school curriculum is very specific and strongly emphasis on meeting KPI deadlines to ensure every criterion is achieved. This can make it difficult for teachers to deviate from the curriculum and incorporate their own STEM activities.

» STEM is for science and maths-based subject, doesn't include art.

The perception that STEM only revolves around Maths and Science makes it difficult to incorporate other areas such as HASS and Art to ground the STEM skills. Especially since STEM learning requires critical thinking and innovation, this requires a combination of different learning disciplines to best stimulate critical thinking and problem solving.

» Partnership between community and classroom is important to integrate life experience with classroom teaching.

In some cases, local environments play an important role in the success of a student's life at school. Involving the local community in STEM partnerships could be key in promoting reciprocal learning and teach real-life experiences that utilise critical thinking and problem-solving. Educating children on the importance of STEM learning in the real world outside of the classroom is essential in promoting STEM career readiness.

» "I used to think STEM was structured activities that integrate Science, Engineering, and Technology but now I think it's about self-guided enquiry and letting go".

The definition of STEM seems to be confusing even for teachers let alone students. The divide in definition and implementation makes it difficult to narrow down the areas of learning that need to address. Finding a way to universally define STEM for starters could be key in delivering impactful sustained ongoing STEM learning.

INTERNAL SCITECH STAFF

» Teachers want more customisation options for DIY kit content.

Tailoring DIY kits for specific schools and their students could be key in seeing improvements in the impact of STEM learning. Understanding the needs and wants as well as the curriculum of the school is important as schools are paying for these kits.

» High schools aren't interested in Scitech because they are busy.

This isn't necessarily true. Based on the interview with Thornlie Senior High School year 7 and 9 science teacher and STEM coordinator, high schools that are more vocational in nature respect SciTech and what they offer in their outreach programs. However, it is important for SciTech's outreach team to understand their target audience, finding out the best way of interacting with high school students and ensuring your presentations are not 1-way learning but 2-way in which reciprocal teaching is utilised could be instrumental in SciTech's success in penetrating the high school market.

» Scitech does well when catering to diversity but could do better.

Diversity in this context is important. Not only referring to gender diversity but also taking into consideration culturally and linguistically diverse (CALD) children, indigenous children and children that come from low socioeconomic statuses. Understanding their values and attitudes could be important in delivering optimal STEM learning.

» Disconnect in the perception of STEM.

STEM is too broad of an acronym. Students need to be able to bring all the skills they get from their math, sciences, English, HASS, and arts into one space and combine them to ensure they are industry-ready. STEAM or even project-based learning could be a more acceptable way of defining STEM.

PRIMARY SCHOOL CHILDREN

» Kids see STEM as a project, not a multidisciplinary learning.

Children perceiving STEM as a "project" that their teacher assigns to them is a key insight into how the definition of STEM differs between teachers and children.

» Teachers are still delivering learning in a traditional format.

Teachers are still delivering learning in a traditional format. 1 way learning from teacher to student. Not enough reciprocal 2-way learning in which the student's input on the best method of learning is still not prevalent in the primary school market.

» Children today are more tech-savvy and prefer digital learning rather than traditional methods of books, and pencils.

Children today are more tech-savvy. They use iPads, laptops, and interactive devices at home for personal use. However, the school market still utilises traditional books and pencils. There seems to be a disconnect between the best method of interactive learning. School budget and resource limitations are some of the main barriers to optimizing primary school learning.

PARENTS OF PRIMARY SCHOOL CHILDREN

» "Unfortunately, the grades are based on the assessments not necessarily on the hard work you do during class hours".

This quote from a parent reinforces the bottom line of education, which is to pass. This doesn't only reflect the student but also the teacher and the school.

» Science is not a subject that is heavily taught to primary school students. The curriculum is more focused on English, maths, drama, and IT.

In primary school curriculum, science is not a subject that is heavily taught. Schools prioritise English and maths as well IT. This insight could be key for SciTech who specialise in science in their presentations and experiments.

» STEM to include arts, humanities, and language.

One of the parents highlighted the need for the STEM acronym to include arts to become STEAM. This growing demand doesn't only exist amongst teachers but even parents who agree that STEM is outdated and not practical as problem-solving requires innovation and critical thinking. Both attributes come from a multidisciplinary approach to learning.

PRIMARY TEACHERS

Primary Remote Private Teacher
Year 3 teacher at a catholic school

Primary Remote Public Teacher
Level 3 teacher and Maths Specialist

Primary Metro Public Teacher
4 years teaching in rural and metro areas

Primary Metro public teacher
Teaches year 1 to 6 science

HEARS

Lack of understanding about how to integrate STEM

Hard to pair **unstructured nature of STEM with structued nature of classes** and reporting

At the root of STEM is providing resources and tools to let kids self-discover and investigate

Most kids and families have a **connection to the land** and integrating the environment with STEM teaching celebrates that

Lack of understanding in weaker subject areas can lead to stress when trying to teach curriculum in exciting ways

Arts doesn't matter in a child's education, that is a fun subject.

Art is not linked to STEM, does not require creativity.

Have to **keep costs under budget** so letters don't have to be sent home for paid experiences

Scitech is well known, reputable and easy to work with in comparison to some other community groups

Scitech is more of a play centre for kids.

Lack of making STEM an exciting subject to learn.

SEES

Excitement of kids @ Scitech Incursions

Some kids don't have access to technology and the internet.

Looking for Scitech to provide experiences that are relevant to what I'm teaching; **"know exactly where it slots in"**

Remote teachers struggle to recall their last Scitech interaction

Hands on learning is the most engaging

Scitech is a focus for **Science teachers**

Access to projectors, interactive whiteboards and ipads; even more so in metro schools

Parents who bring their kids to a catholic school care about religious education.

Students are kids who all have basic needs that need to be met before education

Parents are more involved in lower school and level of engagement depends on their own experience in education systems

Every student have different needs and all learn with unique abilities (seeing, hear, touch, showing etc)

Logistics of creating incursion is time consuming.

DOES

Shares lesson plans across classes of same year so every teacher teaches same lessons and workload is reduced

Promotes **group work** and open enquiry to help scaffold and push students

Puts effort into their education by going out of the way to provide a better experience (will buys supplies, look for content online – **all out of school hours**)

Organise activities with industry and community groups with focus on those that are **easy to organise/reliable** to work with

Attends **curriculum network meeting** to learn about areas of curriculum where weaknesses lie and share resources in areas of strength

Take kids on excursions to relate their learning to the 'real world'

Have to adapt to school's approach to teaching

Puts effort into **establishing relationships with kids and their families** to build trust, educational partnership and common ground

Has a drive to excite kids at school with fun ways to approach subjects

SAYS

HAAS grounds STEM skills in context

STEM teaching could involve giving students open ended projects within the realm of STEM where they get to creatively solve problems for themselves; **I'm just a facilitator to help guide that self-direction**

Indigenous people were the first to be involved in STEM; they were the first Scientists in Australia

Talking is the foundation to build relationships that foster understanding of culture and need

Wishes the school would provide more for STEM subjects rather than having to spend time outside of the classroom preparing.

"I haven't prioritised it; we do a little bit in Science"

Schools and teachers still don't understand the **importance of expanding the acronym STEM**

It is useful to **make learning meaningful and relevant** to kids understand there is a point

"Does [STEM] it always have to include Science?"

Scitech experiences are valuable because **you can only do so much in the classroom**, it pushes the education experience further

The syllabus doesn't recognise the arts and humanities that are involved with STEM education

Kids are tactile; they want to see, hear and feel

THINKS

I used to think STEM was structured activities that integrate Science, Engineering, and Technology but now I think it's about **self-guided enquiry and letting go**

Diffcult to plan and scaffold learning for students who don't attend regularly

Hard to know what resources are out there and which are actually suitable

Hard to allow for unstructured nature of STEM when you **have to mark against the curriculum and are time poor**

Resourcing is hard and expensive

I wish someone would tell me how to integrate STEM

Their method of teaching is not effective and not benefcial to students.

Adding more things to teach with **no more time**

FEELS

Partnership between community and classroom is import to integrate life experience with classroom teaching

I want to provide my kids with **life skills** that STEM teaches

Integrating HAAS into STEM through place and geography created cultural understanding for my students

I'd love an outline of a project that **linked to the curriculum** so I can **tick off criteria**

Great to have a **support system** that provides rescources to teachers who do not know how to conduct STEM based learning.

Scitech executives **need to invest more resources into early learning outreach programs.** Valuable target audience to SciTech who are simultaneously the least impacted target audience.

Scitech don't cater outside the family of young children demographic.

Scitech says no to a lot

Scitech is a playground for children

The **outreach team build strong impressionable relationships with the outreach audience** whether it is giving a high-five or a having quick conversation before and after the delivery of a science show.

Lack of making STEM an exciting subject to learn.

The current **SciTech outreach impact on high schools is "poor at best" and that SciTech could have a greater impact on this demographic**. I imagine his explanation would be that high school students are too busy to deal with SciTech and that perceptual attitudes of SciTech being a playground for young kids could be the main barrier to entry into the high school market.

DIY kits have huge potential to provide learning resources for rural/remote schools

"It's a fun thing, it's that joy of changing people perception that science is boring"

[STEM is] Not necessarily working in the stem field but asking questions and figuring stuff out.

Chose to work for Scitech because it's more fun.

Scitech does well when catering for diversity but could do better

The **reason he chose to work at SciTech was due to his passion for engaging with young children and his own personal experiences** with SciTech when he was young.

Lack of upgrade in the new SciTech strategy for the outreach team **could lead to the outreach team falling behind in content delivery as they visit once every three years** and only spend one hour with their target audience.

The current SciTech strategy not changing much from the previous strategy for the outreach team which could be problematic for ongoing targeted deeper reach.

Teachers want more customisation options for DIY kit content

Scitech needs to do better in entering the high school market.

High schools aren't interested in Scitech because they are busy.

Scitech are good at what they currently do with a 98% satisfaction rate.

Teachers want more agency over content of DIY Kits

Scitech more of a science engagement centre

STEM isn't well defined

I'm not sure whether our role is to inspire or educate

We are separating design and delivery

Concerns with the **current SciTech content strategy not implementing a feedback loop** to modify the outreach experiments.

Not diverse enough, only create exhibitions for the centre and don't cater beyond families and young children. STEM is for boys. Science isn't creative enough

The lack of resources allocated to the early learning outreach programs and the lack of success in the entry of the high school market are clear frustrations.

DIY kits don't take advantage of technology – less accessible and less customisable

Scitech is a science engagement centre rather than a true STEM learning provider

Kids have a universal interest in learning.

Hope Scitech inspires learning.

Vast difference between indigenous communities and metro communities in terms of resources, the number of students and staff and the way the programs are delivered

Scitech falling behind in the way they work and the experiences they deliver

No model for outreach team feedback loop to improve their programs. State-wide team has minimal creative control over design, only delivery.

Scitech could improve on in target ages. **Can change demographic from families with 4 to 6-year old's.** Exhibits are made for them as it works.

The SciTech executive team are not investing enough resources to outreach initiatives relating to state-wide early learning audiences who are the least impacted demographic.

Plans what they will do, how they will do it going forward. Running the team through briefs. Writing every day, brainstorming, working with the design thinking process.

Designing a new exhibit at the moment by figuring out what Perth wants. **They sell to an international market so need to figure out what the international market wants.** Gets the first part of the double diamond done and passes it on to another team.

The behaviour that he has observed that he believes is irreplaceable is the outreach teams' passion and enthusiasm in their interaction with the outreach target audience.

Scale some programs down to give more to other more important programs

Scitech is a creative environment, many inspirational hard-working people, a great company and brand.

Everything that Scitech does has a 98% satisfaction. They are good at what they do.

Trying to **improve entry into the high school market.**

Wants acknowledgement that **children who develop certain skills can succeed in STEM fields regardless of their performance in science or maths subjects in school** Add digital/online component to DIY kits

Moving away from numbers and more towards impact. "Maybe we need to see a few less people but have more impact. Can we spend more time and do something more with them?"

The current SciTech strategy to update the state-wide outreach programs by bridging the gap in digital growth of regional target audiences and subsequently improving the content delivery of these outreach programs.

Wants to have more impact on diverse groups.

Metro schools will organise the one visit to a class to align with current learning curriculum to benefit their class.

High schools being "iffy on the uptake" of Scitech visits because they "just have so much to get through"

Scitech has a good group of creative people who are passionate about what they do.

Works with many different teams within Scitech. Started to work with state-wide team for their shows.

Manager of content. news, scripts, shows (very broad) particle website, fringe shows, videos, podcasts, animations.

Tell Schools about new upcoming shows/exhibits that "not very many people have seen" to try and spark interest

His day to day encompasses meetings, budget updates and liaising with program coordinators within the outreach team.

Professional Learning Consultant – develops learning experiences

Works in a pipeline rather than collaboratively with peers

State-wide manager- currently works out of the SciTech's corporate office where he spends 95% of his time.

Working on a new program involving teachers from kwinana to bunbury.

Working on reconfiguring STEM club.

Research language, what information is going across other sites to determine what is good, what is working well.

The SciTech executives allocating adequate resources to early learning outreach

State-wide playing a larger role in the modification of the content within the state-wide programs from the feedback of the outreach team on the ground.

SCITECH

Content Team

Customer Insights Team

Statewide Team

Professional Learning Team

Customer Service Team

Experience Team

HEARS · SEES · DOES · FEELS · THINKS · SAYS

Figure 38: "Scitech Empathy Map"

HEARS

If you want to be an engineer you have to try really hard at school and go to university

You **dont need to be academic** to be creative

I can do anything if I put my mind to it

Hear **my teacher use things in our environment** to explain new ideas

We do STEM when we build projects

I have to memorise what my teacher tells me

SEES

School days are long requiring 6 hours of learning.

The method of delivery is important "if the teacher explains in a fun way, then I like it but if she talks a lot then I don't like it".

Last visit to SciTech centre he remembers seeing the planetarium where science presentations are (he remembers lasers being used)

Dad helping him with is maths homework

Lots of books used for homework (not enough computers)

The computer lab, lunch, recess, and friends are his favourite things about school.

He has been to SciTech and can only remember science shows (nothing more specific)

Lots of technology use at home and school including computers, interactive whiteboard in the classroom and Computer labs at school.

Not much homework is assigned other than some reading and some spelling words.

Get ready for school in the morning with the help of his parents.

Receives maths and science homework only twice a week.

Receives daily reading and writing homework.

He would need to learn more about science and how life evolved on our planet if he wants to become an evolutionary biologist.

Parents help him out with homework by conducting mini spelling tests. They also help with timetable maths.

SAYS

SciTech visit was too long in duration – standing around for 4 hours was tiring.

"I heard real estate agents get money" (future career aspirations)

Getting help from parents for maths homework not English.

He likes playing with friends during recess and lunch.

STEM is defined as a project that a teacher gives you which involves building things.

He enjoys writing as his preferred method of learning.

Favourite thing about school is playing and eating

Learning maths is his least favourite thing about school.

Has heard of SciTech but has never been there.

Enjoys reading homework.

Thinks science and maths are not really needed for engineering career "only a tiny bit is required".

Maths is his least favourite subject at school.

Using technology and going to computer lab classes is his favourite thing about school.

Favourite way of learning is though watching videos and documentaries.

SciTech has come to his school but not his specific class or year group.

Has been to SciTech and thinks it's fun and educational.

PRIMARY STUDENTS

A primary school student who is currently in year 6

A primary school student who is currently in year 3

A primary school student who is currently in year 2

DOES

Get ready for school in the morning with the help of his mother.

Go to school on time by 9am

Attend every subject (same class different teacher rotations)

Do homework when he arrives at home.

His science teacher giving him a STEM project this term involving making a reusable mask (in response to COVID-19) "I think I'm going to use some silk, some stretchy fabric and then fold it and cut holes for the ears".

THINKS

SciTech visit was too long in duration – standing around for 4 hours was tiring.

You must stay in school for over six hours.

Teachers not being interactive enough (too much talking)

He likes maths but sometimes he doesn't "Only time I don't like maths is when its division and timetables".

Doesn't like maths.

Doesn't like writing.

Learning maths is his least favourite thing about school.

FEELS

Wanting to become a real estate agent.

Teachers to become more engaging during STEM learning.

Dream of becoming an engineer.

Less maths and more science homework

Wants to become an Evolutionary biologist after watching a documentary on Netflix.

Prefers interactive methods of learning rather than traditional methods of reading and writing.

Figure 39: "Primary Students Empathy Map"

HEARS

Her child attends a good school with a good reputation that is still growing. Her child might be interested in pursuing a STEM related career based on her current interests in science. There's multiple of ways to get into university outside of ATAR.

Her child attends a good school with a good reputation that is still growing. Her child may have **1 block of science learning per week.**

SEES

"Unfortunately, the grades are based on the assessments not necessarily on the hard work you do during class hours". Fair bit of homework is given. Quiet of few assessments are handed out "just like university" per term. One in the beginning of the term, one mid-term and a final assessment at the end of the term. Learning how to manage time is also very prevalent in a high schooler's life.
Her child attends a good school with a good reputation that is still growing.

Science is not a subject that is heavily taught to primary school students. Curriculum is more focused on English, maths, drama, and IT. It's only a small school, it's about 500 students. **School fundraisers require parent participation to aid in acquiring resources for school.** Science project would be brought home once a term or semester but English homework essentially every week. School is good in providing adequate resources to the child. School teachers are great.

SAYS

She has taken her child to SciTech during the school holidays as a day out. "Perhaps a **bit less so as they have got older** as other sport and activity commitments take over". She has a reasonably better understanding of the school curriculum as the child's older sibling went to the same school. She understands what STEM stands for but would prefer it to be changed to STEAM. **"I quite like the STEAM version where we include art/humanities as well'.**

Expensive private school are not worth it financially as they offer the same educational content as regular high schools. "And maybe this is me being Swedish, it doesn't mean that you get a better education, it means you have a nicer uniform, and maybe some shiny computer labs. I think it's the teachers at the end of the day".
STEM as an acronym doesn't take into consideration languages, humanities and arts which is required for most if not all industries. STEM should be changed to STEAM to accommodate this.

DOES

Help with any homework they can. Provide the child with necessary equipment to succeed at school (technologies)

Sign permission slips for SciTech excursions. Get involved in homework. **Provide the necessary technological resources for homework at home.** Provide the resources to the child that the school can't. Partake in school fundraisers to help school in acquiring resources.

Staying up to date with child's high school curriculum and study schedule. **Preparing for ATAR subject selection once it comes along.** Aligning current subject selection to that of which she hopes to do once she reaches ATAR selection period. Organising tutors for necessary subjects that the parent/s cannot help with.

Organising after school tutor for child. Help with any homework they can. Provide the child with necessary equipment to succeed at school (technologies)

PARENTS

Parent of a primary school student - Their child is currently in year 3. Child attends a public school.

Parent of a high school student - Their child is currently in year 8. Child attends a public school.

THINKS

Her child receives very little science homework.

School grades are determined by grades rather than how hard her child works. Starting high school during COVID-19 pandemic – made it a bit more difficult. **Both parents did not attend school in Australia. So, they are both learning about the WA's education curriculum as they go along.** Her child receives a fair bit of homework and assessments.

FEELS

STEM to include arts, humanities, and language. **For school to increase science learning into curriculum**

STEM to include arts, humanities, and language. Her child to not worry too much about ATAR – not being too forceful as a parent and allowing her to play to her strengths when deciding her future.
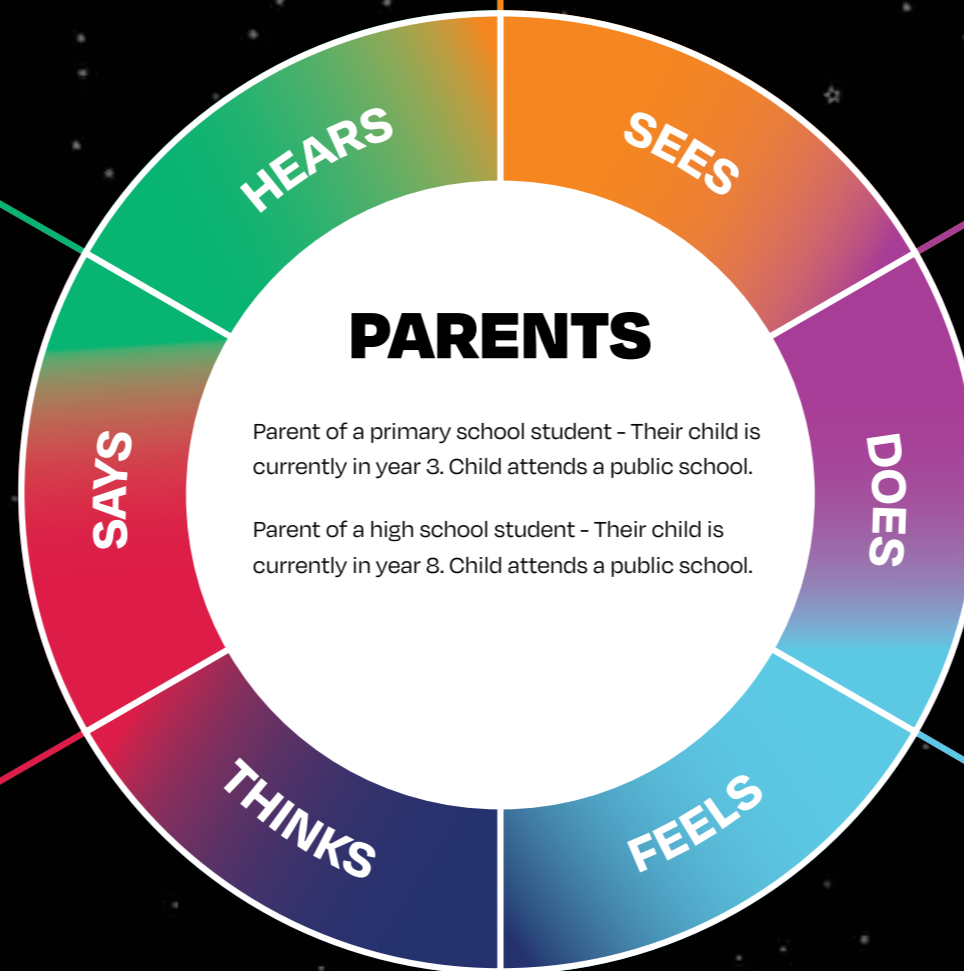
Figure 40: "Parents Empathy Map"

PERSONAL STORY WORLDS

Differing slightly from personas and empathy maps, personal story worlds provide us with a more personal connection to the core actors. Personal story worlds paint a picture of a specific individual we have interviewed from a core actor group. Instead of trying our best to imagine what it would be like to be a person from one of these groups, we have direct quotes and insights from individuals we have interviewed and collated them into story worlds. Using these personal story worlds gave us a direct understanding of what it is like to be a person belonging to our core actor groups, therefore further informing the project problem understanding.

Key findings were as follows:

OUTREACH

» Scitech's strongest asset are their presenters, especially within the Statewide team. They are elite at their job and can teach over a broad variety of contexts.

» Ran a program at a detention centre where a large portion of people there were of indigenous descent.

» Thought that Scitech outreach program was valuable for people like that who are more at-risk.

HIGHSCHOOL METRO TEACHER

» Scitech incursion to school did not hit the mark in terms of engagement and impact.

» Scitech outreach team should improve audience engagement (understand your target audience).

» Scitech outreach team need to utilise more hands-on activities especially for year 7 students.

» STEM is too broad of an acronym. Students need to be able to bring all those skills they get from their math, sciences, English, HASS into one space and combine them to ensure they are industry-ready.

» Aim to improve STEM program by making it more "industry-ready".

» Students should continue maths and English learning in high school while doing workplace learning to integrate real-world experiences with academic learning.

» Far too many students are leaving school with silo skills, but they're not leaving with the prerequisite teamwork skills, problem-solving skills, innovative thinking, and overall critical thinking skills.

PRIMARY METRO TEACHER

» Need guidance on how to integrate STEM in the classroom whilst still meeting marking criteria.

» Lack of collaboration between disciplines makes integrating lessons difficult.

» Activities in the classroom are driven by pressure to teach content heavy curriculum, no time for unstructured lessons.

» Scaffolding lessons for wide-spread of language skills is difficult and no student should be left behind.

OUTREACH AND BOOKINGS

» Teachers book incursions that align with what they are teaching in the curriculum.

» Customer Service team offers DIY kits IF a visit is not possible.

» Outreach presenters are crucial to the success of engaging students, regardless of the program.

» Number of kids dictates how personal an experience is.

» Scitech is about inspiring fun and interest, not necessarily educational content.

» Confusion about the meaning of STEM and who is included; should be more about skills of enquiry, problem-solving and curiosity.

» Need to move away from KPI's and towards actual impact
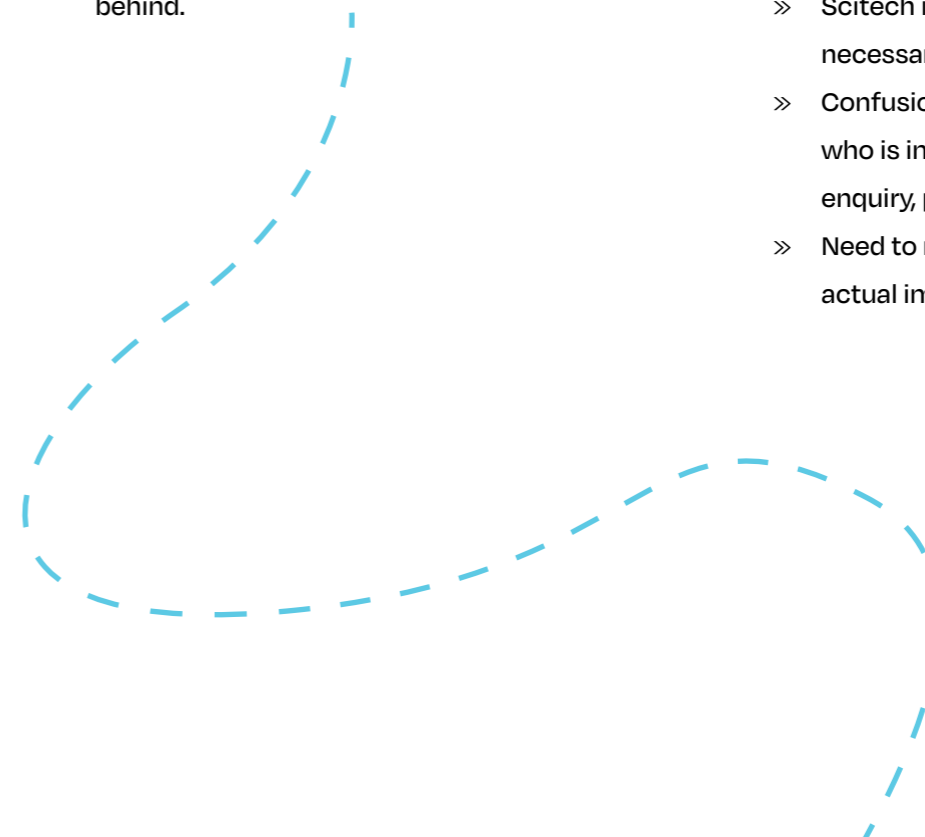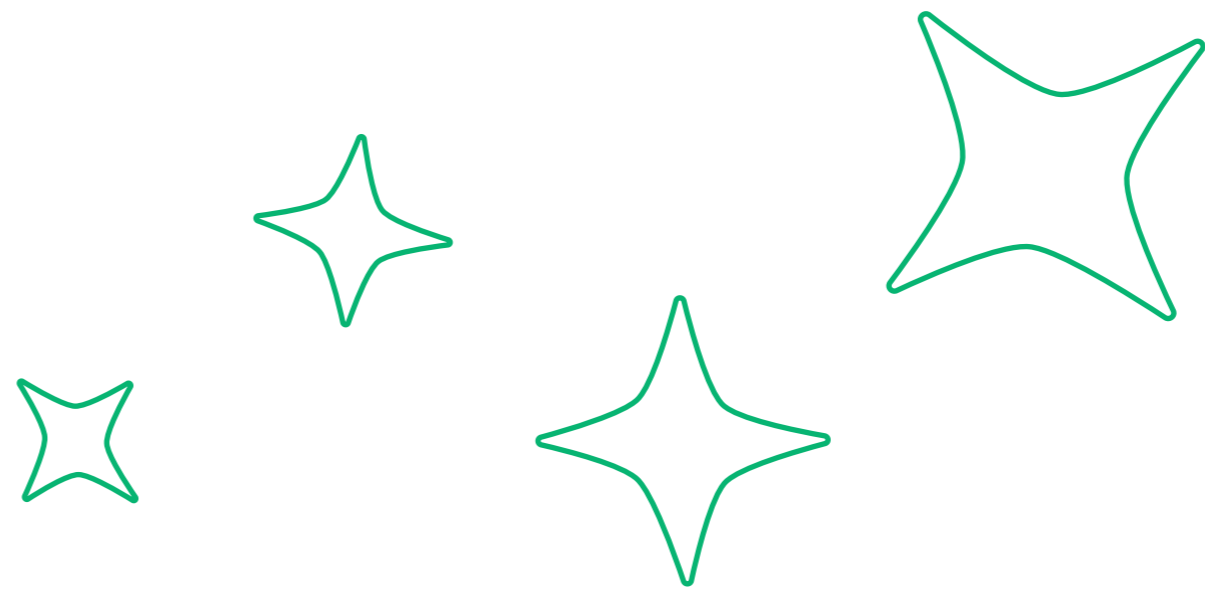
STORYWORLD
METRO PRIMARY SCHOOL TEACHER

THE BACKSTORY

I am a 31 year old primary school teacher. I grew up in the northern suburbs of Perth, WA with my parents and younger sister. I have a keen interest for travelling and conservation which I developed from a young age, inspired by family trips and my parents jobs in the environmental sector.

Further travel once I left school inspired me to study geography and conservation at University, going on to do my Masters. When I struggled to get a job in the field in WA, I studied my Graduate Diploma and became a primary school teacher.

I did rural placements in The Pilbara and The Wheatbelt before settling back in Perth where I now teach 45 minutes away from my home. I am still an avid adventurer with my partner and our dog.

I THINK/FEEL/KNOW

- I think you have to make learning meaningful and relevant for kids so they realise why it is so important; our kids have been spoon-fed for so long that they don't know how to think for themselves
- I feel I don't know enough about STEM to teach it but I'd love to know how to do it
- I know collaboration is required in my school to make a plan to integrate STEM, especially when there are cross-disciplinary links that are identified in the curriculum

CURRENT SITUATION

- I am currently working at a large primary school in the North Eastern Suburbs.
- The school has 850 students, is extremely culturally diverse with a special EALD program, and is in a low-socioeconomic area.
- We use an explicit instruction approach to teaching at the school and teachers share lesson plans to ensure all students are taught the same.
- I specialise in literacy and I don't feel my strengths lie in Science. There is a strong focus in Literacy and Maths to build the fundamental skills of my students.
- We just don't have enough time or resources to teach STEM; I haven't prioritised it because the school hasn't prioritised it.

KEY INSIGHTS

- Need guidance on how to integrate STEM in the classroom whilst still meeting marking criteria
- Lack of collaboration between disciplines makes integrating lessons difficult
- Activities in classroom are driven by pressure to teach content heavy curriculum; no time for unstructured lessons
- Scaffolding lessons for wide spread of language skills is difficult and no student should be left behind.

BELIEFS ABOUT CHANGE

I believe change is necessary to improve the learning experience and outcomes of our students but I think it is challenging when the school is not united in it's approach to change. We are forced to drive change from the bottom up and it takes time and energy that we don't have.

DEVICES & TECHNOLOGIES

- Limited tech - 28 Chromebooks for 6 classrooms, 6 ipads, e-board
- Students have limited access to tech at home
- Minimum budget for resources in design & technology VS Science Specialist

ISSUES & CHALLENGES

- Small budget and lack of resources - lesson planning is extremely time consuming
- Can'tdelive unstructured STEM activities when teaching with explicit instructions
- Parents have to give permission for their children to use technology in the classroom through the communication portal but lack of tech in homes makes communication hard
- Teachers have a specific subject they write lesson plans for so integrating activities is difficult
- Students aren't motivated to learn, it's not something that they value/see the point of
- I have to mark against the curriculum and I don't know how STEM fits into that

WORKAROUNDS

- Try and use interests of students to spark interest in learning
- Share lesson plans with other teachers to ease workload

GOALS & VALUES

- Wants kids to love learning & be able to apply knowledge to building a future for themselves
- Learn to integrate STEM & the support of other teachers to achieve this
- Wants school to prioritise STEM & put resources & time into helping us teach it

CAPACITIES & RESOURCES

- School has subscriptions to a number of online programs
- Number of resource books in library
- Constrained by a heavy curriculum and lesson planning; very time poor

RELATIONSHIPS WITH ORGANISATIONS

Building a relationship with the local Tip and Recycling Facility for the development of a sustainability unit

WEAK TIES WITH

- Year 4 Science Specialist
- Parents of students

STRONG TIES WITH

- Teachers in the same year level across disciplines

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STORYWORLD
SCITECH OUTREACH AND BOOKINGS TEAM MEMBER

THE BACKSTORY

I am 34 years old, and I live in an apartment with my partner and our cat .

When I am not working, I love to spend time hiking around Perth, hitting up cafes around my home and hanging out with my family.

I grew up as the youngest of three siblings with my parents in a coastal Perth suburb. My family would spend holidays out camping where I developed a curiosity and love for being in nature.

I attended university & graduated with a Bachelor of Science (Biochemistry). I worked for a short period in research labs, but was really lacking a social element to work.

By chance, I applied for a role in the Outreach Team at Scitech & was accepted. I spent the last 7 years touring around WA sharing my love for Science with children. This job provided such an amazing level of satisfaction as I got to inspire a passion for curiosity and learning. It also meant I have travelled to some amazing locations around WA and worked with such a tight knit and supportive team.

I transferred to the Event Coordination Team early last year as being on the road for so long was starting to get tiring.

I THINK/FEEL/KNOW

- I think that there are so many differnet ideas about what Science & STEM actually are
- I feel Scitech could do more to cater to diversity
- I know the staff out on the road are the reason Scitech has been so effective

CURRENT SITUATION

- I currently work in a management position in the Event Coordination department at the Scitech Troode St Office
- I'm realtively new to the role, having previously worked in the Outreach team
- Having seen Scitech re-evaluate its focus with the New Scitech Strategy has been really exciting, as it has injected a new energy that we all felt when we first joined the team
- I'm getting to the age where I want to settle down, so being permanently based in Perth has really benefitted my wellbeing and relationships

KEY INSIGHTS

- Teachers book incursions that align with what they are teaching in the curriculum
- Customer Service team offers DIY kits IF a visit is not possible
- Outreach presenters are crucial to the success of engaging students, regardless of program
- Number of kids dictates how personal an experience is
- Scitech is about inspiring fun and interest, not necessarily educational content
- Confusion about meaning of STEM and who is includes; should be more about skills of enquiry, problem solving and curiosity
- Need to move away from KPI's and towards actual impact

BELIEFS ABOUT CHANGE

I think that change is necessary to adapt to how fast the world is changing.

We don't want to be left behind.

DEVICES & TECHNOLOGIES

- Shared mailbox for emails
- Phone enquiries
- Spend most of the time at my desk and computer

ISSUES & CHALLENGES

- Physicality of Outreach job
- Not able to instantly offer incentives to Schools who can't access Scitech (need approval)
- Communication with teachers who are in the classroom during work hours

WORKAROUNDS

Ensuring that resources are available for teachers as soon as they finishing teaching for the best chance of communication.

GOALS & VALUES

I want all kids to be excited & engaged with STEM.

If I can get kids asking questions and have them not be afraid of being wrong, I'll be happy.

CAPACITIES & RESOURCES

- Knowledge of in-centre & outreach programs
- Direct link with schools
- Coordination of Outreach tours

RELATIONSHIPS WITH ORGANISATIONS

- Close communication with annual Science event organisers
- First point of call for communication with schools; reaching out to schools on regional tours

STRONG TIES WITH

- Statewide Team
- Budget and KPI Reporting Head
- In-Centre Team
- Less so with marketing team for knowledge on promotions

WEAK TIES WITH

- Content and Experience team
- Customer Insights team

STORYWORLD
METRO HIGH SCHOOL TEACHER

THE BACKSTORY

I am a maths and science teacher at a Thornlie Senior High School. I have been teaching here for six years. This is my 6th year and last year I was awarded the position of STEM coordinator.

I come from a geologist background. Prior to teaching, I worked in the mining industry, working alongside engineers, environmental scientists, processing plant operators and other geophysicists.

I THINK/FEEL/KNOW

- I think as a STEM teacher using life experiences to highlight the skills and concepts I'm teaching that are relevant to the real world is the most effective way in instilling STEM values in high school students.

- I feel you need kids to be able to bring all those skills they learn in English, HASS, communication to one space & combine them as integrated learning because that's what they do in the industry.

- I know how important maths and science is, but I also know based on my industry experience that writing and communication skills are equally important, and you can only learn these skills by incorporating arts into STEM.

CURRENT SITUATION

- My day to day involves being primarily a youth service specialist

- I currently run two classes for math and science in year 7 and 9.

- I currently run the STEM robotics club and this year it is competing in the First Lego League competition that is facilitated through partnerships with Macquarie University and Curtin University here in Western Australia

KEY INSIGHTS

- Scitech incursion to school did not hit the mark in terms of engagement & impact

- Scitech outreach team should improve audience engagement & need to utilise more hands-on activities (especially for Year 7 students).

- STEM is too broad of an acronym. Students need to be able to bring skills they get from maths, sciences, English, & HASS into one space and combine them

- Aim is to improve the STEM program by making it more "industry ready"

- Students should continue maths and English learning in high school while doing workplace learning - integrate real world experiences with academic learning.

- Far too many students are leaving school with silo skills, but they're not leaving with the prerequisite teamwork skills, problem solving skills, innovative thinking, and overall critical thinking skills.

BELIEFS ABOUT CHANGE

I think change needs to occur to the acronym STEM to include arts & therefore transforming it to STEAM. This is important because it incorporates the communication skills as well the research skills you pick up studying HASS. For kids to enter STEM careers they need to learn how to write and communicate.

DEVICES & TECHNOLOGIES

Fairly low-level resources such as pop sticks, skewers, straws, paper and also, we use cardboard of various sorts.

ISSUES & CHALLENGES

- Far too many students are leaving school with silo skills, but not with the prerequisite teamwork skills, problem solving skills, innovative thinking, and overall critical thinking skills to succeed post-school

- Communicating with the school regarding improving the current STEM program in order to take it the next level

- Navigating mixed academic levels of students when delivering universal STEM activities

WEAK TIES WITH

- Real life STEM industries for workplace learning

- Chevron

- National Science Youth Forum

WORKAROUNDS

Ensuring high school students are industry ready by accessing real-world STEM programs

GOALS & VALUES

I want all high school kids to be industry ready with STEAM skills that are influenced by their life experiences as this will shape their career progression after school.

My goal is to stimulate competition in the kids to expose them to what the larger world is like. Deviating from the traditional STEM teachings and incorporating more real-life learning experiences is my primary goal.

CAPACITIES & RESOURCES

With the robotics programme that I run after school we use ABC Lego robots as well other non-technological resources such as pop sticks and skewers etc. We are also experimenting with design projects via excursions to penguin island and doing case studies on the penguins and other endangered species.

RELATIONSHIPS WITH ORGANISATIONS

- CSIRO with indigenous STEM academy

- Curtin University with the LEGO League

- Indigenous engineering camp at Curtin University

- ABC through Bankwest

STRONG TIES WITH

- STEM departments within school

- Department of Education

STORYWORLD
SCITECH STATEWIDE TEAM MEMBER

THE BACKSTORY

I grew up in the Pillburra region, which is rural and quite isolated. I vividly remember seeing the Scitech van coming down the road to visit my school. This visit inspired my life-long facination and love for science.

My background is in neuroscience, earned my doctorate in the subject. During this time, I real-ised I enjoyed interacting with younger students. I am passionate about providing STEM education to all schools in Western Australia, as I know how vital Scitech's outreach can be in inspiring kids to pursue STEM studies or careers.

I THINK/FEEL/KNOW

- Believes there is a lot of misinformation in the world.
- Thinks that children should start developing critical thinking skills from an early age
- Everyone should have a scientific mindset
- Feels passionate about the capabilities of Scitech presenters

CURRENT SITUATION

- Engaging with clients in the community
- Running programs that Statewide offer
- Maintaining/upkeeping current programs
- Training presenters how to deliver
- Developing new content with the addition of other teams

KEY INSIGHTS

- Consistent, open communication between different teams within Scitech is limited
- Exchange of knowledge and resources between different teams is limited
- Outreach has not been able to provide feedback or contribute the knowledge they have gained while on the road
- Employees unsure if they are ablew to truly create change within their positions

BELIEFS ABOUT CHANGE

I believe that change is needed, but I have doubts that it will happen in any meaningful capacity.

I also do not know how I can have much of a role in that change.

DEVICES & TECHNOLOGIES

I have my laptop, phone, tablet, and access to most tech at the offices.

ISSUES & CHALLENGES

I must work within the parameters set by my superiors, and this can clash with the intentions of myself & the teams I manage or engage with.

STRONG TIES WITH

- Statewide team
- Content Team
- Media Team
- Partnership Team

WORKAROUNDS

- Has power within own sphere
- Able to make some descisions in relation to funding
- Able to grant finanical assistance for rural and remote schools, as well as schools in low-socio economic areas

GOALS & VALUES

I am passionate about bringing Scitech to Indigenous and rural children, as well as those with a low socio-economic status. I know how vital that contact is to inspiring children's interest in science.

CAPACITIES & RESOURCES

- Easy communication with the outreach team
- Cannot easily communicate with superiors
- A decade of experience in current role

RELATIONSHIPS WITH ORGANISATIONS

- Partners that fund outreach programs to go to certain areas
- Employee at Scitech with ties that go back a decade

WEAK TIES WITH

- Indigenous communities
- Diverse communities
- Other educational outreach orgs

STORYWORLD
SCITECH STATEWIDE OUTREACH TEAM MEMBER

THE BACKSTORY

I came from an engineering background, I did engineering and physics at Australian National University and then worked in an engineering start-up for a few years.

I eventually migrated to working full-time in science & communications. I also worked for 5 years in Canberra at National Science and Technology Centre. Then, I moved to WA and landed a role at Scitech.

BELIEFS ABOUT CHANGE

Children should be learning critical thinking skills from an early age to combat misinformation. People will have a bigger contribution to society if they have a scientific mindset.

Wants to see Scitech become more of a learning hub that engages with people across the entirety of the state and gives them skills to run their own programs that Scitech can check back in on. Scitech could de-centralise their role and become a distributive network.

GOALS & VALUES

Wants to foster critical thinking skills to overcome misinformation in the world. Wants more people to have a scientific mindset so that they can contribute more to society. State-wide team tend to share similar values. Believes in transferring skills, not content.

DEVICES & TECHNOLOGIES

Streaming services, prompted by Covid. There is a lot of room for Scitech to grow further into the digital space. There are a few videos on the website.

CAPACITIES & RESOURCES

- Providing programs via State-wide to schools.

- Runs a STEM Club program which goes for a whole semester at schools. There is the potential there to do longer studies of the kids that attend and see what skills they have developed

I THINK/FEEL/KNOW

- Believes there is a lot of misinformation in the world.
- Thinks that children should start developing critical thinking skills from an early age
- Everyone should have a scientific mindset
- Feels passionate about the capabilities of Scitech presenters

CURRENT SITUATION

- Engaging with clients in the community
- Running programs that Statewide offer
- Maintaining/upkeeping current programs
- Training presenters how to deliver
- Developing new content with the addition of other teams

ISSUES & CHALLENGES

Scitech's business strategies may not be in line with what they are trying to achieve.

May lead to a reduction in capacity to achieve compared to what previously happened.

RELATIONSHIPS WITH ORGANISATIONS

Partners that fund outreach programs to go to certain areas

WEAK TIES WITH

- Indigenous communities
- Those that can't afford to interact with Scitech.
- Disadvantaged groups (such as detention centres)

WORKAROUNDS

Presenters have capability to change script on the fly and tailor/adapt to the audience. Presentations are flexible so long as not compromising the key messages in them.

STRONG TIES WITH

- Sponsors
- Outreach Presenters

KEY INSIGHTS

- Scitech's strongest asset are their presenters, especially within the Statewide team. They are basically elite at their job and can teach over a broad variety of contexts.
- Ran a program at a detention centre where a large proportion of people there were of Indigenous descent.
- Thought that Scitech outreach program was valuable for people who are more at-risk.

FUTURE OUTCOMES NETWORK

A future outcomes network highlights across different contexts of the problem the things that are in place and working, not in place but should be, and in place and not working. These are important for us to figure out opportunities to improve future outcomes. The various contexts of the problem include SciTech identity, programs, outreach, diversity, regional, access to data, educational partnerships, educators, and SciTech partners.

KEY FINDINGS

Key areas to note pertained to Scitech's identity, outreach, diversity, and regional. We highlighted opportunities to improve by showing what isn't in place but should be:

Scitech identity
» Catalyst to entice people into Scitech.

Outreach
» Stronger relationship with communities, and information from schools pre-visit about their needs.

Diversity
» Not enough focus on diversity. More access to these communities, such as remotely located stakeholders. Indigenous consultants.

Regional
» Quicker return time. An alternate channel for instant access. Technology/infrastructure for facilitating access.

	SCITECH IDENTITY	PROGRAMS	OUTREACH	DIVERSITY	REGIONAL	ACCESS TO DATA	EDUCATIONAL PARTNERSHIPS	EDUCATORS	SCITECH PARTNERS
IN PLACE & WORKING	Unique	Existing Exhibits Outreach sparking excitement	Enjoyable Experience	Nothing	Regional Visits Face to face once there Audience Participation	Client Data Online Info	Professional Learning Team programs Ongoing support for educators to increase capability	Knowledge of and relationships with students/families	Sponsorship
NOT IN PLACE BUT SHOULD BE	Catalyst to entice people into Scitech	Shifts and changes in programs Relevence to wider age groups Access to experiences	Stronger relationships with communities Info from school pre-visit about their needs	Not enough focus on diversity More access to these communities > remotely located stakeholders Indigenous consultants?	Quicker Return Time Alternate channel for instant access Tech/Infrastructure for facilitating access	Ongoing access to community and stakeholder data > collection strategy > digital x face to face Feedback loop from outreach teams and schools	Funding based on impact potential rather that region/area Focus on expanding networks through teacher-teacher sharing	Embedding this into Scitech curriculum & vice versa	Sharing access to skills & knowledge > Showing links to future oppurtunities > Stem Careers
IN PLACE & NOT WORKING	Scitech is percieved to be for young children Less brand recognition in highschool and beyond Focus on Science pigeonholes Scitech in relation to "TEM"	Not responsive enough Requirements to Access > cost > location > permissions > paper work	Requirements to Access > cost > location > permissions > paper work	Generic Representation View that is isn't a priority (in terms of export?)	Travel via car > access every 3 years	Collection of quantitative data	Location of funding partners determining area of delivery	Single direction of delivery - scitech > schools	Innfluence & Bias - dont understand they could play a bigger role

Figure 41: "Future Outcomes Network"

TOUCHPOINT USER JOURNEY MAP

User journey maps detail a persona's experience when going through the steps of a proposed scenario. They show the touchpoints they will interact with and the actions they will take. Importantly, they show how the persona feels throughout the process. The two scenarios we proposed for a rural primary school teacher were booking a DIY kit to substitute an outreach visit or being contacted by SciTech for an outreach tour. An understanding of teachers from our prior user research and the touchpoints that are involved with Scitech aided in the accurate creation of these user journey maps.

KEY FINDINGS AND OPPORTUNITIES

Opportunities to improve the experience of people that would interact with SciTech came up when creating two scenarios for user journey mapping.

BOOKING A DIY KIT TO SUBSTITUTE AN OUTREACH VISIT

» Opportunity for Scitech to find out more about the needs of the school

» Option for instruction videos or a phone/conference call to provide instruction or advice.

» Option to let teacher keep lesson plans or resources for future use. Maybe a subscription rather than a one-off hire?

» Opportunity to link to next DIY kit.

SCITECH CONTACTING A RURAL PRIMARY SCHOOL FOR AN OUTREACH TOUR

» Opportunity to find out more about the school in terms of ideas about STEM, cultural backgrounds and learning needs.

» Opportunity to provide guidance to teachers about how to prepare for and integrate the visit.

» Opportunity to learn more about how environment and culture impacts ideas about STEM and learning.

» Opportunity to engage the teacher in active improvement of the program and link them with useful resources for use in the classroom.

» Opportunity to link with other teaching staff in school.

JOURNEY MAPS

PERSONA :
RURAL PRIMARY SCHOOL TEACHER

SCENARIO:
CONTACTING RURAL PRIMARY FOR AN OUTREACH TOUR

BEFORE VISIT | **DURING VISIT** | **AFTER VISIT**

TYPICAL JOURNEY	School receives email from the Customer Service Team informing of Scitech tour in their area, extending invitation to book a session	Confirmation of session with Customer Service Team and selection of a show that aligns with curriculum focus of school	Uses DOT session to organise permission slips and organise lesson plans to integrate the session with classroom learning	Sees arrival of Scitech bus on school campus, organising students to head to the assembly area and briefing them for the session	Observes Incursion session and oversees class for behaviour and questions	Reflection session with students	Complete feedback survey for Scitech	Share experience with colleagues
TOUCHPOINT	Email	Email Scitech Website	Scitech Website	Scitech branded red bus	Branded presentation materials Potential prizes for students		Email and survey	Word of Mouth
ACTION	Consultation between teaching staff to determine budget, interest, and teaching or curriculum focuses	Staff research types of Incursion shows Admin sends confirmation email to book session with dates and show	Further research into show and review of Scitech online resources for lesson planning inspiration	Confirmation of session time with admin staff to get students assembled for the correct time	Takes note of topics of interest for class to use in later lessons	Runs feedback session to assess the effectiveness of session Asks about how this relates to classroom learning	Completes and returns feedback survey via email	Has conversation in staffroom with colleagues about experience and how they are integrating it into the classroom

THOUGHTS AND EMOTIONS

	Curiosity about programs and excitement that there is an opportunity to get kids excited about Science	Pressure to fit session into classroom schedule to align witho other classes	Excited about announcing visit to students and getting them engaged with the experience	Pressure to get kids organised on time and for them to behave Anticipation for session	Relief the students are having a good time learning Motivation to implement ideas in the classroom	Interested to hear about the kids interpretation of session and find out what is of interest in the classroom	Happy to provide feedback but I wish there was more guidance for how to integrate the session into the classroom	Interested to find out how others have extended the experience and if they have any ideas I could use

OPORTUNITIES		Opportunity to find out more about the school in terms of ideas about STEM, cultural backgrounds and learning needs	Opportunity to provide guidance to teachers about how to prepare for and integrate the visit	Opportunity to learn more about how environment and culture impacts ideas about STEM and learning		Opportunity to engage teacher in active improvement of program and link with useful resources for use in the classroom	Opportunity to link with other teaching staff in school

JOURNEY MAPS

PERSONA :
RURAL PRIMARY SCHOOL
TEACHER

SCENARIO:
BOOKING A DIY KIT TO
SUBSTITUTE OUTREACH VISIT

	BEFORE VISIT			DURING VISIT			AFTER VISIT	
TYPICAL JOURNEY	School receives email from the Customer Service Team informing of Scitech tour in their area, extending invitation to book a session	School turns down offer due to lack of budget so Customer Service Team offer DIY Kit as substitute, providing information resources	Consultation with teaching staff results in booking of a kit for the year 4 class for the start of the following term	School received DIY Kit in the mail at the end of the term in preparation for next term	Teacher takes DOT session to familiarise with the DIY Kit and plan implementation	Teacher runs through term's worth of sessions with class, using consumables in the Kit	Upon completion, Teacher mails the DIY Kit back to Scitech	Teacher recieves email with survey to complete regarding their experience with the DIY Kit
TOUCHPOINT	Email	PR/Promotional material to share with staff	Email Website Teaching blogs	Parcel and packaging	DIY Kit with packaging, lesson plans & consumables Website	DIY Kit with packaging, lesson plans & consumables Website	Postage Satchel	Email and form
ACTION	Email is filtered through to head of finance who reviews budget and staff need	Reviewing of budget, discussion regarding value of Scitech visit with staff; Principal/vice principal reply to Customer Service team declining offer	Research DIY Kits, reading reviews, initial plan for integration	Signing for parcel, delivering to classroom	Teacher scans through lesson plans, organises consumables for each session and plans approach, talks to other staff about Kit	Implementation in the classroom, minimal planning outside of class time as Kit has everything provided	Teacher returns Kit to administration staff who post it back to Scitech, taked photocopies of lesson plans for record	Fills out digital form during DOT period, talks to other staff about experience

THOUGHTS AND EMOTIONS

NEUTRAL

Excitement that there is an opportunity to get kids excited about Science

Disappointment that students will miss out on an exciting and rare visit

Hopeful that the DIY Kit will still be engaging and the students will be inspired by it

Excitement to receive the package mixed with apprehension about the process

Motivation to get started and relief that all the resources are provided and ready to go

Relaxed about running the lessons and inspired to get the kids involved in the sessions

Slightly inconvenienced to have to organise postage and wishing the kit could be kept to future use

Nice to have a follow up but would like support to be continued

| **OPORTUNITIES** | | Opportunity to find out more about the needs of the school | | | Option for instruction videos or a phone/conference call to provide instruction or advice | | Option to let teacher keep lesson plans or resources for future use. Maybe a subscription rather that a one off hire? | Opportunity to link to next DIY Kit |

05

INSIGHTS & DIFFICULTIES

ANALYSIS OF OUR RESEARCH AND INSIGHTS FOR THEMES, COMMONALITIES AND LINKS ENABLED US TO IDENTIFY A NUMBER OF PROBLEM AREAS, OPPORTUNITY SPACES AND GAPS IN OUR KNOWLEDGE THAT CHANGED HOW WE VIEWED THE INITIAL PROBLEM.

THROUGHOUT THE PROJECT WE KEPT TRACK OF A LIST OF QUESTIONS THAT WE FELT WERE RELEVANT TO OUR LINE OF ENQUIRY. THESE HELPED US TO THINK ABOUT THE AREAS OF CONCERN, FUTURE OPPORTUNITIES AND THE IMPACT THAT FACTORS OUTSIDE OF OUR CONTROL HAD ON THE PROBLEM SPACE. WE HAVE DECIDED TO INCLUDE THESE TO GIVE CONTEXT FOR OUR PROCESS
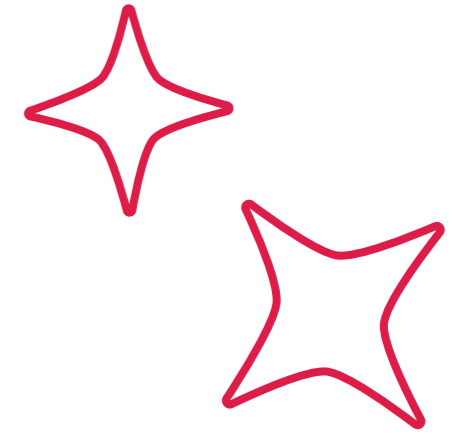
» IS THE AIM TO INSPIRE OR EDUCATE?

» CAN WE MAKE STEM THE FOUNDATION FOR LEARNING OTHER SKILLS (SUCH AS LITERACY)?

» ARE SCITECH LIMITING THEMSELVES BY STICKING TO STEM? DOES IT EVEN NEED A TITLE?

» WHY ARE THERE NO WALK-THROUGHS OF THE EXHIBITIONS ON THE WEBSITE FOR THOSE THAT DO NOT HAVE ACCESS TO THE PHYSICAL CENTRE?

» CAN SCITECH STREAMLINE LEARNING BETWEEN IN-CENTRE AND OUTREACH? WEBSITE RESOURCES?

» IS THE CURRICULUM CORRECT?

» CAN THE GOVERNMENT CHANGE THE WAY STUDENTS LEARN?

» ARE SCITECH LIMITING THEMSELVES BY VIEWING SIMILAR SERVICE PROVIDERS (SUCH AS THOSE IN THE PRECEDENCE STUDIES) AS COMPETITORS RATHER THAN OPPORTUNITIES TO COLLABORATE?

PROBLEM AREAS

DEFINITION AND BARRIERS TO STEM

A combination of our initial desk research into the definition of STEM and the user research we conducted exploring meaning and perception highlighted that there was a disparity between the understandings of the stakeholders about a concept which was intended to be a point of engagement. As a term that is often perceived as a literal reference to Science, Technology, Engineering and Maths, this has the potential to create a barrier to stakeholders engaging with Scitech for STEM based programs. From our interviews, we know that the skills identified as valuable by our stakeholders included things like critical thinking, problem solving, creativity, and analysis. Although these do align with the skills Scitech aim to deliver through their STEM based programs, it appears that labelling them with the term STEM may limit engagement based on interpretation.

This is further amplified by research into participation in STEM by women and Indigenous communities. As a term associated with a male dominated industry that requires a tertiary qualification to enter, connotations of the term present barriers to engaging with Scitech's programs for these key target groups.

In addition, we found that STEM is an area that teachers struggle to integrate in the classroom due to a lack of understanding about how the literal subjects can be taught in a way that aligns with the curriculum and marking criteria. The unstructured nature of STEM delivery poses challenges for teachers who are time and resource poor and may not specialise in these subjects.

DIVERSITY AND REPRESENTATION

Lack of diversity and representation of program design and delivery is an area that creates challenges for engaging with diverse communities. Children are most likely to engage with learning environments in which they see themselves represented and have their cultural identities acknowledged and celebrated. This includes placing value on different types of knowledge and the personal experiences and contributions of each student. Feeling valued and included provides an empowering environment in which students are engaged and motivated. Inclusion of more diverse representation and knowledge in the design and delivery of Scitech's programs has the ability to increase impact and engagement with diverse communities around the State.

Figure 44: "Problem Brainstorming"

IS THE AIM TO INSPIRE OR EDUCATE?

Throughout our user research and review of strategic plans, we uncovered differing views about whether the aim of outreach programs was to inspire and spark interest in STEM or provide STEM education. This view was also echoed in opinions of stakeholders, some of which viewed Scitech as a fun, one off experience, while others were more aware of the educational capacity of service offerings. Becoming clear on the aim of Outreach is a way to unite staff about their role and vision for development and delivery of programs, as well as delivering a strong message to key stakeholders who benefit from services.

OPPORTUNITY SPACES

CAPACITIES AND EXPERIENCES

Through our user research we uncovered incredible knowledge and experiences of Scitech teams that could prove incredibly valuable in the evaluation, improvement and design of programs. In particular, we found that teams who were the main point of contact between Scitech and the core actor groups were incredibly insightful in both their professional knowledge and their understanding of the needs and experiences of those they were engaging with.

The Professional Learning Team holds in-depth knowledge into the Australian Curriculum as well as understanding the needs and experiences of teachers in the classroom on an everyday basis. Through their personal networks they can expand the reach of program delivery and engagement.

The Statewide Team holds invaluable insight into the experiences and needs of communities when engaging with Scitech on the road. As part of their delivery of programs they have the skills required to adapt content and delivery to meet the requirements of audiences and understand the challenges faced when implementing standardised programs with diverse communities who each have their own cultural, resourcing and learning needs.

Through analysis of the way in which knowledge and insight is passed between the teams within Scitech, we identified the great opportunity which harnessing this knowledge and experience could have in shaping and improving program design and delivery.

MODIFICATION OF DATA GATHERING

Through journey mapping, we were able to identify several key points that Scitech engages with core actor groups to gather information throughout their interaction. These points highlight key opportunities to expand the types of data Scitech are collecting to include information on cultural diversity, ideas about STEM, resource requirements and learning needs. Increasing channels for Scitech to understand the unique circumstances and requirements of communities will enable delivery of services that are more personalised and useful to stakeholders.

UTILISING COMMUNITY KNOWLEDGE

It is important to note that every stakeholder is an expert of their own situation, experience and needs, providing valuable knowledge and insight that can be used to inform program design and delivery. Going beyond just collecting data through existing channels, embedding these people and communities in the process will result in highly functional, effective and relevant programs that will help to build cultural competency of not only Scitech but the broader community. By creating an interconnected web of insight and knowledge exchange, we have the opportunity to create deeper impact as well as the development of a highly-connected STEM community, building on pillar two and four of the New Scitech Strategy.

PARTNERSHIPS AND COLLABORATION

In our review of organisations that were delivering projects in the same space, we identified programs with shared funding partners which lend to the opportunity to pool resources for service delivery. Whilst these organisations are usually considered competitors, we uncovered that each shares a vision to increase participation, break down barriers and create more engaging, culturally relevant and inclusive educational experiences. If not to partner, this shared vision provides a foundation to create complementary services that will support this goal, playing to the strengths of each organisation to provide an educational experience that will enhance the lives and experiences of core actor groups now and in the future.
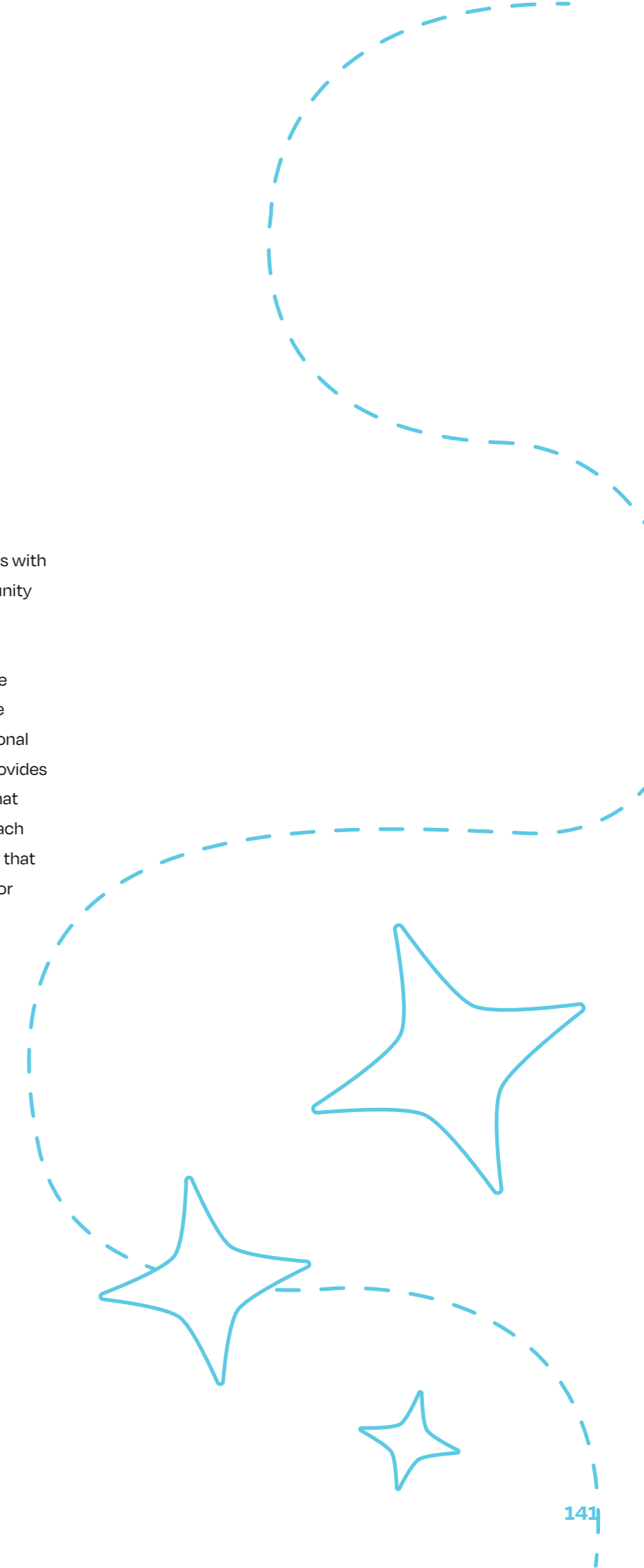
DIFFICULTIES & GAPS IN KNOWLEDGE

ACCESS TO KEY STAKEHOLDERS

Conducting intensive user research with remote communities proved difficult for our team. Locational barriers and the lack of pre-existing relationships which would allow for open, trusting communication of rich insight meant that we were only able to engage with members of remote communities who held positions as teachers and program providers. Moving forward into the second phase of the project, we would like to work closely with Scitech to identify and develop avenues to begin developing these relationships so we can better understand the needs of these communities.

Another significant barrier we faced was access to Indigenous communities. These communities, more so than any other within the core actors, require a prolonged period in which to build trust in organisations and individuals. The team understood from the beginning that designing with Indigenous communities, rather than for, was essential to addressing the design problem. We also understood that Scitech showed a strong desire to connect and co-design with Indigenous communities. However, we found that no infrastructure for a relationship between Scitech and Indigenous communities existed. In addition, the team did not have the time or resources in which to lay the groundwork for this relationship over the course of a semester.

EXPERIENCE OF A REMOTE INCURSION

Due to restrictions faced by COVID-19 and time constraints around school holidays and the timeline of the project we were unable to observe an outreach incursion. We understand that this is a crucial element of current program offerings and although we sought to understand through review of video content and interviews with the 2020 Murdoch Project team, this is an experience that we have prioritised to observe early in the second phase of the project.

Figure 45: "Remote Interviews"

06

REDEFINING THE PROBLEM

WHERE ARE THE FOCUS AREAS?

The project is still focusing on state-wide and how to engage students outside of the metro area. We drew in the key actors and focus to teachers, students, and communities. We will be focusing less on internal Scitech teams, board members, government departments. We determined the importance of community engagement with students' studies which can inspire them to obtain STEM-based jobs in their communities. We determined the importance a teacher plays in the delivery of STEM. If a teacher is supported and equipped with the appropriate tools for delivering programs that are to influence the decisions students make to pursue higher education and get into these areas, the probability of these students making it is higher.

Students need to be inspired by engaging STEM programs that are supported by arts and humanities. The word STEM is restricting students and placing them at a disadvantage. STEM has a broader term beyond science and maths, and using this phrase will rule out girls wanting to study these subjects as they perceive this as something boys do, that it is not for girls even though they perform just as well or even better in these subjects. By creating programs that use the outside environment, supported by HASS and arts subjects will inspire children to pursue these jobs later in life, it is all about the right type of influence that is culturally inclusive and diverse.

NARROWING DOWN THE SCOPE

TERTIARY ACTORS

SECONDARY ACTORS

PRIMARY CORE ACTORS

CULTURAL COMMUNITY GROUPS AND ADVISORS

LOCAL INDUSTRIES/ PARTNERS

HIGH SCHOOL TEACHERS

EARLY CHILDHOOD EDUCATORS

PRINCIPALS

DEPARTMENT OF EDUCATION

COMMUNITY CENTRES/GROUPS

STUDENTS WITH DISABILITIES

DEPARTMENT OF COMMUNITIES

FAMILIES OF STUDENTS WITH DISABILITY

SCITECH BOARD MEMBERS

INDIGENOUS FAMILIES

FEDERAL GOVERNMENT

CULTURALLY/ LINGUISTICALLY DIVERSE FAMILIES

OTHER EDUCATION PROVIDERS

SCITECH FUNDING PARTNERS

STATE GOVERNMENT

OTHER SCITECH TEAMS

Other Scitech Teams Include: customer service manufacturing product maintenance

CULTURALLY/ LINGUISTICALLY DIVERSE STUDENTS

STUDENTS FROM LOW-SOCIO ECONOMIC COMMUNITIES

INDIGENOUS STUDENTS

REMOTE PRIMARY SCHOOL TEACHERS

METRO PRIMARY SCHOOL TEACHERS

PUBLIC SCHOOL TEACHERS

PRIVATE SCHOOL TEACHERS

SCITECH CUTSOMER INSIGHTS TEAM

SCITECH CONTENT TEAM

SCITECH EXPERIENCE TEAM

SCITECH STATEWIDE TEAM

SCITECH PROFESSIONAL LEARNING TEAM

Figure 46: "Refined Core Actors Map"

NARROWING DOWN THE SCOPE

After evaluating all of our information that we gathered through our preliminary and user research, we were determined to narrow down the scope of the project. We revisited our original core actors map and adjusted based on new insights. Our narrowed core actor group includes:

» Culturally/ linguistic diverse communities
» Indigenous students
» Students from
low socioeconomic communities
» Remote primary school teachers
» Metro primary school teachers
» Public school teachers
» Private school teachers
» Scitech Customer insights team
» Scitech content team
» Scitech experience team
» Scitech statewide team
» Scitech professional learning team

REDEFINED PROBLEM STATEMENTS

Problem Statements are a phrase or sentence that articulates the key challenges of a project, potentially from the perspectives of the different stakeholders. They help to develop a shared understanding as a result of initial analysis of the problem. There is potential for the problem statements to shift and change throughout the course of the project as new insights are gained and further problems are uncovered (Lewrick et al. 2020).

Our key insights and narrowing of the scope culminated the generation of problem statements that would guide the project forward into the next phase.

1. HOW MIGHT WE CREATE CHANNELS FOR THE EXCHANGE OF ALL TYPES OF KNOWLEDGE BETWEEN DIVERSE COMMUNITIES AND SCITECH THAT WILL LEAD TO GREATER AGILITY AND REPRESENTATION IN PROGRAM CREATION AND DELIVERY?

2. HOW MIGHT WE CO-CREATE SHARED VALUE FOR FUTURE FOCUSED SKILLS THAT WILL EMPOWER COMMUNITIES TO BUILD MORE SUSTAINABLE, INNOVATIVE AND INCLUSIVE FUTURE-ORIENTED OUTCOMES?

07

IDEATION

WHAT IS

IDEATION?

Will Kenton (2021) describes ideation as "the process of developing and conveying prescriptive ideas to others through a descriptive sequence of thoughts, from the original form of conception to implementation."

Ideation is expressed using visualisation tools, that is comprised of multiple written, concrete or abstract techniques, activities or even verbal methods. Ideas from these sessions can arise from past and present knowledge, influences, opinions and experiences of the group completing the tasks. Anyone can take part in this process, regardless of position, qualifications and skills. This process relies on the contribution of everyone within a team or organisation, to cultivate and include everyone's ideas.

The sole concentration is to create, generate, develop and communicate ideas for the construction of concepts towards a problem. The supporting group of students played a key role in the Ideation phase of the project, sparking innovative and original ideas based on their varied contextual backgrounds. This strengthened our ability to consider multiple perspectives and frames of reference when ideating to address the problem statements.

Figure 47 "GRD503 Design Thinking Tools Workshop"

IDEA GENERATION ACTIVITIES

» **Crazy 8s**
» **Alternate Universe Challenge**
» **Word Association**
» **30 Different Ways to Learn**

CRAZY 8'S

Crazy 8 is an exercise where those that are working on a project must sketch 8 ways to use an object, to complete a task, or to perform a service in a restricted amount of time. This generates creative and abstract ideas in an unrestrictive way, forcing participants to share ideas without the time to cast judgement. We started off with an example exercise looking into 8 ways we could use a paper clip. The second time we did this exercise, we explored a task related to the problem space; 8 different ways we can communicate with each other. Some ideas that spawned were using smoke signals, sign language, brail, message in a bottle and more.
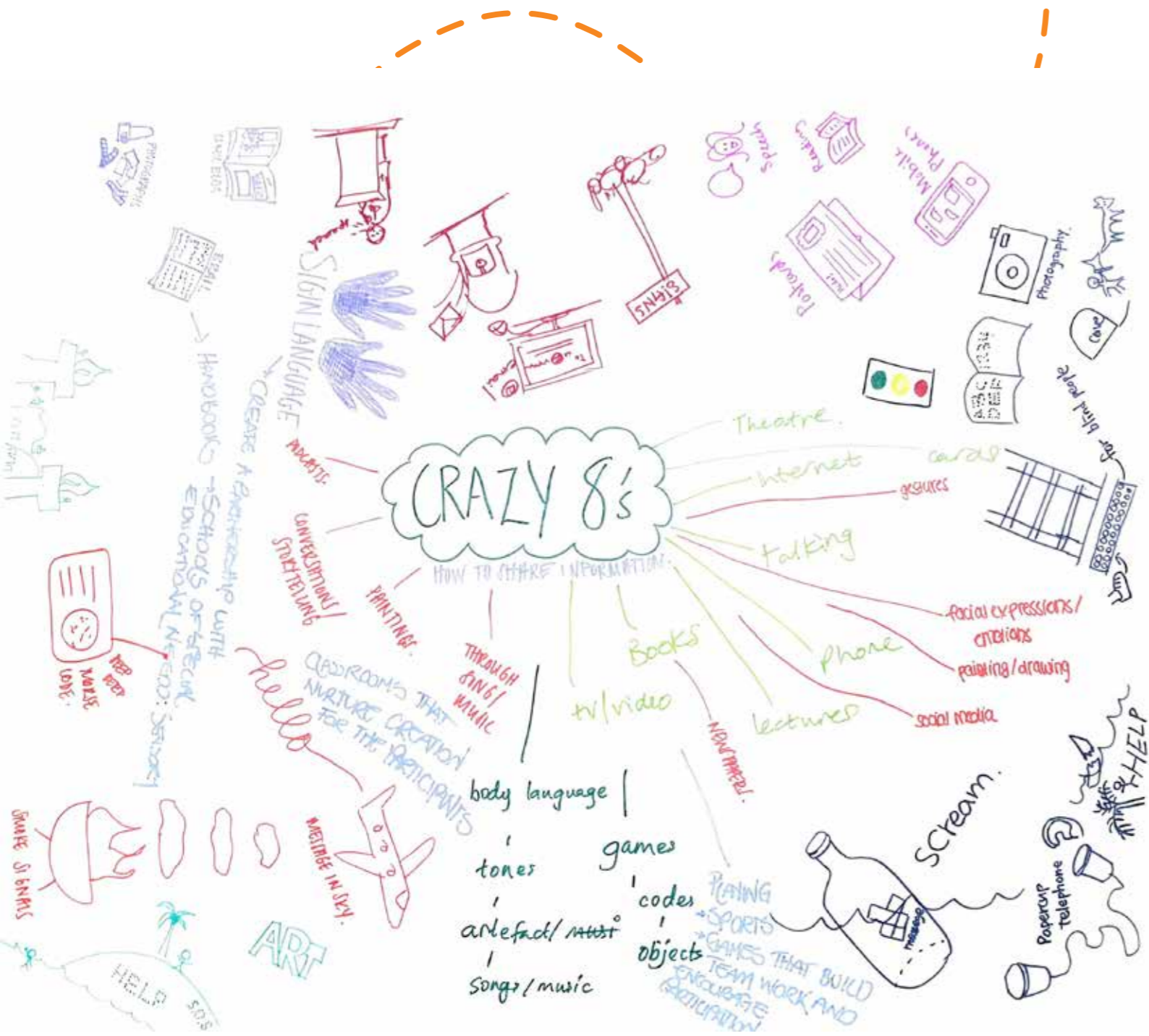
Figure 48: "GRD503 Design Thinking Crazy 8's Workshop"

Figure 49: "GRD503 Design Thinking 30 Ways To Workshop"

Figure 50: "GRD503 Design Thinking Alternate Universe Workshop"

30 WAYS TO...

Following this we completed an exercise to come up with 30 ways to learn, which allowed us to investigate the project problems with an unconventional approach. This exercise forces us to think in unique and outside of the box ways in which we share,

consume and think about learning. These exercises provided output ideas and delivery methods that could be combined to explore more conceptual ways to address the problem statements.

ALTERNATE UNIVERSE

This exercise encourages thinking using abstract techniques. We explored ways to address the problem statement by imagining them in other contexts. An example would be to imagine ways we can travel in the world of "The Hunger Games", or in "Star Wars". By introducing universes to the problem statement, we can

think of abstract ways to address the problems in this project. We explored ways we can share learning in the worlds of "Harry Potter" and "Narnia". By removing that barriers that make our ideas unviable in the 'real world' we are able to ideate without restriction, resulting in more innovative and creative ideas. These ideas can then be re-framed in the current world to explore ways to overcome the limitations we know to exist.
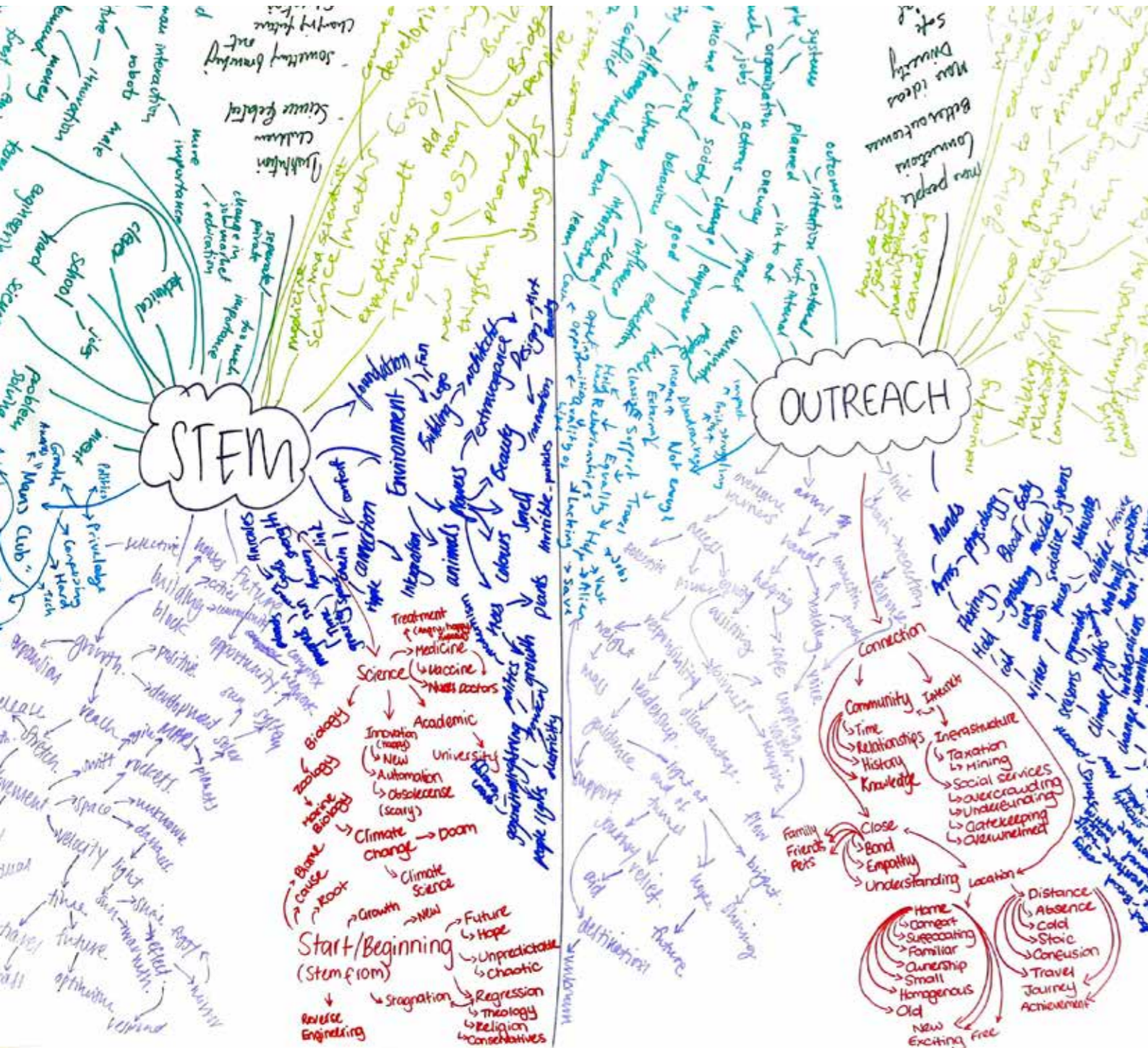
Figure 51: "GRD503 Design Thinking Word Association Workshop "

WORD ASSOCIATION

In this exercise, we took the words that have been common to this project, such as, "STEM" and "Outreach". We recognized these as the most significantly recurring words to the project and its problem. We were able to come up with an immense list of words associated with the meanings of both "STEM" and "Outreach" and compiled two large lists. This was an important exercise in re-affirming our research into the differing definitions and interpretations of STEM. Conducting this exercise with a group of culturally diverse students helped us to understand that personal contexts have an incredible influence on perceptions and understandings of words and shape the ways in which we relate and engage. The value each individual placed on STEM was directly reflected in the types of words they chose to describe it. These two lists were then used, taking one under "STEM' and a second under "Outreach" to form a small phrase that created a new meaning. For example, some of the new meanings were "Unity Trees", "Lightning Arms", "Rigid Matrix", "Academic Myths" and many more. These phrases would give new meanings to the project while also helping the team come up with ideas for the project.

CONCLUSION

With these exercises completed, we managed to prep our minds to become ready for taking these ideas to create rough concept stories. After creating these concept stories, we then determined their viability against our problem statements, determining if it was possible to create the idea both economically and if it manages to address the problem statement.

CONCEPT STORIES

When working on several idea generation activities in large groups of multidisciplinary teams, a range of concepts tend to emerge. To flesh these out in greater detail, we create concept stories that position us to build a backstory and provide context. This is to help others understand the ideas that have been created. These ideas need to be supported by who will use it, and what the experience and value measure is.

In this exercise, we all took our ideas and drew them out to work out the fine details in the clearest way possible. We use texts, drawings, diagrams, interaction, and sometimes create them on a linear story-line.

Figure 51: "GRD503 Design Thinking Concept Stories 01 "
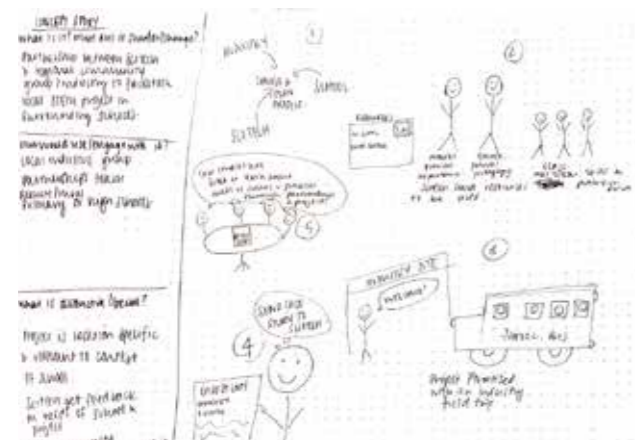
Figure 53: "GRD503 Design Thinking Concept Stories 02 "

YouTube Ad

Weekly STEM podcast for primary school

Radio program/ podcast interviewing people in STEM careers

Expansion of teacher training via online delivery

"Book" DIY Kit

Online Project Database

Scitech rebrand with wearable touchpoints

STEM App for parents

Scitech online learning

Scitech App for teaching rescources

Collaborative Exhibition

Mobile STEM Challenge App

Data collection for Scitech to improve cultural knowledge

Scitech regional community partnership

Local Government STEM challenge in community

Daily Guides for parents/teachers on STEM

STEM workshops for deaf children

Project exhibition

UNLIKELY TO CREATE CHANGE

Stop focusing on teaching STEM

LIKELY TO CREATE CHANGE

STEM TV Program

YouTube series following school STEM projects

STEM Cartoon

STEM in a Vheicle

School panel/ event to share STEM projects

Online STEM lessons support- ed by delivered rescource Kit

Annual Scitech STEM challenges - results shared via YouTube

Nationwide STEM competition

In school STEM competition

Remote Scitech Centre

Indigenous Exhi- bition at Scitech

MORE VIABLE

LESS VIABLE

Figure 57: "GRD503 Design Thinking Viability Map"

VIABILITY MAPPING

Viability mapping is an essential part of the process, this allows us to narrow down the concepts that were generated in our ideation activities in relation to our problem. By narrowing these concepts, it also allows us to converge multiple aspects to create stronger concepts. This allows us to assess our ideas in terms of how viable they will be and comparing the economics and reality, along with how well it fits our redefined

problem statements and addresses all issues relating to the project. Thinking about concepts is this way enables us to consider the types of exchanges that would need to occur between stakeholders in order for them to be successful, as well as the types of infrastructure required for implementation.

On the top right-hand corner, these are the ideas that

seemed the most viable for the project, while the bottom left shows us the least viable ideas that would not contribute to the project adequately. This gave us a clear indication of which of the ideas were most useful in supporting our problem statements, further narrowing down the possible project ideas that contribute to the experiences we are aiming to create.

08

PROPOSED OUTCOMES

IMAGINING THE FUTURE SERVICE SYSTEM

 What became apparent through this exploration was the importance of shared and reciprocal knowledge exchange between all stakeholders. The future service system can be imagined as a network that allows sustained sharing and building of understanding through acknowledgment and celebration of diverse experience and insight that all can contribute.

In order to show how this network can be supported and implemented, storyboards of three concepts were developed to illustrate diverse types of knowledge exchange that occur within this system. A storyboard acts as a graphical representation of the idea as a sequential drawing, with the addition of dialogue that explains the process in a linear storyline to show the passage of time. Similar to a comic book, a storyboard is used to identify the core elements, actors, and narrative that allows us to see the insights of the ideas generated from the planning phase.

 It must be noted that these concepts are by no means proposed as finalised outcomes, they purely demonstrate exchanges.
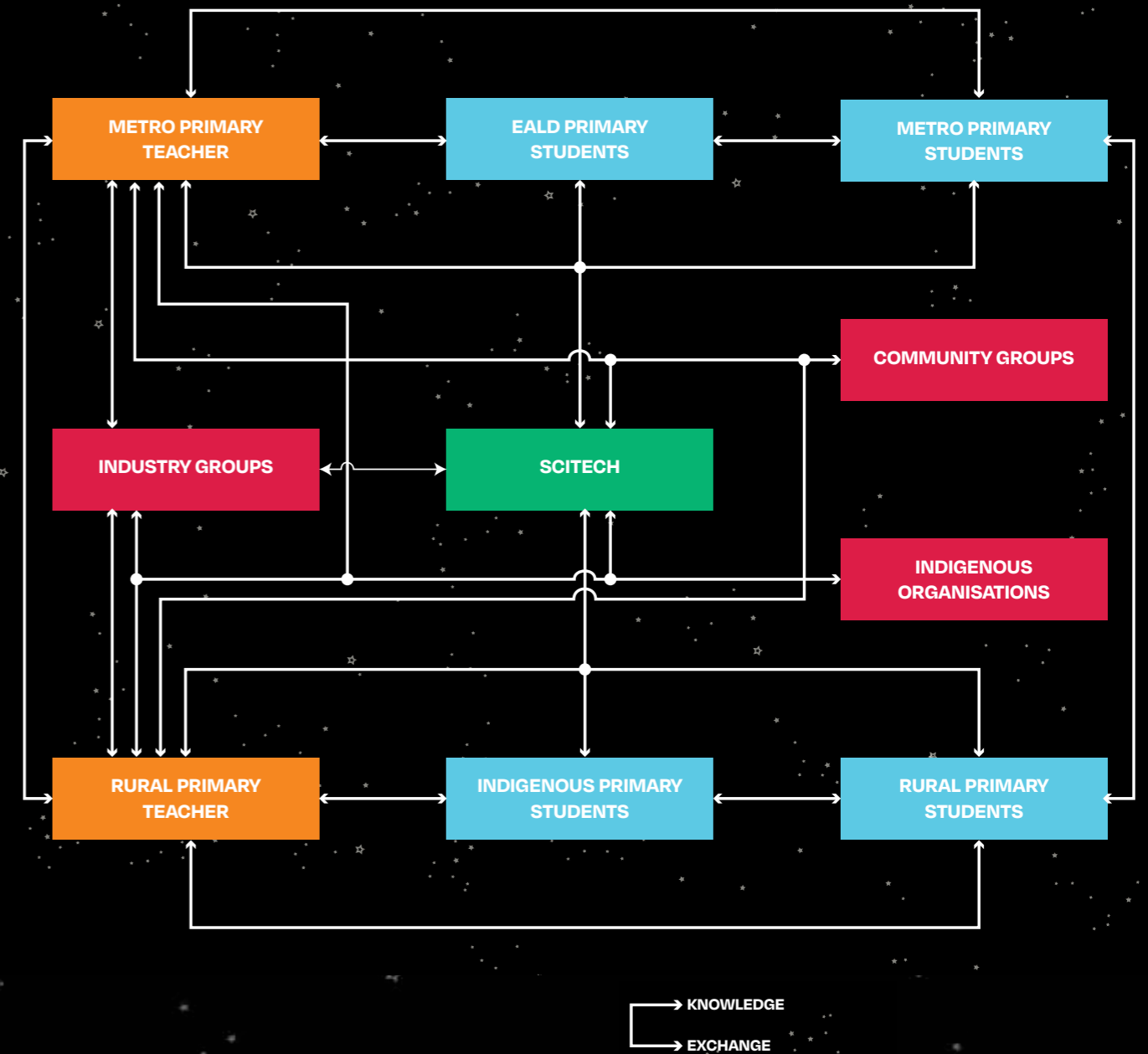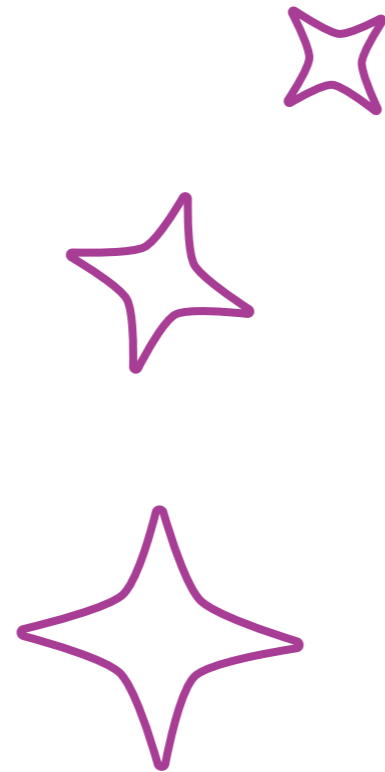
Figure 58: "Future Service System"

COLLABORATIVE EXHIBITION

This concept entails a two-way collaborative interaction between SciTech and Karratha Primary school. Engaging with year 4 teacher Samantha Stewart. Samantha currently teaches maths and science to year 4 students. She is also the STEM coordinator at Karratha Primary school. She is currently teaching her science students the importance of climate change and its implications for farmers in rural Western Australia. She has been in contact with the SciTech outreach team and has expressed interest in co-designing a STEM project with SciTech that involves a hands-on experiment that deals with climate change due to its implications of farmers in the Karratha region.

EXCHANGES

» Remote communities share cultural knowledge, community perspective, and specific skills and context with Scitech

» Scitech shares this perspective with Metro audiences through a display at the Science Centre.

» Contributes to shared understanding about the applications of critical thinking and problem solving and how cultural context shapes the way we engage with problems and challenges.
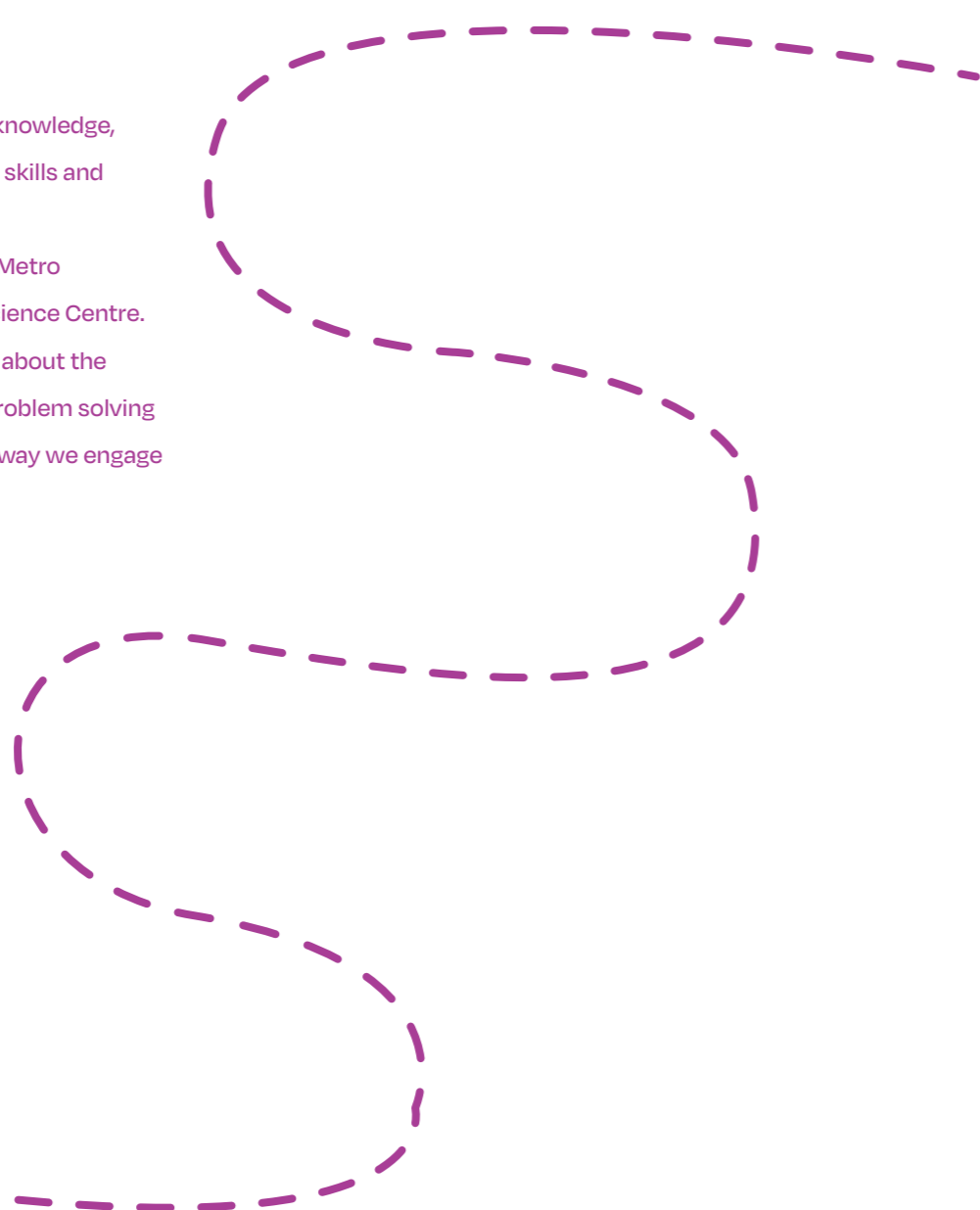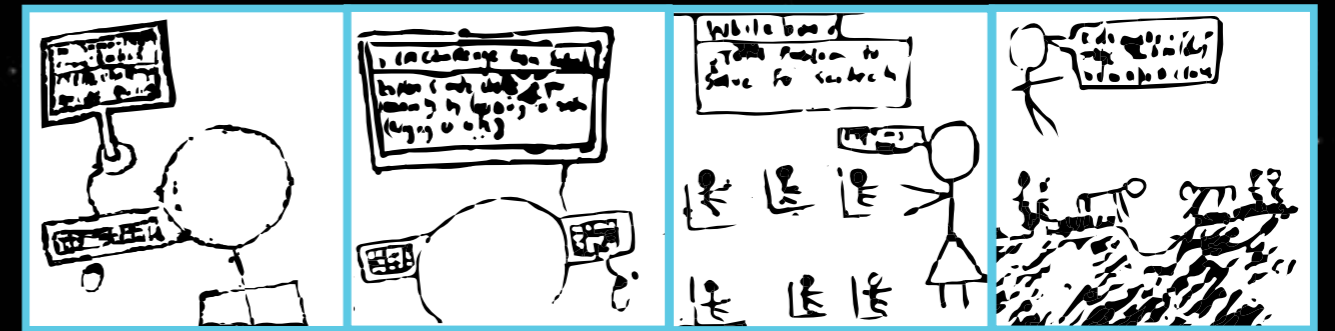
Teacher goes and sends email to the Scitech team

Teacher accepts and reads the assigned STEM challenge

How can we make the soil hold more water? (explained to class)

Children obtain soil from farm land near schoolTeacher accepts and reads the assigned STEM challenge

Children borrow animal manure from farmer and uses it at organic metter

Teacher takes a photo of the experiment with students

Teacher sends the photo to the Scitech content team to put up for the exhibition

Scitech puts photo up in their exhibition space in the metro centre

METRO PRIMARY TEACHER

EALD PRIMARY STUDENTS

METRO PRIMARY STUDENTS

COMMUNITY GROUPS

INDUSTRY GROUPS

SCITECH

INDIGENOUS ORGANISATIONS

RURAL PRIMARY TEACHER

INDIGENOUS PRIMARY STUDENTS

RURAL PRIMARY STUDENTS

KNOWLEDGE

EXCHANGE

Teacher receives promotional email from Scitech as a followup from visit, announcing online resource for STEM

Lands on page and selects education stream

Answers scoping questions and platform generates suggestions for projects

Picks project that sounds engaging and watches info video that talks about learning outcomes and adapting the project

Downloads project session plans and sends materials list to EA to collect

Runs first sesion in classroom with prompts, reviewing session afterwards

Notes areas of struggle and accesses project blog/forum to teacher experiences and advice

Submits review & evaluation of student outcomes on forum before accessing new project

ONLINE PROJECT RESOURCE FOR TEACHERS

Online platform providing curriculum-aligned projects for primary and high school teachers that help to develop critical thinking, problem-solving and enquiry skills across range of subjects, developed by the Professional Learning Team (PLT). Teachers can sign up, select their teaching setting and answer questions about their learning objectives and classroom needs and are presented with a selection of projects to choose from. Each project page provides session plans and a comprehensive list of materials that can be digitally downloaded or printed, an introduction video that addresses learning objectives and ways to adapt the project for learning needs. Blog/forum for each project provides a space for teachers to share how they have implemented projects and ask advice for how to integrate and adapt. Completion of project results in a follow up session with PLT for feedback, review and advice for teaching, supported by an online feedback form for use by the experience team in understanding classroom interests and needs. The online platform suggests other projects to move on to as well as Scitech Incursions that could support areas of learning.

EXCHANGES

» Sharing of experience and education knowledge between Metro and Rural teachers.

» Scitech shares educational resources and guidance with teachers.

» The forum provides an opportunity for Scitech to understand the experiences and needs of teachers and their communities.

COMMUNITY PARTNERSHIP

The idea for a community partnership would allow SciTech and industry to connect and discuss an opportunity for regional schools to gain experience working on a project for industry using STEM skills. This would allow the regional schools to give the students real-life practice using STEM skills and give industry partners incentive to fund these projects since the students can work on a project for them. The project would then fund the students to be able to travel to an industry site for a day and understand the project better. After a period of time when the students finish working on the project, a case study can be compiled that is given to SciTech. The industry partnership will benefit because the students are working for them on a problem. The students will benefit because they will utilise STEM skills during the project. SciTech will benefit from industry funding and having proof via the case study that they are providing skills to these regional schools that often get left out.

EXCHANGES

» Sharing of industry or community knowledge between partner, Scitech and community.

» Communities share with industry partner how their experiences shape understanding and exploration of a problem specific to their context.

» Industry partner provides skills, resources and knowledge to Scitech and the community.

» Scitech shares educational resources and knowledge with the community.

Scitech + industry reach out to regional high schools

School accepts offer and is sent rescources from scitech

Students are introduced to project

Project facilitated with an industry field trip

Student use STEM skills to problem solve

Send final case study to Scitech
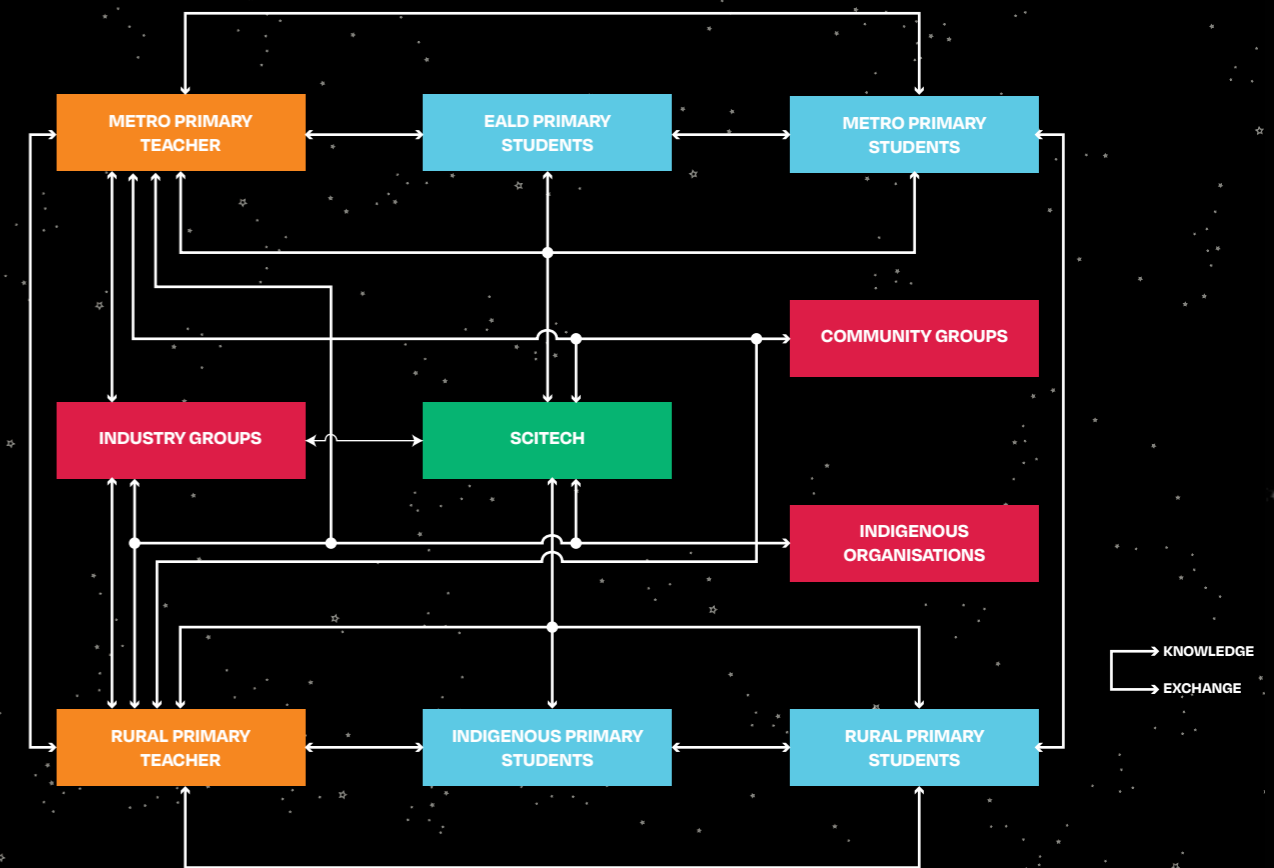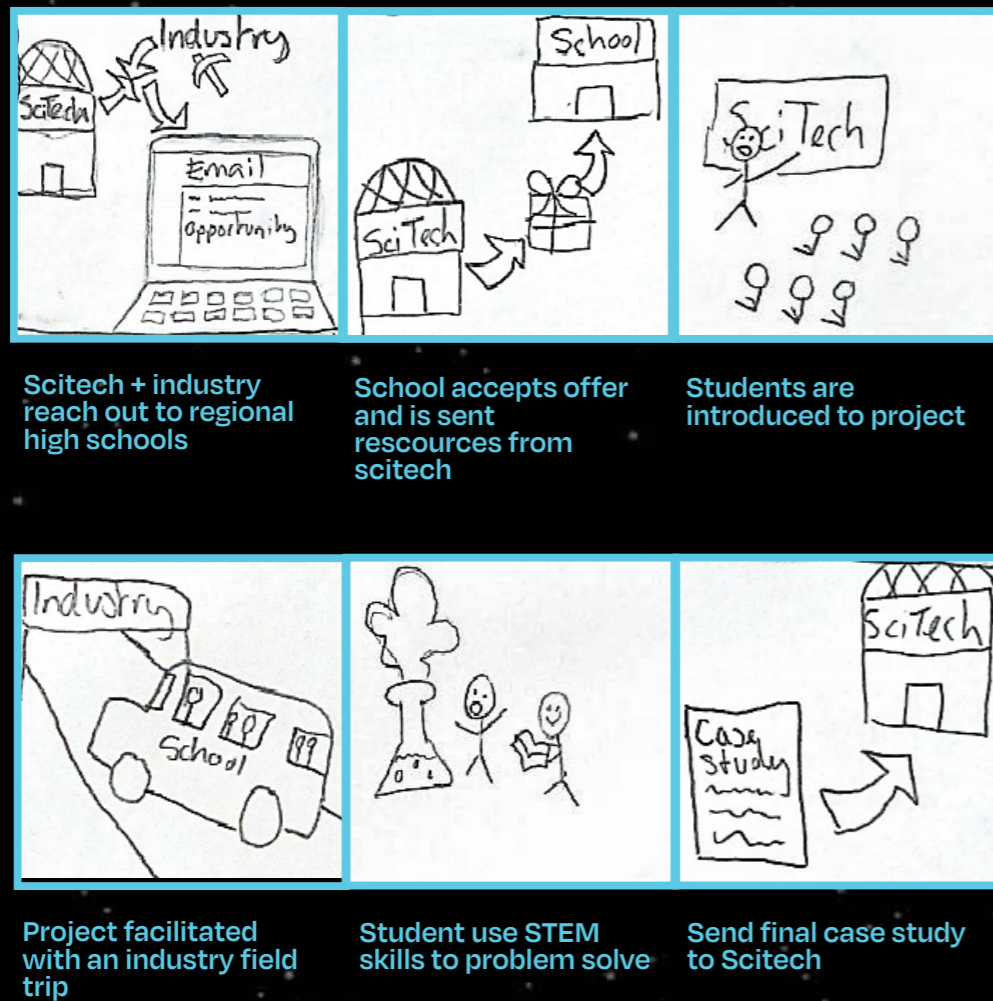
Figure G1: "Community Partnership Storyboard"

EXPERIENCE MEASURE

Currently, Scitech's main measure of experience is through the achievement of KPIs with the aim of reporting to funding partners. We understand that these measures are required to document financials and secure backing for the delivery of programs. We have also noted that these measurement tools are quantitative in nature and miss the opportunity to measure the qualitative impact programs are having on the experiences of stakeholders. To gain a clearer understanding of the way in which current programs and the future service system will influence the lives of those impacted as well as the landscape of STEM, industry, and educational contexts, it is important to implement tools that aim to measure growth and change by way of participation, perception, collaboration, and opportunity. We are interested in the impact the system will have on all stakeholders over an extended period and know that a human-centred approach to reporting will be required to do so.

This new way to measure experiences is something that we will need to investigate alongside Scitech in the next phase of this project, aligning the aim of the project with the outcomes measured. Taking a qualitative approach to measuring impact rather than relying on numbers can be daunting to organisations that are used to immediate indicators of success. We believe that a combination of experience measures are required to assess and modify the system to facilitate these future-ready learning experiences.

As a starting point, we wanted to revisit our core actor groups and envision the experiences they may have as a result of the new service system.
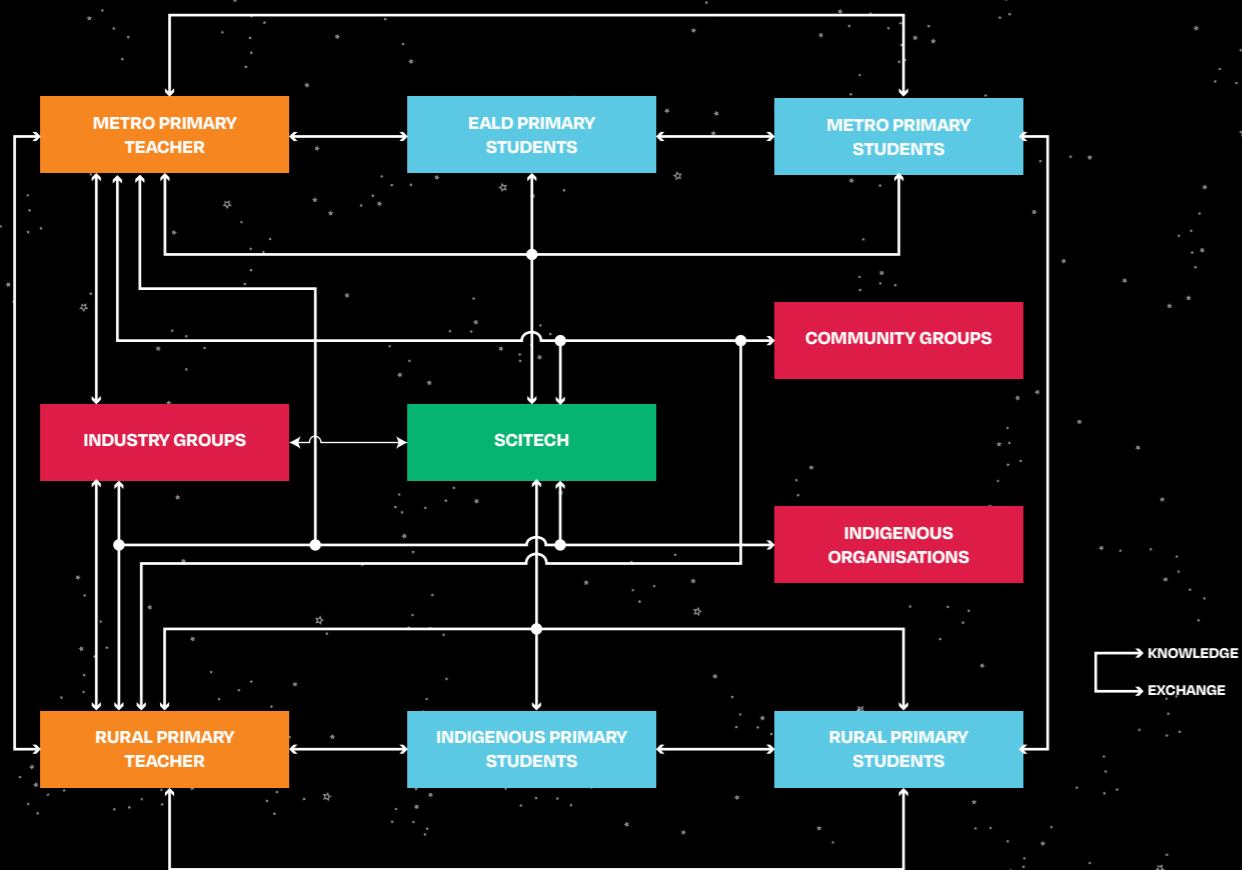
"I HAVE THE OPPORTUNITY TO CREATE ALONGSIDE SCITECH, PROGRAMS WHICH MEET MY TEACHING NEEDS AS WELL AS THE LEARNING AND CULTURAL NEEDS OF MY STUDENTS. I HAVE NEVER FELT MORE CONFIDENT IN ENGAGING MY STUDENTS WITH EXPERIENCES WHICH WILL INSPIRE OUR COLLECTIVE FUTURE!"

- Remote Primary School Teacher

"WE HAVE THE OPPORTUNITY TO WALK HAND IN HAND WITH OUR COMMUNITIES AND HELP THEM TO NUTURE THE FUTURE FOCUSED SKILLS OF THE NEXT GENERATION TO BUILD A WORLD IN WHICH WE ALL THRIVE. DIVERSE KNOWLEDGE RESULTS IN RICHER INNOVATIVE POTENTIAL!"

- Outreach Team Member

"AS HOLDERS OF CULTURAL KNOWLEDGE AND EXPERTISE, WE HAVE THE OPPORTUNITY TO WORK ALONGSIDE SCITECH AND OUR LOCAL EDUCATORS TO EMPOWER STUDENTS TO HARNESS THEIR UNIQUE CULTURAL PERSPECTIVES IN THEIR LEARNING JOURNEYS!"

- Community Leader

"I GET TO JOIN IN WITH SUPER EXCITING PROJECTS WITH SCITECH AT SCHOOL. WE EXPLORE QUESTIONS WE FIND IN OUR COMMUNITY AND I GET TO SHARE THINGS I LEARNED WITH MY AUNTIES ON COUNTRY WHICH MAKES ME FEEL REALLY IMPORTANT AND LIKE I BELONG AT SCHOOL!"

- Indigenous Primary School Student

Figure 62: "Future Persona Experiences"

OUTCOMES

1. AN INNOVATIVE WAY TO REMOTELY DELIVER FUTURE-READY LEARNING EXPERIENCES BEYOND PERTH METRO REGIONS

2. TO CREATE A CULTURALLY RESPONSIVE SYSTEM

3. A PARTNERSHIP BETWEEN EDUCATORS AND SCITECH

4. TO DECREASE BARRIERS WITHIN WESTERN AUSTRALIA, ALLOWING CHILDREN TO ACCESS FUTURE-READY EDUCATION MORE FREELY

VALUE PROPOSITION

Although at this stage, we are proposing the experience of the service system rather than the finalised outputs and touch-points used in its delivery, we can still discuss the value provided for the impacted stakeholders. Based on the research and ideation phases, we have identified opportunities to add value to core actors' experiences. We hope to empower all Western Australians to construct a better world by preparing them with 21st century skills. We wish to bridge the cultural gap between diverse communities by establishing a sustained network of mutual knowledge exchange. We hope to give communities previously barred by economic, societal and/or physical barriers the opportunity to access future-ready learning experiences by co-designing programs with them. As a result, this service system will contribute to a future in which stakeholders are empowered with the skills, confidence and knowledge to innovate solutions to challenges posed by a fast-changing global environment.

IMPACT AND SUSTAINABILITY

When thinking about the future change that this project can bring, it's important to consider how it will adapt over time as well as the impact that comes with the inevitable growth. We realise that implementation of this service system hinges on the development of relationships with communities; a process that requires patience, commitment and attention. We also know that the implementation of a sustainable system requires shared ownership with the communities that will allow

it to be nurtured and developed over time. Therefore, it was crucial that we think about this project over an extended timeline. Although we intend to begin with a focus on Primary School contexts, we have examined the desired growth and impact of the project at three key milestones: 1-2 years, 5 years, and 10 years. This has allowed us to consider ways in which to scale the system to impact a broader range of stakeholders and support students throughout the entirety of their educational

journey from primary school through to industry. The intention is that the impact students will have in the industry will be fed back into the system as their role as stakeholders changes, supporting reciprocal and infinite cycles of knowledge exchange that will nurture the innovative capacities of generations to come.
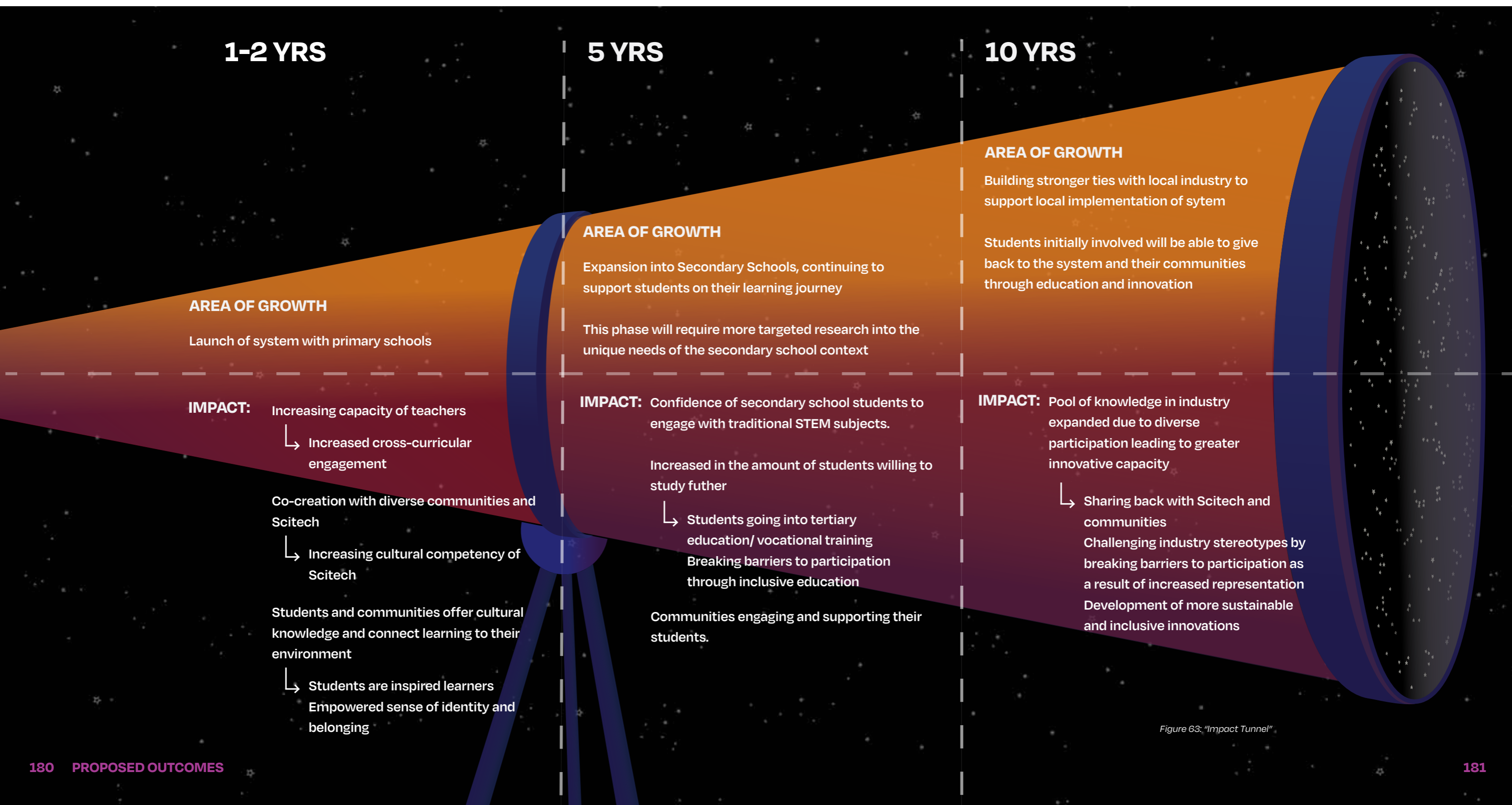
1-2 YRS

AREA OF GROWTH

Launch of system with primary schools

IMPACT: Increasing capacity of teachers
↳ Increased cross-curricular engagement

Co-creation with diverse communities and Scitech
↳ Increasing cultural competency of Scitech

Students and communities offer cultural knowledge and connect learning to their environment
↳ Students are inspired learners
Empowered sense of identity and belonging

5 YRS

AREA OF GROWTH

Expansion into Secondary Schools, continuing to support students on their learning journey

This phase will require more targeted research into the unique needs of the secondary school context

IMPACT: Confidence of secondary school students to engage with traditional STEM subjects.

Increased in the amount of students willing to study futher
↳ Students going into tertiary education/ vocational training
Breaking barriers to participation through inclusive education

Communities engaging and supporting their students.

10 YRS

AREA OF GROWTH

Building stronger ties with local industry to support local implementation of sytem

Students initially involved will be able to give back to the system and their communities through education and innovation

IMPACT: Pool of knowledge in industry expanded due to diverse participation leading to greater innovative capacity
↳ Sharing back with Scitech and communities
Challenging industry stereotypes by breaking barriers to participation as a result of increased representation
Development of more sustainable and inclusive innovations

Figure 63: "Impact Tunnel"

09

PRESENTATION OF PROPOSED CONCEPTS

SEMESTER ONE PROPOSAL

After the all the research we conducted throughout Semester 1, we presented our findings to Scitech. Preparing the presentation to be seen by human eyes was quite the feat. Summarising months of intensive research and user insights into a concise, impactful form was a challenge we met head-on.

The process began by prioritising the information we felt would be most effectively delivered through us as the designers. We also had to accept that despite the mountains of findings we could talk about, we would simply have to simplify this down and allow the client to read through our follow up documents.

The main finding that we really wanted to put emphasis on was the need for co-design with external stakeholders. Through our research, we found that Scitech did not have a method of collecting consistent feedback from the communities the organisation was attempting to reach, and that these communities were often not involved in the research and development process of new outreach shows or centre exhibits.

With this in mind, our team determined that the focus of our presentation would be the need for a continuous, mutual exchange of knowledge, resources and experiences between Scitech and various communities.

This was the first time we were presenting our findings to clients, and the team learned a great deal from that experience. For starters, at this point in time we felt that as students we did not feel we had the right to shake up the method of delivery, and so did the typical process of talking at the audience with little input from them until the presentation ended. This meant we had no way of knowing how the audience felt about our findings or perspective, and it felt like a very one-sided conversation.
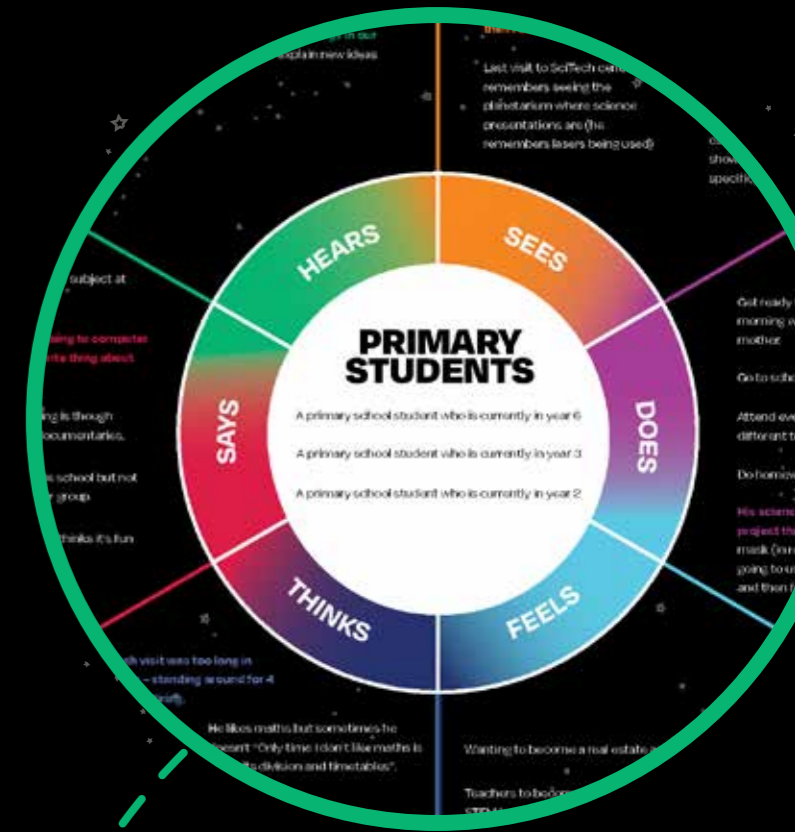
Figure 64: "Presentation of Proposed concepts-slides and question time"

10

A CHANGE IN DIRECTION

A NEW PROBLEM SPACE

REFLECTION

A key finding from the conclusion of our research was the fact that knowledge, both professional and experiential, and the skills of staff members at Scitech were not understood or effectively utilised. We found that this led to a loss of opportunity for reflection, evaluation, and development of more responsive and interconnected outreach programs. We highlighted that knowledge required for these processes was spread across teams throughout the organisation, some of whom were removed from processes which would benefit from their input due to the rigidity of internal structures. With this in mind, we handed out findings over to Scitech for review to inform progression of the project in the second half of the year.

COMMENCING THE SECOND HALF OF THE PROJECT

During this time, Scitech underwent immense structural change, resulting in internal operations that were remarkably different to the understanding we had developed through our research in the first stage of the project. As a result, Learning Futures, Statewide, Content & Activations, and the Science Centre now sit in a single Customer Facing pillar of the organisation to better integrate these areas of operation. Without guidance, these teams are trialling working groups, monthly meetings and lessons learnt but in such early stages of restructuring, were unsure of how to approach this new mode of working. Ultimately, the Customer Facing Pillar could use support in developing new frameworks of operation to work more collaboratively and more effectively utilise the skills and diverse knowledge that people bring to these teams.

As it stood, the operational teams required to implement our original proposal were in no state to work with us on delivery of the project. As a design team that had put an incredible amount of time, effort, and dedication into a project we were passionate about, this was personally disappointing. But it was also an incredibly important catalyst for learning first-hand that we cannot be too attached to our ideas as they are inevitably moulded and shaped by the changing context around us. In our proposal we spoke about the importance of working in agile teams that could adapt easily to change and this was the point at which we had

to put theory into practice and shift as a team ourselves. Knowing how this change impacted our own team both physically and emotionally, we could only imagine how such a large organisational restructure would impact the Scitech team. From first-hand reports of internal operations, we understood that workplace morale was low, workloads had increased, time was limited, and many valued workplace relationships had disbanded. It is also important to note that it is incredibly brave for an organisation to acknowledge that they needed to take the time to examine and understand their internal operations before they could work on their service offerings. Viewing the whole of Scitech as a service allowed us to understand the interconnectedness of the organisation, noticing that underlying patterns that occur internally, were just as likely to be amplified in viewing their external interactions. This was highlighted in our research; skills, knowledge and experiences of staff were being underutilised in internal operations, just as skills, knowledge and experiences of communities were being underutilised in external operations.

In order for us to pivot to a new focus and assist the Customer Facing Pillar to develop ways of working and communicating, with the goal of supporting development of Statewide programs in the long-term, it was crucial for us to take the time to understand the new problem space by revisiting the Discover and Define stages of the Design Thinking process. Cycling back to these stages of thinking provide the perfect example of how design thinking is anything but a linear process as it is depicted in most models (Stickdorn & Schneider, 2011). Whilst rethinking our approach to this project may have been incredibly taxing, it was also such a valuable opportunity to understand the importance of reflection as an element of Design Thinking. It is crucial to undergo constant examination of the problem; wicked problems are unsolvable as they change along with context and this project is the perfect example of such. With scope of the project in mind, and an inability to extend the timeframe beyond October 2021, we aimed to utilise as much of our research around Statewide in this phase of the project as possible. The decision was made to use the Statewide program as a pilot to understand and prototype ways of working and communicating that could potentially be expanded and adapted across the organisation. In choosing to narrow the scope of the project in this way, we acknowledge the challenges of focusing on a singular pillar which contributes to silos in the organisation and understand that we can't focus on a small segment without considering how this fits into the bigger picture. For this reason, re-discovery of the problem space needed to occur in two areas; understanding of the broader organisational context, and intricate understanding of communication and working patterns within the pillar.

We consistently prototyped throughout the course of this semester as a way to build understanding and visualise the problem space. Prototypes are a way for designers to conceptualise their ideas prior to completion of the end product (Coughlan et al., 2007). In the context of this project, we have differentiated the different types of prototyping into 'prototyping
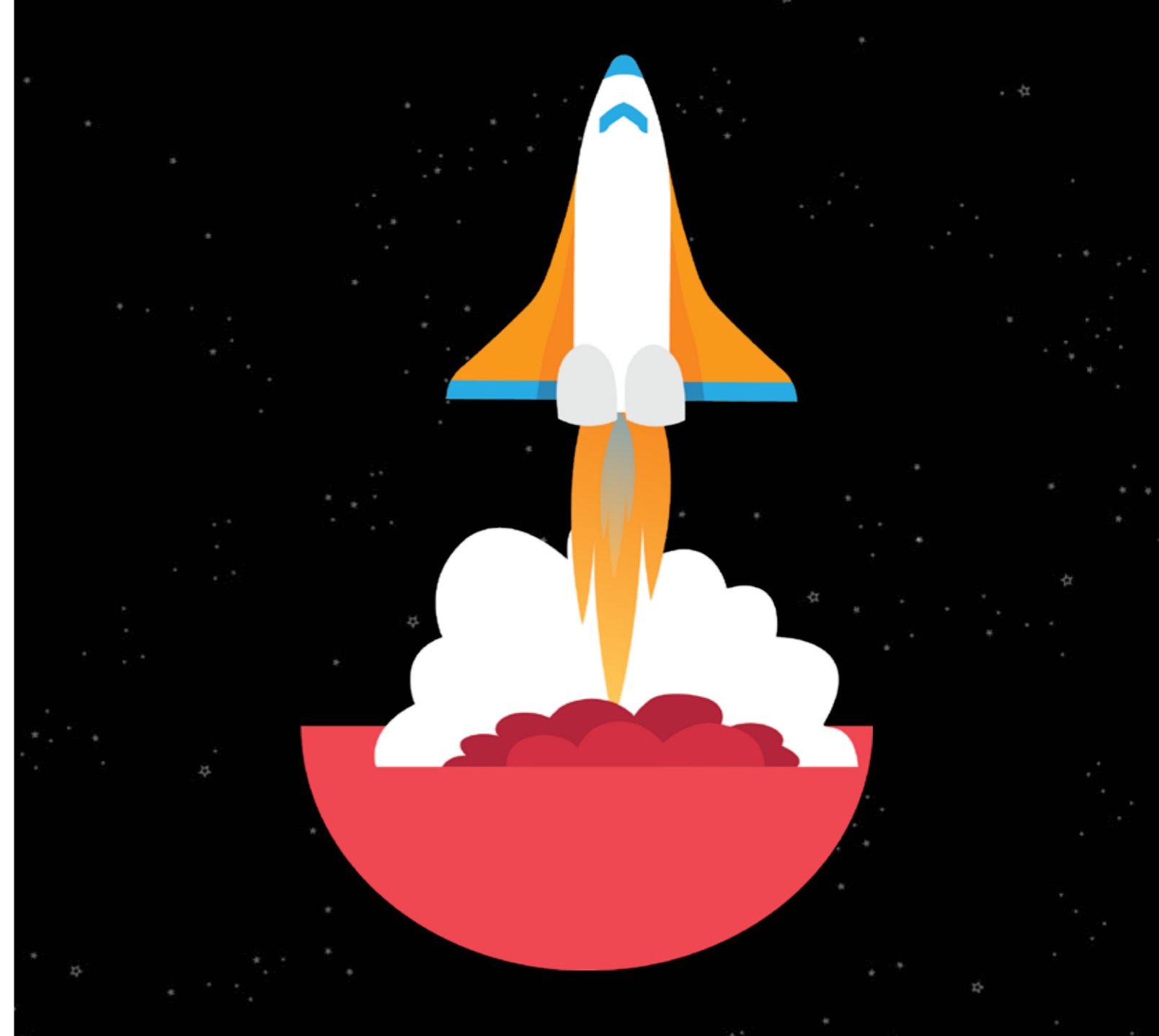
to learn', 'prototyping to understand', and 'prototyping opportunities to implement'. Stickdorn et al. (2018) identified three drivers behind prototyping: to explore, evaluate, and present. The initial stage of exploration, which we have co-opted to 'learning', provides designers with an array of new insights into the problem through fast prototyping (Stickdorn et al., 2018). Building onto that, the next prototyping stage of evaluation helps to narrow the focus of the project to become more specific through prototypes that inform understanding of the experiences of people (Stickdorn et al., 2018). We have adapted this as a way of prototyping to further understand. Lastly, Stickdorn et al. (2018) defines prototyping to present as more polished prototypes that have been adapted from previous iterations used to gather meaningful input from stakeholders that will help guide the continuation of the project. This is what we have related back to 'opportunities to implement' in the context of this project.

11
DISCOVER

UNDERSTANDING THE BROADER CONTEXT

To build greater understanding of the changes occurring throughout the organisation, as well as the challenges they faced as a result of the restructure, it was important for us to work alongside the Scitech team to understand how this played out in their day to day lives. We chose co-design sessions and data gathering tools installed in communal areas to structure this enquiry, encouraging participation and sharing of experience from many voices across the organisation. Learning more about the group dynamics and familiar ways of working allowed us to prototype and develop the way we structured and implemented these tools. These methods enabled us to uncover key insights and make the most of the limited time we had with the team. Over the course of this learning period, we became familiar with the methods that actively engaged Scitech team members and encouraged sharing of knowledge and cross team collaboration, as well as the most beneficial way to utilise the skills of our own team to support these spaces.

Gathering this data is redundant unless it can be understood and shared in a concise way to highlight areas of opportunity and aid Scitech in understanding how their organisation is functioning. **To ensure that we were able to do this in a way that reflected the reality and experience of team members, the tools we prototyped 'to learn' were also used as channels to gather feedback on the prototypes presented in the next chapter.**

Desk research that helped build our knowledge around organisational structure, communication, culture, and change management was critical in being able to ground our observations in theory and identify areas of the current system that needed to be addressed.

Figure 61: "Acknowledgement of Country during Co-design session"

WHY CO-DESIGN?

Co-design is a participatory process that aims to involve those impacted by a problem in the process of designing outcomes that will meet their needs (Stickdorn & Schneider, 2011). It is based on the understanding that in order to generate services that are valuable and meaningful, we must design with people, not for people (Penin, 2018). Success of co-designing relies on using engagement tools that are tailored to the dynamic of the co-design team, working to create an environment where power is evenly distributed, and emphasis is placed on the value of lived experience (McKercher, 2020). This generates a space where participants feel safe and welcome to share their knowledge to build capacity and understanding of the team. Understanding the problem space from a range of perspectives allows generation of creative and innovative ideas, as well as developing a sense of ownership and commitment. Co-design processes are empowering for team members and are central to ensuring implementation and long-term sustainability of outcomes. If people are able to design their own services to meet their own needs, team investment is high, and people feel capable in continuing to make adjustments and improvements to services as context shifts and changes (Stickdorn & Schneider, 2011).

We saw co-design as a valuable tool not only to establish strong working relationships with the Scitech team, but also to build their capacity to work together on improving their internal and external services beyond the scope of our involvement in the project. Co-design provides an opportunity to remove team members from their usual context of working and allows them to engage in creative thinking and play. This process encourages a child-like energy and approach to problem solving, and helps staff to connect to the broader motivation of the organisation; improving opportunities for all children in Western Australia.

APPROACH TO CO-DESIGN
At this stage of the project, we utilised co-design sessions to gain an understanding of the internal operation of Scitech. Following the restructure, a number of roles and positions had changed and whilst official organisational charts gave us somewhat of an idea about how this may have shifted, we needed to understand how this impacted the day-to-day life of the Scitech team. We know that change doesn't happen over-night, so we expected that the reality of operation would be scaffolded between the previous and current structure.

To gain as many perspectives as possible, we ran two exploratory sessions with team members from Learning Futures, Statewide, Customer Insights, and Partnerships.

These sessions were held in a conference room at the Scitech Offices and due to time pressures on workloads, could only run for 1 hour. In order to build trust, safety, and willingness to share, we knew that these initial sessions had to prioritise relationship building and create engagement that was seen as a valuable use of time for staff who had to take time out of their day to participate in a session that did not directly contribute to success in their role.

We recognised that tensions within the organisation were high and there was apprehension around speaking out about experiences for fear of job loss or further changes. As a result, we chose to begin each of our sessions with conversations that outlined our approach to working with each other to foster a judgement free environment that promoted sharing, learning, and empathy. This involved group introductions that included sharing of preferred pronouns, why we were passionate about our contribution to the project, and a personal fact about ourselves. These were conversations that we hoped would develop understanding across the organisation about the beauty and strength of the diversity each person brought to the team and would help to build unity and interpersonal relationships that had been damaged by the restructure. In an organisation that relies on structure through levels of management, it was important to outline the fact that these co-design spaces were non-hierarchical, and that everyone's contribution was necessary and valuable.

PLANNING
As we were limited to 1 hour sessions with Scitech team members every few weeks, we had to be very particular about what we wanted to achieve in each session to ensure we gathered the data that was needed. Initially this began with establishing a structured and timed plan for the session, with introductions, icebreakers, two or three chosen activities, specific questions that we wanted to ask, and a wrap up segment. We chose activities that would help us uncover the insights we needed and that were not completely foreign to team members. We aimed to introduce each of these with an example of what was expected from the team to help enhance their understanding of the task at hand. Setup of the room was orchestrated so that the group could come together in a space separate from their usual work environments around a central table where everyone had space to be seen and interact with others around them. We created a visual presentation to help guide the session and showcase relevant examples to assist the team.

RUNNING THE SESSION

We began each session with an Acknowledgement of Country to pay respects to the Whadjuk Noongar People, Traditional Custodians of the land on which we had the opportunity to work. Prioritising this was a choice made to encourage staff to consider the cultural diversity and needs of the students they engaged with daily. The Statewide team has the most intricate understanding of the importance of these practices from their experiences on remote AEP tours. This was a way to introduce these practices into the vernacular of the internal organisation. If Scitech is to continue to create valuable and meaningful experiences alongside Indigenous communities, we need to start building levels of understanding, cultural respect and initiating ways to practice empathy. These internal co-design sessions are a way to build the capacity of staff to work in these ways, which will help to inform work on projects in the future.

Another key area of our introductions to the session were establishing the 'Ways of Working'. This was critical in setting the foundation for co-design to occur, encouraging team members to come into the space without judgement, willing to listen and learn, and feel supported to share their experiences.

They were as follows:

» We adopt a mindset of curiosity
» We all have something to share and something to learn
» We value lived experience alongside professional experience
» We use visualisations to explore ideas
» We start with what's strong

At a time when we observed that morale within the organisation was low as a result of the structural changes, it was important to guide sessions in a positive and hopeful direction, and so identifying and working from places of strength were key for the team. This was a useful strategy for refocusing potentially destructive conversations on developing constructive outcomes.

We generally stuck to the same roles throughout this semester for facilitating the workshops. The main facilitator was Darcy, who went through the presentations we prepared, and guided each planned activity along. Nina also interchangeably helped facilitate in sessions, but also helped to sit down and work through the activities with the employees to motivate them to get stuck into it. Saskia and Lizeth asked questions throughout the session that would help us gather the necessary and valuable insights. From the questions we had planned to ask, the answers we would receive would often prompt more questions in the moment. For recording these sessions, Hannah used the app "Otter", which both recorded the audio and

transcribed it, as well as recording written notes about valuable insights. Tashi fulfilled the role of the main photographer, making sure to document pictures of our work, as well as capturing shots of everyone working together. These roles were not rigid, and we naturally worked through each session to get the most insights that we could in the moment.

Icebreakers were a task we prioritised to help build rapport with the group, increase our knowledge about what skills and experiences they brought to the room and begin to build connections across teams. Initially we based these around activities that helped to introduce the team to each other. These tended to keep team members in their seats and lacked the fun element we were hoping they would inspire. Instead, we found activities that were short, sharp, got people working together, up and out of their seats, and pulled people out of their expectations of usual work in the office, to be more beneficial. They injected child-like fun and energy into the session, which resulted in greater engagement and productivity. We also found that team members left seeming more energised and with improved mood. We noticed a similar pattern with the activities we chose, finding that more active activities away from seats promoted participation. Over the weeks, we also found that encouraging team members to bring along a cuppa while we provided an afternoon snack was a show of hospitality that seemed to de-formalise the session and open dialogue.

After our first session we realised that planning sessions with an in-depth schedule did not provide the flexibility we needed. Generally, each session never played out quite how we expected it, so agility was key. We required the ability to prolong activities and make time and space for in-depth conversations to run their course. Instead, we entered sessions with a structured introduction, an idea of an activity which was explained to the team along with the amount of time for the session and jumped in with a back-up plan in mind if we exhausted all avenues with the first activity. This gave us the time and space to encourage participation by all team members and actively seek out their contribution when we noticed they hadn't had the chance to engage. A more loosely structured session also gave us the opportunity to pull team members aside for more private conversations where we could ask more in-depth or tailored questions to explore a unique side of their experience, away from the ears of others. Providing multiple ways for the team to participate increased overall engagement, and allowed the more quietly spoken members of the group to have just as great an impact as their more outspoken colleagues.

Figure 62: "Co-design activities at Troode Street Offices"

TEAM RECAP

Following each session, our team came together to collate findings, craft insights and reflect on what could be improved for the next session. When working in a new space with a new set of people who have not participated in co-design before, it is crucial to pay as much attention to the logistical elements of the session as the actual data gathering. Adjusting the functioning of the sessions in order to better meet the needs of participants was a crucial part of ensuring we were making the most of our time and helping team members to see value in what we were creating together. One example is that we noticed how reserved some people behaved in the first session, so made an effort to facilitate an icebreaker in the following session that would require people to work together collaboratively and communicate to build a tower out of cards.

This reflection helped us to better understand the skills of our own team and the ways they were best able to contribute to the sessions, whether this be in planning, facilitating or recording. It also gave us time to understand the group dynamics of the sessions. We realised engagement of the Scitech team was improved when there were less of our team either in the room or participating, as this provided a less confronting environment and enabled the Scitech team to really get involved.

KEY SESSION ELEMENTS FOR FUTURE WORK

» Agile session plan

» Introducing cultural practices

» Active and engaging ice-breakers and activities

» Providing multiple avenues for participation

» Encouraging opportunities for fun

» Ongoing reflection on session content and context

» Providing food or drink to share

Figure 65: "Co-design group activities"

Figure 63: "Team recap"

Figure 64: "Ice-breaker activities"

CO-DESIGN SESSION 1

The aim of the first session was to discover and understand how Scitech was currently working. To do this we planned to guide the team through the creation of a stakeholder map, reflecting on the other members of their team that were most crucial in supporting their role, as well as the arrangement of these team members into an organisational chart to identify silos within Scitech. For this session we had participants from the Learning Futures, Customer Insights and Statewide teams, some of whom had been in their position for several years, while for one participant it was their first day in the role. This was a crucial session, not just to gather data through the planned activities, but also to understand the group dynamic and nature of interaction between individuals within the organisation.

INSIGHTS

There were two extremely important areas of learning that resulted from these sessions; insights that related to our own process of facilitation, and insights that related to the problem space. Inevitably, we came to understand that sometimes, you have to go completely off script! With last minute additions to the attendance list, passionate conversations that needed time and space to occur, and general apprehension about getting involved, the planned timeline for the session went out the window. This was a lightbulb moment for us as we realised this way of working, while familiar to our team, was completely foreign to the Scitech team, and even getting them to put pen to paper in a group setting required guidance and encouragement. We had to make on-the-spot decisions about whether to allow discussions to continue or to move the group on to the next activity. As a result, we prioritised sharing over our agenda. This saw us only carry out the stakeholder map activity in the hour session, but this made way for collection of insights that spoke volumes about the current work environment the Scitech Team faced. This experience reiterated the importance of flexibility and active listening, which allowed us to navigate the session with minimal hiccups. In our reflection, we also identified the importance of getting the team out of their seats and engaged in a hands-on activity as a way to pull them out of the negative mindset that surrounded their regular work schedule.

Creation of the stakeholder map and conversations that supported this activity revealed that structural silos and locational barriers left many teams feeling isolated from the rest of the organisation. This was further reiterated in the lack of understanding and awareness surrounding other people's roles across multiple teams, as well as lack of understanding about one's own role. We noticed that time pressures and large workloads meant that culture building had been neglected, and there was a lack of interest in building relationships due to the high likelihood of people leaving or being fired. Company culture was extremely lacking, which made for an emotionally and psychologically taxing work environment.

CO-DESIGN SESSION 2

The aim of the second session was to make more sense of the data we had gathered around how people were situated within the organisation, and how communication was facilitated between teams. To do this we guided the team through the creation of an organisational chart to understand how Scitech was internally structured and followed this by prompting discussion around intra and inter-team communication. To capitalise on the short time we had to run the session, we pre-labelled sticky notes to represent each team member identified in the previous session, and colour coded these by team. We chose this method of arranging the data as it was intrinsic to staff who were familiar to working in hierarchal organisations, providing a baseline understanding of the task we were asking them to engage with. By setting up this activity across a whiteboard and asking team members to work in pairs to arrange the sticky notes, we were able to observe the interactions and learning moments that took place as others found out about teams they had never engaged with before. Beginning this session with an active icebreaker activity that got people out of their seats was an energising way to start the session and encouraged participation by sharing laughs.

INSIGHTS

» Statewide rely on phone contact when out on the road.

» Decisions are being made by people who are disconnected from those they impact.

» Lack of understanding about roles across organisation.

» Primarily use Email, Teams, Face to face, and phone for communication although there are no set procedures.

» Emails feel most official whilst a Teams message and face to face conversation feel relaxed.

» Sometimes easier to walk over to the centre from Troode street office to contact someone than trying digitally.

» Communication across teams seems to only happen at a managerial level.

» Learning Futures tend to have total control of their programs and their clients, making them feel as a branch to Scitech where they have to do their own bookings and organising of the content.

» Scitech plans to introduce Jira, however some teams reject many new things people implement as they lack time to understand these new software systems.

» Contacting people is a massive challenge, it is also a challenge to bring all of the teams together onto one platform.

Figure 66: "Co-design group activities"

DESK RESEARCH

Based on insights gathered so far from the initial two co-design sessions, we sought to further inform our understanding on specific areas such as communication and organisational culture. These topics developed our understanding of some of the issues brought up in the codesign sessions. From this, we conducted our own desk research that would provide support for the direction we were taking with this project: focusing on facilitating a positive work culture and creating stronger communication.

COMMUNICATION

Communication within a workplace is characterised by Griffin (2021) as a web of social interactions that holds organisations together. For organisations to achieve their goals, strategies, and outcomes, they must communicate and have a plan with strategies in place to allow communication in various forms to occur. Managers have the role of communicating with their employees and relaying the wider strategies of the organisation. They also have the role of communicating with suppliers and customers to understand what is required from the organisation.

Without an effective communication system, employee engagement tends to fail. Employee engagement is linked to higher shareholder return and increased market value. As noted by Former GE CEO Jack Welch (2009), during tough economic times "...you have to communicate like you have never communicated before. People need to feel the excitement of tomorrow instead of the pain of today. This is accomplished by talking honestly. Effective communication skills from managers and senior leaders can empower staff and facilitate a positive work culture and 'vibe' (Griffin, 2021; Band, B., 2021).

COMMUNICATION PROCESS
Communication is a process of transmitting information from one person to another that creates a shared understanding and feeling. Griffin (2021) states some forms of communication include:

» Encoding - Conversion of a thought or idea into a message.

» Message - The encoded information that is sent from one person to another.

» Channel - The medium used to send a message.

» Decoding - When the message is received and is interpreted.

» Feedback - A check on the success of communication.

» Noise - Anything that is heard to alert others of a message sent/received.

Communication involves aspects such as influencing others to behave a particular way. The capability of a medium of communication to achieve this successfully varies, but it tends to improve and streamline with the development of new technology.

COMMUNICATION SKILLS
Communication is effectively an important managerial skill critical for effective leadership, where improving your communication helps to overcome barriers.

'Listening Skills' is when one becomes actively involved in the process of listening to what others are saying. This helps to clarify unclear messages where multiple parties are engaged (Griffin, 2021). Being an active listener requires concentration and reflection so that there is a common understanding of the message being sent.

'Writing Skills' include grammar and tone, as they are important in effectively communicating, however the style of the written content is as important. It is challenging to compose an effective electronic communication as it falls between a letter and a phone call, where etiquette is important.

'Presentation skills' improve with time as many people feel anxious and nervous when they conduct their first presentation. Griffin, (2021) states the importance for managers must have effective presentation skills to effectively convey ideas and new proposals to their team or supervisors.

'Meeting Skills' - Many organisations rely on conducting meetings as a form of communication with their wider teams. Managers rely on this form of communication, however poorly led meetings are a source of frustration for employees where they consider meetings as 'time wasting' (Griffin, 2021). Employee wellbeing relies on the effectiveness of these meetings, and it is especially that their time being present and attending feels well spent (Letcher,J. 2021; Griffin, 2021; Smith P., G, 2021).

BARRIERS TO EFFECTIVE COMMUNICATION
(Griffin, 2021)
Selective perception - People choosing to only hear things that are consistent with their beliefs. This occurs when people choose to listen or hear things based on their own interests, expectations, experience and attitudes, rather than how things are. Conflicting information tends to be ignored. This leads to people only receiving part of the message that is consistent with their own expectations, needs, motivations, interests and other characteristics.

» Misperception

Occurs when the message is not decoded by the receiver in the way the sender intended. Often a result of the sender's words and body language being interpreted differently by the receiver. Poor listening skills and selectively perceiving are both considered misperception.

» Filtering

Occurs when people receive less than the full amount of information provided due to someone withholding it or distorting the message. This can also occur when the sender manipulates information with the intention of leading the receiver to perceive the message in a favourable way.

» Information overload

Filtering also occurs when the receiver has so much information available, it exceeds their ability to process it, as filtering is a strategy to help reduce the message into a manageable package. This can often happen with modern technology, such as emails. One person may receive 500 emails a day and apply a filter to determine what is the most important subject to answer first.

» Organisational barriers

Organisational barriers in communication come from the structure of an organisation with different parts and levels having internal communication. This produces inconsistencies. Communication that is more open is a method through which trust and commitment can be built, and opportunities for collaboration can be formed. Company spaces can reinforce communication culture. For example, having open, agile offices where employees can move and change their workspace to suit their current activities allowed employees to engage with people from different departments and share information. This environment allowed employees to feel like they could ask questions, offer ideas and facilitate collaboration with co-workers.

» Cultural barriers

Words and gestures can mean different things around the world due to the immense number of cultures we have in our current globalised society. Understanding the varied meanings of communication cues around the globe helps in understanding the information and messages that are being delivered and interpreted.

» Noise

Loss of transmission can occur from noise such as computer or machine noises. Ambiguity is another scenario where the receiver is not sure what the sender has meant. Jargon or technical language can create ambiguity when the receiver does not understand the message. Semantics are another barrier where words can have different meanings wherever you are. Therefore, a strong company communication culture is important wherever you are established.
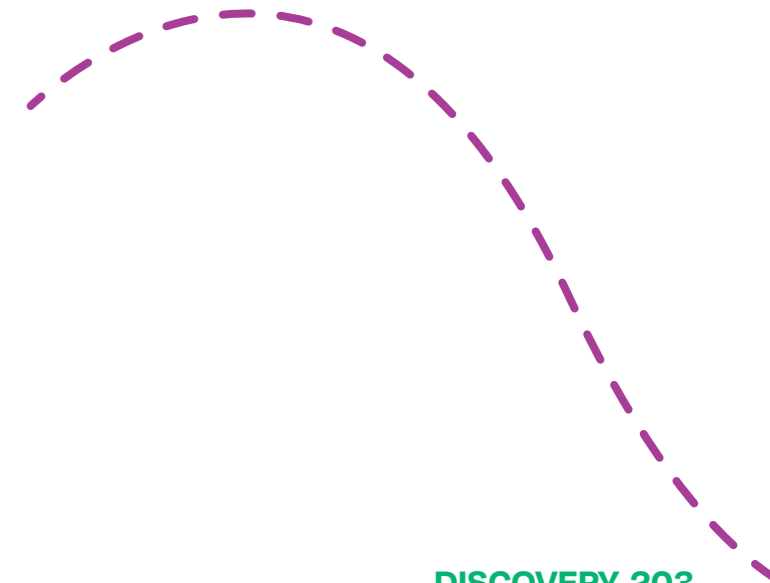
ORGANISATIONAL COMMUNICATION

Griffin (2021) considers 'Organisation Communication' as the exchange of information between two parties within an organisation to create a common basis of understanding and feeling. Communication can be informal and formal, and can flow upwards, downwards, horizontal and diagonal.

» Downward communication

Occurs when higher-level management communicate to employees at a lower level of an organisation. Many of the messages that float downwards are generally about company performance, values, and executive decisions. Setting up a system that allows the flow of communication in a non-restrictive and uninhibited way is considered to be effective communication (Griffin, 2021). Management by walking around, in a non-invasive manner, is one of the most effective techniques, where managers spend time talking informally to their employees, actively engaging in the office environment and building relationships.

» Upward communication

Occurs from the lower-level employees communicate with those who are considered to be in a higher position of authority. Encouraging upward communication, such as employees talking to their managers, allows employees to understand their goals, requirements and instructions (Griffin, 2021). Managers are informed about challenges and complaints, and changes can be made when these opportunities are allowed. Upward feedback can be challenging to establish, however creating a culture that relies on communication, openness and trust will make employees feel comfortable. Attitude surveys, an open-door policy and regular face to face meetings with subordinates can foster upward communication.

» Horizontal communication

This occurs when someone in an organisation communicates with others who are on the same level. At managerial level, managers depend on each other to complete their jobs. Everyone within an organisation can communicate horizontally, and promoting this form of communication will facilitate coordination between groups (Griffin, 2021).

» Diagonal communication

This is when all employees can communicate with everyone, across all departments and levels, in both a formal and informal manner. This form of communication is common in cross-functional teams on projects, composed of different people, within different levels (Griffin, 2021). This form of communication allows everyone to contribute when creating a new project and solving problems. This is useful to link groups and spread information.

ORGANISATIONAL CULTURE

A strong corporate culture is essential to any successful organisation. Humans are social creatures controlled by the whims of their dopamine receptors, meaning we tend to be happier and more efficient when our workplaces engage and support us (Guiso et al., 2015).

Scitech is a highly unique organisation. During the course of our research, we identified that a strong corporate culture was a top priority for the staff. It was also clear that the staff of Scitech are deeply passionate about their roles, especially regarding the part they play in providing science education to the children of Western Australia. This shared passion presented an opportunity to bridge gaps in understanding between various teams and staff members within the organisation.

In this section, we highlighted several facets of a strong corporate culture that we found would greatly enhance the work environment of Scitech.

CONFLICT RESOLUTION

Transparent conflict resolution is an integral part of maintaining an atmosphere of support and trust between staff. Employees need to know it is safe for them to talk about things that bother them, and trust that not only will they not be punished for doing so, but that their concerns will be heard, seriously considered, and addressed in an empathetic and timely manner (Guiso et al., 2015). A workplace where staff are silenced is a stagnant workplace. Conflict and obstacles are what lead to innovation, and it is up to the organisation to then channel this upheaval into a positive change.

ADDRESSING BURNOUT

Burnout has been a well-documented condition for many years (World Health Organization, 2020). The condition typically causes extreme physical exhaustion, an inability to process both internal and external emotions, and causes an individual to feel a sense of disconnection from hobbies or tasks related to work roles, no matter how dedicated this person way have been previously (Queen & Harding, 2020).

In the wake of the widespread anxiety and isolation brought on by COVID-19, burnout has become exponentially more prevalent and debilitating (Queen & Harding, 2020). A 2020 study into the effects of burnout on teachers during the COVID-19 pandemic found that, for example, the move to online professional interaction had a profound impact on the subjects. Emotional exhaustion, a reduced sense of personal accomplishment, and depersonalisation are just some of the most widespread symptoms of COVID-related burnout (Shlenskaya et al., 2020). Yet another study showed that employees in roles with frequent person-to-person interaction tended to suffer from enormous financial stress, anxiety, and social isolation that greatly

impacted their health and productivity. The same study indicates that the extreme stress of COVID-19 impacted employee engagement and job performance, and reduced organisational commitment overall (Rasdi et al., 2021).

With the knowledge that burnout is becoming an increasingly bigger problem in society, how do we go about mitigating it? There is no fail-safe method of preventing burnout, nor is there a universal, instant cure for it. However, there are measures organisations and individuals can take to lessen the onset and impact of burnout. A 2020 study suggests that a strong sense of professional identity and a high level of job satisfaction can help prevent the onset of burnout during times of high stress (Veldhuis et al., 2020). A suitable period of recovery and reflection is needed for someone to go back to their role with new enthusiasm and vision.

SHARED VISION

O'Rielly and Chatman define corporate culture as "a set of norms and values that are widely shared and strongly held throughout the organization" (1996). If a group of people (and/or organisation) share a common set of expectations, they are more likely to act in the interest of the group. The presence of obvious shared values can also make a standard of practice or performance feel less like a goal to meet and more like an inherent, worthwhile part of an individual's role (Guiso et al., 2015).

In other words, relationships between co-workers can be strengthened if everyone is on the same page. If someone understands that ultimately their co-workers share their goals and motivations, it can relieve a lot of stress and prevent possible conflicts in the future.

SUPPORT AND CARE

Humans are more likely to take risks if they know that they have a safety net to catch them should they fail. This idea also applies to very basic, every-day interactions and tasks. Employees are more likely to form connections, contribute to discussions, and actively engage with their work if they feel that they will not be judged, dismissed, or ridiculed. This in turn means that an employee will feel more dedication to their role and co-workers (O'Reilly, 1989). development of new technology.

12
UNDERSTAND

REFOCUS ON COMMUNICATION

While the first two sessions that we spent co-designing with Scitech were based around understanding the structure of the organisation, we spent the following co-design sessions understanding the communications systems at Scitech. Through developing an understanding of the organisational structure with the help of the employees, we began to also learn about the challenges that they faced in their day-to-day work. From this, we gathered insights that led to the conclusion that there was a problem with communication across the organisation.

Turning our focus to communications systems at Scitech, we found that improvement in this space could begin to alleviate multiple issues we had identified in the first two sessions. In the remaining timeframe we had for the project, it was too big a scope to focus and work on the entire organisation's communications channels. We instead built on our understanding from the previous semester and investigated improving communications channels for the Statewide team. This would serve as a pilot that would then help get the ball rolling down the line for making changes organisation-wide to the communications systems. For the remainder of the codesign sessions we wanted to understand the ways in which employees and teams communicated with one another, how they worked/collaborated, and what the day-to-day process was for Statewide.

CO-DESIGNING TO UNDERSTAND

We actively prototyped each session we facilitated to ensure we had the best chance at collecting the information we needed to move the project into the Define phase. This would allow us to define the problem more clearly. Before each session we looked for gaps in our knowledge and what we wanted to accomplish in these sessions, and prototyped ways to achieve that. An example was starting out with icebreaker activities to encourage an open and collaborative atmosphere. Something valuable that we noticed happening in these sessions was that individuals from different teams started seeing the potential to form connections, which they hadn't previously had the opportunity to create. It was quite difficult for us to get everybody that we needed in the room for each session, due to tight schedules which meant team members couldn't prioritise attendance. In the limited time we had available we created conditions for connections to occur by running exercises that would get individuals talking to each other and working collaboratively on activities. Over time, we noticed the employees became more open and trusting in sharing their experiences. By the time that we began co-designing to understand organisational communications, the atmosphere had shifted from tense and withdrawn to collaborative and more hopeful. When prototyping our sessions, we structured them in a way that generally prioritised icebreakers to help people feel more secure, and a wrap up to help everyone debrief and decompress to feel safe continuing attending future codesign sessions. In between, we prepared questions that we could ask while we had the employees working on activities. These questions pertained to things such as communications channels and what a typical workday looks like for various teams.
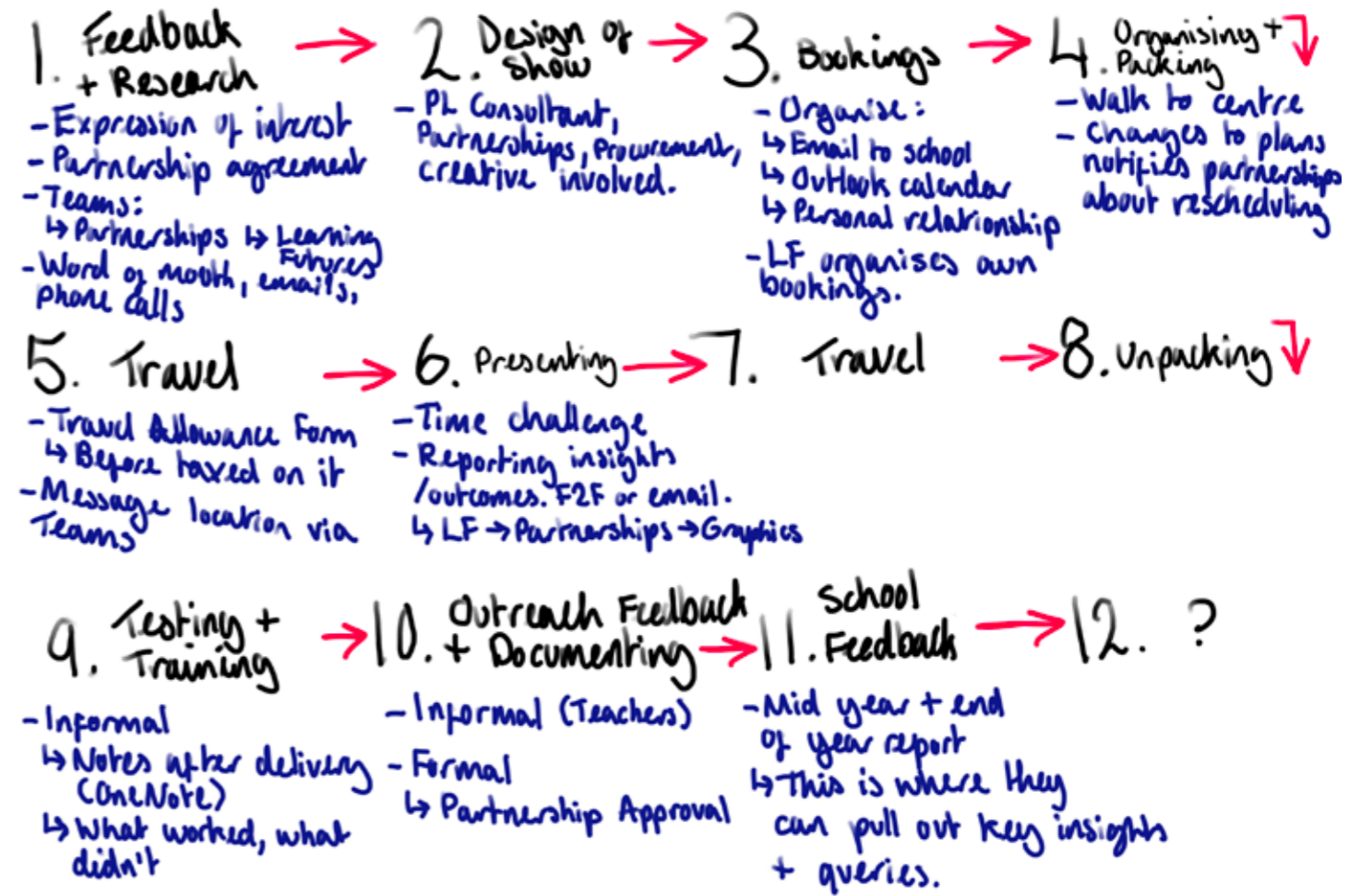
CO-DESIGN SESSION 3

Our third co-design session marked the shift in focus on communications systems. In preparation for this, Saskia visualised twelve of the steps that we thought most accurately reflected stages in the journey of delivering an outreach presentation, from the conception of the program through to presenting and feedback. We printed these twelve steps onto A4 pages and laid them out in order on one long connected table with large notepads underneath. This meant that team members could rearrange the steps if needed or grab a pen and write notes around the steps to elaborate on them or add in extra ones. This session ended up being having the most people we had seen in any session that semester. Our goal for this session was to get the most accurate representation of how a Statewide presentation was facilitated from beginning to end. Unfortunately, throughout the semester it was hard to get people from Statewide to find the time to make it to our sessions due to their very busy schedules and spending a significant amount of time outside the office. In this session, we improvised and since we had members of Learning Futures there, we worked to understand how Learning Futures worked instead. The consensus was that our steps were generally correct but needed much elaboration into how these steps looked in practise. Some of the valuable insights we gathered about from this third session included:

» There is a high level of individual responsibility on members of the Learning Futures team.

» Relationships with schools relies on relationships with the Learning Futures staff. These connections are lost when they leave the organisation.

» A Learning Futures manager must be on call to check that staff are accounted for on the road.

» There is a lack of understanding about the roles of others in the organisation.

» There is a wide range of communication being used in different teams, leading to a lack of overall consistency.

» It's hard to schedule training sessions for new software that everyone can attend due to rostering clashes and low prioritisation.

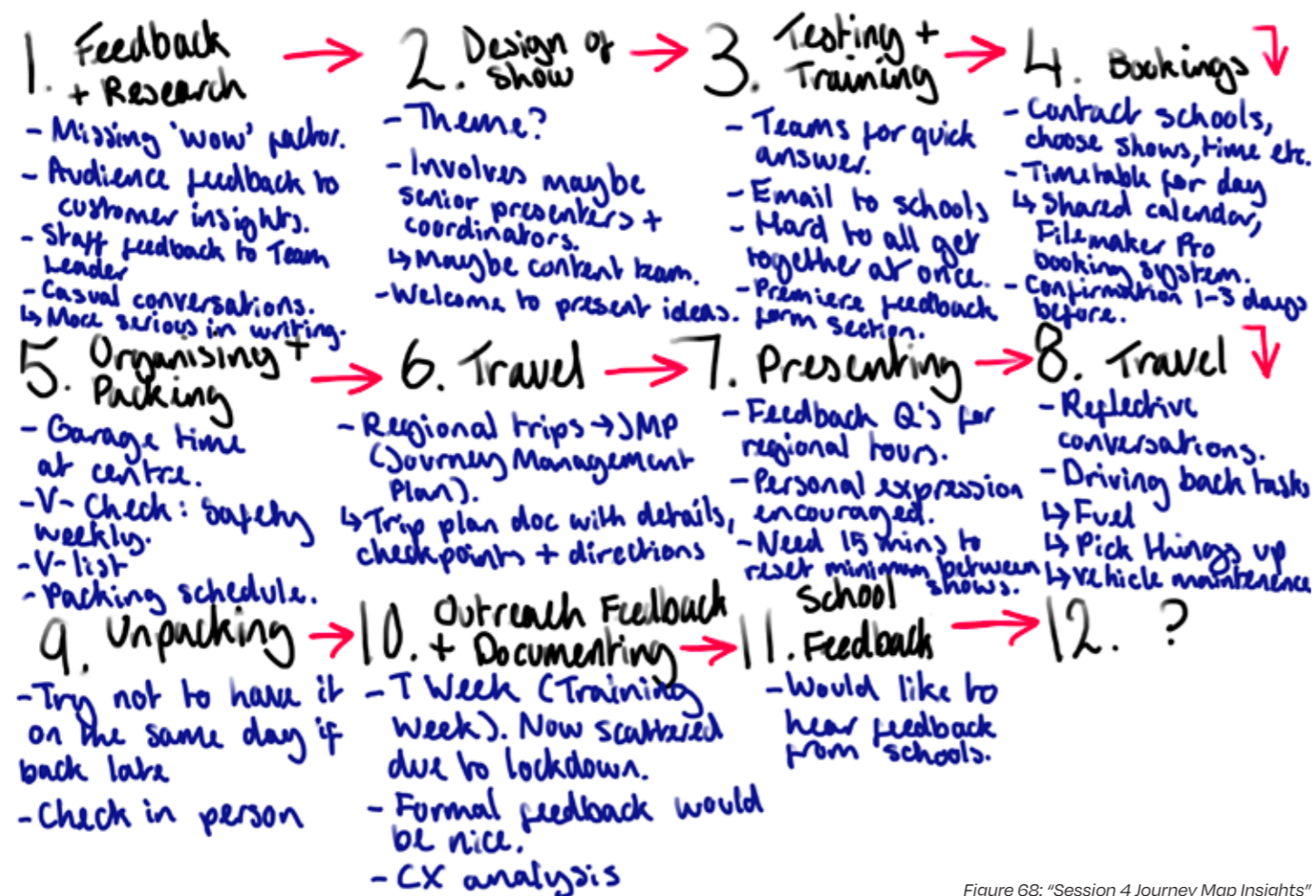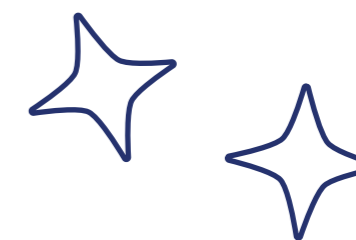» There is a lack of value for the skills that staff already possess.

Handwritten journey map:

1. Feedback + Research
- Missing 'wow' factor.
- Audience feedback to customer insights.
- Staff feedback to Team Leader.
- Casual conversations.
↳ More serious in writing.

2. Design of show
- Theme?
- Involves maybe senior presenters + coordinators.
↳ Maybe content team.
- Welcome to present ideas.

3. Testing + Training
- Teams for quick answer.
- Email to schools.
- Hard to all get together at once.
- Premiere feedback form section.

4. Bookings
- Contact schools, choose shows, time etc.
- Timetable for day
↳ Shared calendar, Filemaker Pro booking system.
- Confirmation 1-3 days before.

5. Organising + Packing
- Garage time at centre.
- V-Check: safety weekly.
- V-list.
- Packing schedule.

6. Travel
- Regional trips → JMP (Journey Management Plan).
↳ Trip plan doc with details, checkpoints + directions

7. Presenting
- Feedback Q's for regional tour.
- Personal expression encouraged.
- Need 15 mins to reset minimum between shows.

8. Travel
- Reflective conversations.
- Driving back tasks
↳ Fuel
↳ Pick things up
↳ vehicle maintenance

9. Unpacking
- Try not to have it on the same day if back late.
- Check in person

10. Outreach Feedback + Documenting
- 1 Week (Training Week). Now scattered due to lockdown.
- Formal feedback would be nice.
- CX analysis

11. Feedback
- Would like to hear feedback from schools.

12. ?

Figure 68: "Session 4 Journey Map Insights"

CO-DESIGN SESSION 4

Following that session, we were still left trying to objectively understand how the Statewide team carry out the process of an outreach presentation. We managed to get in contact with a small number of Statewide presenters that were able to make time for a co-design session that very next week. Once again, we laid out the A4 pages of the twelve steps on a long, connected table to walk along and annotate on as needed. This time, the Murdoch Design Team made the decision to split up and gather more information. Darcy and Hannah worked on conducting this final codesign session while Nina, Saskia, Lizeth, and Tashi split off into pairs to interview employees. These interviews would help to fill in some of the blanks in our understanding about the organisation's structure, functioning, and communication. In this final co-design session, we didn't follow such a rigid structure anymore as it was important that we fully understood the exact steps that are taken in facilitating a Statewide outreach presentation from start to finish. We gained multiple valuable insights:

» Minimal interaction between the Bookings team and Statewide.

» File Maker Pro (the current booking system) is laggy, but they can't risk changing it because it's a crucial function.

» Rosters and V-list (an in-depth schedule) is sent via email.

» There is a centralised database in SharePoint. Past reflections are lost here and not easily accessible to everyone.

» Organisational tasks are left to upper management such as team leaders and senior presenters.

» Decision making in this process is happening in isolation from the end-product.

» Statewide chooses their experiments based on what they know works.

» The Content team play a role in designing the shows, in conjunction with Statewide leaders.

» The presenters are removed from the rest of the organisation, so are less impacted by structural changes.

» The presenters confirm a booking via the phone with schools 1-3 days prior to their visit.

» Presenters only connect with the people they have direct contact with, and there is a lack of incentive for them to actively connect with the broader team. They struggle to build internal relationships because most of their job is off-site.

» Presenters don't get the feedback that they need because it is instead sent to Customer Insights.

» There is no formal process for presenters to give feedback on outreach shows.

INTERVIEWS

During the course of our time with Scitech, we identified that interviewing various members of staff was a crucial stage in our discovery process.

In the beginning, our interactions with staff took place within workshops we facilitated. These workshops combined Design Thinking and co-design exercises with an interview process.

While completing these co-design activities, the opportunity to further discuss points of interest arose frequently. We were able to ask the staff questions about their role, Scitech as an organisation, or about their own feelings and motivations. All this information was vital in helping us understand how to approach the design problem, and best design with the staff of Scitech.

We also conducted more traditional interviews, both face-to-face and online via Microsoft Teams or Zoom. These interviews occurred after the conclusion of our workshops and were primarily performed in order to achieve clarification regarding questions that had been raised during workshops and/or other branches of research.

These interviews were typically scripted with a collection of general questions that could be applied to any staff member, regardless of context, eg. What is your role? What is your professional background? How did you come to work at Scitech? etc. The script then expanded to include questions that were more specific to the interviewee's role within the organisation, or specific questions that had been raised at an earlier date that we believed the interviewee would be able to answer.

In order to retain the information that the staff provided, we typically recorded these interviews by taking notes during the interview, recording the interview audio and transcribing it using the application Otter, or recorded the entire interview within Teams or Zoom. Having this information recorded allowed us to revisit it during the discovery and ideation phase.

USING COMMUNAL SPACES

Whilst co-design sessions played a key role in building understanding of the organisation, we were limited in the range of team members we could reach and thus perspectives we could hear. To gather data from the rest of the team, we devised tools to install in communal spaces to invite others to share experiences.

During our initial visits to the Troode St Office we noticed that the kitchen space was an area where people would congregate around breaktimes. With ample wall space and evidence of a previously used sticky-note wall, we designed tools that could be installed in this space to capture experiences when we were not on site. Design of these tools were guided by observations that we made during our first co-design session; team members were not likely to write or draw without encouragement and were familiar with using sticky-notes to annotate because they seemed less permanent in case a mistake was made. With this in mind, we created tools that gave team members a clear structure to follow if drawing was required, required sticky notes to make annotations or gave the opportunity to indicate their answers using a mark (dot sticker or a shaded shape). Due to scheduling pressures these could only be left in the space for two weeks. Ideally, we would have liked to have had these in place for a longer period to give opportunity for higher levels of engagement. These data gathering tools were first introduced in co-design sessions to outline the tasks and ask participants to initiate engagement from the rest of their teams. In future, we believe that tasks of this nature should be shared with other team members in an announcement on the Sharepoint News TV in the office reception, or via a Teams Message. This highlighted the importance of transparent information sharing as a critical element in supporting implementation of new activities and ways of working.

The three tools we designed helped to capture patterns of interactions between team members, strengths and weaknesses of current communication systems, and an understanding of the organisational structure of Scitech. This data helped us to understand areas of disconnect within and between teams.
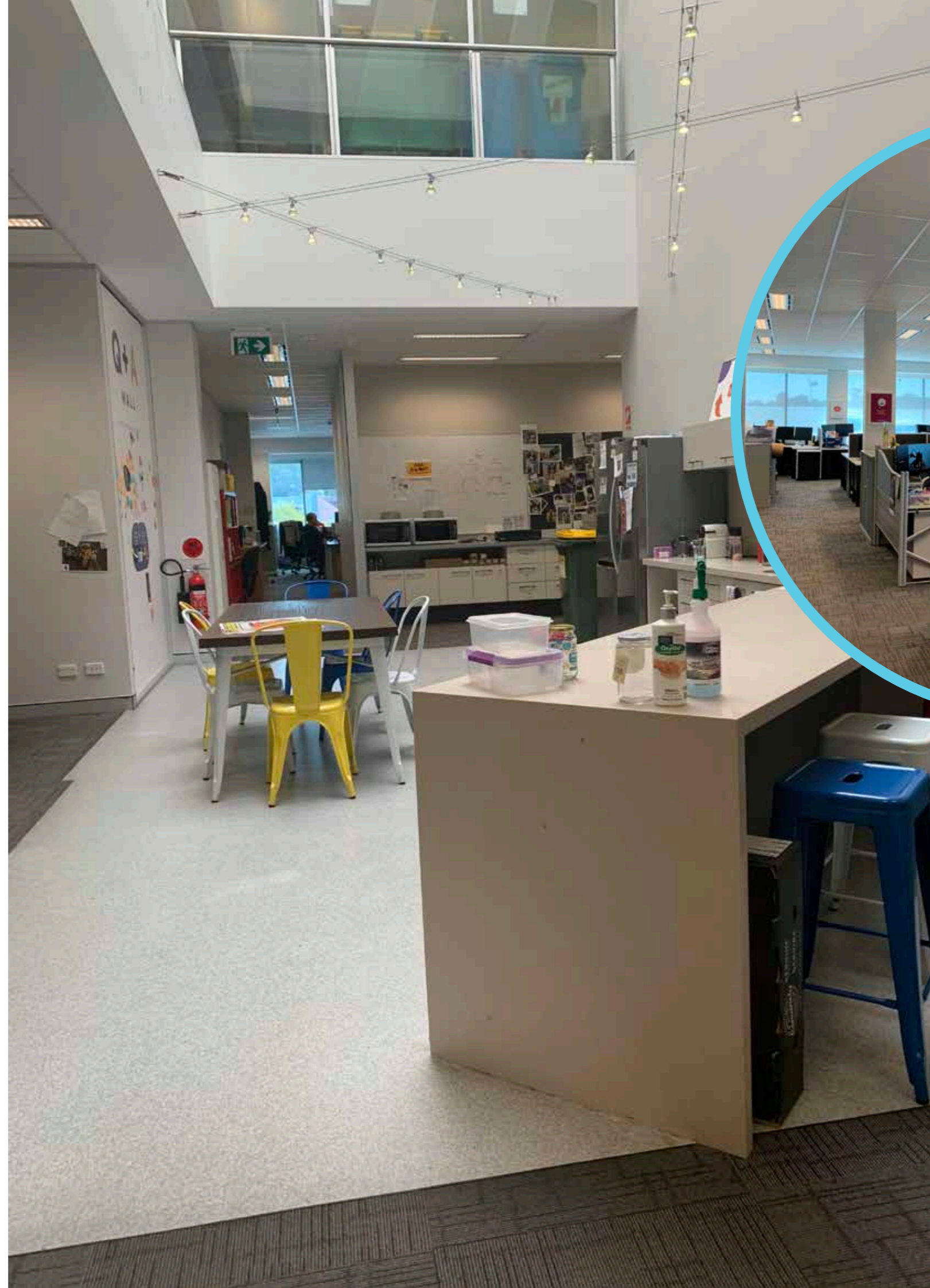
Figure 69: "Internal Troode St Office"
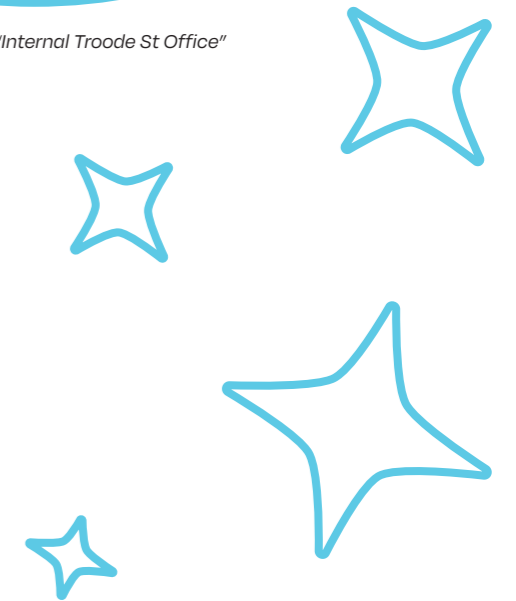
Figure 70: Interactions Map Worksheet

INTERACTION MAP WORKSHEETS

A staff map was created during our first co-design sessions with Scitech to represent the teams that existed in the organisation, as well as the people who worked within them. From this map we created the Interaction Map Worksheet to gather information from staff to show the collaboration across teams within the organisation. By instructing the team member to shade the bubbles of others they interact with on a regular basis, these maps highlight patterns of interaction and disconnect between teams. These worksheets were left on a central bench in the kitchen space with a box to submit once completed.

Presenting the worksheet in a simplified and not overly refined format, along with instructions that encouraged adjustments to be made, resulted in team members making adaptations to the functioning of

the exercise, e.g. showing different frequencies of interaction or varying interactions based on the type of project being worked on. Not only did this uncover patterns of silos within Scitech, but also helped to illustrate the complexities of each role. We noticed that communication between teams tended (with some minor exceptions) to occur through a management level. By analysing these maps from a management perspective, we were able to show the relationships between teams and the points at which silos began to occur. This information informed the Organisation and Communication Charts.

The simplified format of this form was beneficial for user engagement, but it required a high level of analysis on our end to make sense of how this played out in the hierarchal structures of the organisation. It perhaps would have made more sense to use the Organisational Chart as a template for this worksheet to make the silos immediately visible, but we chose to sacrifice this to prioritise needs of team members to make this activity as simple as possible.
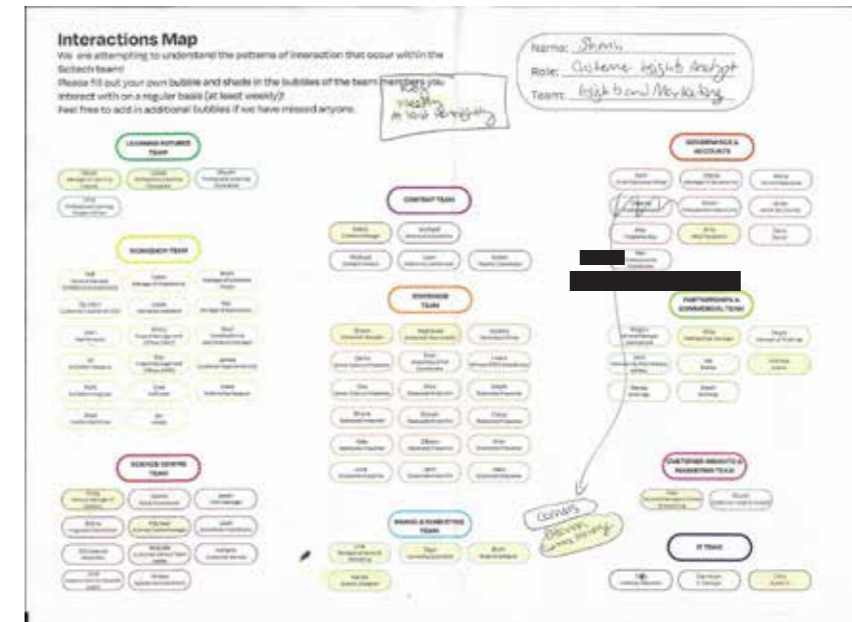
Figure 72: Submitted worksheets showing modification of the task

Figure 71: Submission box in kitchen space
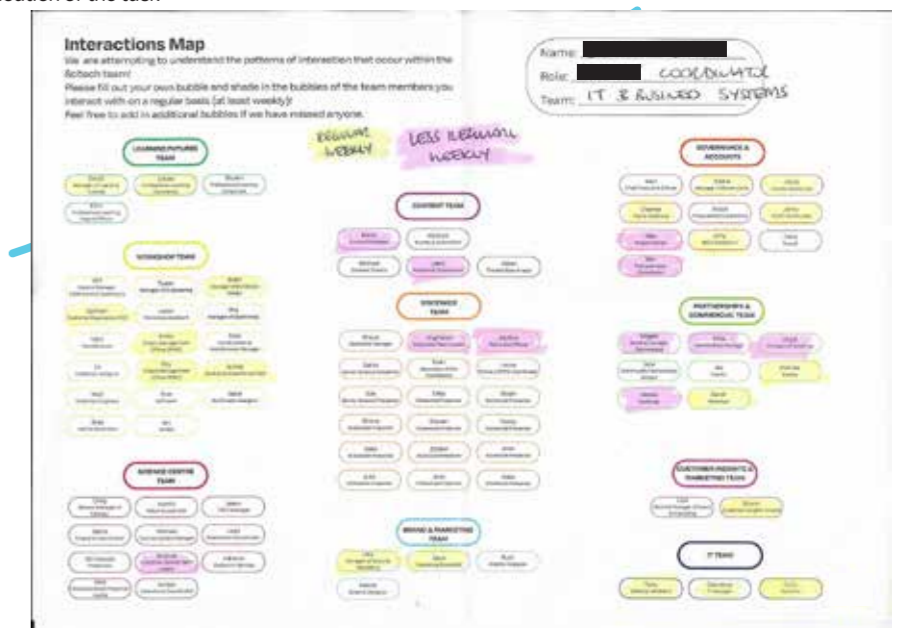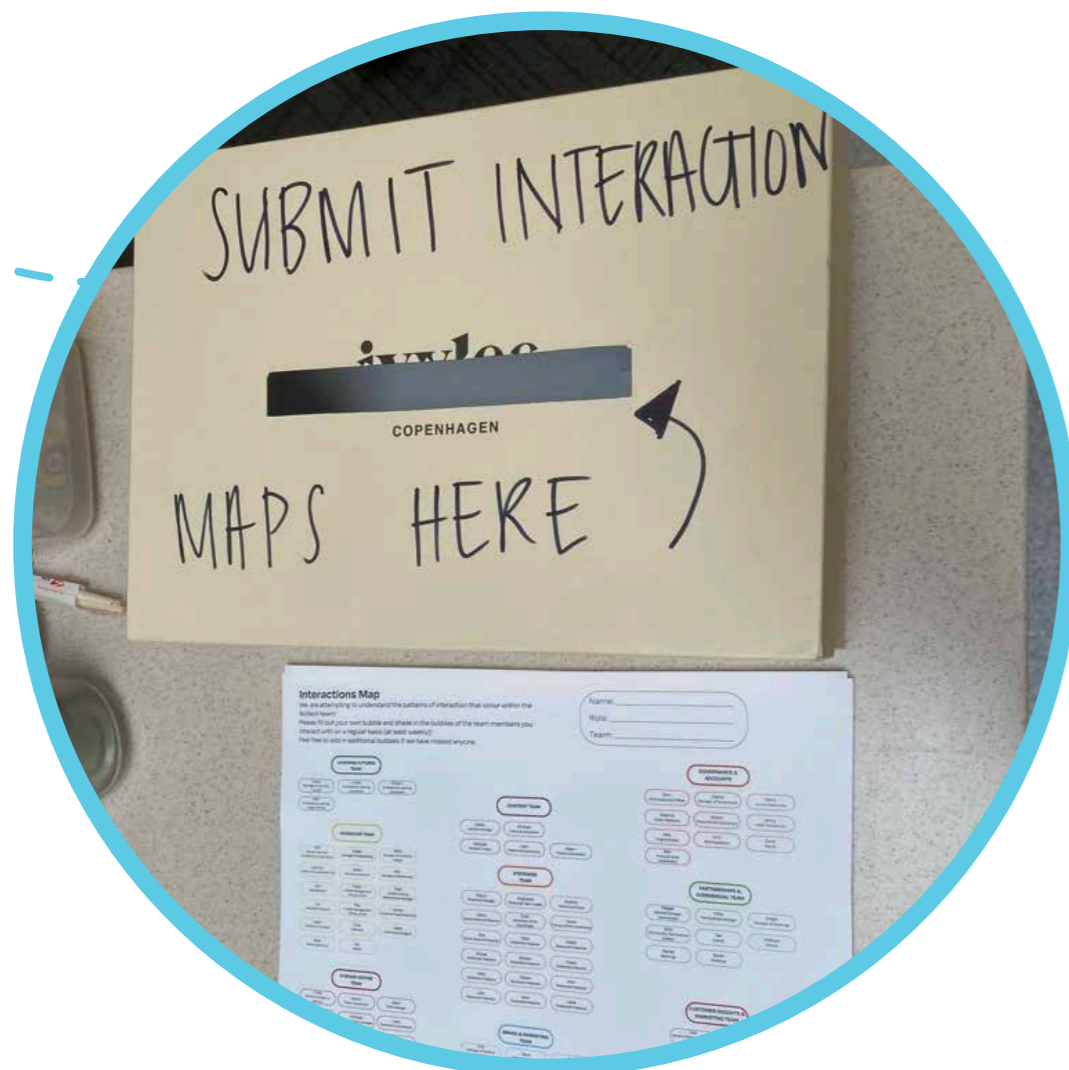
ORGANISATION CHART

During our second co-design session, we worked to organise the staff members identified in the Staff Map into a configuration that showed levels of hierarchy within and between teams. During this session we provided a rough skeleton using names of teams to help guide the layout and provided sticky notes of each staff member to be arranged and rearranged across several whiteboards. This method was extremely effective because of how flexible it was. We found that team members were confident to jump in and participate when they could change their answers and make changes based on new information. To ensure that we had captures the structure correctly, we digitised this arrangement and printed it at A0 size to hang on the wall in the kitchen for feedback. The chart was accompanied by instructions prompting editing and additions to the chart using Sharpies provided. Whilst we would have ideally liked to replicate the sticky notes in the kitchen space, we knew that there was a possibility they would fall off the wall and we would lose the information and feedback we needed. The annotations and changes to this chart were minimal but we are unsure if that was due to its accuracy, or if the concrete nature of writing on the chart was a barrier to participation. Development of the Organisation Chart can be seen in Chapter 4.
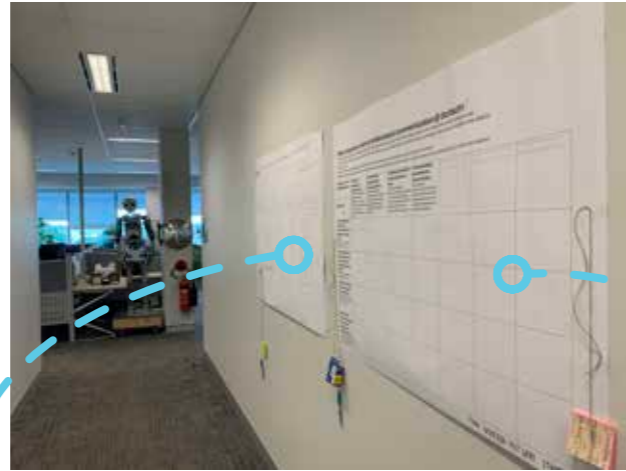
Figure 73: Installation of Charts in corridor
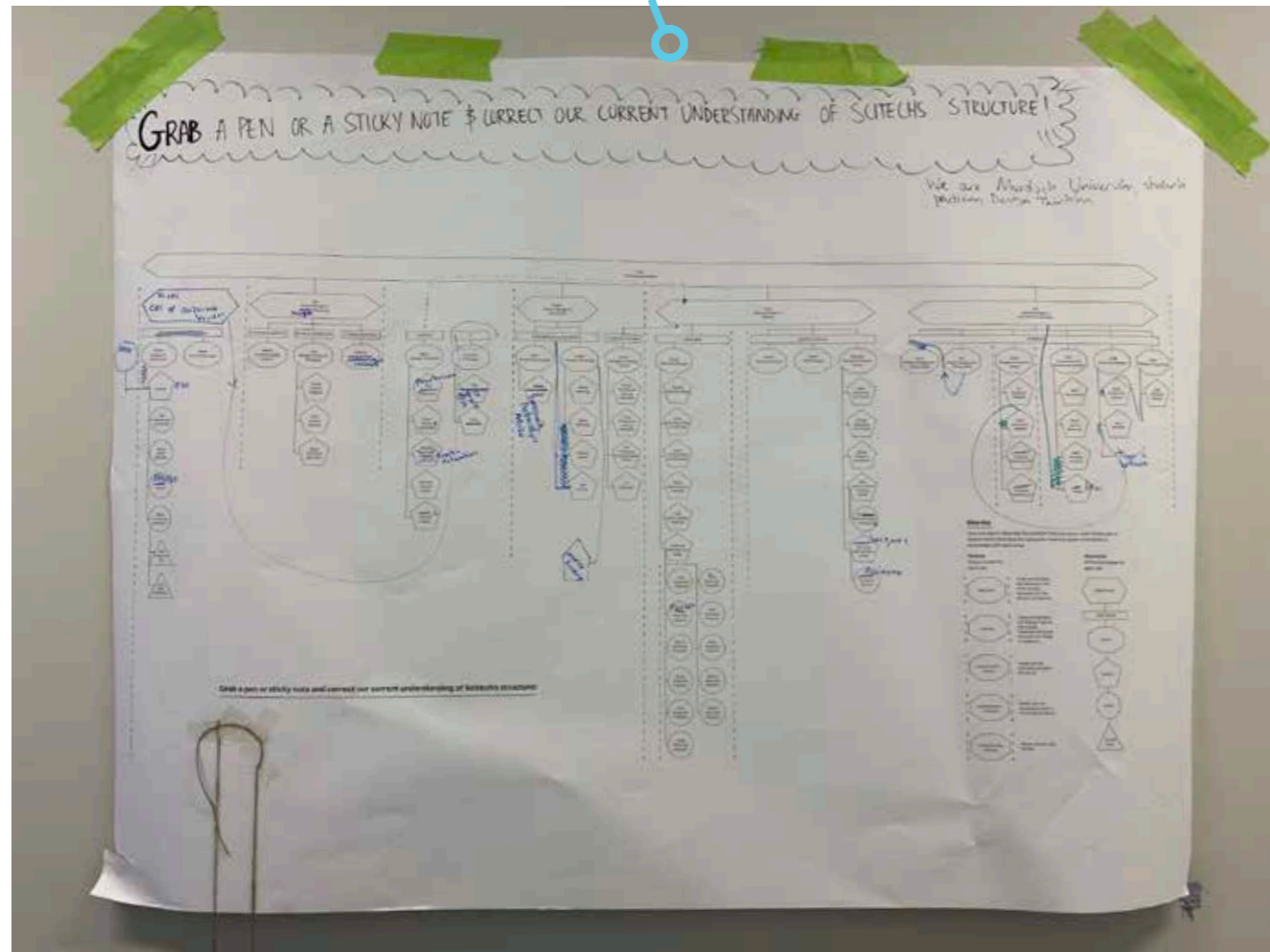
Figure 74: Organisational Chart with feedback

COMMUNICATION MATRIX

The first two co-design sessions highlighted communication as a factor that was impacting the teams' ability to work effectively together. From these sessions we were able to categorise the types of communication within the organisation as Interpersonal, Task-oriented, Documentation and Administrative. To gain greater understanding of where the strengths and weaknesses were in the current communication strategy, we utilised a quantitative dot voting system to allow team members to indicate which category of communication were working well for them, and which needed improvement. Additionally, we asked for input around the channels used for each type of communication, as well as suggestions for changes that could be made to each category to improve effectiveness. Prompts on the chart were tested amongst peers before installation to ensure that they were clear and easily understood. We provided sticky notes and markers for annotations and stickers for voting by attaching them to the chart with twine. Empty categories were left to be filled out if team members felt there were other types of communication they utilised. This chart was adhered to the wall with Blu-Tak, but due to the weight of materials attached to it, we found the chart required something stronger to keep it in place. We were thankful to find staff had re-attached it to the wall with painters' tape when we returned to collect the charts, and noted that this type of adhesive would be useful in the future.

This chart was not positioned in the main kitchen space due to lack of wall area, instead placed down one of the corridors to the east side of the office. We wonder if its location, out of direct eyesight of all staff, lead to disproportionate participation by team members who used this corridor to get to their desks.
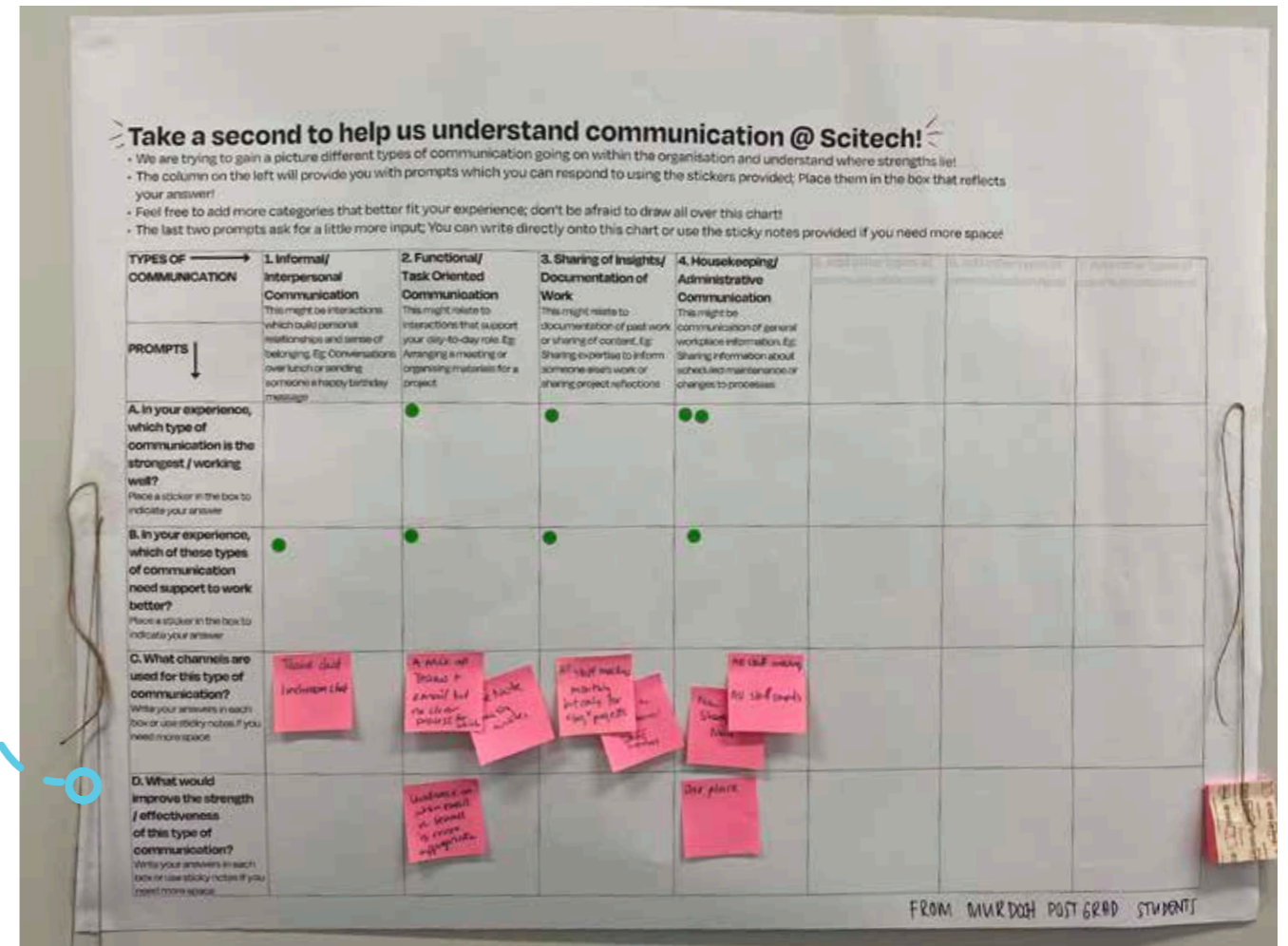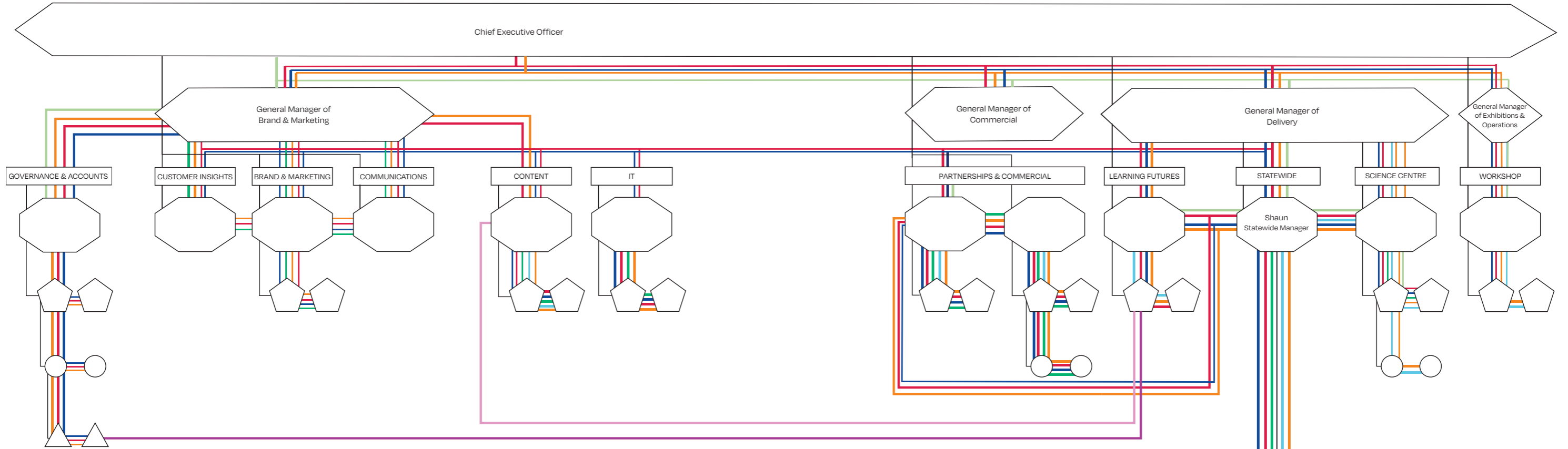

Figure 75: Communication Matrix with feedback

13
DEFINE

INSIGHTS CONSOLIDATED FROM DATA GATHERING ACTIVITIES WERE EXHAUSTIVE AND COMPLEX, REFLECTIVE OF AN EXTREMELY INTERCONNECTED YET SILOED ORGANISATIONAL STRUCTURE AND PROCESSES. WE PROTOTYPED WAYS TO MAKE SENSE OF THIS COMPLEX SYSTEM IN A WAY THAT WOULD HIGHLIGHT PAIN POINTS AND AREAS OF OPPORTUNITY TO BUILD CAPACITY AND IMPROVE COMMUNICATION.

COMMUNICATION MAP

THIS MAP ILLUSTRATES CHANNELS OF COMMUNICATION UTILISED WITHIN
SCITECH TO COMMUNICATE WITHIN AND BETWEEN TEAMS

Chief Executive Officer

General Manager of Brand & Marketing
General Manager of Commercial
General Manager of Delivery
General Manager of Exhibitions & Operations

GOVERNANCE & ACCOUNTS · CUSTOMER INSIGHTS · BRAND & MARKETING · COMMUNICATIONS · CONTENT · IT · PARTNERSHIPS & COMMERCIAL · LEARNING FUTURES · STATEWIDE · SCIENCE CENTRE · WORKSHOP

Shaun — Statewide Manager

Alyshia — Technical Officer · Evan — Secondary STEM Co-Ordinator · Laura — Primary STEM Co-Ordinator · Zahra — Senior Science Presenter · Zoe — Senior Science Presenter · Angharad — Statewide Team Leader

Kate — Statewide Presenter · Aska — Statewide Presenter · Jenn — Statewide Presenter · Elise — Statewide Presenter · Zibeon — Statewide Presenter · Steven — Statewide Presenter

Aron — Statewide Presenter · Shona — Statewide Presenter · Steph — Statewide Presenter · Julie — Statewide Presenter · Cassy — Statewide Presenter

COMMUNICATION MAP

Research uncovered that Scitech used 10 different communication channels to carry out daily functions. These included Microsoft Teams, Outlook, Text/Phone, Satellite Phone, Sharepoint, Outlook Calendar, Jira, Dynamic, File Maker Pro, Sentiment as well as Face-to-Face interactions. Functionality of a number of these channels meant that communication was time consuming when it didn't need to be or lacked capacity and required an additional program to support its function. The sheer number of communication channels in place is overwhelming, and expectations about which channel to use for what function are sometimes unclear. We observed that this often resulted in loss of time, by-passing of processes, and lack of cohesion which posed additional difficulties when staff transitioned through roles across different teams. The Communication Map was prototyped to show current understanding of communication pathways between team members, highlighting the complexity of the current communication strategy. Each channel is signified with a designated colour and

the full organisational chart has been simplified to illustrate commonalities in communication patterns at each level in the hierarchy of each team. Densities in colour indicate more frequent use of a particular channel.

Even with a simplified version of this Map, we struggled to show all of the interactions happening throughout the organisation whilst maintaining legibility. This in itself helps to show an unsustainable communication system that lacks clarity in its processes. This map also has limitations in its ability to show how communication channels used are impacted by location of the team member, therefore its effectiveness is bolstered when viewed in tandem to the Hybrid Organisational Chart.
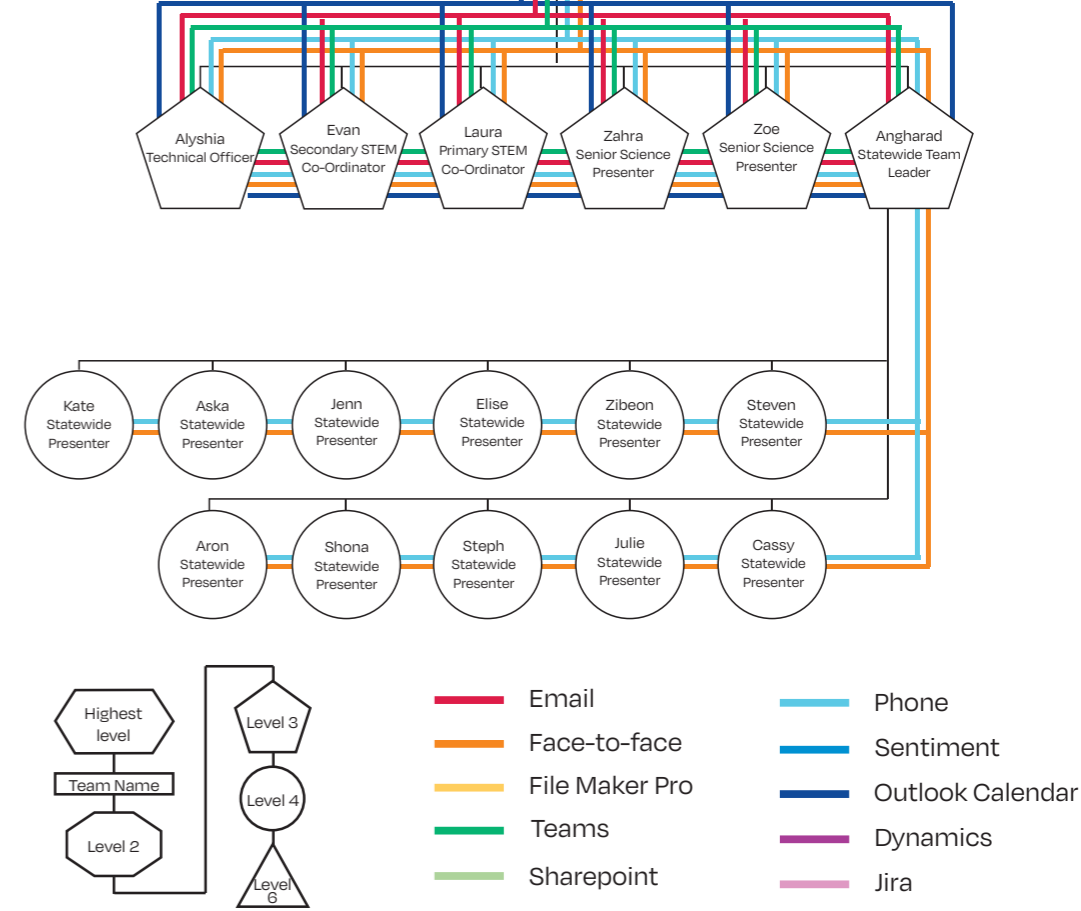
Key

Highest level · Team Name · Level 2 · Level 3 · Level 4 · Level 5 · Level 6

- Email
- Face-to-face
- File Maker Pro
- Teams
- Sharepoint
- Phone
- Sentiment
- Outlook Calendar
- Dynamics
- Jira

Figure 76: Communication Map

HYBRID ORGANISATION MAP

ORGANISATIONAL CHART

In our co-design sessions with Scitech employees we sought to develop our understanding of the organisational structure. In the second session, we ran a collaborative activity on a whiteboard with team members to organise employees into their teams and positions. This formed an organisational chart, showing the levels of management over the whole of Scitech. At the top sat the CEO, and at the bottom sat people in roles such as Statewide presenters. Running this activity with team members helped us to understand everyone's roles in Scitech and encouraged them to

work together collaboratively to create the chart. With the limited amount of people in the room at the time, we took into consideration that this may not be fully accurate and would need further development with more staff. Following this codesign session we digitised what was created on the whiteboard into a traditional organisational chart for feedback by the rest of the organisation (refer to Chapter 3).

This organisational chart was very familiar to what many organisations already have in place to map out the roles of employees across the company. When digitising the chart, we found it important to highlight the silos between teams and levels of employees. These silos spanned both horizontally and vertically. Those in positions of power were often disconnected from

what was happening below their roles. We represented these using shapes: from the highest level represented with a hexagon, to those at the lowest level on the chart represented by a triangle. Each shape symbolised an individual working at Scitech. A prevalent insight that recurred throughout the semester was the disconnect between teams. This disconnect was fuelled by physical distance across locations (the Scitech Centre, the Troode St offices, and the Scitech vans out on the road) and gaps in communication. We represented this on the chart with coloured dashed lines. These lines on the chart represent physical location silos as well as strategy silos (teams facilitating delivery vs discovery).

Choosing to represent the structure of the organisation and its silos with an organisational chart was instinctual to us, as it was something both we and Scitech

employees could quickly gain an understanding of. Organisational charts are frequently used in organisations to show where employees sit across the organisation. The difficulty with this style of visualisation was that it made the organisation's current situation look very clean, meaning that the silos didn't impactfully communicate the reality of the disconnect between teams. This reality was hard to understand from this visualisation alone, relying on the 3D Site Map to pain a fuller picture. Creating this chart in the same format as traditional organisational charts emphasised not only power between levels of management, with the CEO at the very top while roles such as presenters were placed at the bottom, but also seeming importance of these roles. We know that presenters at Scitech are an integral part of the organisation as they are the face of delivery and are as equally important as those in higher positions of management, so this discrepancy seemed unfit.
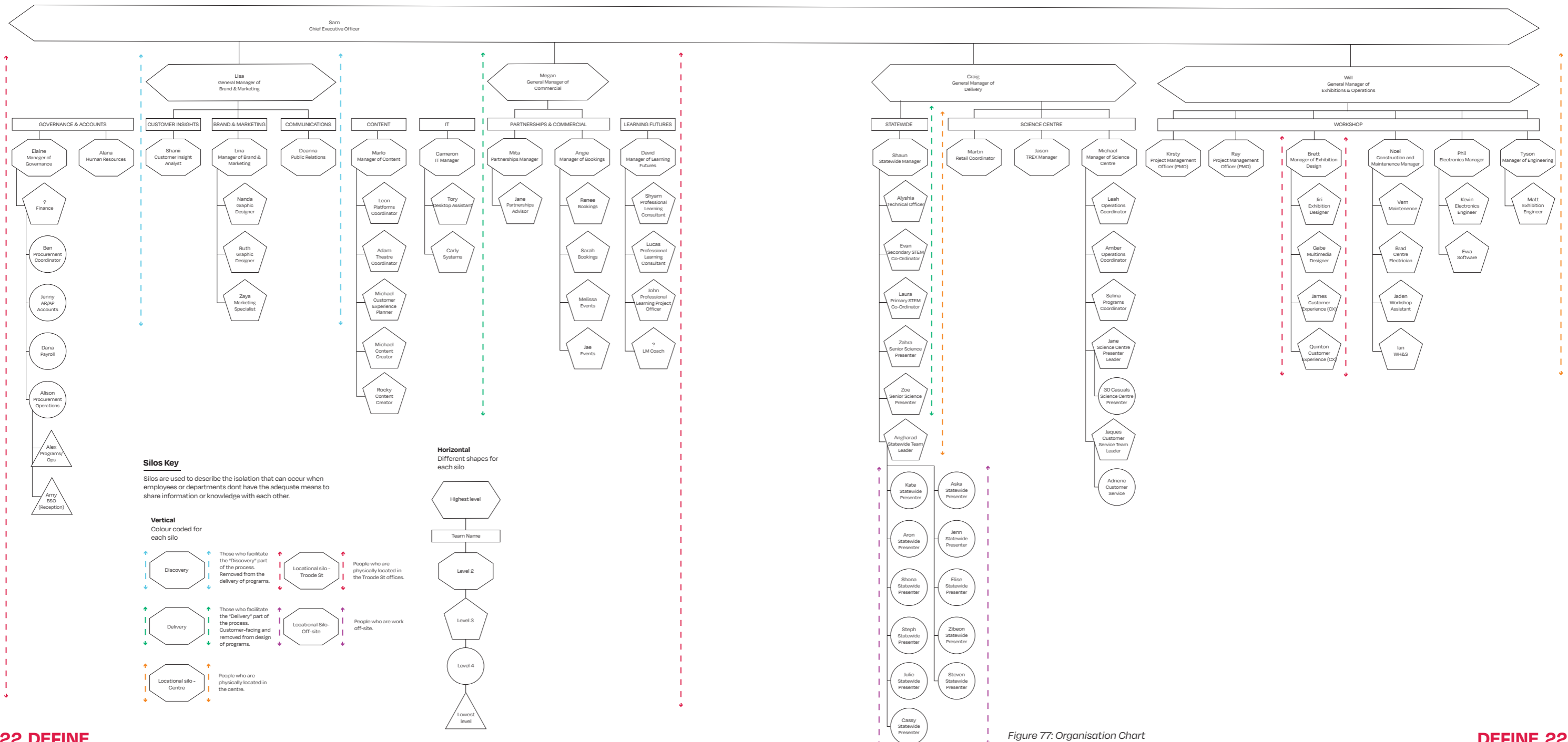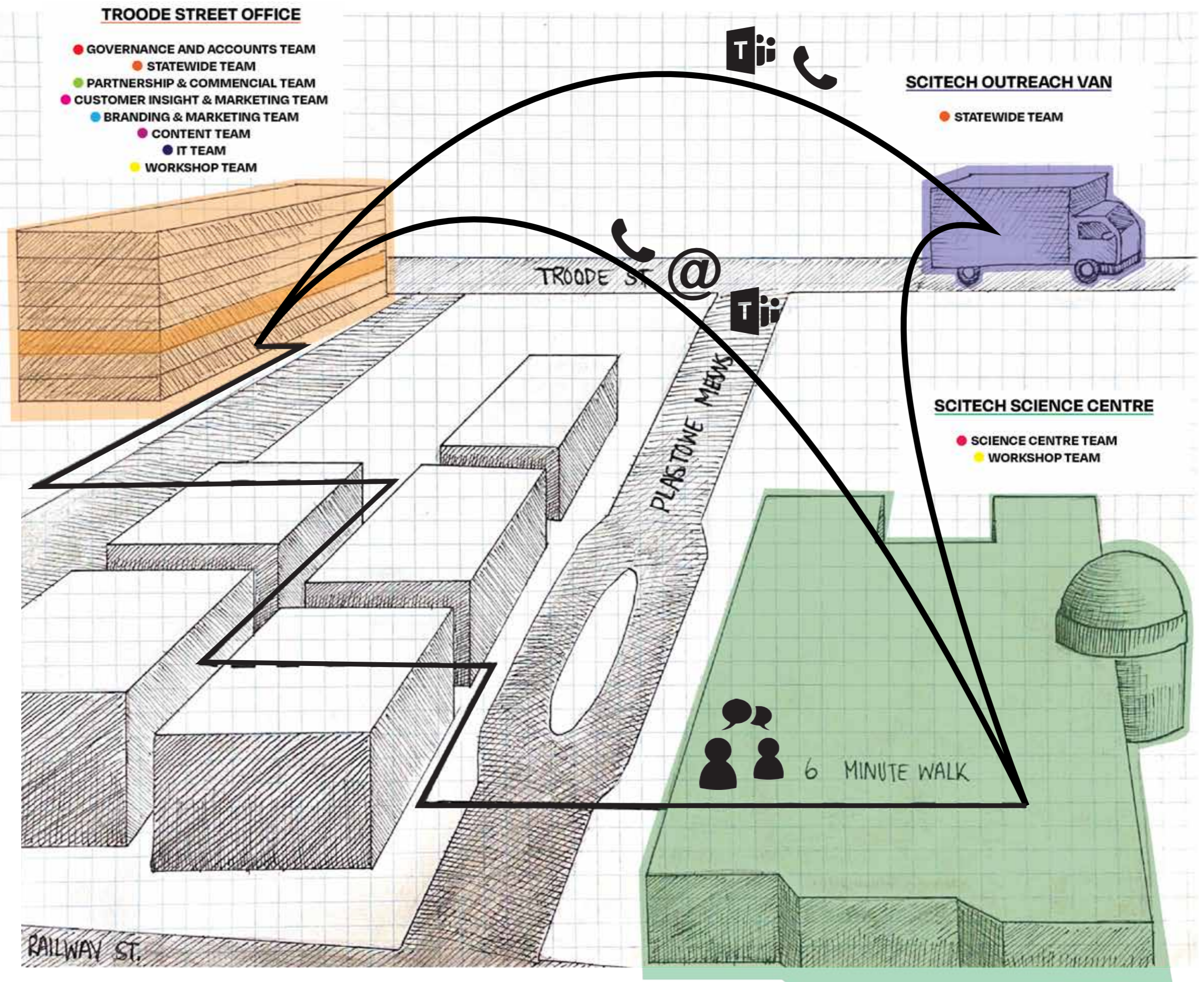

Figure 77: Organisation Chart

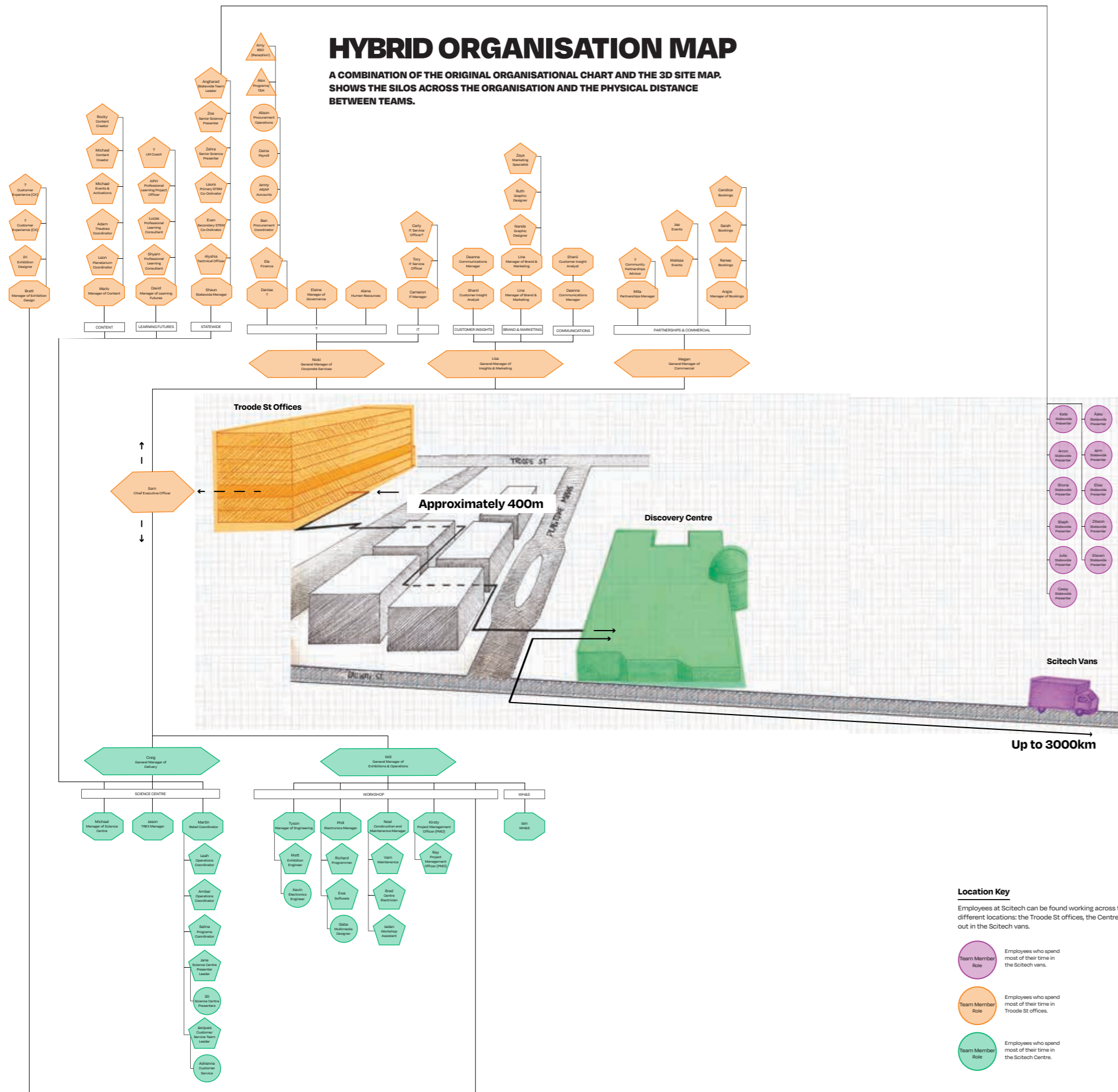**SCITECH SITES INDICATING LOCATION OF TEAMS AND CONNECTING COMMUNICATION CHANNELS**

TROODE STREET OFFICE
- GOVERNANCE AND ACCOUNTS TEAM
- STATEWIDE TEAM
- PARTNERSHIP & COMMENCIAL TEAM
- CUSTOMER INSIGHT & MARKETING TEAM
- BRANDING & MARKETING TEAM
- CONTENT TEAM
- IT TEAM
- WORKSHOP TEAM

SCITECH OUTREACH VAN
- STATEWIDE TEAM

SCITECH SCIENCE CENTRE
- SCIENCE CENTRE TEAM
- WORKSHOP TEAM

6 MINUTE WALK

TROODE ST

PLASTOWE MEWS

RAILWAY ST.

3D SITE MAP

Aiding in showing the impact of physical distance of silos, we created a 3D rendering of what the journey looks like between the different locations of the Scitech Centre, Troode St offices, and the Scitech outreach vans. In this drawing shows the route that an individual would need to take a 6-minute walk between the centre and the offices if they needed to speak with another team member or use facilities located in that building. Between each location are the main channels of communication that connect teams across those locations. For each location, the 3D rendering lists the teams that work there. The goal of representing the locations in this way was the physically show the impact of distance on locational silos. It would also visually show how teams communicated across the locations. We found that this representation was quite limited as we couldn't physically see the people or teams that work in these different locations. Simply listing the teams in each space didn't accurately reflect what Scitech looks like internally.

Figure 79: Hybrid Organisation Map

HYBRID ORGANISATION MAP

Accurately reflecting what Scitech's structure looks like as well as the silos involved was communicated in different forms with both the organisational chart and 3D site map. Both visualisations had limitations in conveying the whole scope of the organisation and its silos. We realised that combining both prototypes could resolve the limitations of what they depict. In this hybrid of the locational organisation chart, we placed the 3D map at the centre while placing fragments of the chart around it. The organisational chart was split up and colour coded by locational silos and placed next to the corresponding-coloured location on the 3D map. Breaking the organisational map up this way helped to communicate the impact of distance on the organisational silos. The long distance connecting between teams in the chart emphasised the distance between locations on the map. We maintained the horizontal silo key using shapes that the initial organisational map contained but overcame the traditional top-down approach by flipping the locations in relation to where they were placed next to the map. The CEO was placed towards the centre of the visualisation, whereas those in lower levels of management were placed closer to the outer edges of the chart.

PERSONAS

Based on the research carried out on a project, personas are created to represent the different users and stakeholders that will interact with a service or product. Personas help within the design process to understand the users' needs and wants, along with their behaviour, experiences, goals and frame of mind when tackling issues. As we had to change the direction of the project, we were able to utilise some of our previous research to inform who our personas for this new project would be. We started to shift focus from Scitech being at the centre and started to view it from the stakeholders that are affected, School kids.

HARRIET WILSON
REMOTE PRIMARY SCHOOL STUDENT

AGE
9 yrs old

PROFESSION
Year 4 student at Tambrey Primary School

BIOGRAPHY
Harriet lives with her parents and older brother in Nickol, Karratha. She attends Tambrey Primary School where she is in a split 3/4 class. At school, Harriet loves to get outdoors and play sport, and learn about the world around her in Society and Environment subjects. She hopes to work in Conservation when she is older, so tried her best in Science even though it isn't her favourite subject.

On the weekend she spends most of her time with her family on camping and fishing trips around the Pilbara. She loves this time as her parents teach her how to identify different animals and she has built her survival skills. Harriet especially likes sharing the stories of her adventures with her friends and classmates during 'show and tell'.

INTERESTS
» Camping and fishing
» Collecting keepsakes from her family trips
» Playing netball
» Playing with her family's rescue dog
» Nature Documentaries

VALUES
» Time spent outside
» Learning how to live off the land
» Trying her best at school
» Looking after the environment

ASPIRATIONS
» Harriet wants to help save the Earth by becoming a Conservation Biologist
» She wants to travel the world and see everything she has seen in her favourite David Attenborough documentaries

NEEDS
» Ways to link her out of class learning to what she learns at school
» A hands on approach to learning
» Encouragement and enthusiasm for her to succeed
» Interesting ways to get her engaged in Science
» Tasks catered to her level of understanding and her interests

POWERS
» Power to share her thoughts with friends during show and tell at school
» Power to teach her family about what she has learnt at school
» Influence to lead younger students in her class

BEHAVIOURS
» Plays outside most days after school
» Spends weekends on family trips, learning outdoor skills from her parents
» Very passionate about her interests and will talk to anyone she can about them

BRANDS

NATIONAL GEOGRAPHIC

WEST COAST FEVER

Typo

TECH

IT & INTERNET

SOFTWARE

MOBILE APPS

SOCIAL NETWORKS

LAURIE SMITH

SCITECH STATEWIDE PRESENTER

AGE
29 yrs old

PROFESSION
Scitech Statewide Presenter

BIOGRAPHY
Laurie has always had a passion for science since he was young, which he carried through his education and job. He grew up in Fremantle with his sister and parents, encouraged to chase his passions. Following high school, he pursued a Bachelor of Science degree at Curtin University in Chemistry. When he completed his studies, he wanted to work somewhere that would allow him to use the skills he learnt while also being enjoyable. Laurie cares about making a positive impact through his work. Upon getting hired as a Statewide presenter at Scitech, Laurie found that he now had the opportunity to get children excited about science just as he once was, while travelling across the state and meeting new people.

INTERESTS
» Teaching and education
» Loves to get people engaged with things he is passionate about
» Casual photography

VALUES
» Providing an inspiring learning experience
» Improving how kids learn and make a meaningful difference to quality of education across WA
» All aspects of science, maths, the environment

ASPIRATIONS
» Inspire the future generation of kids to love science as much as he did and still does
» Being a part of the positive change to Scitech's evolution
» Create a more equal access to education for disadvantaged groups of children

NEEDS
» Stay in touch with loved ones when working over long distances and work hours.
» To have the space to share experiences and get feedback
» To have his voice and opinion heard in the workplace to help improve quality of program delivery
» Opportunity to use and expand disciplinary skills

POWERS
» Spark excitement in students
» Sharing of knowledge, experience and expertise to schools
» Provides access to resources and inspiration to peers working in education
» Personal connections that can lead to places for Scitech to take outreach shows to.

BEHAVIOURS
» Works away on the road as a Scitech educator completing tours around Western Australia.
» Consistently prepared to work on across constantly changing schedule.
» Collaborates with festivals, fairs and carnivals.
» Supports local businesses where ever tour stops.

BRANDS

TECH
IT & INTERNET

SOFTWARE

MOBILE APPS

SOCIAL NETWORKS

JESS WALKER

SCITECH STATEWIDE LEADER/MANAGER

AGE
33 yrs old

PROFESSION
Scitech Statewide Team Leader/Manager

BIOGRAPHY
Jess grew up in the southwest outside of Perth in Bunbury, Western Australia. Throughout her time living there she developed a sense of community with the other locals. She was encouraged to take up education in fields now known as STEM, as it was proven by those around her to provide a secure future in the workforce. Jess went on to study Environmental Science at Murdoch University, fuelled by the love for the natural environment of Australia that she grew up in. Following completing her studies, Jess found herself as Scitech in the role of a Statewide presenter. She loved the change that she could inspire in young school children. After several years in her job, she advanced to a role that allowed her to oversee the functions of other Statewide presenters.

INTERESTS
» Inspiring a love for STEM in students
» Positively changing the future of education
» Empowering girls to take charge of their future
» Loves animals and children

VALUES
» Empowering students from marginalised groups
» Creating equal opportunities for all students
» Giving children a passion for learning

ASPIRATIONS
» Wants to help evolve Scitech to positively change the face of education in WA.
» Wants to get involved with expanding tours, creating online platforms and collaborating with communities and schools.
» Wants to create an impact on Indigenous communities and improve education facilities and inspire kids.

NEEDS
» Connections with people in other areas of Scitech
» Streamlined channel for feedback collection and monitoring
» Skills to inform development of Statewide programs and wider organisation projects

POWERS
» Skills and knowledge based in educational background
» Advocate for presenters
» Sharing insight and feedback amongst team

BEHAVIOURS
» Oversees roles of other presenters and helps them out to carry out their jobs more smoothly.
» Monitoring progress of staff
» Facilitating rostering of presenters
» Encourages and inspires presenters to see the "bigger picture" of Scitech's goals.

BRANDS
THE BODY SHOP

LUSH

SAMSUNG

TECH
IT & INTERNET

SOFTWARE

MOBILE APPS

SOCIAL NETWORKS

COMMUNICATION NEEDS BRAINSTORM

After the insights we gained through our co-design sessions and interview sessions with Scitech staff, the team interpreted all the information we had been given regarding communication at Scitech into a brainstorm of communication needs. We were able to consider the data we had gathered from the perspective of our personas, to ensure we accurately captured their needs in context. As a group, we each allocated ourselves a persona and brainstormed the ways that Scitech communicated, how those communication methods were not meeting the needs of the organisation, and what methods of communication we could feasibly prototype that would address those needs, from the persona's perspective. This was an effective way for us to ensure that the definition of the problem reflected the experiences of the Scitech team and to help us consider the problem from a more personal and emotional perspective

For example, we identified that the ways in which data was stored was not intuitive or even accessible to many staff members at Scitech which was incredible frustrating. This prevented them from utilising past data and experiences in newer endeavours. In response to this need, the team focused on ways that this information could be made accessible to the entire organisation given the limited time and resources of the staff.

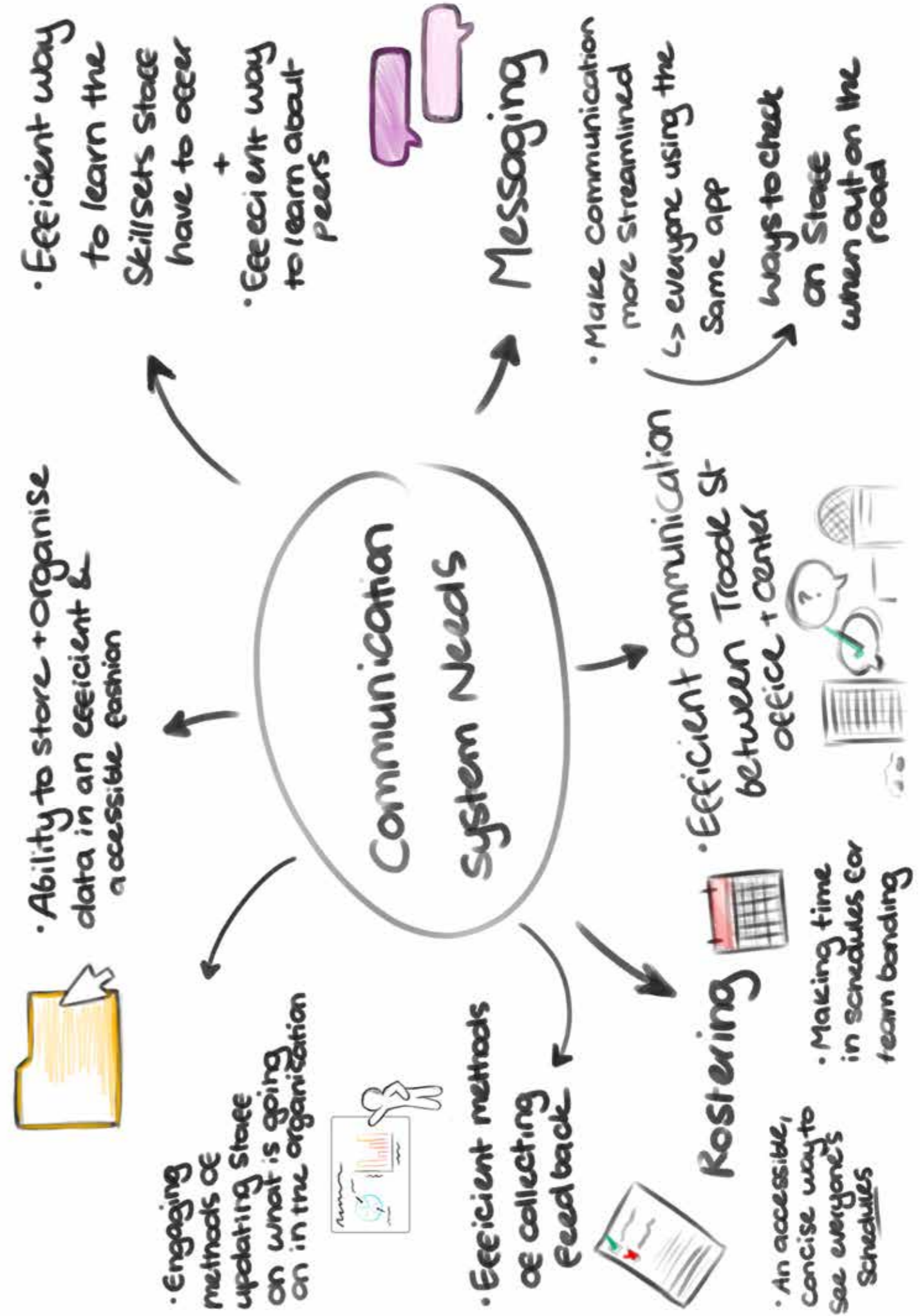Figure 80: Communication Needs Brainstorm
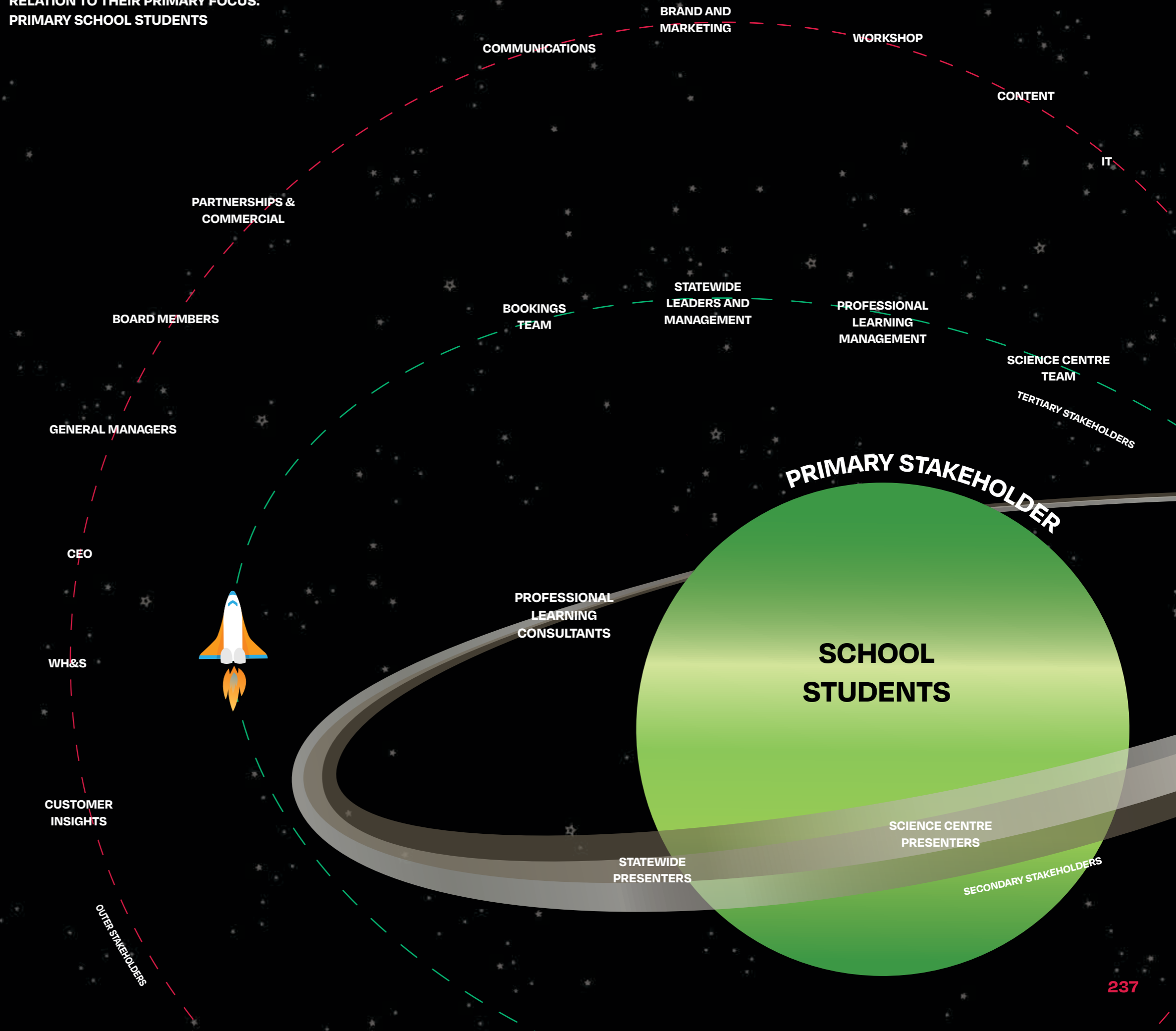

Figure 81: Clarified Communication Needs

CIRCULAR INTERNAL STAKEHOLDER MAP

The insights gathered from research with the Scitech team showed that silos existing between teams impacted their ability to recognise a common goal or vision for work. It seemed that those at the forefront of interactions with schools recognised the importance of their role in directly impacting the learning experiences of students while those in more internal roles seemed disconnected from the end product of their work.
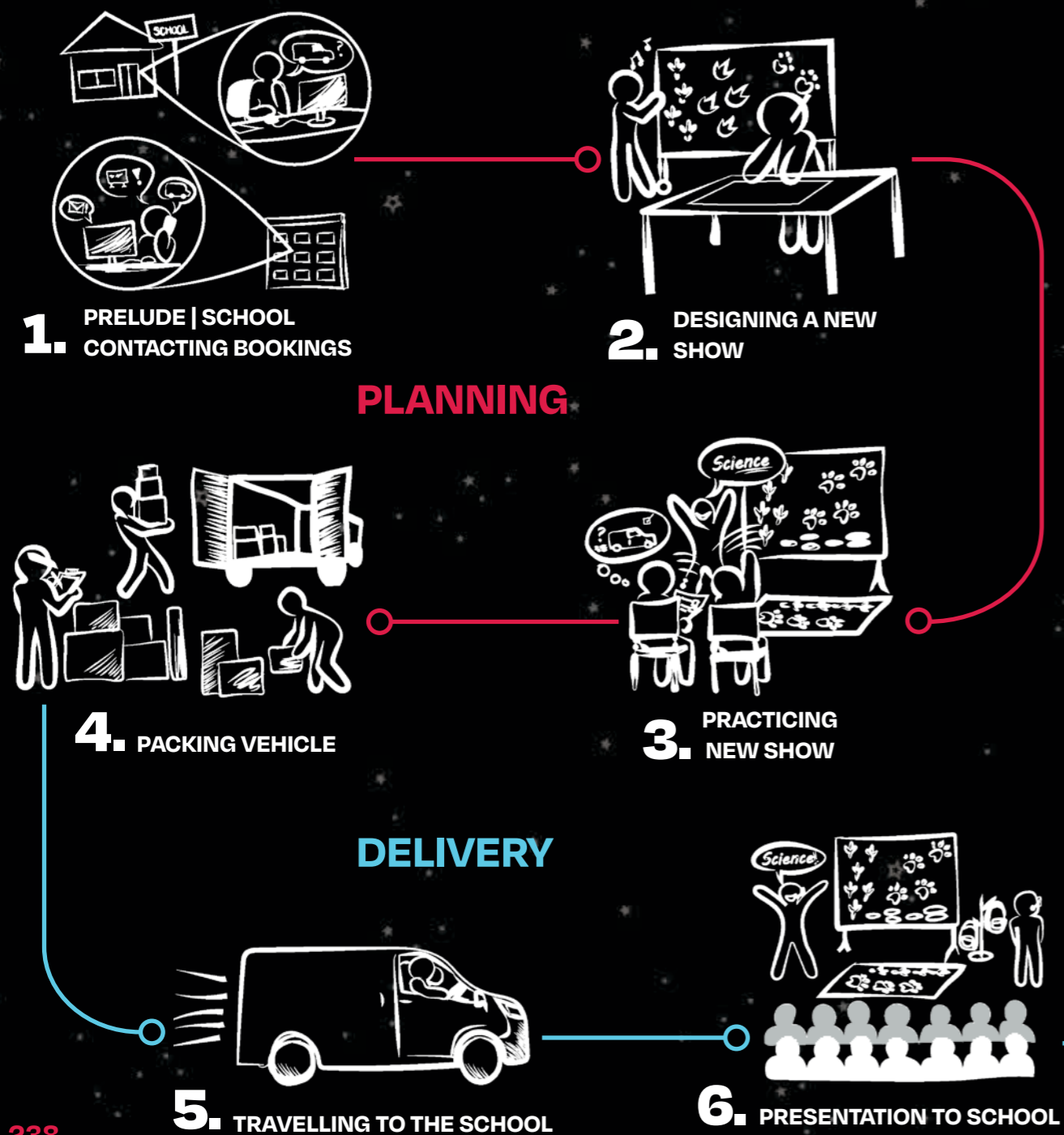
At this transitional time for Scitech, there is benefit in uniting the team with a reminder of the end goal they are working towards: providing engaging opportunities to all students across the state. This will help to guide decision making for future projects and developments by centring the needs of these students and viewing Scitech from their perspective. This enables reframing of the organisation as a service system and series of touchpoints (points of interaction between users and a service) that students and schools interact with. The Circular Internal Stakeholder Map depicts the organisation through this lens. Students are placed in the centre surrounded by teams that they engage with first-hand. Teams that support these interactions are arranged in the next ring and so on. When exploring future opportunities or service offerings to enhance the experiences of students, this map helps place the student outcomes in the centre and consider the range of infrastructure and support that will need to be put in place to support first-hand interactions, followed by support processes as we move out through the rings.

Considering the organisation in this way helps to prepare teams to think about their work in the timeline of a connected service, from back-end design and coordination to front end program delivery. It shows that change to a team in one ring has a ripple effect inwards and outwards to other teams and ultimately the experience of students.

THIS MAP SHOWS WHERE THE INTERNAL STAKEHOLDERS AT SCITECH SIT IN RELATION TO THEIR PRIMARY FOCUS: PRIMARY SCHOOL STUDENTS

BRAND AND MARKETING

COMMUNICATIONS

WORKSHOP

CONTENT

IT

PARTNERSHIPS & COMMERCIAL

BOARD MEMBERS

BOOKINGS TEAM

STATEWIDE LEADERS AND MANAGEMENT

PROFESSIONAL LEARNING MANAGEMENT

SCIENCE CENTRE TEAM

TERTIARY STAKEHOLDERS

GENERAL MANAGERS

PRIMARY STAKEHOLDER

CEO

PROFESSIONAL LEARNING CONSULTANTS

SCHOOL STUDENTS

WH&S

SCIENCE CENTRE PRESENTERS

CUSTOMER INSIGHTS

STATEWIDE PRESENTERS

SECONDARY STAKEHOLDERS

OUTER STAKEHOLDERS

JOURNEY MAPS

As the scope of the project was huge and ever so complicated, we focused on the Statewide Team's journey, particularly the actions of the presenters. We identified that there were three phases, planning, delivery and post-delivery, where their actions and interactions with schools and students are illustrated.

In the phase of "planning," we identified the first action was the interaction of schools contacting Scitech to plan a show for the students. The Statewide presenters may utilise a show they currently have or plan a new show. In the meantime, they practice this when they are back at Scitech Centre and then proceed to pack the vehicle when the time comes around for the delivery phase.

The delivery phase starts from, packing the vehicle and the presenters making their way to these schools. Once they arrive the presenters will set up and prepare themselves before conducting a presentation and workshop for the students. Once this ends, the presenters will continue to pack the vehicle and hit the road back to Scitech centre.

The next phase of their journey is "post-delivery" where it starts from presenters driving back to Scitech. In the meantime, while they are driving, presenters will complete feedback before they get to the centre to record important information before meeting with their leaders. They continue to arrive at Scitech, unpack the vehicle and later, Scitech will receive feedback from the schools.

OVERVIEW OF STATEWIDE JOURNEY PHASES

PLANNING

1. PRELUDE | SCHOOL CONTACTING BOOKINGS

2. DESIGNING A NEW SHOW

3. PRACTICING NEW SHOW

4. PACKING VEHICLE

DELIVERY

5. TRAVELLING TO THE SCHOOL

6. PRESENTATION TO SCHOOL

POST-DELIVERY

5. PACKING AND LEAVING SCHOOLS

6. PRESENTER FEEDBACK

7. UNPACKING

8. FEEDBACK FROM SCHOOLS

Figure 83: Circular Internal Stakeholder Map

SERVICE BLUEPRINT

Service Blueprints are "a diagram that visualises the relationships between different service components, such as people, props (physical or digital evidence), and processes – that are directly tied to touchpoints in a specific customer journey" (Norman & Nielsen, 2021). Service blueprints are a multidisciplinary method for designing and harmonising multi-interface business and technical methods and experiences. They illustrate service processes, designed as a flowchart diagram depicting essential processes and activities (Shostack, 1984). These prototypes display complex interactions and create more clarity, transparency, and cohesion in how people interact with products and services. It also highlights pain points such as delivery and waiting times, service fails, and gaps of knowledge. Service blueprints are created with extensive research of current service experience to understand the interaction and needs. They are critical to service design and beneficial to this project as they place the users first through understanding the complexities of how a product/service is curated before it is available for use. We chose a service blueprint prototype for this project to highlight issues within the current system at Scitech as well as opportunities to improve the service.

Generally, a service blueprint illustrates a customer journey and the internal processes that support this interaction. We required the blueprint to show multiple journeys in tandem, the School/Student journey, the Statewide team journey, and the Supporting team journey. Consequently, we created a service blueprint hybrid that would allow us to illustrate the interaction and cross-over between these journeys and the resources and processes that were required for support. We chose this method of visualisation to show all of the challenges Scitech and its employees face in its current climate. This particular prototype focuses on the delivery of a Statewide program, articulating the specific members of the Statewide team, the actions they use, the technology resources, supporting actors and/or teams within Scitech, the support process, and the issues and opportunities they present.

The size of this service blueprint reflects the complex nature of the Statewide journey so to make this more manageable, it can be broken down into three stages: Planning, Delivery, Post-delivery. The overview of this service blueprint can be seen in the simplified version in Figure X. The stages in this simplified journey will be referred to in the footer throughout the Service Blueprint to help locate the reader in the overall journey.

Personas play a key role in displaying who these actors are within a service. Many diagrams like services blueprints show processes, the actions, steps, in house actions, technology and equipment used, however, they do not display the roles of personas within these systems.

In this service blueprint diagram, we utilised the 4 main personas to roleplay how every action plays out and determine where issues and opportunities lie. In the first step of the service blueprint, we have the schools/student persona interacting with Scitech's booking team, and in this first interaction, we were able to use the data gathered from our co-design sessions and interviews and identify an issue. Scitech uses an array of applications, and the bookings systems are over multiple 2 different systems that are aged. This process of making a booking is difficult and timewasting as there is no unified process and communication system in place to make this streamlined. A streamlined system will benefit the internal supporting teams by saving their time and resources when making bookings for the Statewide shows.

We created a state-wide presenter persona to see who the face of Scitech is. Their main point of interaction with the public within the service blueprint is when they are presenting and completing workshops at the schools. We noticed an issue with this interaction that students don't have a way to communicate their personal reflections to Scitech. We believe this is a perfect opportunity to capture and harness student feedback with quick and effective ideas that are beneficial to the implementation of innovative or improved programs in the future. Having only one QR code is not enough data to bring in from a student's perspective. We also noticed a gap in capturing presenter feedback on these shows. In this action, an opportunity to design and prototype a way to gather student first-hand account feedback is beneficial for Scitech's future Projects.

In the post-delivery phase, we broke up the actions of the journey map in detail to show when important meetings occur. In these meetings, we realised how beneficial previous information from students and presenters are for the future development of a show. We noticed that presenters were not having a chance to voice their opinions and ideas when deciding to create new shows or implement changes. Not having this team part of crucial moments, creates the disconnection within the organisation. An opportunity arose to bring these presenters into meetings and conduct co-design sessions with their leaders and other teams within Scitech.

Opportunities have been coded using icons are displayed in the bottom row of the blueprint with reference to a page that expands on the opportunity with a full description.
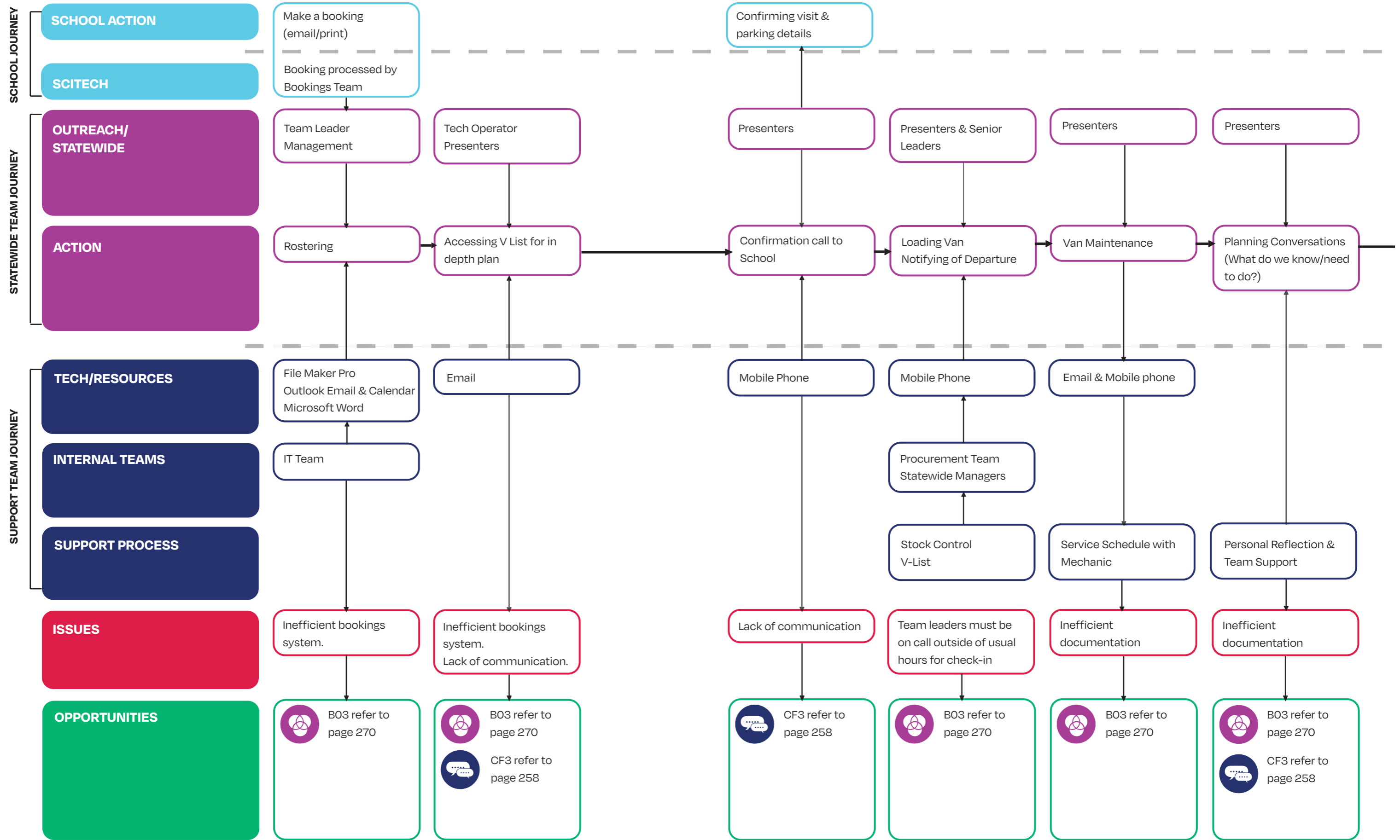

PRIMARY SCHOOL STUDENT

STATEWIDE PRESENTER

STATEWIDE LEADER/MANAGER

SUPPORTING TEAM MEMBER

Figure 84: Personas

SERVICE BLUEPRINT OF STATEWIDE JOURNEY

PLANNING PHASE

SCHOOL JOURNEY

SCHOOL ACTION

Make a booking (email/print)

Confirming visit & parking details

SCITECH

Booking processed by Bookings Team

STATEWIDE TEAM JOURNEY

OUTREACH/ STATEWIDE

Team Leader Management

Tech Operator Presenters

Presenters

Presenters & Senior Leaders

Presenters

Presenters

ACTION

Rostering

Accessing V List for in depth plan

Confirmation call to School

Loading Van Notifying of Departure

Van Maintenance

Planning Conversations (What do we know/need to do?)

SUPPORT TEAM JOURNEY

TECH/RESOURCES

File Maker Pro Outlook Email & Calendar Microsoft Word

Email

Mobile Phone

Mobile Phone

Email & Mobile phone

INTERNAL TEAMS

IT Team

Procurement Team Statewide Managers

SUPPORT PROCESS

Stock Control V-List

Service Schedule with Mechanic

Personal Reflection & Team Support

ISSUES

Inefficient bookings system.

Inefficient bookings system. Lack of communication.

Lack of communication

Team leaders must be on call outside of usual hours for check-in

Inefficient documentation

Inefficient documentation

OPPORTUNITIES

B03 refer to page 270

B03 refer to page 270

CF3 refer to page 258

CF3 refer to page 258

B03 refer to page 270

B03 refer to page 270

B03 refer to page 270

CF3 refer to page 258

JOURNEY KEY

PLANNING

SERVICE BLUEPRINT OF STATEWIDE JOURNEY

DELIVERY PHASE

| Schools & Teachers | | Schools Kids | | | Schools & Teachers | | | |
| Presenters | | | | | Presenters | | | |

| Presenters | Presenters | Presenters | Presenters | | Presenters | Presenters & Senior Leaders | Presenters | Presenters & Senior Leaders |

| Arrival & Introductions | Unpacking van to set up | Presenting Workshops | Pack Up and loading the Van | | Feedback from Schools and Teachers | Notification of departure | Driving & Debrief Filling out feedback form (Regional Tour) | Arrival & Unloading van Team check-in |

| Mobile Phone | | (Consumables) Content | | | QR code provided to schools | Mobile Phone | Filing System via Sharepoint | V-list process to keep stock & storage in check. Mobile phone for check-in |

| | | | | | IT & Customer Insights | | Statewide technical officer | Statewide technical officer |

| | Training and Program Manuals | Personal Relationships & Team Support | | | | | Reflection Feedback Printing of Forms Personal Relationships | Stocktake Rotation, Stocktake storage & Protocol |

| Inefficient communication | | Missing chance for capturing student feedback | | | Inefficient engagement & documentation | Team leaders must be on call outside of usual hours for check-in | Feedback forms only utilised on Regional Tours | Team leaders must be on call outside of usual hours for check-in |

| B03 refer to page 270 | | CF1 refer to page 257
 CF2 refer to page 258 | | | CF1 refer to page 257
 CF2 refer to page 258 | B03 refer to page 270 | CF2 refer to page 258
 CF3 refer to page 258 | B03 refer to page 270 |

JOURNEY KEY ——— DELIVERY

School Feedback

Presenters, Senior Leaders & Management

Manager of statewide team leader
Senior presenters and tech officer

Senior Leaders & Management

Manager of Statewide Team Leader

Manager of Statewide Team Leader

Presenters & Team Leaders

Presenters, Senior Presenter & Team Leader

Feedback shared via
1. Informal conversation
2. Report of problem via
@ RT upload of feedback form

Statewide management meeting for program review

Feedback portal survey

Program Review Meeting

Fortnightly Management Meeting to review projects

Program update meeting. Creation of updated program collateral. Updating training manuals resources & equipment

Rostering of Individual learning day to learn updated program

Sign off and feedback Session

---

2. Microsoft Outlook and RT Sharepoint

Microsoft Teams. Outlook Calander. Reports & Analytics.

QR code data analytics gatherer

Email
Microsoft Teams
Outlook Calander

Microsoft Outlook
Outlook Calendar
Microsoft Teams

Jira & Share Point

Sharepoint
Microsoft Outlook
Program Equipment
File management

Sharepoint
Paper feedback forms

IT Team

Customer Insights

Customer Insights

Content Team

CEO, GMs, Managers, Partnership co-ords Content team.

Manager of content team Content team digital design team. Procurement

File management process

Meeting at Toode St to review analytics received from Schools

Insights analysis + reports

Rostering authority minute keeping. Calendar blocking

Meeting rooms Troode St. Job request processes

Staff training Matrix Training rooms @ centre Rostering time & blockings

Staff training Matrix. Training rooms @ centre. Rostering time & blockings.

Insights not captured. Inefficient documentation

Inefficient documentation Employee disengagement

Insights not captured. Employee disengagement

Lack of development. Lack of employee growth. Inefficient engagement & documentation.

Inefficient documentation. Organising tasks.

Lack of program collaboration &development. Inefficient engagement & documentation.

Inefficient scheduling & documentation system. Team bonding.

Inefficient documentation system. Learning from feedback.

B03 refer to page 270
CF3 refer to page 258

B03 refer to page 270
MS2 refer to page 262

B03 refer to page 270
CF2 refer to page 258

MS2 refer to page 262
BO2 refer to page 269
OC1 refer to page 272

BO2 refer to page 269
MS2 refer to page 262

B01 refer to page 268
OC1 refer to page 272
MS1 refer to page 260

B01 refer to page 268
OC1 refer to page 272

B01 refer to page 268
OC2 refer to page 274

JOURNEY KEY

POST-DELIVERY

14

IDEATION
(TAKE 2)

BRAINSTORMING

The first stage of addressing the design problem was identifying the key stakeholders, the existing systems, and the potential outcomes of the project.

In order to give ourselves a starting point, we utilised brainstorming. This allowed us to visualise these different aspects quickly, and in a way that didn't demand us to commit to any ideas or concepts right away. This was especially important, given that we knew our approach and concepts would change drastically as we learned more about how Scitech functions from our co-design sessions and interviews. We based these brainstorms around the four opportunity areas identified during analysis of issues in the Service Blueprint. By beginning these brainstorms with 'how might we' questions, we were encouraged to directly address key opportunity areas and build on others' ideas. Roughly ten minutes were spent coming up with as many ideas as possible for each of these areas. At the end of the brainstorming session, we could see links beginning to form between ideas across the four spaces, indicating that some ideas had the ability to address a range of issues.

REFINING CONCEPTS

This stage of development was where we really started to flesh out our ideas in a way that would be palpable to a viewer. Instead of the throwing-slighty-educated-spaghetti-at-the-wall method we utilised in the very early stages of the project, this time we were using the insights gained specifically through our co-design sessions, interviews, and other forms of engagement with Scitech staff to inform the methods of approach we were developing. Each member of the team dedicated time to a specific opportunity area, taking all ideas from the brainstorming activity and synthesising them into clear, cohesive concepts.

With an expanded understanding of how Scitech operated, we were able to ensure that the needs of the organisation were translated into concepts that built on foundations that already existed. We used rough sketches of storyboards, scenarios, and diagrams to help explain the functionality of these ideas.

Figure 88: Brainstorming concepts
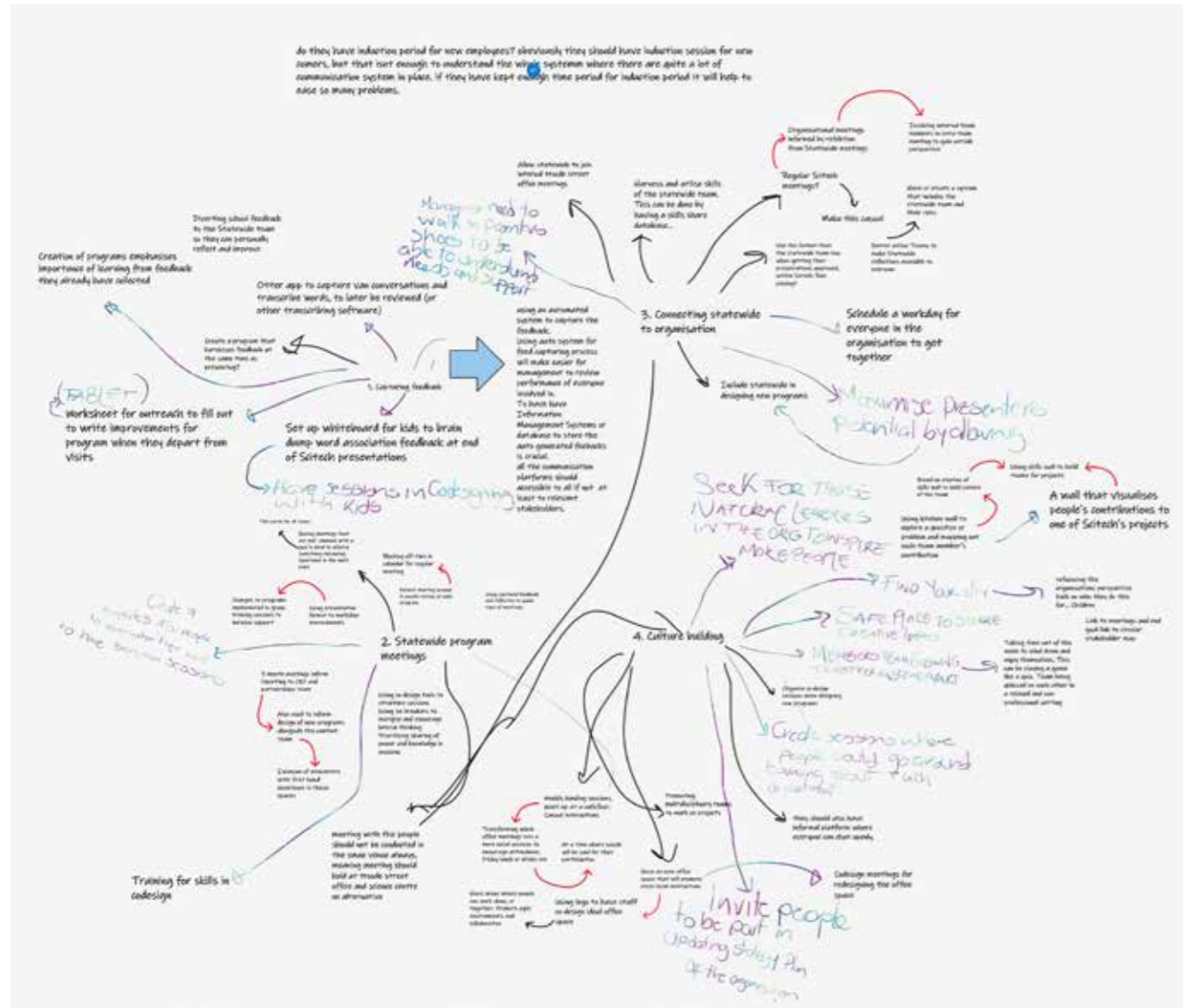
ASSESSING VIABILITY

Assessing viability was an important step in narrowing the scope of concepts to continue developing. This process involved mapping the viability of these concepts within the specific context of Scitech as an organisation against their ability to drive change.

The viability of concepts for this design problem was mainly determined by the time and monetary resources needed to implement them. If something required a large amount of time and a large amount of capital, it was less viable, etc. The impact of a concept was determined for how well we felt they would address the design problem if implemented, informed by our research.

For example, as low morale was a significant factor we observed within the organisation, we felt that concepts such as paid time for team building would go a long way to address this. Concepts that fell within the top right quadrant of this viability map were strong contenders for us to prototype further.

Figure 89: Viability map
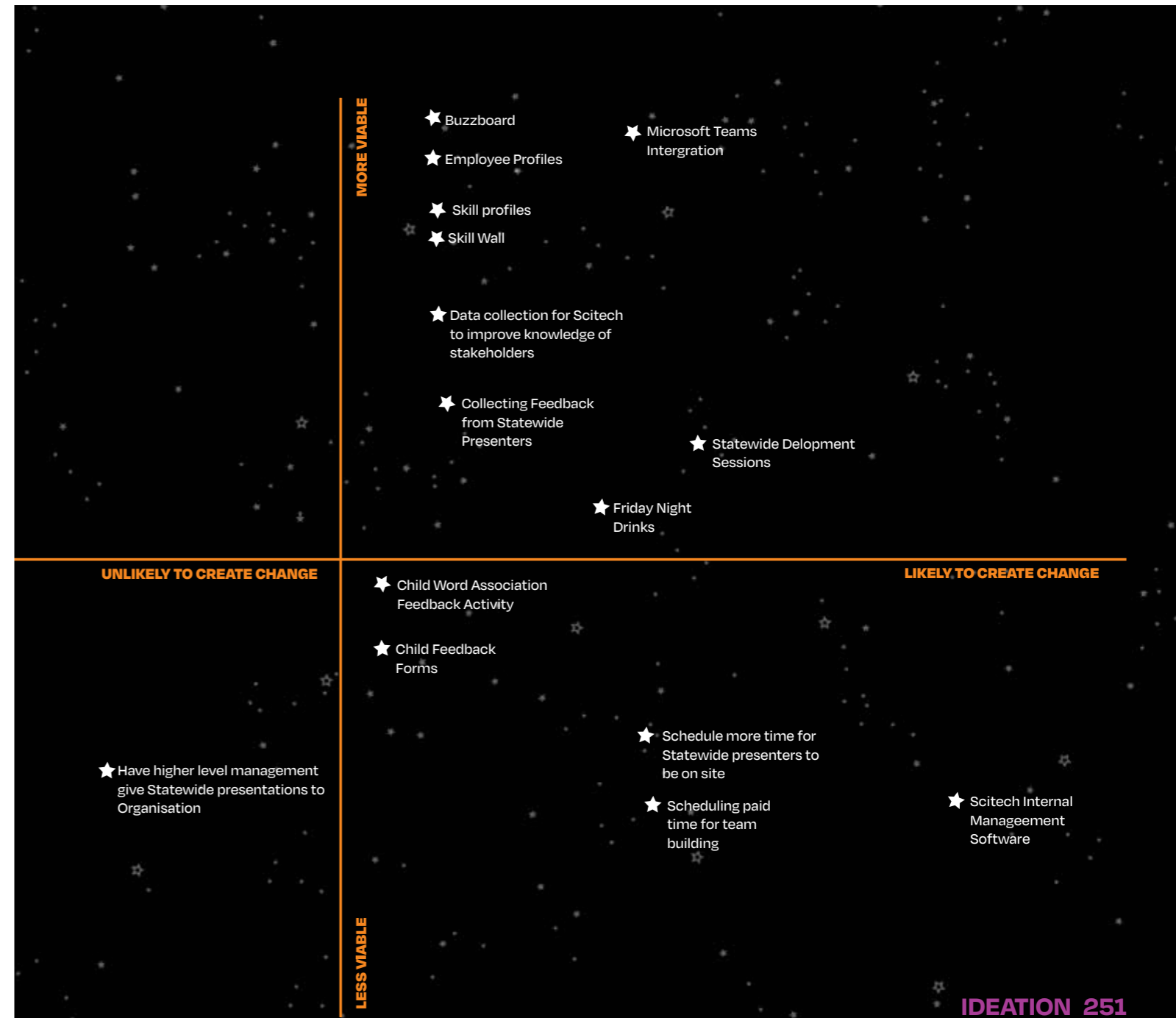
15
PROTOTYPING

OPPORTUNITIES TO IMPLEMENT

Our team identified that with every issue raised in the service blueprint, there was an opportunity to explore. These ranged from capturing valuable insights, culture building, connecting the organisation and improving internal communications. We found that here was scope for these opportunities to be implemented beyond the Statewide team and used throughout the entire organisation. Review of the opportunities that would help to address the issues identified in the service blueprint fell into the areas below. Each opportunity has been coded and assigned an icon to indicate where it fits into the overall service blueprint.

COLLECTING FEEDBACK (CF)

STATEWIDE MEETING STRUCTURE (MS)
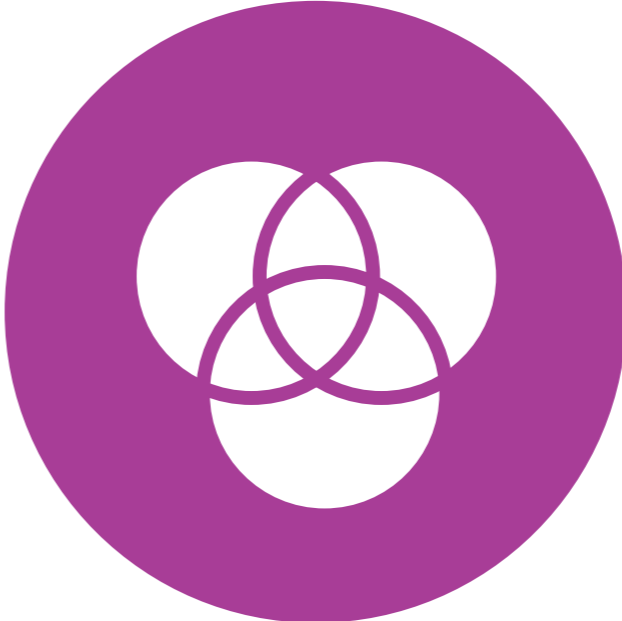
CONNECTING STATEWIDE TO TO BROADER ORGANISATION (BO)
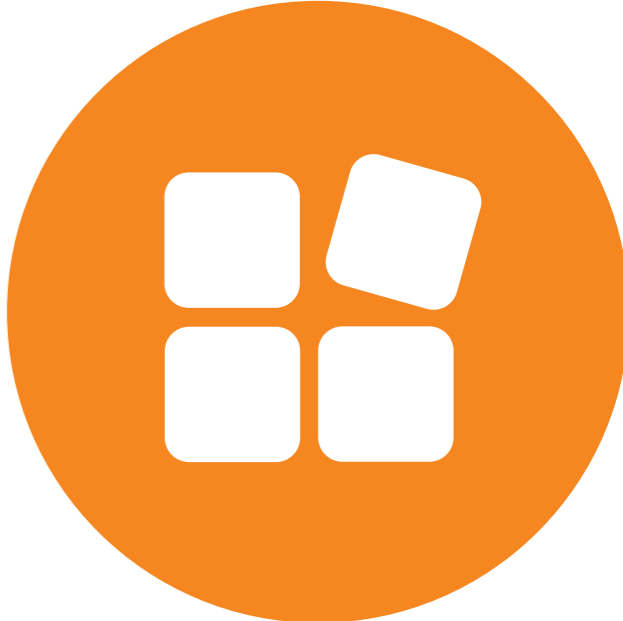
BUILDING ORGANISATIONAL CULTURE (OC)

Figure 90: Four opportuniity areas

COLLECTING FEEDBACK (CF)

Collecting feedback highlights ideas that address the gaps in Scitech's gathering of feedback from its key stakeholders.

Based on research and insights gathered from Scitech, we identified opportunities to capture feedback on program performance and functionality. We found that there was a disconnect in how the teams collected, stored, and used feedback, and in some cases an absence of all of these. In order to adequately address the needs of employees and stakeholders that interact with Scitech, they need to leverage feedback based on their experiences to improve program offerings and inform development of new services. Capturing this feedback in a way that is intuitive and easily accessible is crucial for understanding the impact that programs are having, providing baseline data to measure improvement over time, assisting in advocating for funding and partnership support. This also a solid foundation and pool of data to inform Statewide Development Sessions (MS2) and would rely on improved File Management (BO3) to ensure

this information became more transparent. We have proposed several different ways to capture feedback that needs to undergo further testing and development. Implementation of these strategies would require further Co-Design (MS1) with impacted stakeholders to adequately address usage, resourcing and functionality requirements.

We identified multiple possible ways for Scitech to capture feedback. In the storyboard visualisation, we showed how these different concepts would potentially play out together in one timeline. This timeline followed from a Statewide presentation through to the aftermath of the learning experience. There were three key areas on the timeline of feedback capturing concepts:

» Capturing Student feedback

» Statewide presenters completing feedback forms

» Transcribing debriefs that happen in the van

COLLECTING FEEDBACK STORYBOARD- INTEGRATING FEEDBACK CONCEPTS INTO THE STATEWIDE JOURNEY

At the end of a presentation, kids participate in a word association game related to what they've learnt.

Kids are asked to draw things related to what they've learnt that day.

The presenters finish the day by packing everything back into the van.

Presenters prepare to depart.

Before leaving, the presenters fill out a feedback form on a tablet about their day.

This feedback is then sent back to Scitech to a shared system.

The presenters depart from the school on the drive back to Scitech.

The presenters chat on the drive back.

These conversations are recorded in an app that can be transcribed.

These transcibed conversations are sent to Scitech's shared system.

At school, teachers have children participate in a quick, 15-minute feedback form about their experience with Scitech.

Children are assigned online home-work that asks about what they learnt with Scitech.

Figure 91: Storyboard of collecting feedback concepts

CF1- STUDENT FEEDBACK

Since Scitech's primary audience are children, it would be instrumental to gain their feedback on these learning experiences. There are numerous ways to capture their feedback. One way could be integrating feedback into an outreach presentation. In this example, we proposed a word association game at the very end of an outreach session. On a board, the words "Word Association" are written, and children are given a marker to write on the board. They are given the freedom to write any words that come to mind about what they've learnt that day, and how they feel about it. Empowering children to get involved in their learning experiences may benefit their relationship to the learnt materials.

Another way to gain feedback from children is asking them to draw things related to what they've learnt that day. Drawing is a medium that children tend to feel more comfortable expressing themselves in, especially younger children that are still learning to write, and this data would provide a visual way of measuring retainment of learnt materials. Once again, this is a way to empower children to get involved in their own learning and find enjoyment in the subject matter.

When children later re-enter the classroom following an outreach presentation, it would be beneficial to see how much information they have retained following the presentation. Scitech could provide schools with a printable template for a feedback form that children can quickly fill out in the first 10 minutes of class. This could

feature child-friendly data gathering techniques, such as asking them to tick boxes and circle images as opposed to writing complex answers. These feedback forms could ask about their experience with the presentation and question their knowledge related back to what was taught. These forms can then be collected and later sent back to Scitech.

One other way that children can be involved in the feedback process is assigning them online homework from Scitech. Like the feedback forms, the online homework could be a digital way of collecting children's experiences of a show and testing what they've learnt and retained. Using the Scitech website, children would fill out an easy-to-comprehend feedback page that suitably engages them for 10 minutes.

Further development of these feedback gathering techniques could benefit from co-design with the Customer Insights team who have experience with data-gathering, the Statewide team who have knowledge of how these activities could be implemented on the ground, the Learning Futures Team who have expertise about levels of comprehension required for children to effectively engage with activities, and the IT team who understand the back end of collecting feedback via the Scitech website.
to the presenters, who are one of the most visible facilitators of Scitech's goals and values.
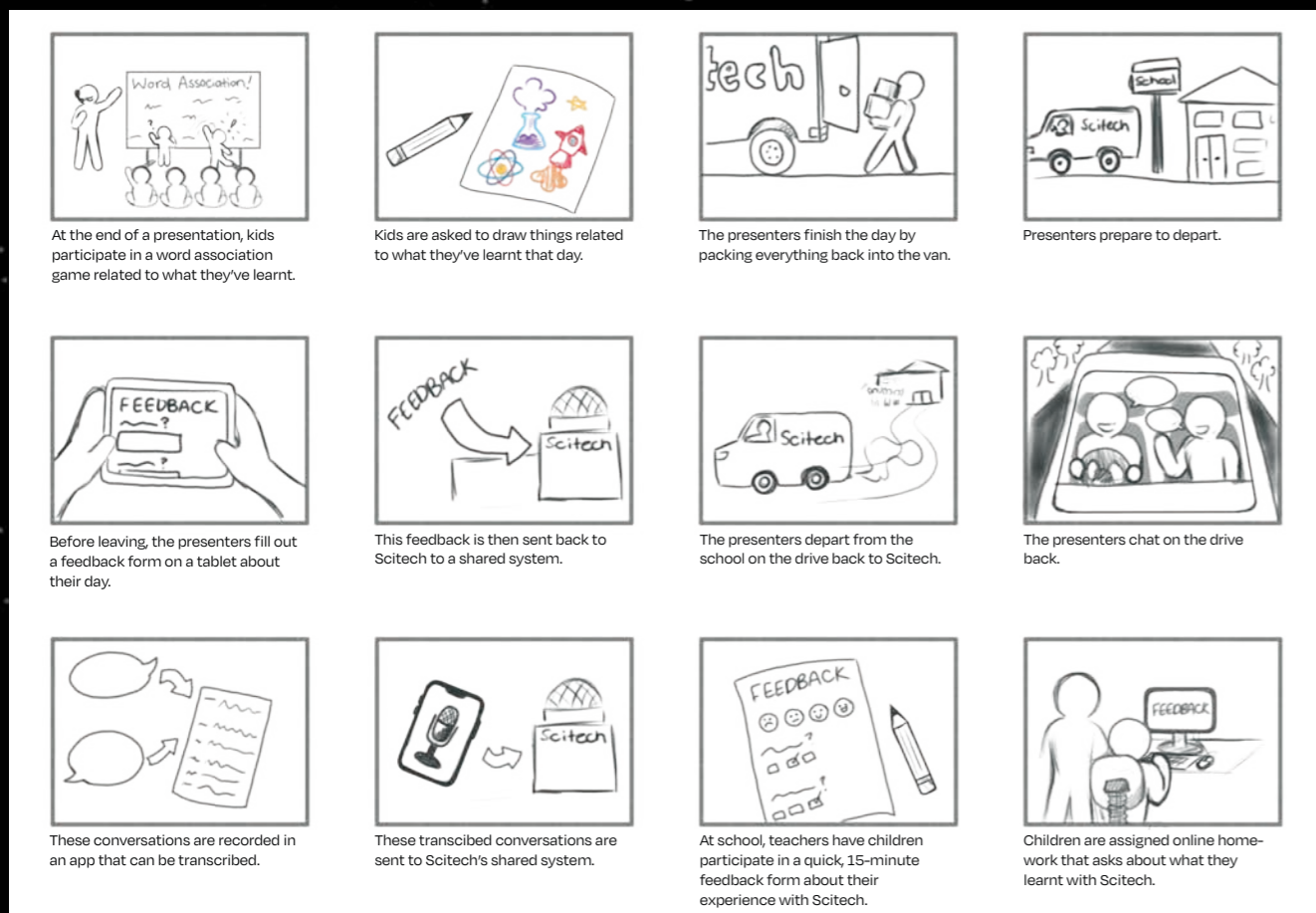
Figure 92: Feedback forms

CF2- STATEWIDE PRESENTERS COMPLETING FEEDBACK FORMS

After Scitech's presenters have finished packing away their equipment for the day, and before they drive back to the Scitech centre, they could fill out a feedback form that seeks to gain an understanding about how their day went. We know that a similar process is in place for the Regional Tour Schedules, and this could be implemented across the range of Statewide programs. This could be on a physical piece of paper, or like in the diagram, a device such as a tablet. The presenters are posed with questions that they are then able to write elaborate answers to. This process should take no longer than 15 minutes, as the presenters are understandably running on a tight schedule. These insights will then be sent back to Scitech's shared feedback system, where the insights can later be used to inform decision making in Development Sessions (MS2) that impacts the workday of the presenters (such as outreach presentation design). This process could integrate into proposed Communication Software (BO3) to streamline this process. This will provide a voice to the presenters, who are one of the most visible facilitators of Scitech's goals and values.

CF3- RECORDING DEBRIEFS

Insights that we gathered about the workday of Statewide presenters is that there are debrief conversations happening in the van on the way back to Scitech. Often these conversations pertain to reflection on the day, and possible feedback given between the presenters on their performance. This immediate reflection would be valuable to gather to help inform the design of future experiences that impact the presenters and schools and help to promote shared learning and development of the whole team. A way to capture this would be to use an app that records the audio of the conversations and transcribes them into written words. When this is sent back to Scitech's shared feedback system, those looking for insights can then skim through the transcriptions. To begin testing this idea, the presenters could use their phones and record the audio during their drive, which could then be later passed on to another team to be transcribed through an application. Ideally, this process would be integrated into the Communication Software (BO3) for ease of use.

PRESENTER FEEDBACK

WHAT WAS TAUGHT IN TODAYS PRESENTATIONS?
Write in the text box

WHAT WORKED WELL, AND WHAT RESONATED WITH THE STUDENTS?
Write in the text box

WHAT COULD BE IMPROVED, AND WHAT DIDN'T ENGAGE STUDENTS AS MUCH?
Write in the text box

WRITE ANYTHING EXTRA HERE FOR FEEDBACK TO BE PASSED ON FOR REFLECTION AND CREATION OF FUTURE MATERIALS.
Write in the text box

Figure 93: Feedback gathering concepts

SCITECH FEEDBACK

HOW DID YOU FEEL ABOUT THE SCITECH SHOW? SHADE/COLOUR IN THE FACE!

WAS THE SCITECH SHOW RELEVANT TO WHAT YOU'RE LEARNING AT SCHOOL?
Tick a box

Yes   No

HAVE YOU TALKED TO ANYONE ABOUT WHAT YOU LEARNT IN THE SHOW?
Tick a box

Parents/family   Friends   Teachers   Noone

HAVE YOU USED ANYTHING YOU'VE LEARNT IN THE SHOW IN YOUR EVERYDAY LIFE?
Tick a box

Yes   No

DO YOU HAVE ANYTHING YOU WANT TO SEE IN FUTURE SHOWS?
Write or draw your ideas

STATEWIDE MEETING STRUCTURE (MS)

The Statewide Meeting Structure opportunity area highlights ideas that get affected stakeholders involved in the reflection of feedback for current processes and creation of future service offerings.

At this point, the Statewide team did not have the time nor infrastructure to effectively leverage personal insights and feedback gained whilst at the forefront of program delivery and apply these to improvement and development of current and future programs. To be able to assess the impact of programs and determine the ways to make program delivery more valuable and responsive for communities, Scitech must prioritise time for evaluation and reflection throughout the process of delivery, rather than just at the end of the scheduled season of a program. Learning and insights across the repertoire of shows delivered by the Statewide team are valuable to development of program offerings across the organisation, from School programs, General Public programs, exhibitions, and in-centre shows. Leveraging this data in conjunction with feedback collected from schools and students, and expertise from other teams within Scitech, to improve current program offerings and inform new program design will improve the value of programs for students across the state and ensure they are responsive to changing needs. For this reason, we propose a preliminary framework that guides the process of Meetings, specifically for the Statewide team, that will help to materialise insights and recommendations and use these to inform continual development of Scitech's service offerings. It is important to note that the exact structure and frequency of these meetings will need to be dictated by the Statewide staff who have inherent knowledge of their workload, skills, and preferred ways of working. Just as these meetings are meant to guide development of Statewide programs, they should also be used to develop the way in which these meetings functions to best meet the needs of the team.

FOUNDATIONS OF DEVELOPMENT MEETINGS

» Meetings to be facilitated using Co-design frameworks

» Planning to be informed by insights from previous sessions

Figure 94: Examples of co-design sessions

MS1- CO-DESIGN FRAMEWORKS

Co-design is a participatory process that aims to involve those impacted by a problem in the process of designing outcomes that will meet their needs (Stickdorn & Schneider, 2011). It is based on the understanding that in order to generate outcomes that are valuable and meaningful, we must design with people, not for people (Penin, 2018). Success of co-designing relies on using engagement tools that are tailored to the dynamic of the co-design team, working to create an environment where power is evenly distributed, and emphasis is placed on the value of lived experience (McKercher, 2020). This generates a space where participants feel safe and welcome to share their knowledge to build capacity and understanding of the whole team. Understanding the problem space from a range of perspectives allows generation of creative and innovative ideas, as well as developing a sense of ownership and commitment. Co-design processes are empowering for team members and are central to ensuring implementation and long-term sustainability of outcomes. If people are given a voice and the opportunity to contribute in a meaningful way, team buy-in is high and people feel capable to continue to make adjustments and improvements to services as context shifts and changes (Stickdorn & Schneider, 2011). Actions in these meetings should be based on insights gained from feedback and experiences from Statewide team members, Schools and students, and knowledge of other Scitech teams.

As we understood under current operations, if changes to programs were required (most frequently in General Public shows to keep them fresh), collaboration occurred between Content Team, the Manager of Statewide, and the Team Leader to carry out the planning and implementation of updates. Whilst members of this group had innate understanding of planning, scheduling, production requirements, they lacked the first-hand experience that the Statewide presenters brought to the table, as well as their specific knowledge they brought from their Bachelor's degrees. These development meetings could further benefit from the input of the Learning Futures Team who bring a wealth of knowledge and experience in teaching and curriculum requirements that could inform programs that meet the needs of teachers and students. Moving forward, we suggest that utilising co-design frameworks for development sessions, involving team members from across the organisation would be beneficial for updating and developing programs that are well informed. We also believe that working in this way, alongside considering the new Stakeholder Map (see pg x), will encourage decision-making that centres around the needs of those that are most impacted by the end-product: the students.

This way of working is not foreign to Scitech. We understand that these principles were implemented by the former Experience Team to work more directly on customer facing programs in the Science Centre and suggest that it has just as crucial a role in addressing more internal opportunities across the organisation. Work undertaken in this manner was supported favourably by surrounding teams and we observed team members actively participating, sharing knowledge and building on ideas in our own co-design sessions facilitated throughout the year. Co-design provides an exciting opportunity to bring together staff from across the organisation to build team capacity, improve service offerings and deepen the impact Scitech has on students across the state.

Whilst we have seen this way of working have great benefit in the organisation, these are skills which need to be built and nurtured over time. For this reason, we suggest that a team with the skills to facilitate co-design need to be assembled to help guide and facilitate these projects whilst building co-design capacity of other staff. Alternatively, external facilitators could be brought on to support these processes. If the latter should occur, it is crucial to highlight that they would lack the intrinsic knowledge of how the organisation functions and therefore time should be taken to understand the context before beginning work. It would also be useful in this instance to bring on this facilitator as a mentor to help build the skills of internal staff so they would be able to work independently in the future.

As a first call to action, we suggest the creation of a "Ways of Working" document, created as a team, to outline the principles, expectations, and responsibilities of team members who are come together and co-design. These may include agreements about active listening, encouraging all ideas, making space for participation, and outlining the common cause motivating the work, in this case students across Western Australia. These should be shared amongst participants as a reminder about their commitment to their team and a common goal. Setting the foundation for co-design to occur in this way helps to ensure that participants feel safe to share their experiences and ideas and feel equally valued in an environment which is usually quite segmented due to the hierarchal structure of organisations.

MS2- DEVELOPMENT SESSIONS

Currently, we understand that the Statewide team works to a tight timeframe, with a packed program calendar and little time in the office. Generally, presenters working together get a day in the office once a week to carry out admin work or training for new shows, with little time to get together as a whole team. 'TWEEKS' or training weeks for the whole team are difficult to coordinate and are often planned for quieter times in the calendar (like school holidays). These have recently been interrupted by unforeseen barriers like COVID-19 lockdowns. Although challenging, we know it is possible to block off time in the program calendar for team meetings. We acknowledge that this may be a hard decision to make as it involves sacrificing time spent on the road presenting, but time and space must be made for positive change to occur. The current schedule has placed incredible pressure on the Statewide team and the prolonged time on the road has created feelings of disconnect with the rest of the organisation. This has resulted in the team feeling isolated and the rest of the organisation in the dark about the incredible work the team carry out, the insights and understanding they build on the job, and the skills and expertise they have to offer. Creating space to bring the Statewide team together with the rest of the organisation will open opportunities for the team to create connections that foster a supportive and enjoyable work environment. Prioritising opportunities for presenters to have their voices heard and insights valued not only increases satisfaction and empowerment of the team, but also provides opportunities for both professional and personal development.

These meetings should ideally be scheduled in person to provide a space to build team relationships. This provides opportunity for informal and casual conversations that occur outside of structured work activities that help to build a sense of belonging for team members and strengthen their support network within the organisation. Where possible, these meetings should be held in open plan spaces with option to move around table configuration, resources to conduct work in groups (whiteboards or large paper pads), and space to move around and not be confined to chairs. Changing the physical context of meeting spaces has the potential to change the emotional or psychological context for employees, taking away prior reminders of work structure and pressures and allowing for more relaxed, creative, lateral thinking which is useful for sharing knowledge and problem solving.

For times when this is not possible (potentially due to clashes with regional tour schedules, or COVID-19 lockdowns), platforms such as Microsoft Teams provide capability for breakout rooms to facilitate smaller discussions and Whiteboards to capture brainstorming and notes from the session. Smaller discussion groups ensure that all team members have the opportunity to share ideas and have the time and space to speak. Changing up the format throughout the meeting diversifies ways in which people can contribute, creating safer spaces and environments that ensure everyone has a voice (Holmes, 2018; McKercher, 2020).

Figure 95: Scheduling

SCHEDULING

Whilst the exact scheduling of these development meetings needs to be determined by the Statewide team, we suggest this rough quarterly outline which is expanded on in the Development Meeting Structure on pg 50:

» **Month 1- Exploratory Meeting to review collected feedback, explore issues and choose focus/ goals for the quarter (potentially 3). Group might be divided to focus on a particular goal relevant to their knowledge.**

   o Fortnightly hour follow-up with groups to develop concept to be tested

» **Month 2- Review Meeting to solidify concepts and guide the ways these will be tested in the coming month**

   o Fortnightly hour follow-up with groups to discuss testing progress

» **Month 3- Review Meeting to finalise concepts and guide implementation strategies**

   o Fortnightly follow-up with groups to discuss implementation

» **Month 1 (Second quarter)- Exploratory Meeting to review progress of previous quarter goals, prompting continuation of these projects or setting of new goals based on feedback collected.**

Holding these meetings at regular intervals will allow for forward planning in the programs calendar and ensure that clashes are minimised, and the format becomes naturalised in the rostering system.

In order to encourage connection with the Statewide team, it is possible that the quarterly goals from the Development Meetings would feed nicely into the proposed broader organisational meetings. Giving the Statewide team the opportunity to share their work with other staff in an informal and safe setting will help to build ownership of work and build connections across the organisation with others who may be able to share knowledge to inform development. This also creates a rostered time for Statewide presenters to come together during the workday that doesn't require additional commitment in their personal time to socialise with their team and the rest of Scitech. This will help to combat feelings of isolation and disconnect.

In addition to feeding into the broader organisational meeting, insights and progress from the quarterly meetings should be synthesised into a yearly report to capture impact of the Statewide programs and inform planning for the following year.
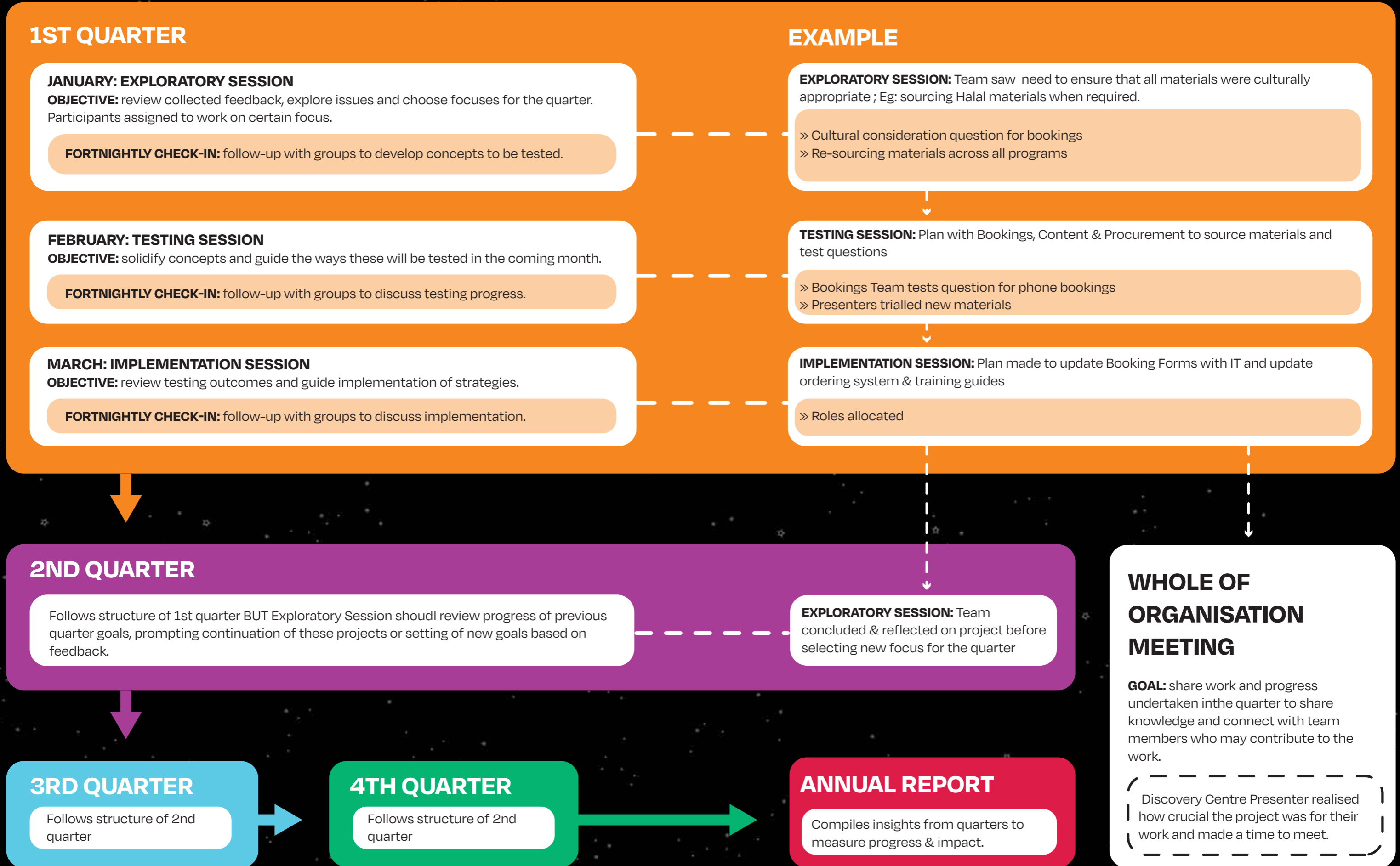
PLANNING AND FOLLOW-UP

Planning of these meetings should be informed by review of collected feedback that will give the facilitator a rough idea about issues that may be brought up in the session. This will allow the facilitator to refer to the Skills Matrix/ Wall and invite members of other teams who may provide valuable insights and guidance in the session. Activities for the session should be chosen to encourage participants to work with people they do not usually work with, and to get people actively out of their seats. Guidance should be given about the next stage of the process to keep all participants informed and instil confidence in a new process.

Findings from the session need to be analysed and synthesised into insights to be shared with all participants. Access to knowledge and transparent communication is key to maintaining team buy-in and empowering participants to take ownership of their work and contribution. These insights also play a key role in informing planning for future sessions as well as the yearly review of the Statewide team to be shared across the organisation.

DEVELOPMENT SESSION STUCTURE

1ST QUARTER

JANUARY: EXPLORATORY SESSION
OBJECTIVE: review collected feedback, explore issues and choose focuses for the quarter. Participants assigned to work on certain focus.

FORTNIGHTLY CHECK-IN: follow-up with groups to develop concepts to be tested.

FEBRUARY: TESTING SESSION
OBJECTIVE: solidify concepts and guide the ways these will be tested in the coming month.

FORTNIGHTLY CHECK-IN: follow-up with groups to discuss testing progress.

MARCH: IMPLEMENTATION SESSION
OBJECTIVE: review testing outcomes and guide implementation of strategies.

FORTNIGHTLY CHECK-IN: follow-up with groups to discuss implementation.

EXAMPLE

EXPLORATORY SESSION: Team saw need to ensure that all materials were culturally appropriate ; Eg: sourcing Halal materials when required.

» Cultural consideration question for bookings
» Re-sourcing materials across all programs

TESTING SESSION: Plan with Bookings, Content & Procurement to source materials and test questions

» Bookings Team tests question for phone bookings
» Presenters trialled new materials

IMPLEMENTATION SESSION: Plan made to update Booking Forms with IT and update ordering system & training guides

» Roles allocated

2ND QUARTER

Follows structure of 1st quarter BUT Exploratory Session shoudl review progress of previous quarter goals, prompting continuation of these projects or setting of new goals based on feedback.

EXPLORATORY SESSION: Team concluded & reflected on project before selecting new focus for the quarter

WHOLE OF ORGANISATION MEETING

GOAL: share work and progress undertaken inthe quarter to share knowledge and connect with team members who may contribute to the work.

Discovery Centre Presenter realised how crucial the project was for their work and made a time to meet.

3RD QUARTER

Follows structure of 2nd quarter

4TH QUARTER

Follows structure of 2nd quarter

ANNUAL REPORT

Compiles insights from quarters to measure progress & impact.

IMPACT OF DEVELOPMENT SESSIONS ON THE SERVICE BLUEPRINT

LOCATE STATEWIDE MEETING STRUCTURE ICON ON FULL SERVICE BLUEPRINT TO SEE WHICH STEPS ARE REPLACED BY THE FOLLOWING SEQUENCE

STATEWIDE TEAM JOURNEY

STATEWIDE TEAM MEMBER

- Managers, Team Leaders, Senior presenters.
- Whole Team.
- Whole Team.
- Manager.
- Whole Team.
- Whole Team.
- Whole Team.
- Presenters

ACTION

- Review rosters & schedules to book off time in program calanar for meetings.
- Team meeting to establish ways of working to introduce concept of development meetings.
- Planning session to review feedback & Identify participants for exploratory session + send invites. Book room.
- Communication outlining purpose of session, venue & confirming times & attendees.
- Sends request for rescources for session.
- Sets up room for session & conducts introduction.
- Session (content & structure to be co-designed)
- Review session, synthesise insights & share on with team.
- Share progress with the whole organisation in a meeting.

Line of Internal Support

SUPPORT TEAM JOURNEY

TECH / RESCOURCES

- Microsoft Teams. Outlook Calandar to roster & communicate meetings.
- File Management system. Microsoft Teams. Outlook Calendar.
- Microsoft Teams.
- Dynamic (Potentually Jira)
- Projector . Powerpoint.
- Microsoft Teams.
- Projector . Powerpoint.

INTERNAL TEAMS

- Facilitator.
- Facilitator.
- Facilitator. Attendees. Team Members.
- Facilitator. Procurement Team.
- Facilitator. Attendees. Team Members.
- Facilitator. Attendees. Team Members.
- Facilitator. Attendees.
- Whole Organisation.

SUPPORT PROCESS

- Bookings & rostering system.
- Employee profiles school feedback. Feedback forms.
- Support processes.
- Procurement processes.
- Rostering System.
- Rostering System. Tech Maintenance.
- Rostering System.

JOURNEY KEY

POST-DELIVERY

CONNECTING STATEWIDE TO THE BROADER ORGANISATION (BO)

The ideas that support connecting Statewide to the broader organisation are intended to bridge the disconnect between the team and the rest of Scitech, as they are the face of organisation and it would be beneficial to leverage their insights and streamline their processes.

During our time with Scitech, we observed a notable disconnect between Statewide and the rest of the organisation. This disconnect was something that many of the staff we worked with provided insight about over time, and the data regarding Scitech's structure supports this.

The Statewide Team is a valuable part of Scitech. The presenters are the face of the organisation in all areas beyond the reach of the centre. The team provides valuable experiences to children who would otherwise never engage with Scitech at all. Statewide presenters in particular engage with key stakeholders frequently, and in those stakeholder's own environment. They have a wide range of experiences and perspectives to draw from, and could inform the development of new exhibits, Statewide shows, in-centre shows, and even redefine the way Scitech approaches their methods of delivery and engagement.

However, the Statewide team is not only rarely involved in these undertakings, but people in presenter roles are also rarely physically present at either the Scitech centre or the Troode St offices due to the demands of their roles. In addition, in the small window of time where they are in either location, it must often be accounted for down to the second. This leaves little room for anyone to ask them for their input.

We prototyped several scenarios which could potentially facilitate deeper Statewide engagement in the wider organisation.

BO1- PRIORITISING TIME WITH ROSTERING

Firstly, we prototyped a scenario where time is set aside within the Statewide Team's schedules, especially the outreach presenters, where they are physically present at the centre/Troode St offices and still on the clock. This will allow the Statewide team to be included in vital data gathering and decision making, while not being expected to sacrifice their off-hours. This ethos could eventually be extended to the rest of the organisation.

The time of Scitech's staff is valuable, and methods of ensuring staff with valuable insights are available to contribute to wider decisions within the organisation is worth investing in.

BO2- BROADER ORGANISATIONAL MEETING

We also prototyped ways in which Statewide would be able to present the outcomes of their Development Sessions (MS2) to the rest of the organisation. There is potential to adopt the Development Session formats across other teams to feed these insights into the meetings. This meeting is a key opportunity to build organisational culture by altering the expected context of the meeting structure. We propose rostered quarterly meetings on a Friday afternoon that are more loosely structured than current management meetings, allocating time for teams to share their work at the start of the session, followed by time to socialise and share ideas over food and drinks to wrap up. This would allow other teams to understand the goings-on of Statewide (and also other teams), especially regarding the unique experiences of the outreach presenters. It would also allow Statewide to feel more integrated into the organisation, without having to sacrifice their much needed down time from their long schedules to participate.

Figure 98: Elements of the Broader Organisational Meeting

BO3- COMMUNICATION SOFTWARE

Whilst there was noticeable disconnection in Scitech between statewide and the organisation, we also noticed communication issues organisation wide. There is not one formal and streamlined platform Scitech staff can use to connect to everyone in one place. Rather, they use 10+ individual applications for communication depending on their roles. Consolidating these applications would save time spent navigating between platforms, promote cross team collaboration by allowing for transparent data sharing and access, and provide greater clarity around which channels of communication are required for specific processes. Ideally, Scitech would benefit from a tailored Communication Software that integrated the functionality and operating needs of each team and could be customised based on usage. This is a long-term process that would need to be co-designed with external consultants in collaboration with the IT Team. Input would also be required from other teams across to organisation to gain insight into patterns of communication, and usage requirements.

Allowing everyone to make contributions will make employees feel valued, especially in creating something important that will be a foundation with the functions of Scitech's day to day business. This application should be agile and have abilities to adapt to each team member's role. An outreach presenter may only need a schedule, communication, filesharing and transcribing tool. A content creator may need a more complex filing system with a search engine when finding older data, and collaboration software to develop content alongside peers. Co-design (MS1) and Development Sessions (MS2) provide opportunities to conduct activities and uncover the needs and priorities of each team. A project of this size with require a large basis of user research and time for collaboration, therefore we suggest this occurs during a quieter period for the organisation, where time can be prioritised for development and rostered accordingly (BO1).

This software system will support many of the opportunities we have presented. This space can harness and store feedback that is gathered from the statewide presentations. It will be able to connect statewide team to the broader organisation by scheduling team meetings and training weeks. It can also schedule meetings for the whole organisation when working on new presentations and programs by using the data that is stored in the software. It can also be a fundamental tool to organise team and culture building sessions.

ACTIONS TO SUPPORT IMPLEMENTATION

In the interim, we suggest that use of existing platforms may be reconsidered to make the most of their functionality. This may involve a review of the File Management Strategy in Microsoft Teams to improve usability and aid in intuitive ways to store and recall Feedback to inform Development Sessions (MS2), or trialling integration of the three different scheduling systems (File Maker Pro, Sentiment, and Outlook Calendar) to streamline booking processes and save time. Development Sessions are an ideal time to begin exploring these options and co-design strategies should be prioritised to ensure that outcomes meet the needs of the team members who engage with these systems.

Card sorting is a tool we would suggest to begin improving usability of the File Management Strategy. This is useful method to actively to figure out the best configurations and features of an application, website, or filing system by evaluating the information architecture (the way information is organised). In a sorting session, participants group topics into categories and subcategories to arrange information in a way that is most intuitive for them. There are several online software tools, but we advocate for the use of sticky notes or actual cards as it allows multiple team member to participate at once. Much like out Organisational Chart activity, team members should be provided with cards that represent the type of information or file names in the current system and asked to arrange it in a hierarchical order that makes sense for them. This will uncover patterns in logical ways to arrange the information that will help team members to locate materials with ease and make information sharing more transparent. The benefit of this activity is that it will allow participants to understand other's needs, along with their own. These structures can them be tested and implemented in the current File Management Strategy and will also inform the structure of the future Communication Software.

Figure 99: Card sorting to inform Information Architecture of Microsoft Teams or future Communication Software
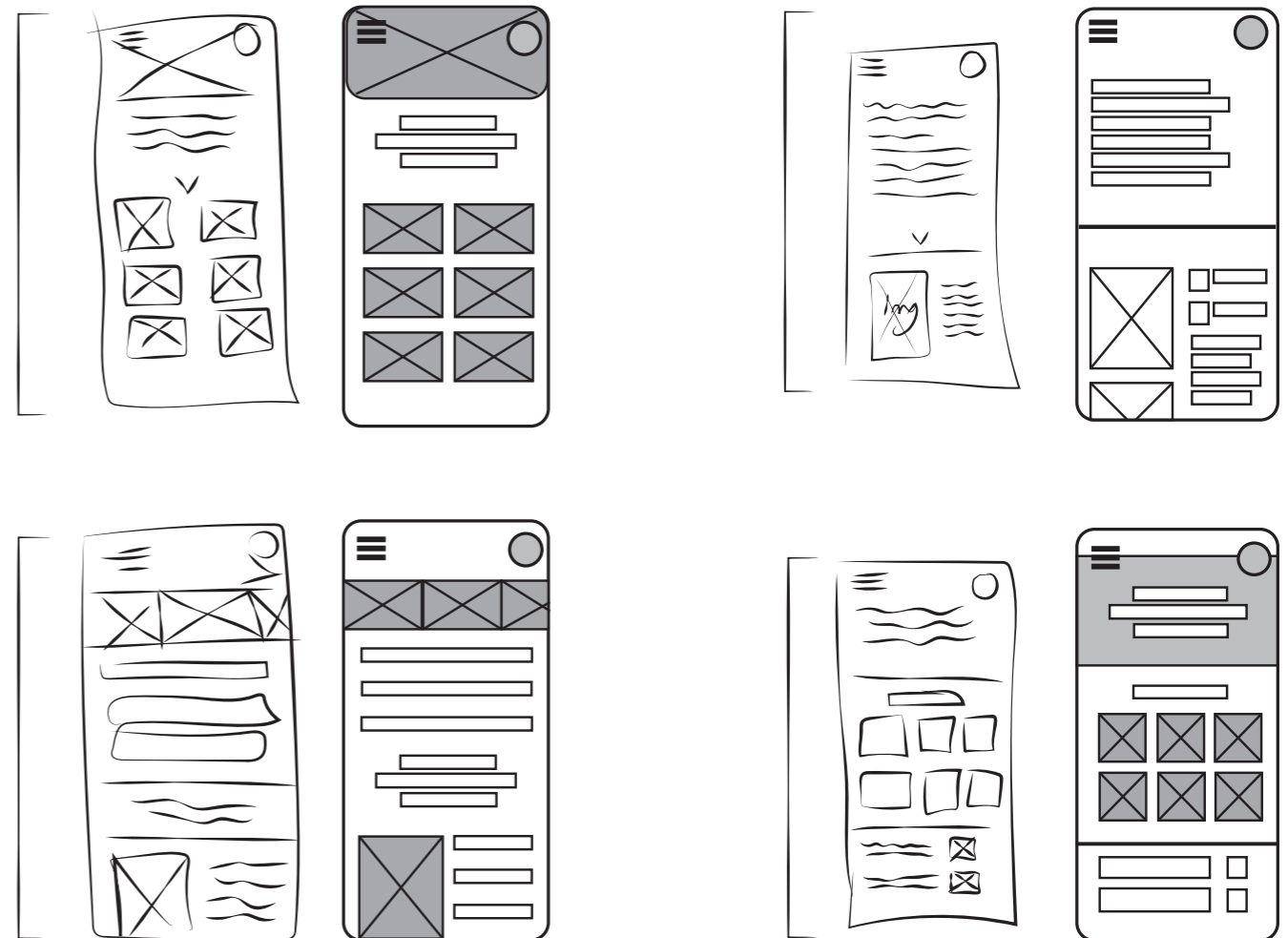
BUILDING ORGANISATIONAL CULTURE (OC)

Building organisational culture includes ideas that reinforce a positive working culture at Scitech that enables everyone to work efficiently and collaboratively alongside each other.

Following the large restructure of Scitech halfway through this project, the culture across the entire organisation was impacted. This restructure led to changes in the roles of many individuals across the organisation. When running codesign sessions in the second semester, there was a noticeable difference in how staff reacted to this project and interacted with other staff. With such drastic change, it was understandable that many employees felt that they were struggling to understand their new roles. Adapting to this change had negatively impacted morale of employees. We observed how people at Scitech now went about their day-to-day work following the restructure, and found opportunities to facilitate a positive, effective change in organisational culture. Working towards creating a healthier organisational culture within Scitech will help support employees in achieving goals.

OC1- TEAM BUILDING EXERCISES

Time pressures, increasing workloads and locational barriers have led to team members feeling increasingly disconnected from each other and unsure of how their own work or that of others fit into the bigger picture of the work Scitech is doing as an organisation. Feeling disconnected can have impacts on the emotional and psychological environment of the workplace for team members. This can be counteracted by intentionally setting aside time to bring the organisation together with activities that promote engagement, connection and development of personal relationships. They might include team problem solving games, story sharing spaces, or building of a group art piece. These kinds of activities were introduced through the previous Experience Team and resulted in team members having a clear understanding of how valuable and important their contribution was to the overall functioning of the organisation and the profound impact Scitech has on Students around the state. In addition to an understanding of their own roles, these activities helped to foster understanding of how interconnected the rest of the team was. With knowledge of the strengths that each member of the team brought to the organisation, team members reported they felt personally valued and more connected to and supported by other members of their team. Team members tend to be much happier and more efficient when workplaces allow them to

feel engaged and supported (Guiso et al., 2015). We suggest that bringing on board external consultants to help conduct these activities across the organisation would be beneficial to enrich team culture at Scitech. By increasing cohesion across teams, these activities will in themselves help to overcome the silos in the organisation that pose barriers to communication, understanding and support. These activities and the connections they encourage will also help to support suggested co-design frameworks for the Statewide Development Meetings and the development of 'Ways of Working' to guide these sessions. More broadly, team building exercises will also assist in the facilitation of Whole Organisation Meetings; building personal connections and understanding of others' roles helps to promote support and interest in work of other teams. This increases awareness of projects beyond one's own team and helps an individual to feel more connected to the organisation. Set up of the Skills Profiles (OC2) could be used as a starting point for these activities. Completion of the profiles in a group setting is a way to facilitate learning about other members of the team.

FILLING OUT SKILLS PROFILES AS A TEAM BUILDING ACTIVITY

Figure 100: Team building activities

OC2- BUZZ BOARD & SKILL PROFILES

During our own sessions at the Troode Street offices we observed that the Kitchen was a space where team members congregated. It is the first place of contact in the morning where a cup of tea can be made or lunch can be stored in the fridge and it's a buzzing hive of activity around lunchtime, holding space for conversations, idea sharing, and laughs. This space provides an ideal opportunity to create conditions to bring team members together and support connections across teams in an office space that currently feels empty and disconnected with an array of empty desks and siloed teams. On our first tour of the office, we noticed the remains of a sticky-note wall that had been used to generate ideas and questions relating to current projects Scitech was working on. This had fallen to the wayside as time pressures and workloads increased and those who reviewed the board lost the chance to act on suggestions. From feedback, we understand that this concept was originally beneficial and helped staff to feel like they had a voice in the organisation. We propose re-activating this space with a slightly different focus and shared responsibility to help build team culture and understanding.

The Buzz Board concept provides a platform for team members to pose questions to the rest of the team with the intention of creating connections with others they may not usually interact with. We know that questions relating to larger projects rendered the concept unsustainable so we suggest that this concept should be used to explore more trivial, niche or personal questions. Team members gathering in the Kitchen have to opportunity to read the question and respond on the board or reach out directly to the enquirer to collaborate or explore the idea together. The Buzz Board also ties in directly with the Employee Profiles. We suggest that they be arranged together on the wall space to allow anyone with a question to review other team members area of expertise and skills to help them reach out directly with their question, or for team members who don't have the answer themselves but know someone who might, to be able to put forward profiles to help the enquirer.

The Skill Profiles that are arranged on the same wall space as the Buzz Board provide information about the different skills that individuals within Scitech bring to the table. These are pieces of paper with question prompts that staff can fill out to stick on the wall. This provides an opportunity for everyone to talk about their passions, their background, and what they can do. Participating in the Skills Profiles helps to create a sense of community and creates the opportunity to build new relationships. Scitech employees can get in contact with people who have the skills needed for what they are working on based on what people have put up on the Skills Profile wall.

TO HELP EXPLAIN THIS CONCEPT IN USE, HERE IS A SCENARIO:

» Tim, a Statewide Presenter spends most of his time on the road but is scheduled to spend the week in the office to complete a training module. He usually has a chance to pick up a coffee on the road and can't stand the instant coffee in the Kitchen. He wants to know where he can get the best coffee close to the office, so he poses the question on the Buzz Board and signs his name.

» Sue, a member of the Procurement team frequents the kitchen to make herself a cup of tea when she starts work everyday and reads Tim's question. She knows her team member George is a coffee snob and has a favourite place nearby so places his profile under Tim's question.

» When Tim passes through the Kitchen on his way to a desk, he notices George's name has been put forward so makes a detour by his desk to ask for a recommendation.

» George mentions he is popping out for a coffee break at 10:30am and says he will pick up Tim on the way.

» The pair talk about the projects they are currently working on whilst they wait for their orders and George realises how the procurement order he spent the last week organising is being implemented in a show and how much of an impact this has had on the students participating. Tim gains an insight into the background work required to put a show together before he is able to present it.

» The two walk away with a greater appreciation of how complex and interconnected their roles are, feeling more connected to the organisation.

» At the next Whole Organisation Meeting Tim and George have a great conversation about how the program is running, drawing their colleagues into the conversation, promoting other connections between teams.

IMPLEMENTATION

It should be noted that the exact functioning and setup of this concept needs to be developed and implemented with input from team members. We expect this concept to grow and change with this input, enabling it to better meet the needs and patterns of interaction of the organisation.

To begin with, in its simplest version, we suggest installation of a whiteboard and supply of markers to allow team members to write their question at a size that will attract attention of others in the office and be legible from afar. To provide a baseline to work and improve from we suggest starting with one question a week and announcing the operation of the Buzz Board in the whole organisation Teams channel and on the SharePoint News TV in the reception of the office. Uptake and participation will need to be encouraged and perhaps initially led by team leaders to gain support of their teams.

We understand that Statewide Presenters spend limited time in the office and the Discovery Centre Team spend even less time in the space. To increase participation, we suggest that the in-office setup should allow for prototyping and testing of the concept that can eventually be implemented into the dashboard/welcome screen/communal space of the Communication Software (BO3). This should sit separately from the working and task functions to mimic the way the board allowed team members to interact outside of the context of the working environment in the office.
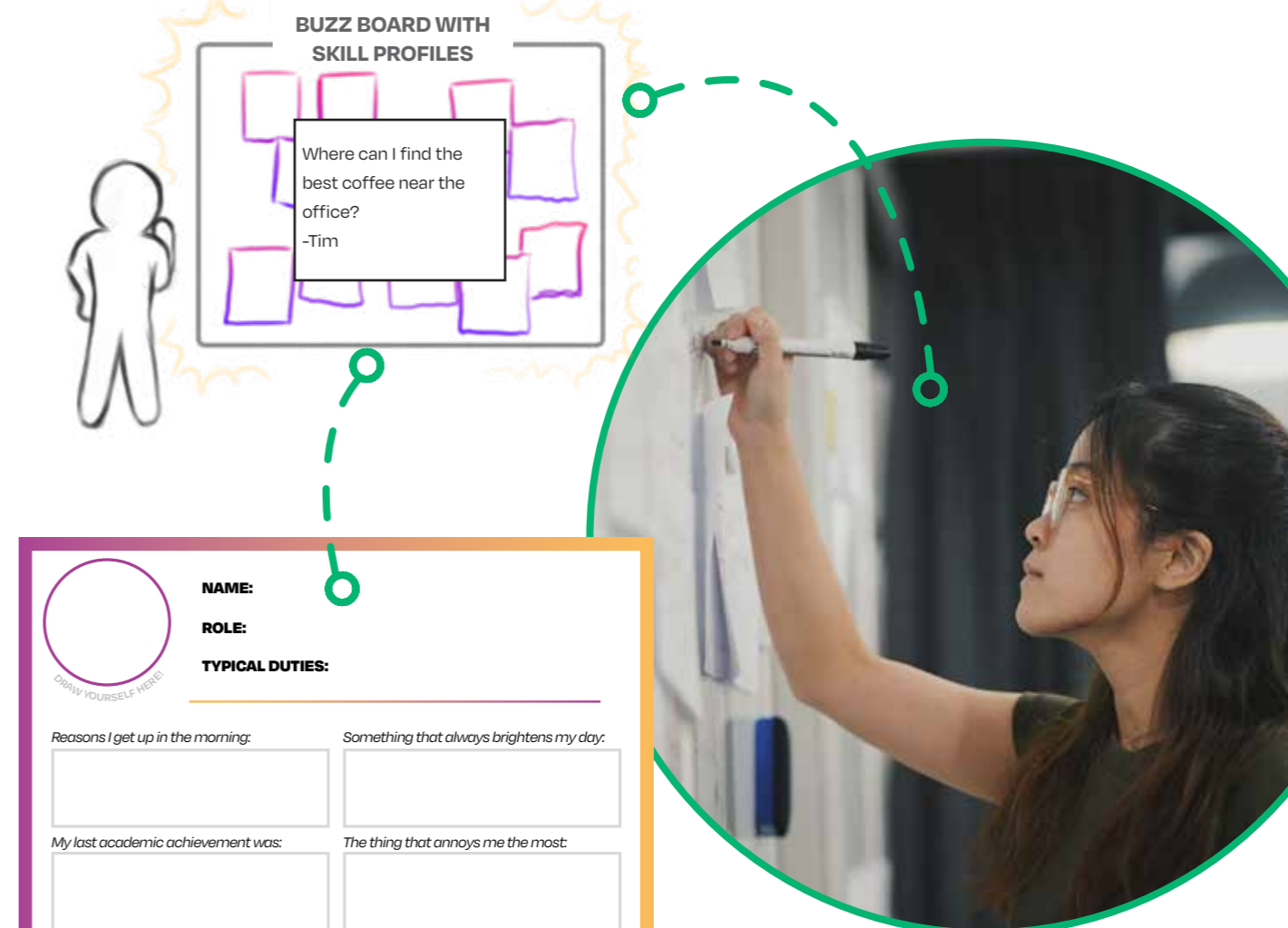
Figure 26: Tim uses Buzz Board to ask question

BUZZ BOARD WITH SKILL PROFILES

Where can I find the best coffee near the office?
-Tim

Figure 101: Sue links Tim's question to George's profile

NAME:

ROLE:

TYPICAL DUTIES:

DRAW YOURSELF HERE

Reasons I get up in the morning:

Something that always brightens my day:

My last academic achievement was:

The thing that annoys me the most:

My special skills are:

When I was a kid, I wanted to be:

I want to learn how to:

Why I work at Scitech:

Figure 102: Skills Profile

RELATIONSHIP BETWEEN OPPORTUNITY AREAS

It is crucial to realise that these opportunities are interdependent and should not be considered in isolation. Success of one opportunity impacts the way another functions. Without a strong culture, needs to be supported by priorisiting opportunities for connection and collaboration in everyday tasks. The ability to work together towards a shared goal relies on trust and respect between team members and is supported by communication infrastructure that supports this agile way of working. Development and growth relies on the ability to reflect on past experiences and feedback. These insights can only be leveraged when we have

ways to capture information that doesn't interfere with our ways of working. Creating infrastructure that intuitively aids complex teams can only be achieved when we prioritise time and space to understand their experiences.

Whilst the complexities of this system may seem overwhelming and non-linear, we know that organisational culture is critical in building the foundation for these processes to occur. When team members feel supported, valued and heard, they are empowered to make positive and sustainable change.

Figure 103: Opportunity area relationships
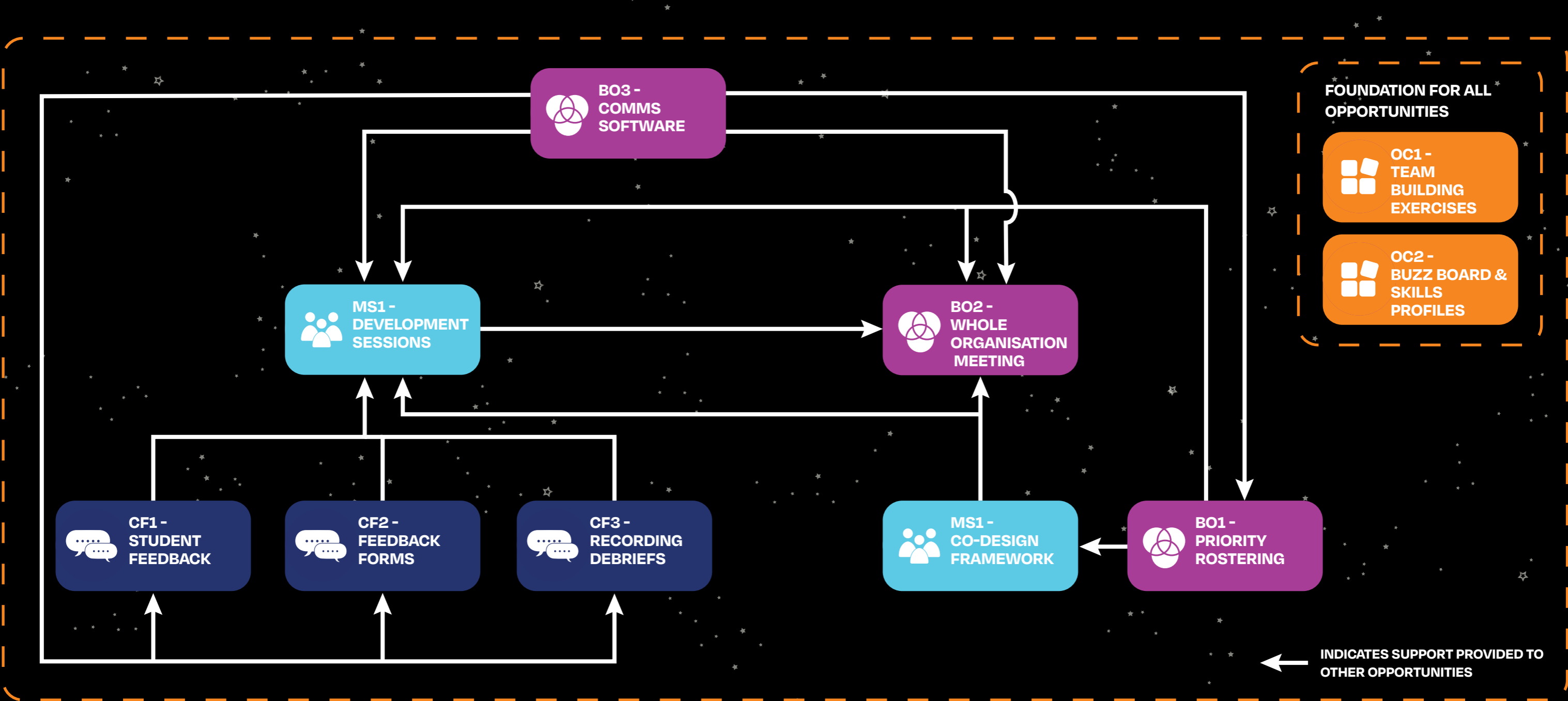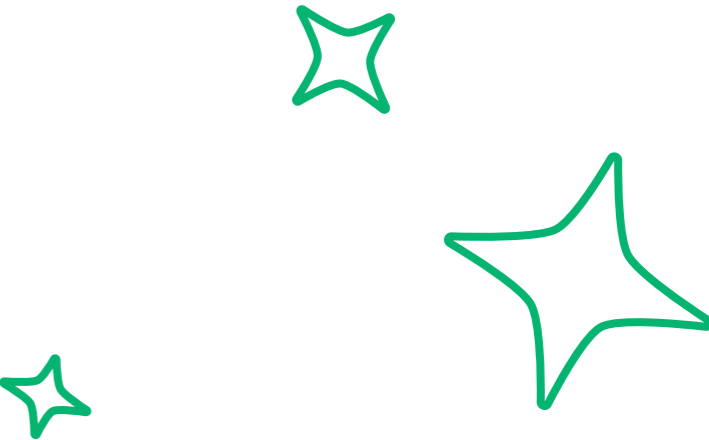
15
IMPLEMEN-TATION

IMPACT OF IMPLEMENTATION

With the multiple prototyped concepts mentioned earlier in Chapter 8 that addresses the four opportunity areas, it was important to remember that these were not fixed ideas. These were a range of prototypes that we proposed to help address these opportunity areas that needed further co-design and testing to create positive change. At this point, these concepts were targeted towards the Statewide team as they were the pilot team for the project. With further co-design, the prototypes could be evolved to benefit the needs and desires of the Statewide team and the organisation's primary stakeholder: students. The narrowed focus on the Statewide team was based on the research that we had gathered over the year, as working on making a change to the wider organisation would require deeper research spanning longer than a year. Working on implementing concepts that impacted Statewide served as a pilot for how change could be implemented across the organisation over time. As time would progress following the implementation of the concepts, they would need to have a continuous review to monitor how they addressed the wants and needs of the affected stakeholders. With the primary focus of Scitech being the students they provide services for; these concepts would emphasise to everyone in the organisation to refocus on those students as the commonly shared motivation.

CAPTURING IMPACT WITH PERSONA SCENARIOS

At this stage of the project, it wasn't possible to know how these concepts would impact integral stakeholders because they still need to be tested and developed further. Instead, our team mapped out how these concepts could affect the intended stakeholders with successful co-design. Based on three key personas (primary school student, Statewide presenter, and Statewide leader/manager) we created persona scenarios. These persona scenarios detail how the concepts would impact the experiences of each persona.

Primary school students are the core focus of Scitech and gathering their feedback would greatly inform creation of future materials. This would get the students involved in their own learning through fun activities that simultaneously help improve Scitech's service offerings. Statewide presenters are at the forefront of delivery of services, and in the scope of this project they would be the most impacted by changes. All of the proposed concepts would affect the functioning of the presenter's roles. We hoped with implementation of these concepts that the presenters would find their roles to become more streamlined, supported by reliable systems of communication and feedback, healthy organisational culture, new relationships across teams, and an empowered voice for creation of output. Supporting the presenters are the leaders/management of Statewide.

Similarly, all of the proposed concepts would directly impact the leaders and the ways that they would perform their roles. With effective implementation of these concepts, this persona would feel supported by a reliable system of technology, helping to reduce stress. The new system would make communicating with other teams and their presenters streamlined and efficient. It would also mean that they didn't need to be active outside of work hours to manually check in on their presenters. In the creation of new programs, their insights and experience would be considered, making them more involved in the process.

CF1 - STUDENT FEEDBACK

PRIMARY SCHOOL STUDENT

"I love when Scitech come to my school because its lots of fun! I like when Scitech ask us to help them make their shows better. Drawing pictures about what I've learnt is fun."

OC2 - BUZZ BOARD | **BO1 - PRIOTITY ROSTERING** | **BO2 - WHOLE ORGANISATION MEETING** | **BO3 - COMMS SOFTWARE**

CF1 - STUDENT FEEDBACK | **CF2 - FEEDBACK FORMS** | **CF3 - RECORDING DEBRIEFS**

STATEWIDE PRESENTER

"The new changes within Scitech have helped to make my job run smoother. There isn't as much pressure to stay up to date with different systems through the work day. I feel like my input is taken into consideration when creating new shows. I've also made some new friends in teams I didn't know very well before!"

MS1 - CO-DESIGN FRAMEWORK

MS2 - DEVELOPMENT SESSIONS

OC1 - TEAM BUILDING EXERCISES

OC2 - BUZZ BOARD | **BO1 - PRIOTITY ROSTERING** | **BO2 - WHOLE ORGANISATION MEETING** | **BO3 - COMMS SOFTWARE**

CF1 - STUDENT FEEDBACK | **CF2 - FEEDBACK FORMS** | **CF3 - RECORDING DEBRIEFS**

STATEWIDE LEADER/MANAGER

"With the newly implemented changes, I feel like my role is supported by reliable technology, reducing my stress. I can easily contact my presenters and don't need to be up at unusual times to check in on them. I feel equal to everyone else at Scitech and my voice is heard."

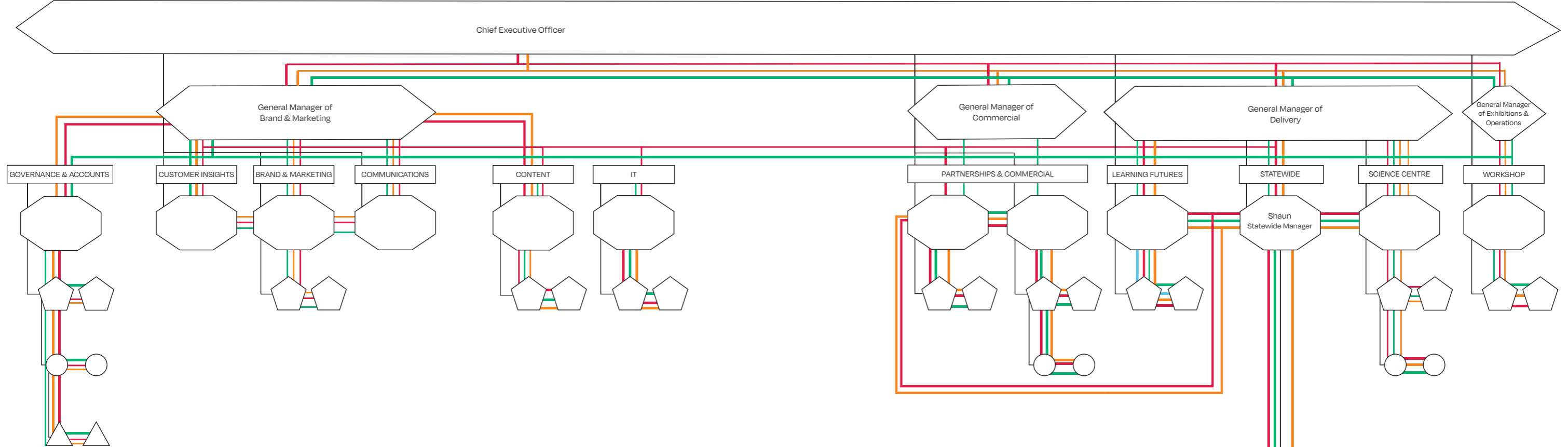**MS1 - CO-DESIGN FRAMEWORK**

MS2 - DEVELOPMENT SESSIONS

OC1 - TEAM BUILDING EXERCISES

COMMUNICATION MAP AS A RESULT OF OPPORTUNITY IMPLEMENTATION

ILLUSTRATES CONSOLIDATED CHANNELS OF COMMUNICATION AS A RESULT OF COMMUNICATION SOFTWARE (BO3)

Chief Executive Officer

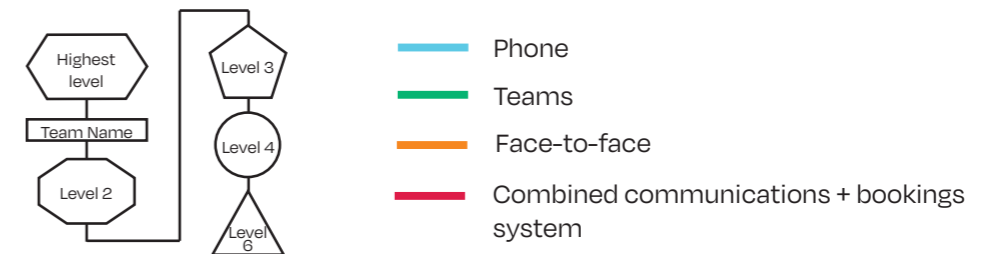General Manager of Brand & Marketing

General Manager of Commercial

General Manager of Delivery

General Manager of Exhibitions & Operations

GOVERNANCE & ACCOUNTS | CUSTOMER INSIGHTS | BRAND & MARKETING | COMMUNICATIONS | CONTENT | IT | PARTNERSHIPS & COMMERCIAL | LEARNING FUTURES | STATEWIDE | SCIENCE CENTRE | WORKSHOP

Shaun
Statewide Manager

Alyshia
Technical Officer

Evan
Secondary STEM
Co-Ordinator

Laura
Primary STEM
Co-Ordinator

Zahra
Senior Science
Presenter

Zoe
Senior Science
Presenter

Angharad
Statewide Team
Leader

Kate
Statewide
Presenter

Aska
Statewide
Presenter

Jenn
Statewide
Presenter

Elise
Statewide
Presenter

Zibeon
Statewide
Presenter

Steven
Statewide
Presenter

Aron
Statewide
Presenter

Shona
Statewide
Presenter

Steph
Statewide
Presenter

Julie
Statewide
Presenter

Cassy
Statewide
Presenter

IMPACT OF OPPORTUNITIES ON THE COMMUNICATION SYSTEM

Streamlining of the communication system in response to improved interactions and consolidation of applications/introduction of tailored Communication Software would result in clearer, more concise communication channels. Consequently, communication would be more precise, processes that required input from multiple parties would become more direct and time would be saved without having to navigate across platforms. More transparent information sharing and access to communication would leave team members feeling empowered in their contribution to projects whilst stronger ties to others in the organisation would increase feelings of support.

Designing communication systems in ways that are intuitive and delightful to use would bypass frustrations resulting from complex processes and lacking functionality. This would improve team members ability to do their job and positively impact overall mood.

Key

Highest level

Team Name

Level 2

Level 3

Level 4

Level 6

Phone

Teams

Face-to-face

Combined communications + bookings system
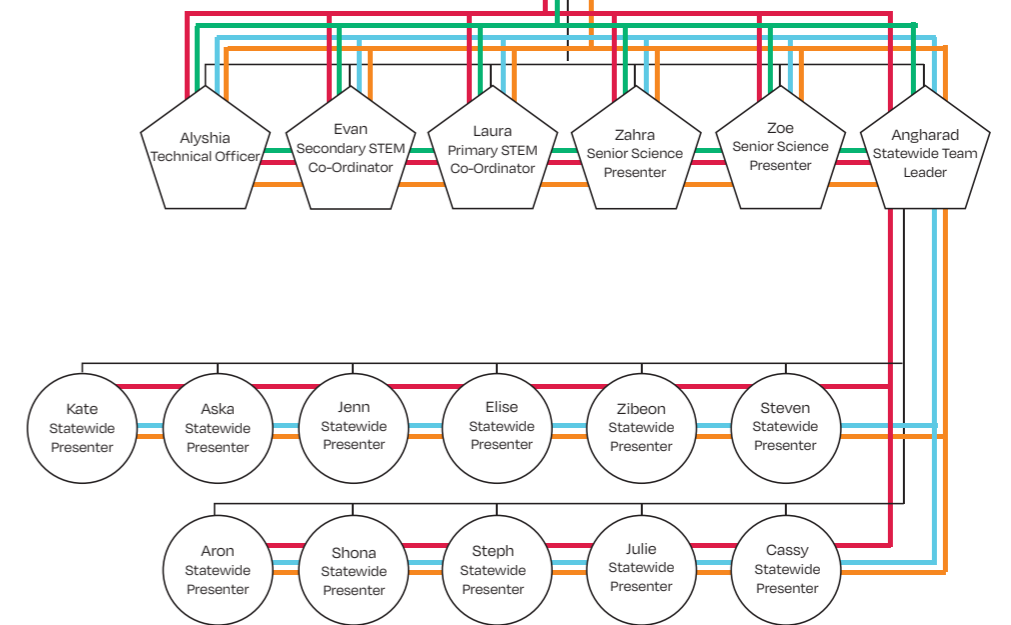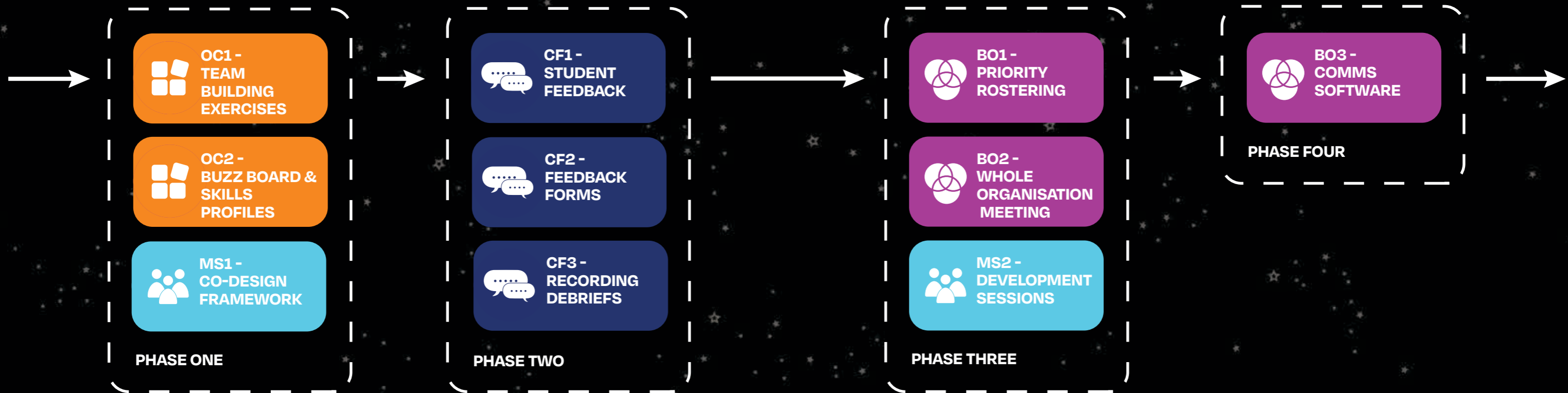
Figure 106: "Phases of Implementation"

PHASES OF IMPLEMENTATION

The process of fully implementing these concepts would require an extended timeframe. This would allow time for Scitech to test these concepts and refine them through the process of co-design. Doing so ensures that the proposed concepts don't disrupt the processes of other teams at Scitech. Beginning to implement these concepts would be overwhelming at first glance for the organisation, but they can be implemented in phases. Each phase would serve as the foundation to support the next:

PHASE 1
This initial phase would be the starting point for implementing the concepts. To facilitate all the proposed concepts, they would need the underlying foundation of a positive, strong organisational culture and a framework for co-design. Creating this supportive environment allows people to build strong relationships and voice their opinions and expertise in development of new programs. This phase would be able to be tested in an immediate timeframe at comparatively minimal cost to Scitech.

PHASE 2
Following that is the second phase of implementation: collecting feedback. Development of this opportunity area would evolve. To begin implementing, Scitech should start small by testing working prototypes of these concepts. Based on insights gathered from these tested prototypes, they could be continually developed to higher fidelity and better support the needs of Statewide. This phase would be supported by the collaborative environment created in the first phase, further informed by insights from a range of individuals at Scitech based on cross-team relationships and a co-design framework.

PHASE 3
Alongside continuous development of concepts from the previous phase, the next step for Scitech would be to implement whole organisational meetings, development sessions, and priority rostering. With a supportive, collaborative environment in place and modes of capturing feedback for the Statewide team being developed, the next step would be to delegate time for teams at Scitech to come together. This will strengthen the concepts proposed in the first two phases by giving voice to people across the entire organisation. Phase 3 will also help to break down silos, improving functionality across teams.

PHASE 4

This final phase requires the development of a new communications software. As previously stated, this can be prototyped, co-designed and developed with other existing software in the meantime. To begin this phase, Scitech can examine how their communicative needs can fit into pre-existing software such as Microsoft Teams. Over time, Scitech can then investigate how they can streamline all their communication channels into one system, which may require the development of a custom software. This phase will allow all individuals to communicate efficiently with a reduced amount of required applications and software systems to function. This new software will be created with the insights gathered co-designing with members across the greater organisation, established in the previous 3 phases.

LIMITATIONS

In the scope of this project, we were limited by what we could do. Following the organisational restructures that Scitech underwent following the first semester, we were required to pivot our focus to the internal structure. This meant that we had to begin again with our research in terms of our understanding of the problem. Utilising the insights that we had gathered from the first semester, we focused on addressing changes to the internal structure of Scitech with a focus on the Statewide team as a pilot. With this sudden shift in project focus, we had less time than anticipated for prototyping, testing, and implementation of concepts. By the end of the project, we had consistently prototyped throughout the semester to learn, understand, and conceptualise opportunities to implement. With the continuation of this project, it was expected that prototyping of these concepts developed through testing with stakeholders through a co-design approach. Implementation of these concepts would need to be consistently evaluated to make sure they are having the desired impact on the organisation and its stakeholders.

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HANDOVER

OUR APPROACH TO THE PRESENTATION

Based on our co-design sessions with Scitech, our proposed collaborative concepts to address the opportunity areas, and our previous presentation in the first semester, we decided to make alterations to the way we would present to Scitech as we started to finalise the project. We found it important that we lead by example to facilitate change by creating a collaborative presentation environment. As opposed to this taking place in a formal manner of reading from a PowerPoint presentation and speaking at the Scitech staff, we wanted to include them in the conversation and make them feel empowered to be a part of the next steps of this project. To do this, we accompanied our presentation slides with printed visualisations and examples drawn/pinned to a double-sided whiteboard. These A0-sized printouts were laid out on two sets of long tables for us and Scitech staff to stand, walk around and view. Encouraging

them to come up to the tables while we guided them through the presentation, we moved all the chairs to the sides of the room so that everyone was required to be involved by walking around the tables. To help create a relaxed atmosphere, we also provided biscuits at the door and welcomed people in as they arrived into the room. Having physical prototypes that the staff could interact with and see in person was a way for us to get them involved and invested in discussing the project. Our method of presentation encouraged the breaking down of barriers across teams and between us and Scitech by coming together and discussing the project on an equal level. We welcomed any interjections that staff had during the presentation, as they would provide valuable insights for the potential continuation of the project.
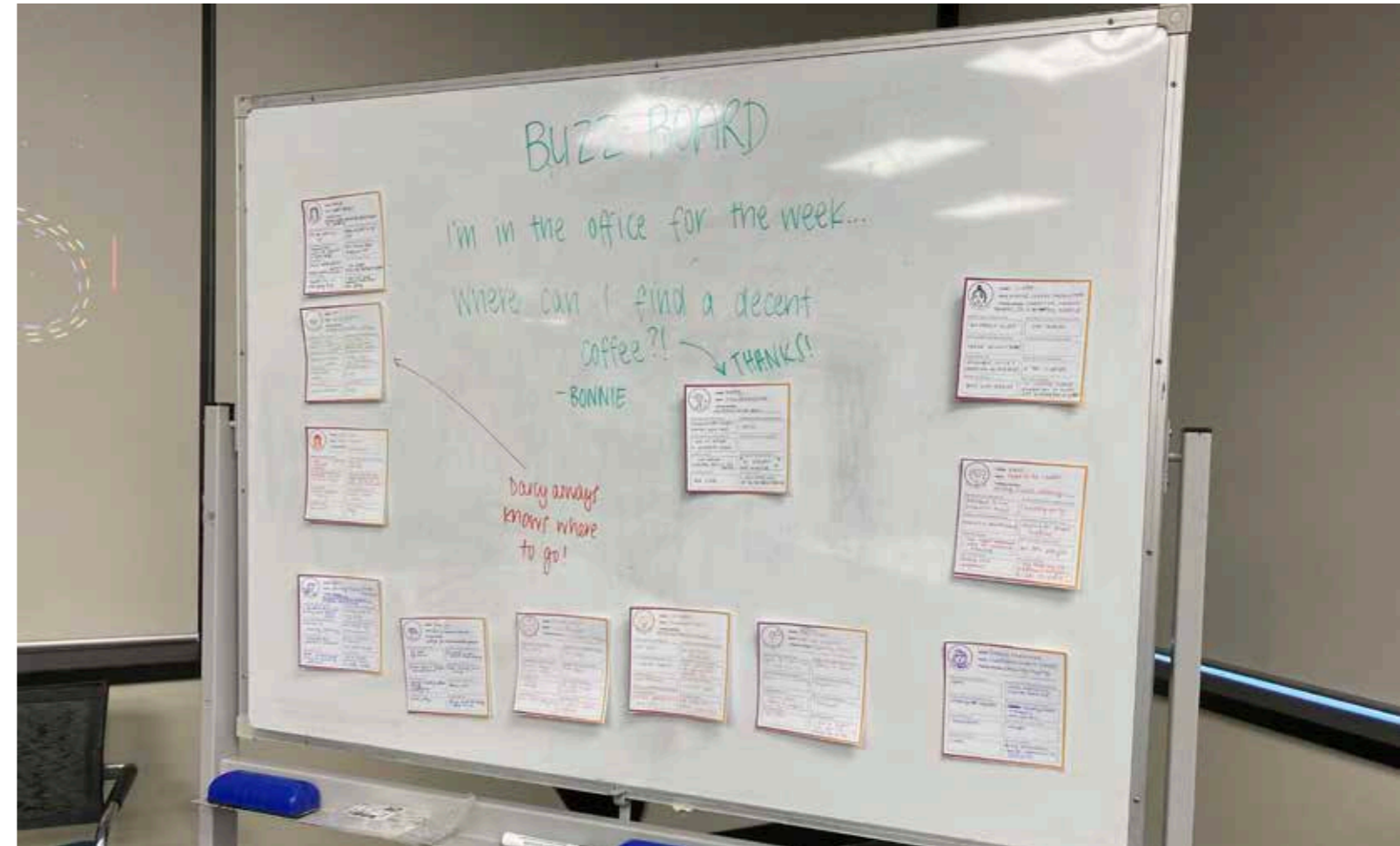
PLANNING

In preparation for this presentation, we prototyped how we would facilitate it by drawing on our experience from the co-design sessions we conducted earlier. Firstly, we needed to figure out what would need to be condensed from this semester to be spoken about and represented in our presentation slides. From this, we thought about how we should present this information to Scitech in a way that both communicated what we had worked on in the second semester and exemplified a way forward for creating a collaborative environment. We looked back on how we conducted four co-design sessions with staff throughout the semester, and how we managed to break down barriers and get people to open up to us, leading to valuable insights. Working alongside staff on an equal level and bringing physical touchpoints with us helped them to understand our goals for the project and see a way forward to creating positive change at Scitech. This way of working showed a way in which the organisation could then go on to conduct their co-design sessions in the future, as one of the concepts to address the opportunity areas. With this in mind, we decided to facilitate the presentation in a similar manner. We set out to create a collaborative and equal environment by standing with the staff to discuss the prototypes on tactile printouts and guide them through the project

From here, we prioritised what would be most important to physically show them. We had created a long and complex service blueprint that mapped out the inter-

actions between stakeholders, actions, and variables along the journey of facilitating a Statewide show. It was important to show individuals at Scitech how work from different teams, along with different processes, contributed to the journey of a Statewide show. We ran through this by explaining how different personas would interact with the journey, issues that arose, and areas of opportunity. Alongside the printed service blueprint, we also had a visualisation of the communication system needs and how implemented development sessions would impact the overall service blueprint in the future. We ran through these to help the Scitech staff understand in depth what it would take to implement changes to communication in the organisation and how a concept such as development sessions could impact the overall journey of the Statewide team. Further communicating our concepts, we utilised a double-sided whiteboard to show a basic example of how they might look in practice. On one side we posed a hypothetical question to signify the Buzz Board, and alongside it, we placed Skills Profiles with made-up personas filled out on them. This showed how the two concepts were connected by pinning someone's skills profile next to the answer to the question, prompting the person asking to seek out that person for more information. On the other side, we created a hypothetical Word Association activity that could be used as a way to gather feedback from students. Drawn on this board were words and phrases related to what kids had learnt during the Statewide presentation that day, with arrows connecting to each other.
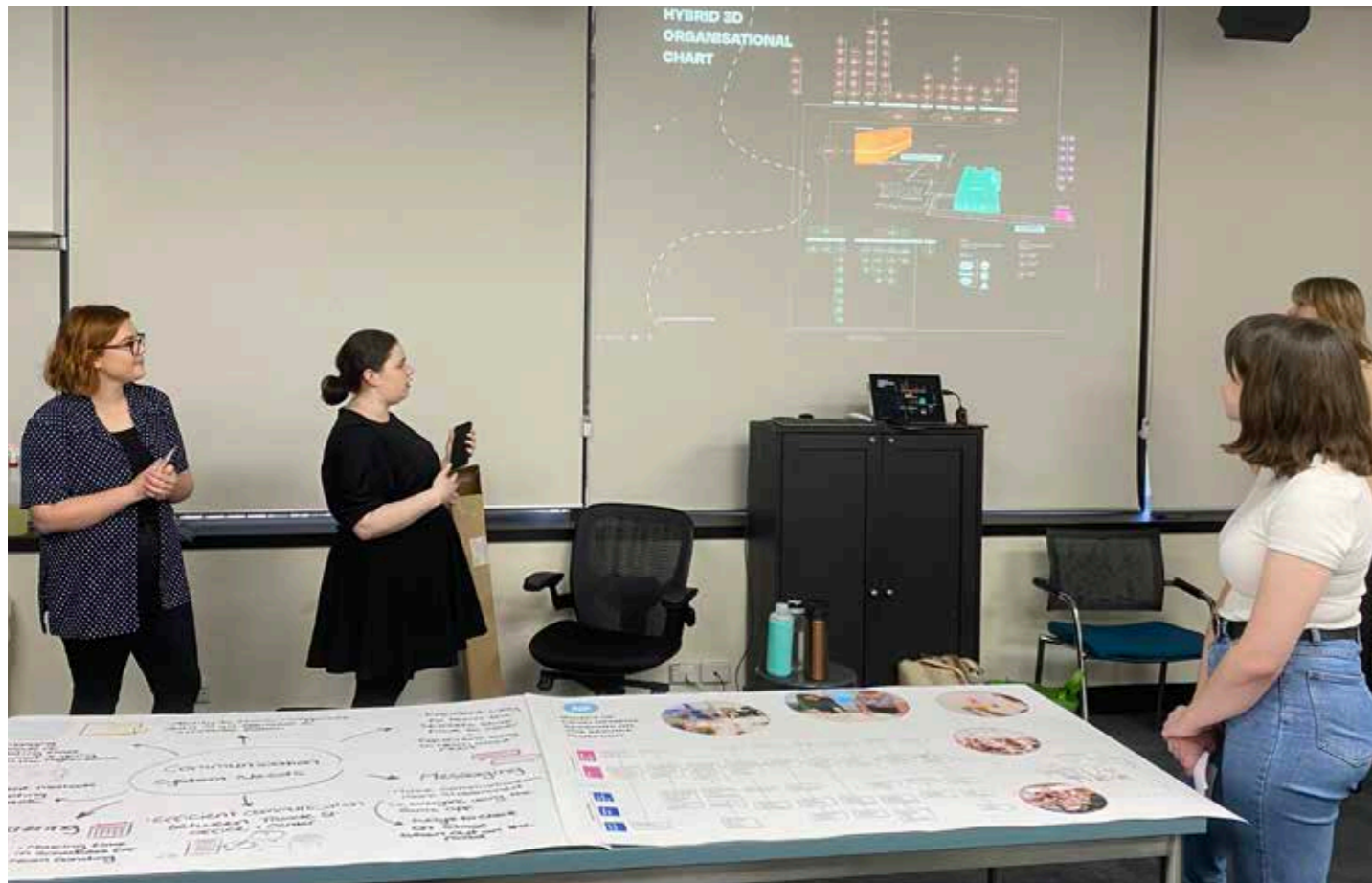
Figure 109: "Explaining the Hybrid 3D Organisational Chart"
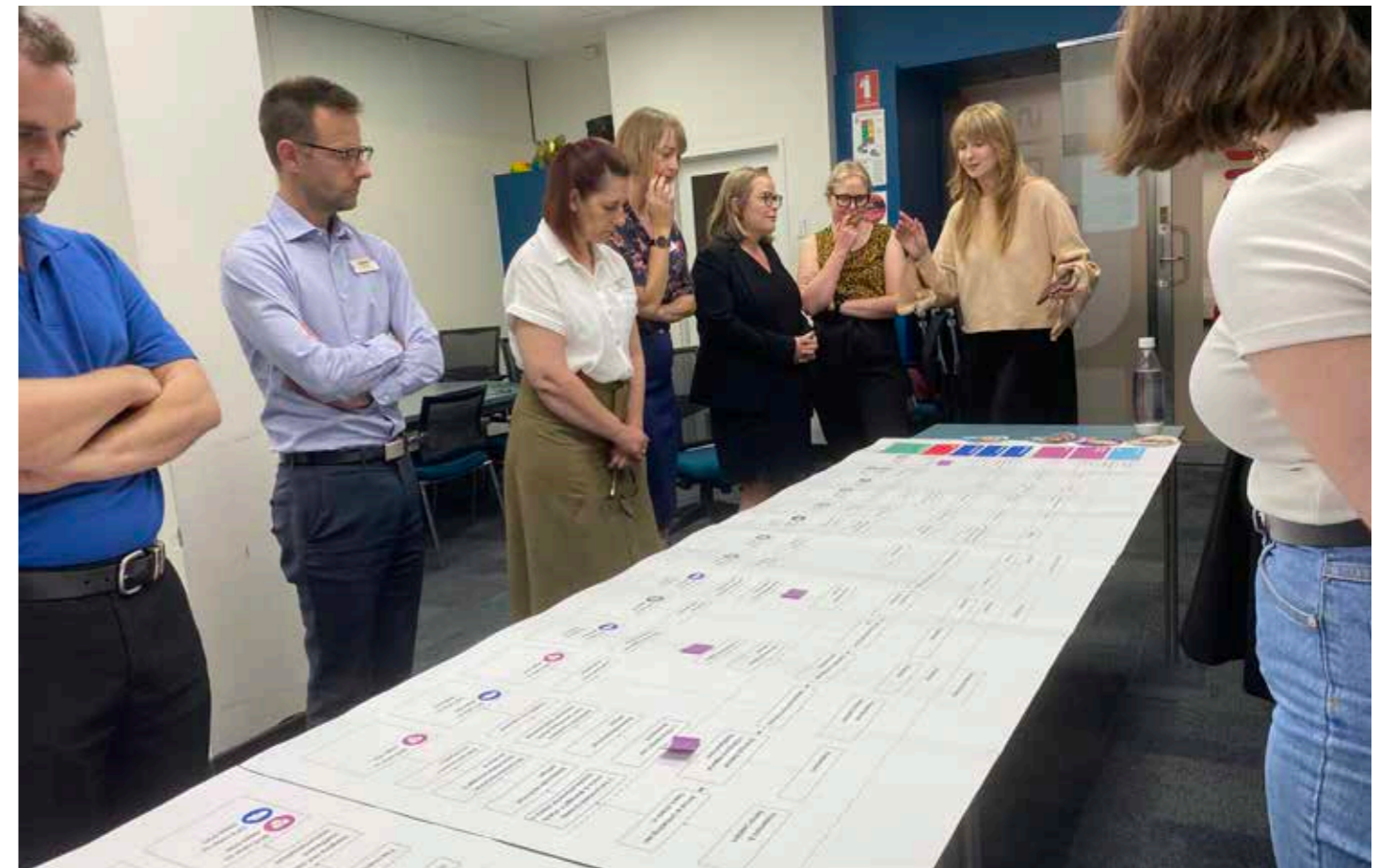

Figure 110: "Running Through the Service Blueprint"

REFLECTIONS ON THE SESSION

Immediately following the conclusion of the presentation, the staff who were present immediately offered their questions and feedback. One question that was asked pertained to how our proposed changes to the functioning of Statewide's journey might impact the journey of another team such as 'Learning Futures' team. Following up, we assured them that with a focus on co-design, these proposed concepts could not be implemented without further understanding of how they might impact functioning in other areas of the organisation. These concepts would be developed with the insights of individuals from multiple teams at Scitech to assure that everyone's needs and desires are accounted for. Overall, the feedback that we gained from those present was receptive to our research. Some of our information confirmed what Scitech already suspected, whereas other things helped change

the perspective of how they looked at certain things. For example, we helped the staff to consider what the primary motivator behind Scitech's processes were: the students that they are providing the services for. This is ultimately what should be uniting all the teams together. Something else that we learnt from the staff present was that they had trailed something similar to one of our concepts before with getting children to draw feedback, with minimal success. They felt encouraged by our research to think about developing this feedback collection method again with further testing. In comparison to our presentation in the first semester, the people we had in the room were more united and open to the possibilities that this project proposed.

18
BUDGET

ESTIMATE

This year we were not assigned a budget by Scitech. Since this was the case, we wanted to track the number of hours we spent working on this project to determine the costs and gain experience for future purposes. This budget research and exercise was to inform us for future Service Design Projects. The team calculated the average pay of a Service Designer in Australia, at $59.87 per hour. As we completed 4 units per semester that required 10 hour each, this totalled 40 hours a week, so we decided to use the standard full time work hours at 38 hours per week.

» 59.87 x 38
» Times that by 4 students
» Times that amount by 14-16 weeks
» Times that amount by 2 semesters
» This equates to $254,806.72 - $291,207.68

To gain a better understanding of budgets on projects of large scale, we discussed this with senior levelled service designers who have been designing, prototyping, and implementing systems for over 10 years stated that our yearlong project with Scitech would cost up to $500,000 if any other firms took on the work.

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CONCLUSION

THE TEAM

This project was dependent on our small core group consisting of four students, studying a Post Graduate Diploma in Design Thinking and Service Innovation, working alongside each other collaboratively throughout the year. All of us came from the background of Graphic Design meaning our group felt confident with visualising data and constructing documents for our client. The focus of our core team was to learn Service Design from a Design Thinking approach, where we were able to work alongside and utilise these skills with a real-life client, Scitech.

Students who all came from vast backgrounds of various disciplines and cultures brought their multidisciplinary skills and experiences over the year while collecting the required data for this service project. Their knowledge and skills were utilised to help us research, ideate and design relevant prototypes that we had created for our client.

Each group member was able to use their unique set of skills to valuably contribute to the project, learning how to problem solve from a unique perspective and tackling projects in efficient ways of dividing and delegating tasks to members with the relevant skillsets. Our whole team were able to bring in their own unique perspectives when ideating concepts and creating ideas to prototype; this generated many unique prototypes while allowing us to enjoy the creative process.

Collaborating on this project created value and formed friendships between team members where we were able to walk out, not as individuals, but as one team. We experienced major pivots that don't always occur in large projects like this, making us more agile and efficient with our project. This project rewarded us with a unique real-world experience that was invaluable to us. Doing this all together while experiencing the highs and lows made it more worthwhile as we were able to share our thoughts, emotions and ideas together.

PROJECT CHALLENGES

Initially, we were given the task to bring STEM to the wider community of Western Australian school children. For the first half of the year, our focus was to research rural children and schools, along with how girls interact with STEM and how to encourage Indigenous youth to uptake STEM education. We had to carefully plan the process, redefine the problems and understand the scope of the project. By the end of the first semester, we had formed a greater understanding of the problem at hand as we had gathered data from researching, organising interviews of our stakeholders and generating viable concepts by ideating how to bring STEM to the wider Western Australian community.

Following the mid-year break, we expected to arrive back and continue where we left off. We were shocked to find out about the drastic changes that had occurred internally with teams that we had been working closely with in the first semester that were dissolved or reshuffled. After engaging with the employees and management, we witnessed the low morale of team members which negatively affected the way they worked. The organisation had lost sight of their collective goal, which meant that we had to refocus our project to help the internal teams get along and work cohesively.

The employees we met with during our co-design sessions were struggling with the new restructure, not knowing what their roles were, and feeling exhausted and overworked. We had to refocus our project to help the teams within Scitech. We gained a great understanding of their feelings, empathising with these individuals to understand who they were and what they did within the company. We started researching organisational management and behaviour to gain an understanding of communication channels, company structures, teams and how they run a successful organisation.

Every fortnight we ran sessions approximately an hour-long with employees to collect valuable insights about their organisation, their roles and their current thoughts and feelings. These insights informed the development of our concepts. To fill in gaps and find more data, we conducted interviews with various members from different teams to gain an understanding of their roles. This data helped our team find a new project direction: ways for which Scitech could communicate effectively and efficiently, using the state-wide team as a pilot.

PROJECT SCOPE

This was the first time our team worked on a year-long project at this scale. Our team learned valuable insights, learning how to navigate massive changes and adapting to new environments. As our team was relatively small, it was overwhelming with the number of resources that we needed to gather along with the data we required. Our team managed successfully to keep the scope at arm's reach, understanding the clients position time and resource wise, along with understanding how much work we required for research, defining, ideation, prototyping and implementation. We met challenges head on and conquered complex issues that not many university students get to experience.

We set realistic goals and created concepts that were attainable for the organisation to take on within a timeframe that is applicable. We placed empathy at the heart of the issue as we realised that all our work for Scitech will ultimately impact the school kids, the next generation of leaders in the near future.

DESIGN THINKING APPROACH

We followed a Design Thinking approach on this Service Design project. This is a user-centred, co-creative, and multidisciplinary approach to creating experiences and services that are desirable, feasible, and viable (Strickdorn & Schneider, 2011; Lewrick et al. 2020). We worked on this project in multiple Service Design stages (Friis Dam & Yu Siang, 2021): empathising, defining, ideating, prototyping, and testing. With the sudden change of project focus halfway through the year, we found ourselves starting semester two back at those beginning stages again, working to understand the problem and defining it. In the limited timeframe of a year working with Scitech, this left less time than anticipated for ideating, prototyping, and testing. This further exemplifies how a service design approach can look in practice: not linear and revisiting various stages.

OUR EXPERIENCE

We were able to work with a real-life client and experience the issues that organisations face. It was an amazing opportunity to work alongside them the whole year, and work on two projects rather than a singular one. We were able to use our Design Thinking skills in unique ways, with the first, trying to discover ways in which we could bring STEM into the broader community of Western Australia and the second project, working on systems and organisation structures.

We were able to witness raw, behind the scenes processes and organisation operations. This was eye-opening to us as it showed how unique and complex organisations are. We were able to empathise with employees to understand their position and feelings. The Scitech staff trusted us and allowed us to come in to witness how they work, interview them, and use concepts such as co-design to help foster company culture while we gathered our data. We were able to understand how important and valuable everyone's role was within an organisation, along with the interactions that Scitech make with schools, children and the wider public. There are countless teams, operations and resources working hard to make it successful.


Figure 111: "Viewing the complete project"

OUR VISION FOR THE FUTURE

We hope that Scitech takes away how important co-design, a fundamental Design Thinking tool, is to facilitate within any organisation and how they operate, especially if they want to continue being a viable and successful organisation in our rapidly changing future.

Co-design allows collaboration to exist and allowing people from multiple teams to come together and work in new ways will create culture and harness creativity. We hope Scitech establishes co-design sessions within their organisation when implementing our prototypes to find the best ways they can connect the Statewide team to the organisation more cohesively, collect fundamental and important feedback from children and Statewide presenters, organise meetings that make every member feel valued, and most importantly, co-design ways to bring a stronger, more positive culture back into their organisation.

We hope this project, and our prototypes guide Scitech to make the necessary changes within the internal structures, and we hope it helps guide the staff when trying to co-design new ways for the organisation to function cohesively in its future.
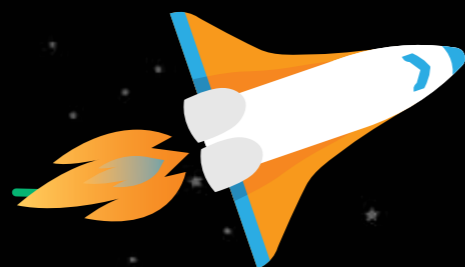
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