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A U S T R A L I A

Human-centred Not-for-Profits: Designing digital storytelling software for end user connection in the homelessness sector

by
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Dear Professor Abbosh,

In accordance with the requirements of the degree of Bachelor of Engineering (Honours) in the School of Information Technology and Electrical Engineering, I present the following thesis entitled *“Human-centred Not-for-Profits: Designing digital storytelling software for end user connection in the homelessness sector”*. This work was performed in partnership with Mr Jay Almaraz and Mr Stephen Pozzi and under the supervision of Dr Dhaval Vyas.

I declare that the work submitted in this thesis is my own, except as acknowledged in the text and footnotes, and has not been previously submitted for a degree at The University of Queensland or any other institution.

Yours sincerely,

A handwritten signature in black ink that reads "Alex McLean". The signature is written in a cursive, flowing style.

Alex McLean

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My utmost respect and appreciation must be stated for those individuals who, whilst experiencing some of the toughest times of their lives in homelessness, were willing to participate in this project. Alongside these individuals I also wish to voice my appreciation for the staff, volunteer, and donor communities in the not-for-profits surrounding these individuals with much-needed support and service.

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Abstract

In these unprecedented times, rapid shifts throughout society are forcing businesses and individuals to be readily positioned to adapt, innovate, and transform their ways of being. Largely chaperoned by the constant advances in technology, these shifting expectations and opportunities impose indiscriminate impacts on the organisations that surround us. For those experiencing homelessness, these surrounding organisations will often consist of a consortium of not-for-profit (NFP) organisations, of whom the readiness to acclimatise to the changing world is of critical importance. We set out to investigate the technological intersection between these NFPs, and the individuals whom they altruistically set out to support. Our understanding builds initially on the currently understood technology utilisation patterns of these two parties in isolation, before ultimately discussing and developing the augmentations that technology can facilitate in connecting them through the implementation of digital storytelling (DST). In developing and delivering a real-world example of a DST-based connection strategy in an established Australian NFP, we bring forth our deepened understanding and findings of the space, as well as propose a number of potential future studies to extend upon our work. The findings put forth in this report aim to assist not just further research, but also the practical implementations of technology in homelessness sector NFPs. In brief, we find that a number of considerations must be made by NFPs in the delivery of DST technology, specifically the implications of the *network effect*, the benefits of relying on existing interpersonal relationships, and the limitations on using a shared device. We also recommend the utilisation of existing design principles due to the benefits of familiarity, and finally we see that the desire to share a recording of one's voice extends beyond that of simple stories. NFPs may benefit from this report through our detailed recommendations on designing, delivering, and exploring similar technology within their service models.

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Chapter 1

Introduction

In a rapidly evolving technological and societal landscape, it is of increasing importance that no demographics, sectors of industry, or geographical regions are left behind. In this report we aim to investigate the impacts of this evolving landscape on one of society's most marginalised demographics, in those experiencing homelessness. We also intend to extend our investigation to include the ecosystem surrounding this community, specifically the supporting not-for-profit (NFP) organisations that provide invaluable services to these individuals. Emphasis will be placed on the role of technology when considered as a vital mechanism in connecting NFP services to the individuals whom they intend to serve. We strongly believe that a thorough understanding of technology's role in this ecosystem will result in meaningful recommendations and pathways towards increased mutual benefits in the space. This investigation also hopes to perform practical research in the field, in an effort to validate and build on existing empirical evidence, as well as to develop increased empathy in the area.

In acknowledgement of the immense scale of homelessness when viewed globally, with an estimated 150 million people currently experiencing homelessness [1], as well as the inherent disparity across cultural and geographical boundaries, our investigation will primarily focus on the western world. Further, narrowing the scope, particular emphasis will be placed upon those experiencing homelessness, and the supporting NFPs, across Australia and New Zealand. NFPs that will be considered in this investigation will usually be limited to those whose core mission specifically relates to supporting those experiencing homelessness, or similarly marginalised individuals. In a further effort to ensure that the scope of this investigation is well bounded, prior work relating to technology will first be validated for its recency and current relevancy; acknowledging how rapidly certain technology-based studies may

have become dated in recent times.

Overall, we wish to garner a deep understanding of the machinations of the Australian and New Zealand NFP sector, specifically the strategies in which modern technology plays a pivotal role in connecting to those experiencing homelessness. Regarding the implementation of such technology, we intend to utilise digital storytelling (DST) methodologies to exemplify one potential approach to connection in this space. Ideally, this understanding will result in new considerations that can be utilised for the mutual benefit of both NFPs, and their end users. Specifically, we aim to answer the question of *“How can homelessness NFPs utilise DST technology in connecting with those who use their services?”*.

Structurally, we will begin by performing a detailed review of the existing literature in this area. This review will be followed by the design and development of a prototypical DST application. Our process will culminate in the attempted delivery of this application to those experiencing homelessness within the operational reality of an existing NFP’s services. Ultimately, we will bring forth any findings and concluding thoughts that have arisen throughout our review, our design, and our delivery.

Chapter 2

Literature Review

2.1 Foundations

Technology has undeniably reshaped almost every facet of our modern world. Indiscriminate of an individual's socio-economic background, or a business' operating industry, the method in which almost any conceivable task can be completed will now include some form of technological augmentation. Whilst these augmentations may seem to be universal, there are still a number of business sectors and groups of people who have not been a constituent in this global shift. Whether it be business sectors that are unwilling or otherwise unable to embrace this change, or individuals who have inadequate access, there does ultimately exist a number of parties that stand to benefit from their unrealised technological potential.

This review of the literature intends to examine the position of two specific parties amongst the wider technological adaptation of the modern world; individuals experiencing homelessness, and the NFP organisations that aim to assist them. We will first examine the role of technology within both of these parties, when considered in isolation, before ultimately delving into the ways in which technology has, does, and should augment the connection between the two. The aim of this review is to understand potential opportunities for technology to be utilised such that the homelessness NFP sector, inclusive of both the organisations and those utilising the services, may be greater connected.

In an effort to ensure currency and relevancy of our research, we have primarily focused on information from recent years, given the immense velocity of technological change. Historical information has been used in order to provide deeper context or understanding, but was not considered when drawing conclusions about the current state. We primarily focused on research relating specifically to NFPs supporting

homelessness, however we also recognise that many areas of NFPs are agnostic of the sector they are directly supporting, such as fundraising, volunteering, and community engagement. Where appropriate, we have considered NFP research which extends beyond the homelessness sector, in order to gain a better understanding of the NFP space.

The specific sources which were considered for this review are almost entirely from published, reputable, academic sources, along with a small sampling of sources from other publications and media as was considered relevant. This sampling of non-academic sources was only considered when it came from a reputable organisation deemed to be in a relevant sector. News outlets and opinion pieces were not considered for this review.

2.2 Technology and the Not-for-Profit Sector

From as early as the 1980s, researchers were astutely aware that emerging technology could provide a “*huge competitive leap*” that would be “*open to exploitation by others*” if not appropriately capitalised on [2, p. 11]. As the world progresses even deeper into the Information Age, it is important for organisations to continuously adapt to the evolving technological landscape. This revolution provides opportunity, for those who have the access and resources to evolve; and challenge, for those who do not.

In an effort to better categorise and understand the different levels of technological adoption a business may have attained, Haines proposes a model of four distinct levels of web service adoption [3]. Haines suggests that there are not only systematic differences between the levels of adoption, but also between the organisational requirements to reach each level, and ultimately the potential business outcomes. The four levels are defined as *Technical Solution*, *IT Solution*, *Internal Business Solution*, and *External Business Solution*. Haines also goes on to relate these levels to the existing Information Systems innovation types initially proposed by Swanson [4], who outlined three levels of organisational Information Systems innovativeness, and the subsequent ability for an organisation to survive. Understanding the implications of these categorisations gives strong insight into the important factors to be considered when reviewing the technological adoption of an organisation, with this review focusing specifically on how they apply to NFPs.

NFPs are precariously poised in this technological shift, as the benefits of technology stand to drastically reduce operational overhead, streamline incoming funding,

simplify data collection, and enhance reporting [5] [6]. However, the capabilities required to utilise these benefits are potentially not within reach of these organisations.

A recent report by Infoxchange, on technology utilisation in the Australian NFP sector, found that although NFPs spent similar amounts on technology to equivalent small to medium size businesses, only 4% of these NFPs consider themselves to be “*highly satisfied*” with the way they utilise technology [7]. The report further outlines some underlying correlations which may be contributing to this lack of satisfaction. 56% of NFP staff members were either “*not confident*” or only “*a bit confident*” in using technology and systems, and this was generally not well alleviated by the NFPs with 40% not providing staff with any development opportunities in these areas. From a branding perspective, the report did find that most NFPs do have a good understanding of the importance of their externally facing digital footprint, with website and social media improvements emerging as the top priorities across all participant organisations.

The difficulties and challenges faced by NFPs in trying to embrace technology were further investigated in another recent study [8]. The study found that a variety of factors within NFPs may result in the inability to fully realise the potential technological benefits, more specifically: *growing pains in rapidly scaling NFPs*, *lack of clear organisational structure*, and *insufficient computer literacy*. The Infoxchange report identified similar challenges, with the most common across all participant organisations being *budget/financing*, *staff capacity and capability*.

The challenges that have been observed in NFPs, and the subsequent limitation in technological adoption, align well with the Haines’ model discussed earlier. Haines identified that for an organisation to achieve a level of adoption higher than *IT Solution*, the organisation is required to have organisation-wide scope in their technology strategy, be willing to undergo significant changes in internal structures and process, and champion innovation from an administrative level. Evidently, the observed challenges conflict directly with these requirements, and ultimately result in an NFP’s inability to enhance their level of adoption without first striving to meet Haines’ requirements.

Not only are NFPs aiming to augment their existing operations, fundraising activities, and reporting methods through innovative use of technology, they are also aiming to expand their activities beyond what was previously possible. For example, Ko & Liu recently investigated the emerging trend for NFPs to extend beyond their traditional revenue streams, and explore more direct commercial opportuni-

ties as social enterprises [9]. One of these potential commercial opportunities for NFPs is direct to consumer retail purchases, delivered either physically or online. A 2020 Australia Post report, reflecting on the impacts of COVID-19 on eCommerce, showed a staggering 95% year-over-year growth in online shopping across the country, highlighting a potentially lucrative opportunity for technologically advanced NFPs to capitalise on [10].

Whilst there are evidently many possible ways in which NFPs can benefit from technology, it has been found that there are few NFPs that fully realise these benefits [7]. The potential for NFPs to identify and execute on technological opportunities can be greatly enhanced by further investigation and understanding of the ways in which technology is represented in their wider community. Such an understanding would assist in the organisation’s fulfilment of the technological innovation requirements outlined similarly by both Haines [3] and Swanson [4].

2.2.1 Traditional Technology Strategy

NFPs, like any other type of business, can vary immensely in their composition. From massive multinational NFPs like the Red Cross or UNICEF, all the way down to grassroots organisations comprising just one individual with a mission. The Australian Charities and Not-for-profits Commission (ACNC) classifies almost two-thirds of the nations NFPs as “*small*”, with annual revenues below \$250,000. At the other end of the spectrum, the ACNC recognises only 0.4% of charities in its highest classification, as those who have an annual reported revenue over \$100M [11]. This immense variation in scale can make it difficult in attempting to analyse and aggregate the needs, challenges, and opportunities of NFPs in their entirety.

Work by Srinivasan, in studying a number of emerging and rapidly growing NFPs, ultimately identified a number of consistencies in the growth patterns and life cycles of NFPs [12]. Srinivasan proposes that it is common for NFPs to progress through the fundamental stages of *Start-up*, *Expansion & Growth*, *Consolidation*, *Phase-out & Metamorphosis*. The observations made in this proposed model acknowledge that the complexities arise due to the underlying tendency for NFPs to be project organisations at their core. Whilst this work does not explicitly make reference to the role of technology throughout these stages, it follows that the need for enhanced levels of adoption would simultaneously increase, in alignment with the outlined monotonically increasing sophistication across the organisation more generally. It has also been observed that during the *Start-up* stage of an NFP’s life cycle, there is potential to grow rapidly through a crowdfunding model [13], a model which

has been shown to be increasingly effective when supported by technology [14].

Prior to the current boom in accessibility of technology in the wider business landscape, it was often seen as too expensive, or unfit, for the needs of an NFP [7] [15] [8]. Alongside this perceived inaccessibility, there was also traditionally a steep learning curve required to fully recognise the benefits of technology within an organisation [16] [17]. Prior to the ubiquity of modern software and devices, proficiency in certain technologies was often a desirable and expensive skill for someone to possess, and therefore often beyond the affordability of NFPs. Compounding these perceived financial limitations, is the ever-present pressure for NFPs to reliably and responsibly ensure that funding is used to directly improve service offerings.

2.2.2 Modern Technology Strategy

Evolution in the ways in which technology is delivered to, and utilised by, organisations has seen a drastic shift in the ability to scale. Software solutions, once seen as a tool for the largest and wealthiest of organisations, is now readily available thanks to the growth of the Software as a Service (SaaS) industry. Recent analysis shows that SaaS spend has increased almost 50% in the last two years, across a selection of progressive organisations [18]. The ease with which an organisation can discover and implement new technologies to augment their processes enables these organisations to scale readily and rapidly. It is now extremely common for almost all organisations, including NFPs, to have a set of SaaS tools underpinning almost everything they do. Not only are these tools easier to discover, and more intuitive to use, but they are also usually far more affordable [19].

The need for specialised skills and knowledge to properly utilise technology within an organisation is all but gone, outside the most niche cases; with the ability to adequately operate SaaS applications becoming almost as ubiquitous as the ability to type was in generations past [20] [21] [22]. Major business benefits can be realised on the back of this underlying expectation of fundamental technical competencies. This expectation, particularly on the employees of an NFP, enables modern tools to be integrated readily across the board; ultimately enabling the NFP to spend more of their time and resources on their core business, rather than on any process that can be automated, streamlined, or otherwise augmented by technology. More specifically, NFPs stand to benefit from this revolution in technology accessibility through a variety of avenues [23].

In relation to an NFPs core business, technology is able to assist in delivering their service more reliably, safely, and at a larger scale [5]. These enhancements

in service delivery allow for an NFP to not only provide a better service to their end users, but also to provide a service which is readily able to scale and assist in the growth of the organisation. Technology is also capable of assisting NFPs in algorithmic optimisation in matching the capacity of their service delivery models with the needs and distribution of those utilising their services. Dombrowski outlined one such optimisation in the geographical distribution of a food service to those experiencing homelessness [24].

NFPs also stand to benefit in the fundraising space, as these new tools will assist not only in payment processing, but also in running campaigns, tracking donors over time, and numerous other enhancements that can be obtained through the recent advances in eCommerce [25] [26]. The ability to reach and engage a wider audience has also been enhanced through technology with integration of social media strategies into NFPs wider brand strategy offering near limitless potential in the diversity and sheer scale of individuals that can be reached [27] [28] [29] [30].

Alongside these benefits specifically pertaining to NFPs, there are countless other opportunities for modern technological tools to be beneficial to the organisation; with everything from payroll and regulatory compliance [31], through to instant messaging and website content management. Beyond the opportunities for internal technological benefit in an NFP, it may also be possible to utilise modern technology to deliver a better service, and ultimately enhance the connection to service end users. Although it is obvious to see the upsides when considering how an NFP may utilise these tools, it is also important to consider the potential downsides, or barriers to entry, when it comes to the real world implementation with an NFP.

2.2.3 Barriers to Progressive Technology Strategies

Despite eradication of numerous barriers that have historically limited the full utilisation of technology in NFPs, some challenges do still remain.

For example, NFPs in the *Consolidation* or later stages of their growth, likely to be in a position of lesser agility and comfortability when it comes to change, are in a disadvantaged position to embrace this technological shift when compared to an NFP in the *Start-up* stage. One of the most universal barriers to a large transition toward technology comes through the fundamental issues of managing change within an organisation [32] [33]. An organisation with more ingrained and entangled operations may find it more difficult to entirely transition away from the processes that have, in some cases, been in place for decades or more. Research shows that there are mechanisms and ideologies that can be employed by an organisation

to mitigate this barrier of organisational change, Markus suggests that implementing change incrementally can “*sharply cut the risks of technochange*” [34, p. 18], and alternatively emphasises the importance of guiding and supporting the individuals through their unlearning of old systems and processes [35].

On the other hand, *Start-up* stage NFPs may be willing to adopt technology, but may not have the strategy and clarity to do so effectively. Without strong clarity on the machinations of an organisation, both currently and looking towards the future, NFPs may experience inefficient forays into the technological world. A lack of structure may also make it unclear as to the responsibilities of the individuals in an organisation, when it comes to driving and championing these types of change. In a framework proposed by a group of Hong Kong Polytechnic University researchers, a number of critical success factors (CSFs) for the adoption of enterprise resource planning (ERP) software were outlined [36]. Amongst the outlined CSFs, exist a number of factors which may prove difficult to achieve for *Start-up* stage NFPs, such as *Business process/rules are well understood*, *Empowered decision makers*, *Company-wide commitment*, *Organisational experience of IT or organisational change projects of a similar scale*, and *Alignment between business strategy and IT strategy*, amongst others. Whilst this research does primarily pertain to the adoption of ERP software, which is quite large and complex by nature, it is still a relevant work in identifying some success factors which may prove to be more of a barrier for a less mature NFP.

There are also barriers to adopting technology that exist in a more foundational sense. Lack of general computer literacy, or the inability to recognise the potential that technology can bring to an organisation, may result in the option never even being considered viable or useful. Even if the option of shifting towards a more modern approach of business is considered, it may often fall outside the range of affordability, or the resources to implement change may not be available. These concerns are not new, and have long been recognised as a challenge for organisations, in their inability to be cognisant of the opportunities of which they are unaware [2]. A 2003 article from the *Harvard Business Review*, aptly titled *Wanted: Chief Ignorance Officer*, recognises that steering away from the known to the *terra incognita*, or the unknown, is a requirement for innovation to occur [37]. For an organisation that may not hold this ideology, technological adoption may never even be considered.

For technology to be successfully utilised by NFPs, particularly in connecting with their end users, these barriers must be considered, and methods to overcome them discovered. Further on in this review, we will discuss the incentives and po-

tential pathways with which NFPs, their end users, and the surrounding ecosystem can assist in overcoming these challenges.

2.3 Technology for those Experiencing Homelessness

As recently as 2008, a study dishearteningly found that *“for every person who thinks the homeless are not dangerous; another person thinks that they are”* [38, p. 117], illustrating the dichotomy of public perceptions when it comes to those experiencing homelessness. As well as these perceptions around safety, it is often more generally assumed that the lives of people experience homelessness are drastically different from those that are not. Whilst this is true in many regards, the differences in utilisation of technology are smaller than is often imagined [39] [40] [41]. In understanding the current state of technology utilisation across the homeless population, it is also an interesting point of discussion to consider the historical context which leads to these misconceptions.

2.3.1 Historical Technology Usage

Prior to the ubiquity of owning and operating a personal technology device, such as a phone or a laptop, it can be assumed that those who were experiencing homelessness were technologically disconnected from the wider world similarly to those who were not having the same experience. With a reported 1% of US adults having broadband access in their own home in the year 2000 [42], it is important to recognise that the technological connection gap between those who were experiencing homelessness, and those who were not, was once not as much of a pressing concern.

Earlier studies into technology use amongst those experiencing homelessness show that the utilisation of technology was traditionally more of an intentional and sustained effort, rather than a habitual part of everyday life. Those experiencing homelessness would often need to seek out a library, or some other form of public access, to be able to utilise the most rudimentary technological applications [43] [39]. Whilst it was often found that the means of accessing and utilising technology were drastically different from those who were not disadvantaged, the reasons for using the technology was often not too disparate. Whether it was checking the weather, searching for jobs, communication via electronic mail, or reading the news, the desires that were met through technology have seemingly always been universal.

Whilst this universality in desired technology use has remained mostly unchanged over time, the universality of access has increased drastically since the times of these early studies. With an estimated 73% of US adults now having broadband access at home [42], it must subsequently be acknowledged that many of these earlier sources must be considered primarily for their historical context rather than their current relevancy.

2.3.2 Modern Technology Usage

Along with an omnipresent increase in all forms of technological use in recent years, the rates of technology utilisation by people experiencing homelessness have also been found to be rapidly increasing [41] [43] [40], particularly amongst younger demographics, or any other demographic that is already more likely to utilise technology across the wider population [44].

A 2014 Australian investigation surprisingly found that mobile phone ownership within the homeless population (95%) actually exceeded the mobile phone ownership rate of the general Australian population (92%) [45]. This finding also held true, to an even greater extent in fact, when only smartphones were considered (77% vs 64%). The study also emphasises that these findings were “*not indicative of their affordability but rather the degree of their importance and priority given to them by participants because of their essential role for ‘survival’ when no ready alternative was available*” [45, p. 55.7]. Whilst the rates of ownership were found to be encouraging, a number of challenges are still present when it comes to the utilisation of these devices. In particular, it was found that individuals may struggle to keep the device charged, or connected through a network provider. These findings were further supported by alternative studies [46] [47], and a number of recommendations, including development of low energy smartphones [48], have been proposed.

Technology is generally utilised by people experiencing homelessness in extremely similar ways as those who are not, for example social networking, checking the weather, searching for jobs, searching for services [41] [43] [44]. The high rate of mobile phone ownership has also been linked to certain activities which are often required to be undertaken by those experiencing homelessness, particularly those related to welfare and support programs. For example programs that require participants to record actions such as job applications and job interviews are often best recorded using a mobile phone [45].

Studies have also shown that there is a strong belief in the homeless community that technology can be readily utilised to connect, empower, and educate others who

find themselves temporarily within this community [43]. This connection enables those who can best empathise with someone experiencing homelessness to provide vital empathy and support in a time of need.

2.3.3 Benefits of Technology

As already identified, technology use amongst those experiencing homelessness is not only far more commonplace and widespread than usually assumed, but also the gateway to an incredible range of untapped opportunities aimed at benefiting these individuals. In fact, technology has been already been found to provide people experiencing homelessness with a vast array of benefits.

It has been proposed that mobile phone technology should form an essential component in efforts to improve the safety of young people experiencing homelessness [49]. The proposal recognises the intrinsic link between an individual's safety and their mobile phone, primarily as a result of the mobile phone being worn on the body. Specific design opportunities resulting from this proposal range from *Support a homeless young person's need to document abuse*, through to *Support for safe, non-stigmatized access to infrastructure*. Further development in these areas could prove to be immensely beneficial for those looking to their mobile phones for an added layer of safety, particularly those who are often found with limited layers of safety to begin with.

In parallel, it has also been shown that technology can be utilised and encouraged in order to reduce substance abuse amongst a similar population [50]. One of the key focuses on the substance abuse study was the importance of social networking technology, and digital connection, that provide tangible benefits to the user.

Further, studies investigating the importance of technological connection for people experiencing homelessness show that there are significant mental health and wellbeing benefits to the individual [50] [51] [52]. Reduction in the incidence of HIV infections, incidences of depression, and levels of addiction amongst those experiencing homelessness have all been recognised as potential outcomes from the connection provided by modern technology [53].

It is important to note that the benefits of technology outlined in this section of the review are intended to illustrate the benefits that may not be similarly apparent in the general population. However, it is still important to note the important benefits that the general population obtain from technology can also be realised by those experiencing homelessness, such as finding a job and social connections [54].

An increasing utilisation of technology amongst those experiencing homelessness,

and the evidential benefits which this provides, results in a growing need for NFPs to more appropriately integrate these individuals into their already broadening technology strategies.

2.3.4 Barriers to Success

Whilst some form of access to modern technology has been shown to be almost universal in the population of those experiencing homelessness, there are still a number of barriers which have been found when compared to the general population. Some of these barriers have already been outlined, specifically those pertaining to battery charge or network connectivity, and a further set of challenges will be investigated later in this report. In this section we will review barriers experienced directly by those who are experiencing homelessness, but also by those who are developing technology specifically for this user group. The intersection of the barriers faced by both of these parties, evidently results in the disinterest, or lack of incentive, to develop and/or utilise such technologies.

When developing technology for a user group that has universal access to a mobile phone for example, it is easy for a developer to require the use of a native application, or multi-factor authentication, to interact with their platform. Inherently, these developers have made the decision that they are not interested in supporting the use case of an individual who does not have stable, secure access to a mobile phone. The alternatives to this decision require the developer to either develop and maintain another technological form of interaction with their platform that does not require this access, or to allow for more traditional methods such as phone calls or brick and mortar establishments. Both of these alternatives are obviously more cumbersome and expensive for the organisation, and often will not be considered.

This predicament in designing for those who do not have universal stable and secure access to mobile phones, can be extended to also consider any other similar requirement such as Wi-Fi, GPS, or phone credit. When designing technology with the intention of connecting those experiencing homelessness, this predicament will often not be overcome, and a solution will either be provided that is inaccessible by a large number within the target user base, or no solution will be provided at all.

Whilst we have already outlined the almost global possession of mobile devices in those experiencing homelessness, it is also important to differentiate possession from an individual's ability to reliably and securely have access to up-to-date hardware, in a trusted environment, on a secure network.

Specific design considerations, aimed at combating many of these outlined bar-

riers, will be further investigated later on in our review.

2.4 Connecting to those Experiencing Homelessness

The benefits that can be attained from people experiencing homelessness utilising technology are extremely evident; as are the benefits that NFPs stand to obtain by further embracing technology. In light of these observations, it becomes apparent that there exist many opportunities for NFPs to further benefit the lives of those experiencing homelessness; specifically, through an emphasis on technology designed specifically for the individuals they are trying to serve.

These opportunities present a pathway towards mutual benefit, for both the NFP and those experiencing homelessness. The NFP has the potential to benefit from technology through advancements in reporting and data collection, optimising and streamlining operational processes, and ultimately achieving their proposed mission through the betterment of those experiencing homelessness. As previously discussed, the benefit technology can provide to those experiencing homelessness are vast, and largely untapped at a large scale.

Efforts from NFPs to provide technology directly to those experiencing homelessness are not commonplace in Australia. The most notable effort thus far is undoubtedly Ask Izzy, developed by Melbourne based organisation Infoxchange. Ask Izzy acts as a service finder for those experiencing homelessness, and is an excellent example of technology being developed with the sole focus of improving the lives of those in need. An in-depth evaluation of Ask Izzy found it to be empowering for those who used it to find new information [55]. The evaluation also uncovered a social component of the service, as it was found that users would often be accessing on behalf of another, or by service providers themselves.

Whilst Ask Izzy is an excellent example of technology being designed and implemented for the sole benefit of those in need, often due to experiencing homelessness, it is only one such example in what should seemingly be a cluttered landscape. There does exist alternative, often geographically constrained services, however these smaller services are often incomplete, unknown to those in need, too specific for widespread use, or otherwise insufficient [56] [57].

In attempting to develop new examples to be discussed alongside Ask Izzy, this project aims to outline an approach to fill this gap in the technological connection between NFPs and those they are trying to support.

2.4.1 Benefits for a Not-for-Profit

An individual's experience with a NFP service, like an experience with any service, can be considered to be a journey, composing of a number of discrete phases. At the start of this journey, an individual is unaware of the existence of this service, and at the end of this journey they may be a regular user of the service, or even an advocate for the service in the wider community.

Initial discovery of a service is the first step for an individual, and this step can be increasingly simplified through an NFPs utilisation of technology. Whether it be through digital advertising, online news stories, listing in an online service directory, or otherwise, an individual will likely discover a service over the internet. Even in the case where an individual discovers a service through word-of-mouth, they will still likely validate and explore this information further by investigating an NFPs online presence. This online presence can potentially extend beyond the basic information and marketing of a service, to include extensions such as logistical information, terms of use, and testimonials. Examples of this can be seen at sites like `locations.orangesky.org.au`.

Upon discovering and subsequently committing to engaging in a particular service, an individual user's experience can be enhanced greatly through technological systems aimed at simplifying logistical issues such as booking, cancellations, and scheduling, as well as informative issues such as contact and directional details for the service. A study into the digital experiences of users accessing service information online outlined that *"interactions with service websites create opportunities for positive experiences that can foster trust and brand equity"* [58, p. 7]. During an NFP's service, a user may also benefit from technology that has been implemented to simplify and streamline the service delivery, or even to provide extra comfort and anonymity. A previous study has shown that adequate utilisation of technology does not solely serve to enhance service delivery of an NFP, but also stands as a potential barrier to adoption by end users, in the case where the technology is inadequate [59].

Beyond the participation in an NFPs service, individuals may wish to be provided with further information such as reports, referrals, and other opportunities which may be useful. NFPs may also wish to follow up with their users to show appreciation, confirm the delivery of service, or to otherwise further engage the individual. All of these opportunities that exist beyond the point of participation are excellent examples of ways in which technology can augment the experience, and provide mutual benefit to all parties. These techniques are not unique to homeless-

ness support services, and have been thoroughly studied in adjacent areas, such as public service works [60].

Not only are technological innovations relevant in the area of service delivery when it comes to connecting directly with end users, technology may also be utilised to foster a community of users, NFPs, and other third parties who are all digitally connected. Through forums, social media channels, and other forms of communication, the connection between all parties surrounding an NFPs service may be connected in an ongoing capacity. The shared experiences which exist between these parties allow for immediate relevancy to be established between everyone involved, and hopefully allows for strong bonds to be formed throughout the surrounding community. NFPs should note that the *Harvard Business Review* proposes that the most potential can be recognised from an organisation's online community when the community is controlled by the members themselves, in an environment created by the organisation to enable such a community to thrive [61].

2.4.2 Risks for a Not-for-Profit

Alongside the immense benefits which an NFP may obtain through the integration of technology into their operating strategy, there are also a number of risks which should be considered. These risks must form an integral part of the organisation's decision-making strategies when making decisions related to technology.

The misuse and subsequent public distrust, in the collection of individual's data has evolved quite rapidly in recent years. An organisation must always consider the ethical problems surrounding any data they wish to collect, as well as how they will ultimately store, analyse, and display this data. Incorrect or unethical considerations around individual data may result in an NFPs technology being seen as pervasive, indulgent, or unnecessary, amongst others. The resultant reputational and operational risk for an NFP must not be overlooked. A piece by Hirsch in 2014, foresaw many of the affects that increasing data velocity would have on the corporate world, particularly corporate reputation, insightfully stating that "*consumers will appreciate companies that both take this area seriously and are willing to grapple with the implications*" [62, p. 39]. As NFPs invest in their technology strategies, this insight by Hirsch should remain a key consideration.

It is also commonly a core part of NFP services, particularly in the homelessness space, that anonymity is offered to all end users. Not only should any technological solution allow for the highest degree of anonymity to be retained by the end users, but it should also be implemented such that this anonymity is obvious to the end

user, who will likely not have an enhanced technical understanding of the problem. If an end user is unable to feel anonymous through a service offering from these NFPs, then there is the increased potential for them to disengage, provide false information, or even tarnish the NFPs reputation by word-of-mouth [63]. The ways in which different types and groups of users develop trust in a technical product is known to differ [64], and as such, a generic view of user trust should not be assumed. NFPs must ensure that care is taken to understand the antecedents to trusting their software in a manner that is tailored to their intended users. The technical problem behind retaining anonymity has become increasingly prominent recently with COVID-19 tracking apps, and extensive empirical evidence outline numerous differing approaches [65] [66] [67]. These outlined best practices and methodologies should be considered in designing technology by these NFPs.

An organisation who chooses to embark upon the journey of delivering a technical product, must also acknowledge the commitment that they are making to maintaining, developing, and delivering the product for the lifetime of the solution. The ongoing cost of investing in technology development cannot be overlooked, and must be factored in financially. An explanatory piece of work on the software development life cycle outlines *Poor maintenance* as one of the key reasons for low quality apps [68]. Inadequate resourcing towards the ongoing aspect of these projects may result in an unreliable, insecure, or outdated piece of technology; ultimately resulting in similar reputational and operational risks as the above issues.

Whilst there does exist a multitude of risks which must be considered, many of these are common across all industries, and therefore prior work can be heavily considered when pursuing these strategies.

2.4.3 Prior Work by Not-for-Profits

Although it has been acknowledged that there is not a large quantity of technology aimed directly at those experiencing homelessness, there has been some previous discussions and events aiming to improve this.

Hackathons are a staple in any industry utilising software engineering, described by Briscoe as “*a problem-focused computer programming event*” [69, p. 1]. Usually an event running for a day or more, dedicating a passionate group of developers, designers, and product people at a specific problem. This problem is often business focussed, or process focussed, however it can realistically be adjusted to almost anything people are willing to spend time on. As a result of the flexibility this format provides, it has been readily embraced multiple times in attempts to help solve the

biggest problems around homelessness [70] [71] [72]. Whilst it was notably difficult at getting products from these hackathons to market, they have been recognised as a good opportunity to better understand the issues, and to further educate those involved on said issues.

2.4.4 Considerations in Design

In the design of any system, technological or otherwise, it is vital to make considerations in alignment with the desired or identified user groups. Applying this ideology to the design of technology for those experiencing homelessness provides interesting insights that need to be considered during the design process.

The nuance of the different groups within the homeless community is extremely complex. The homeless community is often thought of as a single demographic; whereas in reality, the homeless community is an incredibly diverse community with representation equally diverse to that of the general population [73].

A 1990 study specifically targeting women experiencing homelessness stated that due to the complexity of homelessness, development within the space *“requires careful analysis of the unique features of identifiable groups within the homeless population”* [74, p. 1]. This careful analysis allows any development within the space to best benefit the intended group, or groups, of users. For example, a study aiming to understand and design around the needs of people experiencing both homelessness and depression found that supporting the immediate and future needs of the individuals was the most beneficial course of action for this particular group [75].

Designing around the general needs of a desired group within the homeless community also allows for design to be focused on the collective needs of the users, as outlined by Lehane [76]. Lehane suggests that the correct user experience decisions can be made by treating every individual as part of a larger collaboration, and considering exclusively the factors binding these individuals. Ultimately designing not just for the user, but for the user’s community of practice. In the case of people experiencing homelessness, it may be beneficial to identify not just the relevant user groups within the homeless community, but also to consider what binds these user groups, and the shared practices which they undertake.

2.4.5 Accessibility

As has been identified, the importance of designing new systems specifically for those experiencing homelessness has immense potential. However, there is also a lot

of potential that can be realised by adjusting the way in which existing technology is developed.

Accessibility is a pertinent concern of any modern technology endeavour, the best efforts are made on websites, apps, and media to ensure that the content can be utilised by as many people as possible [77] [78].

Nevertheless, a Google study found that there are some widespread accessibility pitfalls that often lead to making certain technologies inaccessible to those who are financially insecure [79]. These pitfalls usually fall outside the commonly considered accessibility requirements, mainly those pertaining web technologies such as HTML and CSS, indicating that there is an unconscious bias when it comes to the types of accessibility that are commonly accounted for. This study also suggest ways in which these pitfalls could be rectified, and encourages developers to consider the implications of these issues. More specifically the study outlines four key challenges that are faced by financially insecure users:

1. *Limited financial resources*, resulting in susceptibility to scams, difficulty withholding personal information, and difficulty in quickly recovering from an issue
2. *Limited access to reliable devices & Internet*, resulting in the need use public or shared devices, or the inability to utilise multi-factor authentication methods
3. *Untrusted relationships*, resulting in devices being vulnerable to untrusted use
4. *Ongoing stress*, resulting in drastic response to security and privacy threats, and difficulty in taking decisive actions

This distillation of some core challenges faced by this user group provides an excellent insight into the types of accessibility concerns which are often overlooked when developing for emerging, or otherwise under-represented user groups. It is critical that any software designed for those experiencing homelessness is cognisant of these issues.

Another study also highlighted the importance of including emerging technology users in design considerations now, rather than waiting for them to catch up technologically [80]. By including the emerging technology users, potentially on lower end or older hardware, developers are ultimately able to engage, and design around, a previously untapped group of potential users.

Accounting for the above considerations when designing technology for those experiencing homelessness will ultimately result in a product that is empathetic, useful, and empowering for the user.

2.4.6 Collaboration in Design

During the design of any technology for those experiencing homelessness, it is important to collaborate with the eventual users. This collaboration can have many forms, and also many potential benefits.

A variety of co-design principles were validated in the homeless community through an SMS service project in London [81]. The project showed that co-design with a vulnerable user group can lead to a sense of shared ownership, and improved participation, of the end technological product.

Beyond the homeless community, it has been observed that collaboration with a diverse range of stakeholders will ultimately lead to a wider set of possible solutions being considered in almost any circumstance [82]. Further, it has been shown that co-design is not only influential on the possible solutions to a perceived problem, but can also influence and modify the understanding of the perceived problems themselves [83].

One Canadian project even went as far as to put the entire responsibility of design and development of a mobile application for youth experiencing homelessness into the hands of youths experiencing homelessness [84]. This project was aimed at empowering the youths, as well as harnessing their experiences and knowledge in a way that can be beneficial to others experiencing similar events.

In ensuring the involvement of as many end user groups as possible in the design process, it is evidently conducive to creating technology that accurately identifies, responds to, and empathises with the needs of these same groups.

2.5 Promoting Not-for-Profit Technology

In investigating the relationship with technology for both homelessness NFPs, and for those experiencing homelessness, it is extremely evident that individually there is immense benefit to be recognised through embracing modern technology. Our review has also seen that the intersection of these parties, and their relationships with technology, allow for potentially compounding mutual benefits to be obtained.

NFPs that are able to be proactive in their embrace of technology will not only be able to provide better service delivery, have enhanced ability for outreach and engagement, and raise more funds, but they will be able to do this whilst simultaneously providing additional benefit to those experiencing homelessness.

Those experiencing homelessness stand to benefit greatly from an NFP providing a technologically augmented service model that better caters to their needs, along

with the ability to be more informed about the accessible services and therefore make more informed decisions around logistics and service participation. Ultimately, technology-based solutions will enhance the connection between NFPs and those experiencing homelessness, leading to better outcomes for both parties as previously outlined.

2.5.1 Existing Incentives

It is also paramount for this review that there is consideration for the existing incentives for an NFP to invest in technology-based solutions, particularly those connecting themselves directly to their end users. These incentives can be considered to exist in both a formal and an informal capacity.

Formally, NFPs are able to take part in many challenges, grants, or other such formalised funding processes to bring to life an idea or a project that will connect to their end users through technology. These processes are often run by large organisations with a philanthropic mission, with more and more of an emphasis on the utilisation of technology as the years go by. Australian NFPs are estimated to receive almost half (47%) of their funding from the government, with the percentage on an individual NFP basis increasing as the size of the organisation increases [11].

Whilst these more formal processes have underpinned the Australian NFP sector for generations, a study by the University of Technology in Sydney recognises that this sector is “*in transition*” [85]. This transition leaves the formal model of NFP operation as just one possible model, amongst an extremely fluid set of models that shift the NFP into an entity within a wider “*social economy*”.

In alignment with this transition into informality, it may be considered by an NFP that a strong technology strategy and implementation will excite potential investors and ultimately result in greater funding. Strong adoption of technology within an NFP may be seen by certain donors as a strong indication that an organisation is wisely distributing their resources, and possesses a strong potential for scale. These observations by donors may result in enhanced funding opportunities, and subsequently the enhanced potential for an organisation to scale.

Another means of informal incentive for an NFP to benefit from technological investment is an extension of the earlier discussion around mutual benefit for the end users. An NFP that is able to more readily provide an excellent service, to an informed group of end users, could see an enhanced growth in reputation and word-of-mouth growth as a result. Reputation is incredibly important in the NFP space, as there is often competition for funding and growth potential within the industry.

It should be noted that although this competition may seem to be counterproductive to the altruistic nature of the NFP sector, it is actually provably beneficial in a similar sense to healthy competition in the for-profit world [86]. Following from the observation of the healthiness of competition, is the observation that this competition may subsequently drive an NFP towards technological progression and adoption, resulting in an ultimate benefit for the end user of the NFP's services.

2.5.2 Future Avenues

Whilst there does exist a variety of incentives for homelessness NFPs to invest in their own technological solutions, accompanied by an evidentially large number of donors interested in assisting financially, there is still the potential to better grow this area of technological connection to end users.

Many of the facets of an NFPs operations that can be augmented through technology remain the same, or similar, from organisation to organisation. Therefore, the opportunity for a standardised technological solution to be developed and shared within these facets is apparent. Financial backing by already interested donors may be utilised to support the ongoing development and delivery of technology solutions that may be shared across the NFP space. Providing a standardised, scalable, and affordable solution to everyone in the industry, without the requirement from large individual and bespoke solutions. Recent support for this ideology has been shown by Google, awarding the 2018 Google Impact Challenge \$1M prize to a software project aiming to standardise the volunteer management software used across the Australian NFP space [87].

Adjacent to the idea of developing shared solutions to shared problems, it may also be beneficial for NFPs to invest in information sharing infrastructure that could more readily connect NFPs to each other, ultimately connecting those experiencing homelessness to a multitude of beneficial services and individuals. The ability for NFPs to share more information between each other would not only reduce the existing redundancies in data collection and analysis, but would also bring to light opportunities to collaborate more often and more effectively. Benson goes as far as challenging the sector in that there *“is agreement that open data is worth it, now the question is how do we go about it?”* [88, p. 2].

Not only should information be shared by NFPs, to other NFPs, it should also be shared by other third parties to promote the technological success of certain projects or initiatives [88]. Promoting success across the industry is an excellent mechanism for encouraging others, and representing the potentials for success that

do exist down the route of technological adoption or investment.

2.6 Digital Storytelling as a Technological Connector

We have thoroughly analysed the overarching landscape, and the underlying machinations, of the technological intersection between those experiencing homelessness and the supporting NFPs. However, we are yet to analyse the internals of this intersection. As with the wider technology space, there exist an almost infinite number of possibilities when it comes to the design and implementation of an application within the overlap of NFPs and their end users. In an effort to avoid an infinitely long review of the literature, we have narrowed our discussion to focus on a connection method which we deem to be fit for purpose within this space, digital storytelling (DST).

DST, in the most general sense, denotes a story told using digital media [89]. Researchers in the academic applications of DST have developed a loose set of constraints around the methodology; outlining their approach to storytelling as a short and sharp format, rarely exceeding 3-5 minutes in allowed length, and usually combining a number of different mediums to create a cohesive story. These incorporated mediums may include photographs, voice narration, videos, music, or text [90]. Initially utilised primarily in the arts space, DST has since become a more formalised methodology, largely on the back of early innovations from those at the Center for Digital Storytelling (CDS) in California in the early 1990s [91]. Similar digital storytelling (DST) programs commenced across the world in subsequent years, reaching Australian shores through the Australian Centre for the Moving Image in 2002 [92]. Numerous studies have been performed utilising DST, aiming to identify a wide number of benefits which may present from this storytelling methodology.

A focus on the potential usefulness of DST in educational programs has arisen in recent years, particularly in response to the ongoing integration of digital technologies into the education space [93]. Not only has DST been shown to be a proficient educator in the development of the general digital literacy skills required to participate [94], but also in specific targeted areas such as public health advocacy [95], cultural competencies [96], and numeracy [97]. Within these studies into the educational benefits of DST, there is also a consistent finding of increased motivation, enthusiasm, and engagement amongst participants. Harnessing the educational potential of DST, as well as the enhancements that have been observed in participant

behaviour, organisations such as NFPs may stand to positively and informatively connect to their end users through an implementation of DST.

Beyond educational implementations of DST, inherently delivered with the intention of informing a user, there also exist more exploratory implementations of DST, aimed at generally providing a storytelling medium to users who stand to benefit from participation. A study analysing the benefits of DST for socially excluded people in various context concluded that the methodology “*can serve as a tool to enable them [to] find and strengthen their voices in order to empower their social, economical and political inclusion*” [98, p. 224]. Similar studies, have found the methodology to: assist in the development of personal and social identities amongst minority youths [99], indicate growing confidence and competence in the storyteller’s identity and connectedness with others in a cohort of youths at risk [100], and also to provide Forgotten Australian storytellers with the ability to produce truly unique and profound stories of their lives [101]. We recognise that the benefits experienced by users in these studies are largely complementary to the benefits discovered earlier in our review in analysing the technological utilisation by those experiencing homelessness, in that they are empowering, self-driven, and augmented through a digital medium. We propose that these benefits be jointly considered by NFPs in their emerging technology methodologies.

Exploring the existing literature of DST implementations in the homelessness space, we find empirical evidence to suggest the methodology may be beneficially utilised by relevant NFPs. It has been shown in the literature that DST can be utilised as an excellent method of capturing and amplifying the voices of those experiencing homelessness. The amplification of these voices was found to assist in offering recommendations, and expanding awareness of complex experiences of those experiencing homelessness [102], both benefits that may be channelled strategically by NFPs in aligning with their core mission and service delivery strategies. Beyond the study of the DST methodology itself, the methodology has also been proven useful amongst those experiencing homelessness as a more generalised data capture and research method [103].

Upon identifying the relevancy and potential benefits of DST when utilised amongst those experiencing homelessness, we further aim to adopt this understanding and ultimately include DST in our technological implementation later in this report.

2.7 Review Summary

This review examined the role of technology in the connection between NFPs and their end users to identify the existing understanding, the present barriers, and the future potential in this space. It initially explored literature relating to NFPs generally, then analysed the relevant literature around those experiencing homelessness, and ultimately examined the intersection of the two. Lastly, this review explored the potential for DST to be implemented in this intersection.

We conclude from our review of the literature that there are immense benefits to be obtained through the greater emphasis of using technology to directly connect homelessness NFPs to those experiencing homelessness. We observe that the universality of access to modern technology within the homeless population has reached a critical mass at which it is now possible for NFPs to develop technology-based solutions with their direct end users in mind. Also acknowledged are the existing barriers to entry, and potentially lacking incentives, for NFPs to willingly invest in this space.

Further analysis into the potential use cases of individual NFPs may provide a more detailed understanding of the barriers, incentives, implementations, and end result of technological adoption strategies within homelessness NFPs. It may also be beneficial to further study success stories within this space, in an effort to better understand the factors that enable the successful connection to those experiencing homelessness.

Alongside these areas for further research, we have identified the need to provide further incentive and awareness to organisations that may be in a position to benefit from a technological shift with their organisational strategy. Through sharing information, standardising solutions to common problems, and promoting successes within technology-focused NFPs, we believe that there is large potential for improvement in the lives and connectedness of those experiencing homelessness.

More specifically, we have identified DST as a viable concrete methodology in providing a technological connection between our two relevant parties. We saw that DST has proven educational and psychosocial benefits, and already has proven success being implemented in the homelessness sector.

The remainder of this report aims to further investigate the findings of this review, in an attempt to expand upon, further understand, and potentially validate or invalidate some concepts that have been uncovered.

Chapter 3

Theory

In our review of the existing literature we were able to identify a variety of potential benefits, perceived barriers, and future avenues for the technological connection between those experiencing homelessness and the surrounding NFPs. In this chapter of our investigation we aim to extract from our review the findings that we deem most valuable for the remainder of this project. Namely, we aim to bring some of our key findings into reality, and explore these findings in the real world. In our development and implementation of a DST solution we will aim to incorporate the existing DST literature into our other findings. Finally, our real world exploration will aim to further scrutinise the findings of our review, particularly those relating to NFPs developing and implementing technology to connect directly with end users.

3.1 Those Experiencing Homelessness

A key focus of our review revolved around the experience and adoption of technology for those experiencing homelessness. We aim to build upon this initial focus by developing real world empathy for the technological experiences of these individuals.

Our review was able to acknowledge that whilst ownership was not a key accessibility concern in participating in modern technological activities, there are a variety of other accessibility concerns which must be addressed. The general population stereotypically participate in a digital world where, without much exception, an individual is expected to be always contactable. This continuous expectation has some implicit requirements that may be difficult to meet for someone who is experiencing homelessness, such as requiring a device to be frequently charged, or for credit/data to be constantly available. These connectivity accessibility concerns were found to be amplified by similar concerns pertaining to individuals who may

be financially insecure. Financially secure individuals were found to have difficulty participating in certain types of technology design, such as multi-factor authentications or assumed exclusive access to a device [79]. These accessibility concerns have been identified as crucial in any attempts at designing technology for these users.

Beyond access, our review also detailed the desires and common use cases exhibited by those experiencing technology. These use cases were found to align almost entirely with those of the general population, with the addition of desired use pertaining to support and service discovery, and welfare prompted record keeping. These findings suggest that there are no use cases that would be fit for the general population, that wouldn't also be appropriate and desirable by those experiencing homelessness.

A number of benefits of technology use by those experiencing homelessness were also found in the literature, with consistent use being linked to a variety of mental health benefits and deterrence programs. These benefits are also compounded by the benefits received through technology by the general population, such as finding a job, or increasing social connectivity through social media applications. In striving to acknowledge and embrace these benefits, our project will intend to develop a technical solution that capitalises and enables these benefits to materialise.

3.2 Not-for-Profits

The fiercely competitive nature of the modern NFP sector in the western world was found to be well documented in our review. As with any competitive industry, it is crucial for an organisation striving for success to be innovative in their strategy. Pathways towards innovation were also identified for NFPs, with many opportunities being underpinned by the rapid adoption of technology. Whether these opportunities were direct implementations of technology as a business model, or were enabled and supported by technology, it became clear that an NFP with a fledgling technology strategy is open for exploitation and supersedence by their competitors.

We found that internally NFPs are capable of adopting and exploiting technology to enhance their internal processes and operations, augment their data collection and reporting models, and also to widen their network and incubate their base of potential supporters. Externally, we saw that NFPs are able to provide a superior service to their end users by augmenting their delivery approach with technology. These augmentations were seen to be capable of elevating an individual's experience both before, during, and after the actual delivery of an NFPs service.

Our review also explores the incentives, risks, and barriers that NFPs may face in their journey towards technological adoption. Beyond the aforementioned benefits, NFPs may also stand to gain financially, reputationally, or through growth. These incentives are often supported by the investment appetites of third parties, and we found that technological innovation is an excellent approach for increasing this appetite. We further acknowledge that the adoption of new technology is not without risk, and empathise with NFPs in their common requirements for cost effective, low risk tolerance, strategies. In our review we outline best practices that NFPs can use to mitigate some of these risks, and we also explored some determining factors as to the organisational requirements necessary for attaining certain levels of technology adoption. These factors and mitigation methodologies will differ from NFP to NFP, and will be considered as such throughout the practical components of this project.

Whilst our review does touch on the potential avenues for increasing the incentive for NFPs to invest in technology strategies, we will not be bringing this into the remaining scope of this project.

3.3 Intersection

In addition to the thorough analysis of the two previously discussed parties, our review ultimately examines their intersection; particularly with emphasis on the role in which technology plays in connecting them. Building on the identified benefits that can be experienced with technology by both parties in isolation, we showed the success of existing efforts in achieving benefits in cooperation. We found that there were examples, albeit limited, of technology being successfully developed with the primary focus on those experiencing homelessness. It was also identified that there was interest and potential to further this space, previously explored through a number of hackathon events aimed at solving problems in the homelessness space.

The literature also clearly highlighted the considerations in design and accessibility that must be made when aiming to establish a technological link between NFPs and their end users. Further efforts in this project will ensure that the shared practices which are undertaken by those experiencing homelessness are considered foremost when discussing user groups. The accessibility considerations outlined above for those experiencing homelessness have been shown to be crucial if an NFP is to design a technology-based solution for their end users.

Lastly, we have found that collaboration in the design process of software connecting these two parties can be pivotal in developing an optimal solution. Co-design

has been shown to instil a sense of shared ownership, and subsequently improve eventual participation in a project. Collaborating with a diverse set of stakeholders was also found to be beneficial beyond solving individual problems, extending to the diversification of problem identification in the first instance.

Building on our understanding of the technological intersection of these two parties, based on the existing literature, we will continue to develop this knowledge through practical implementation in this space.

3.4 Digital Storytelling

In attempting to identify a concrete implementation methodology which may be utilised in exploring the intersection of those experiencing homelessness and NFPs, our review identifies DST as a viable candidate. We saw that studies have demonstrably shown DST can benefit those experiencing homelessness, in a complementary manner to the benefits that were previously identified from general technological utilisation. Through educational and emotional engagement with DST implementations, those experiencing homelessness may realise personal growth, learning outcomes, or an increased sense of connection, among other identified benefits.

It was evident from our extensive review of the DST literature that the methodology is immediately applicable to the technological implementation we look to explore in this report. The method's applicability is derived not just from its proven benefits for those who are experiencing homelessness or are otherwise socially excluded, but also from its alignment with the desired outcomes for the end users of supporting NFPs.

This report will continue to explore the implementation details of DST in this space, and will ultimately develop and experiment with a DST application towards the end of this project.

Chapter 4

Methodology

4.1 Project Aim

To provide a practical component to this report, we intend to design and implement a DST-based technological solution that connects an NFP directly to those experiencing homelessness. We believe that this practical implementation will enable us to extend our investigation to include the entire life cycle of a DST-based solution in this space. In designing and developing the application we will be exposed to the processes and considerations which lead to a realised product; this exposure will be from both the NFP, and from those experiencing homelessness. Further to these initial phases of the product, we will also be involved in the delivery and roll-out strategies for this application; and will study the implications and receptions to these strategies from both perspectives. Lastly, we will discuss the process of iterating on the application, through the facilitation of an ongoing feedback loop between the NFP, the users, and the developers.

Using this approach, we aim to further some understandings already presented in the literature. We believe that this method of undertaking will also give us the most exposure to all facets of the technology life cycle in this space and will therefore provide us with the greatest potential for unexpected or unforeseen learnings. Furthermore, in addition to contributing to empirical evidence, we also aim to provide mutual benefit to both the NFP and the individuals experiencing homelessness who participate in our program. We do not believe it to be ethically viable to perform this study without a primary focus of providing actual recognised benefit to all participants. In discussion of our results, we will also critique our success in providing this benefit.

We also note that prior to the engagement of any external participants, formal

ethical approval was received from The University of Queensland and the National Statement on Ethical Conduct in Human Research (approval number 2020000631). This study ensures adherence to the guidelines of the ethical review process.

4.2 Requirements

In an effort to simplify the design process, it was apparent that a core problem area and the surrounding development context must be identified as early as possible. Working with Brisbane based NFP Orange Sky, as well as acknowledging the technical and logistical limitations of their services, particularly as they relate to COVID-19 response efforts, we were able to immediately narrow our scope. The remainder of this section outlines the initial statement of scope, and subsequently discusses its further distillation into a concrete design.

4.2.1 Problem Area

It was well established by Orange Sky, an NFP with a proud mission of *Positively Connecting Communities*, that an emphasis on interpersonal connection would be seen by the organisation as immensely beneficial in improving the lives of those who use their services. It was also established that Orange Sky stakeholders could be separated into the following five groups:

- *Friends*: A term used to describe any users of the Orange Sky services, as well those who visit shift but do not participate directly. Usually synonymous with those experiencing homelessness, but also extending to the financially insecure, nomads, and others in need of service.
- *Volunteers*: The heart and soul of Orange Sky, with the day-to-day services entirely run by over 2000 volunteers across Australia and New Zealand. Each shift is usually accompanied by anywhere from two to ten or more volunteers,
- *Donors*: Those responsible for keeping Orange Sky running every day, usually through financial backing but also occasionally through other tangible support.
- *Staff*: The team employed by Orange Sky to do everything from building the vans to operating payroll. Primarily based in a head office in Albion, Brisbane, but also distributed throughout Australia and New Zealand.

- *Followers*: Generally speaking, this group encompasses any stakeholder within Orange Sky who does not fit into the above groups. Although these individuals may not use, operate, fund, or work for Orange Sky, they may be a devout supporter on social media or something similar.

If we were to consider all possible connections of two stakeholders within the Orange Sky community, including self-referential connection within a single group, there are 15 possible types of connections involving just two stakeholders. Working with the knowledge of the operational model of Orange Sky, we aim to identify some gaps that may exist in these 15 combinations, and will ultimately aim to bridge these gaps through the implementation of connecting technology. We note that as with the rest of this study, we have an explicit affinity towards connecting those experiencing homelessness, and will thus consider the connections not involving this group to be outside the scope of this design. However, to have a comprehensive understanding of Orange Sky, we have still documented these out of scope connections in Table 4.1. We have also identified for each connection whether it is augmented by modern technologies, and also in what direction the connection flows, accounting for situations where it may be unidirectional in nature.

A	B	Connection	Tech	Flow
Friends	Friends	In person connection on shift	No	$A \longleftrightarrow B$
Friends	Volunteers	In person connection on shift	No	$A \longleftrightarrow B$
Friends	Donors	Friend stories distributed to donors	Yes	$A \longrightarrow B$
Friends	Staff	—	—	—
Friends	Followers	Friend stories shared publicly	Yes	$A \longrightarrow B$
Volunteers	Volunteers	In person connection on shift	No	$A \longleftrightarrow B$
Volunteers	Donors	Volunteer stories distributed to donors	Yes	$A \longrightarrow B$
Volunteers	Staff	—	—	—
Volunteers	Followers	Volunteer stories shared publicly	Yes	$A \longrightarrow B$
Donors	Donors	—	—	—
Donors	Staff	Donation messages distributed to staff as well as staff directly contacting donors to say thanks	Yes	$A \longleftrightarrow B$
Donors	Followers	Large or interesting donation stories shared publicly	Yes	$A \longrightarrow B$
Staff	Staff	In person connection in the workplace	No	$A \longleftrightarrow B$
Staff	Followers	Staff stories shared publicly	Yes	$A \longrightarrow B$
Followers	Followers	—	—	—

Table 4.1: Connections between stakeholder groups facilitated by Orange Sky

It is important to emphasise that Table 4.1 simply documents the connections that are directly facilitated by Orange Sky as part of their operating model. This is not to say that other connections do not occur, such as followers interacting with each other on social media, however these extra connection mechanisms are not occurring as a direct result of Orange Sky's model.

Of most interest to our project, based on the prior findings and discussion in this report, are rows in which some or all of following criteria is met:

1. There are no existing directly supported connection mechanisms.
2. The supported connection mechanisms are unidirectional in nature.
3. The supported connection mechanisms are not underpinned by technology.
4. *Friends* are at least one of the stakeholder groups (must be met).

Whilst the mutual exclusivity present in these criteria results in no one row being able to meet all points, the connection combinations which we can extract as being most relevant to our work are:

- *Friends & Friends*: No technological implementation
- *Friends & Volunteers*: No technological implementation
- *Friends & Donors*: Unidirectional flow
- *Friends & Staff*: No direct mechanisms
- *Friends & Followers*: Unidirectional flow

It is immediately evident that every single combination involving the *Friends* stakeholder group has been identified as meeting the criteria necessary for being included in the further design of this project. Whilst this connection analysis was not capable of narrowing down our scope, we now have a greater understanding of the wider landscape of Orange Sky, and also have a more detailed understanding of the connection shortcomings for *Friends*.

To tighten the scope of our project before continuation, it was collectively decided that the criteria of unidirectional flow would be dropped, based on the reasoning that rows meeting solely these criteria were at least providing some form of technology-based connection. Upon tightening these criteria, we were able to more concisely define our problem area in the following statements:

- The primary focus of our application is on connection throughout the Orange Sky community as experienced by *Friends*.
- The Orange Sky community will be considered to exist of *Friends*, *Volunteers*, and *Staff* for the purpose of this application. *Donors* and *Followers* will not be considered directly.

These statements will be the main reference point for the following design discussion, in which specific requirements will be distilled. The statements that did meet some criteria, but were subsequently filtered out for this project, provide an excellent platform for future work.

Upon analysis of the requirements distilled from the problem area stated above, both non-functional and functional, it was concluded that a DST application would indeed enable these requirements to be met in their entirety. The further distillation of these requirements, and the subsequent development of this application, are outlined below.

4.2.2 Non-functional Requirements

Based on the operational models and geographical distribution of Orange Sky's services, it was necessary to identify some fundamental non-functional requirements that will shape the overall composition of our application. These requirements are outlined in Table 4.2.

Requirement	Reasoning
Application must run on 7" Android Tablet running Android Oreo Go	Orange Sky use this type of tablet readily in their services; as such, delivery and participation will be streamlined by accommodating for this device specification
All data must be stored remotely and securely	Orange Sky do not provide physical theft protection mechanisms on their existing devices. Orange Sky's model revolves around all important data being immediately offloaded to the cloud, such that theft of a tablet would not be a loss or unintended disclosure of any data. We will aim to replicate this security and privacy model.
Internet connection required at all times	To accommodate for the previous requirement, it will be necessary for our application to be deployed in an environment with a constant internet connection.
No identifying information may be intentionally collected	Protecting the right to anonymity that all Orange Sky <i>Friends</i> have is extremely important to the organisation. Whilst we cannot prevent anyone from sharing this information if free text or audio input is allowed in our application, we will not encourage or require the collection of any such information.

Table 4.2: Non-functional requirements of our application.

4.2.3 User Stories

Enhanced understanding of the problem area, and simultaneously the next phase of design, involved empathising with the potential users of this application through the distillation of user stories. These user stories were developed through consultation with experts within the Orange Sky environment, as well as through the knowledge that was established during our review of existing literature. These user stories follow the generally accepted pattern of “*As ... , I want ... so that ...*” and are listed below.

- *As a local friend, I want to share my stories with others in my local community so that shared experiences can be established in my local community of friends.*
- *As local friend, I want to read and empathise with other stories from my local community so that I can better understand my local community’s experiences.*
- *As an Orange Sky friend, I want to share my experiences with Orange Sky HQ so that they can be heard and understood by those who make shifts happen.*
- *As an Orange Sky friend, I want to share my ideas and opinions with Orange Sky HQ so that they can be considered in future decision-making.*
- *As a socially disconnected friend, I want to read stories from all across the country so that I can feel connected to those who may be distant, but are still having similar experiences to me.*
- *As a socially isolated friend, I want to share my stories with other friends so that I can feel heard.*
- *As a storytelling friend, I want to see who reads my stories, and where they are from so that I can feel empowered about my ability to share my stories.*
- *As Orange Sky HQ, I want to read stories shared by friends so that I can empathise with their experiences and better deliver our service.*
- *As Orange Sky HQ, I want to obtain potential storytelling leads so that these leads can be further investigated and shared as an Orange Sky case study or story.*
- *As a knowledgeable friend, I want share important information I have obtained through my experiences so that others may also benefit from this knowledge.*

4.3 Proposed Solution: Story Sharing

As previously alluded to, upon the analysis of both the non-functional and functional requirements, we believed that a story sharing application would enable these requirements to be met in their entirety. We also postulate that a story sharing application would also be generic enough in nature to encourage participation from a larger audience, and would also be open to a large amount of iteration and progression over time, encouraging co-design processes and collaborative feedback loops to be established by Orange Sky. Storytelling is at the core of Orange Sky's communication strategies, and thus we also confirm that this proposed application aligns well with wider organisational imperatives. The following sections outline the process of refinement from our abstract requirements to a concrete design right through to our final prototypes to be taken into the field.

4.3.1 Use Cases

Here we list the concrete use cases which our application will implement. These use cases have been extracted from the user stories above, and provide a blueprint for application design and development.

- Friends can share stories using the application
- Stories will remain anonymous, and should be identified by the Orange Sky shift name, the date and time, and optionally a first name
- Shared stories will be viewable in the application
- Shared stories must be manually reviewed and approved by a moderation team before they can be viewed in the application
- The application will provide important information around maintaining privacy and anonymity when sharing stories, as well as the types of stories which may or may not be appropriate for sharing
- The application should make it easy for an administrator to remove or edit stories after they have been shared
- Upon viewing a story, the application will track and increment the read count of the story

- The ability to give stories Orange hearts will also be implemented as a means of acknowledging the positive reception of a shared story
- It will also be visible when viewing a story to see when/where/who initially shared it, as well as when/where/who viewed it, and finally how many Orange hearts it has received
- The ability to provide general feedback on the tool will also be present at all times
- General information on the tool will be available at all times, such as privacy information, contact information and general help

In bringing these use cases into a tangible application, we aimed to first iterate with high fidelity mockups. These mockups provided enough context that they were able to be used for obtaining feedback from potential users. This feedback would then be used to update the designs, and this process would continue until such a point where the application felt ready to begin functional prototyping. Below we summarise our experiences with this process.

4.3.2 Initial Iteration

Our initial mockups were first conceived using a whiteboard, before being translated into a digital format using online mockup tool moqups.com. The initial designs are included in Figure 4.1 and focus heavily on the core components within the application, *Login*, *Drawer Content*, *Read*, and *Share*. The branding and stylistic choices made throughout are done so in an attempt to assimilate the application with existing Orange Sky technologies.

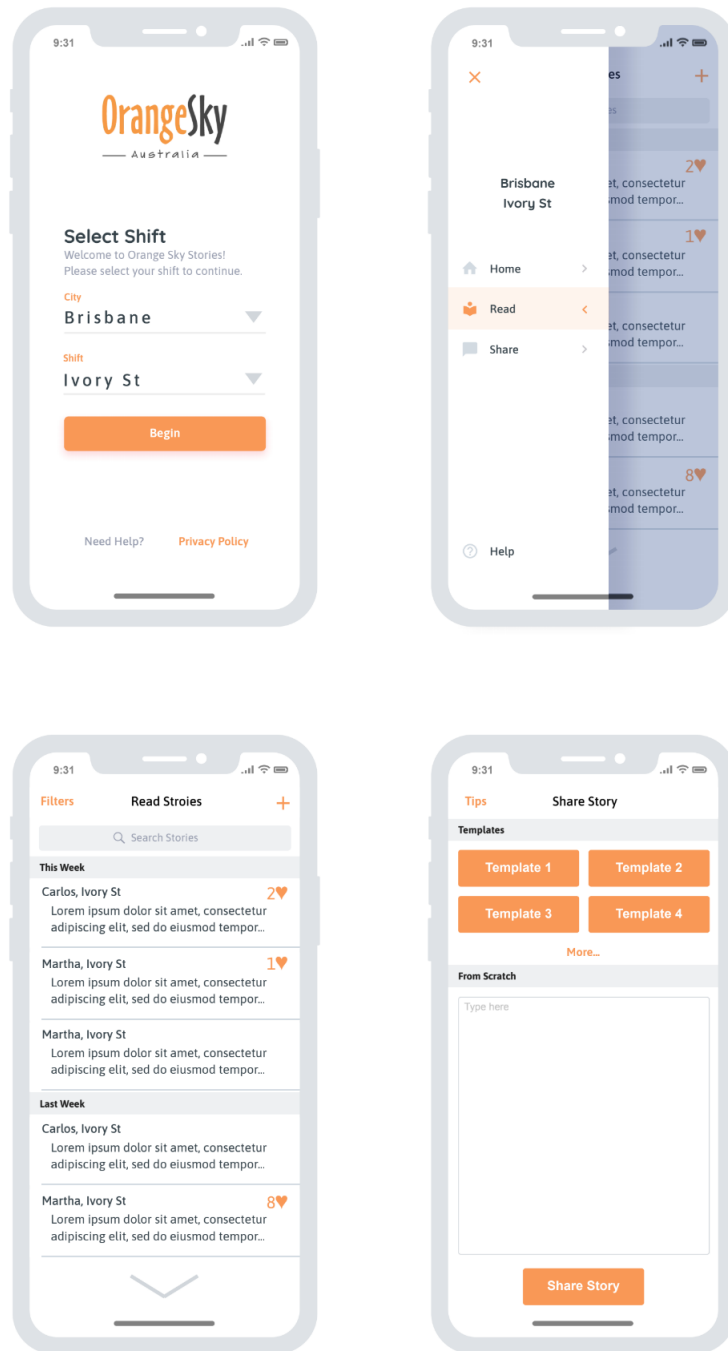


Figure 4.1: Initial Designs: Login (top left), Drawer Content (top right), Read (bottom left), and share (bottom right)

The *Login* screen allows for a number of our use cases to be implemented, including the ability to obtain information about the current use context, as well as the avenue towards providing the current user with important privacy and support information.

The *Drawer Content* provides a navigational element to the application, and also

provides the user with an understanding of the core functionality of this application. Support for the user is again readily available on this component. We also note that utilising a navigational drawer, rather than a bottom or top bar, allows for a greater amount of extension in the future. The drawer is capable of accommodating an arbitrary number of additional screens due to its handling of y-dimensional overflow, compared to the limited screen real estate and potential for growth provided by a top or bottom bar.

Our *Read* screen design proposes the utilisation of a reverse chronologically ordered, endlessly scrolling, list of stories. This is a design approach with modern users are extremely comfortable with thanks to the ubiquity of news and social media, and has proven to be successful in these areas. We have also attempted to provide important information on this screen, such that users are able to accurately identify the stories which might appeal most to them. This information consists of data points such as whom, where, and when the story was shared, as well as small preview of the stories content and a small indication of the number of stars that the story has received from readers. This endlessly scrolling list is headed by filter and search options for enhanced user discovery, as well as an *Add* button in the top right to promote the other half of the application's functionality.

Finally, the design for our *Share* screen aims to prompt and encourage an individual aiming to share their story. By providing tips and templates to the user, we believe that this may assist in their synthesis and sharing of their own stories. These templates would be work-shopped and designed alongside experts from Orange Sky, and potential users.

4.3.3 Final Prototype

After a number of iterations aimed at improving our initial designs, based primarily on the feedback of Orange Sky experts, potential users, and the expertise of our supervisor Dr Vyas, a final prototype was established. This prototype represents the design that was ultimately built and distributed as a functional application. Screenshots of this final design are shown in Figure 4.2.

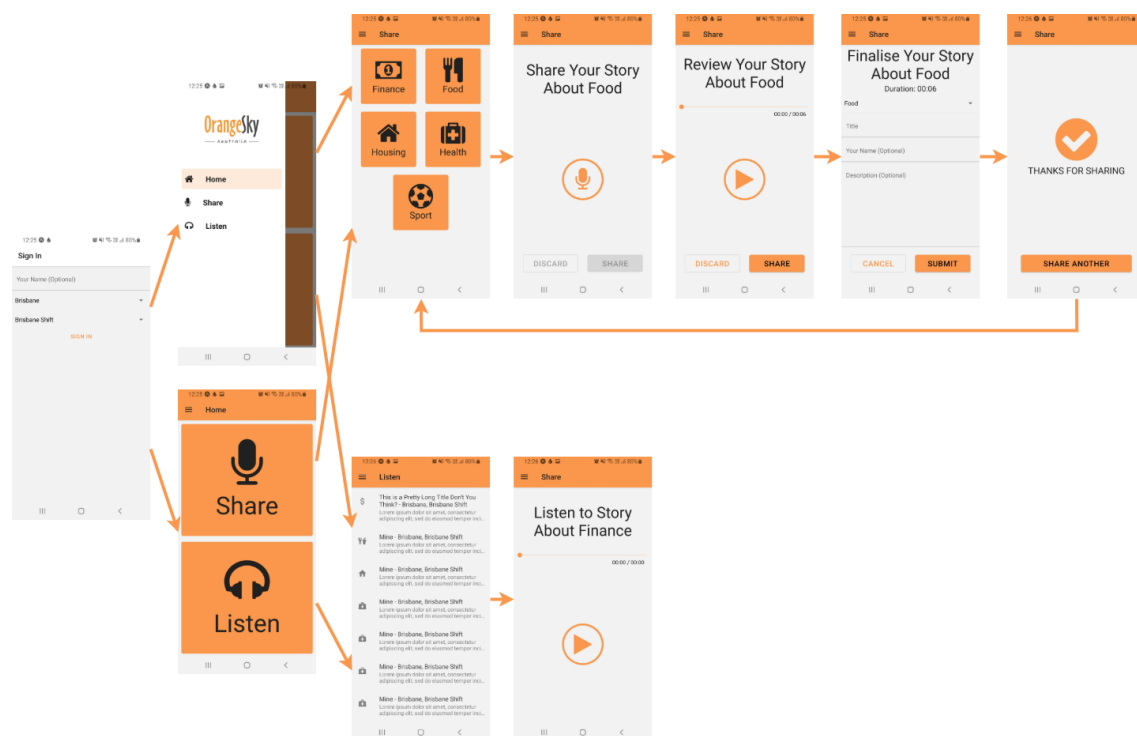


Figure 4.2: Final Prototype: Login & Navigation (left), Share (top), Listen (bottom)

Most notably different from our initial designs, beyond the visuals of the application, is the medium that is being utilised for story. Whilst our initial designs outlined a desire to capture stories through text, it was decided that this was potentially not conducive to the type of connection that we were hoping to establish in Orange Sky's service model. We also note that our initial designs were potentially exclusive to those with literacy challenges. By shifting to voice recording as our collection medium, it was postulated that this would lead to the establishment of stronger empathy when listening to another individual's story. We also reason that collecting through voice recording is more in line with the expectations of an Orange Sky service, a service which is renowned and celebrated for its emphasis on conversations with those experiencing homelessness. Our results will look to discuss the accuracy of our assumptions around voice recording as the ideal medium, and recommendations may be made for future development in this space.

Most major differences in visuals can be simply put down to limitations in technical libraries, frameworks, and even ability. The only notable visual change that was intentionally made from the initial designs, was to incorporate less white, and more of Orange Sky's recognisable colour scheme. This was done to ensure that the application was in alignment with established branding, as well as to ensure that the application would be easily usable in harsh lighting conditions out in the field.

Other noteworthy changes from initial design include the simple (Home) screen, implemented as two large buttons consuming the entire screen such that it is immediately clear to all users what the key functionalities of the application are. The templates and tips in story sharing have also been streamlined into a category system, allowing users to share and read stories within their own categories of interest. We propose that these categories are adjusted and expanded over time, as their use patterns becomes more apparent. Our voice recording interface is also designed to be as simple and intuitive as possible, utilising icons and design patterns that are commonplace in most audio based applications.

In landing at this final design, all that was now required was for the application to be made functional, before it could be finally sent out into the field with Orange Sky. Further details on these designs can also be found in Appendix A.

4.3.4 Technical Information

In determining the appropriate technology stack to develop the application, the following factors were deemed critical:

- *Developer familiarity*: due to the desire for rapid prototyping
- *Orange Sky familiarity and fit*: such that the application can be transferred into the organisation if desired
- *Secure*: to ensure the safety of those experiencing homelessness, as well as to mitigate any organisational risks for Orange Sky
- *Performant*: as it is important that the application can run on the older tablets utilised by Orange Sky without rapidly draining their batteries
- *Portable*: ensuring the ease of deployment and the mitigation of any infrastructural difficulties in delivering the application

In consideration of the above requirements it was decided that the application would utilise *PHP* on the back-end, supported by a *MySQL* relational database. This would be accompanied by a *React Native* application on the tablets, built using the *Expo* tooling package.

PHP 7.4 is the standard back-end programming language within Orange Sky, and is also of most familiarity to us. Through diligent programming practices in alignment with industry standards, it is known that *PHP* is satisfactory for providing the security, performance, and portability that is required. *PHPStan* was utilised as an accompanying development tool to ensure the type safety and best practices were sufficient in our back-end code. This code was containerised and deployed in a cloud environment utilising *Docker*, another tool in standard use within Orange Sky.

Alongside the containerised and deployed back-end code was positioned a *MySQL* instance, locked down and only accessible by the networked back-end containers. A *MySQL* for, *MariaDB*, is in standard use at Orange Sky, and this is of little concern if our application is to be adopted.

The Android application itself was built using the open source *Expo* platform which runs over the top of the standard *React Native* development workflows. *React Native* is in use at Orange Sky for the existing tablet applications. *TypeScript* was also implemented in this application in an effort to provide compile time checks and linting, as well as bundling and optimisations benefits. An APK was built for distributing and installing the application.

4.4 Delivery Strategy

Given the scale of Orange Sky's services throughout Australia and New Zealand, it was determined that a number of different delivery strategies would be explored. With the differences in these strategies to be discussed and conclusions drawn as to their comparative effectiveness.

In general, all of these strategies revolve around the core concept of the application being installed on a tablet that is present on a regular Orange Sky shift. This application would then be introduced to those experiencing homelessness who were present on these shifts, in the hope that these individuals would engage with the application either by sharing their own experiences, or by listening and responding to someone else's.

The different variations of this core strategy that were to be tested are listed below:

- *Accompanying formal interviews*: Formal academic interviews were also being performed on Orange Sky shift at this time, as a component of an accompanying study. Asking an individual if they wish to participate in the application was to occur alongside the established interview process.
- *Informally through researchers*: The application was to be introduced informally through general conversation and mingling by an academic researcher.
- *Informally through volunteers*: The application was to be introduced informally through general conversation and mingling by an existing Orange Sky volunteer.

As previously mentioned, each of these strategies are assumed to have differing levels of success, and this will be discussed later in this report. Compounding the variations in strategies being trialled, the application was also to be distributed geographically throughout Australia in an effort to attract as much participation as possible, as well as to investigate the effect of sharing stories with individuals with whom one will likely never cross paths.

4.5 Accompanying Work

Alongside this project, work was also being conducted by two other students also under the supervision of Dr Vyas. Jay Almaraz and Stephen Pozzi were also fortunate enough to conduct field research with Orange Sky, and at times were also

assisting in data collection for this study. Almaraz's work was primarily focused on the experiences of those experiencing homelessness with relation to the existing Orange Sky services. Pozzi's work intended to investigate the impacts and experiences of temporary homelessness, particular as a result of the COVID-19 pandemic.

Chapter 5

Results and Discussion

As has already been outlined throughout the previous sections of this report, our intent was to perform a multi-faceted investigation into a wide range of factors impacting the overall success of an NFP utilising DST-based technology to connect directly to those experiencing homelessness. We have attempted to categorise the varying factors that we have investigated, and provide subsequent analysis of our results, extract our key findings, and ultimately put forth any recommendations for future work in the space, by both researchers and NFPs themselves.

Note that supporting information and transcriptions of all captured data can be seen in more detail in Appendix B.

5.1 Impacts of COVID-19

We note that the overall implementation of our project was hindered by a multitude of external factors, and as such, we have not been able to perform our research to the thorough extent which we had desired.

The impacts of COVID-19 generated heightened expectations and requirements for our initial ethics applications to be approved; resulting in a delayed commencement to our engagement with Orange Sky. The service model of Orange Sky was also heavily impacted by COVID-19, with all shifts across Australia being halted for a large period of time. This disruption in Orange Sky operations was subsequently also a disruption to our project, we were instead able to utilise this time to extend the depths of our initial review of the literature. Even upon recommencement of Orange Sky services, and thus our project, there were a number of health and safety restrictions enforced to provide all individuals present with a safe, socially distanced, environment. Whilst we are immensely appreciative of the severity with

which Orange Sky treated their health and safety obligations to the community, we also acknowledge that this impacted some of our delivery strategies, as will be discussed.

Lastly, we acknowledge that the initial intent of our project was to both release and iterate on our application during the course of our study. This iteration was initially intended to not only occur based on our findings, but also on the findings and knowledge gained by the accompanying work of Almaraz and Pozzi. Due to the destructive impacts that COVID-19 has had on our adjoining time frames, it was unfortunately not possible for Almaraz and Pozzi to perform their work in a window that was conducive to informing our application’s future development cycles. As a result of these difficulties, our application did not undergo any major iterations beyond the final prototype.

5.2 Delivery

In an effort to provide greater insight and guidance to NFPs who might attempt to implement similar applications to ours into their services, we ensured that observations were continuously made as to the effectiveness of different delivery strategies. Delivery success factors were observed to appear not just from the intentional variations in delivery methodology, as explicitly outlined earlier in this report, but also in the form of unintended emergent variations observed throughout our study.

5.2.1 Network Effect

Upon initial efforts to encourage and elicit participation in sharing stories via our application, it was evident that our application suffered from an almost causality-like dilemma. For us to be able to demonstrate to potential participants the effectiveness, or the outcome, of sharing their stories, we first needed to have already acquired some stories to illustrate this. We acknowledge that this phenomena, particularly used in the context of technology-based social applications, is often referred to as the *network effect*; described by Shapiro as a situation where “*the value of a product to one user depends on how many other users there are*” [104, p. 13]. Whilst this may seem like an obvious statement about our application, it was not foreseen, and thus proved to be an initial challenge in establishing our ability to readily collect many stories. The impact of this effect on our study extended the lead time, and minimised the time we were able to be in full delivery capacity. Shapiro’s insight confirms that this growth pattern is to be expected in our application, stating that

“technologies subject to strong network effects tend to exhibit long lead times followed by explosive growth”. Unfortunately, the duration of our study did not allow our application to culminate in the prophesied explosive growth, however it was observed that the friction in the collection of stories reduced with each story collected. In future work, we encourage the consideration of this effect in any delivery strategies and proposed time frames. We also put forward the potential to use or gather an initial data set prior to application delivery, such that a portion of the long lead time can be mitigated.

5.2.2 Formal Facilitation

We also observed in our delivery strategies that accompanying a formal interview was an effective means of inciting participation in our application. Quantitatively, 2 of our 5 total stories collected came from this approach. Whilst not formally recorded due to the informal nature of some of our participation encouragement techniques, it is also noteworthy that the success rate in participation of this strategy was also substantially higher than other strategies. We believe that the existing trust and relationship that has been established, as well as the correlation with an individual’s willingness to participate in a more formal interview process, are contributing factors to the success rate of this delivery strategy. We recommend this strategy to future efforts, particular those where high response rates are required.

5.2.3 Volunteer Facilitated

From a purely volumetric perspective, we find that the largest number of stories collected through our application come from the informal prompts to participate by existing Orange Sky volunteers, with a total of 3 (60%) stories being shared through this strategy. Further, we saw that of the stories collected through this strategy, 100% of these were shared by an individual to a volunteer with whom the individual had an existing relationship. Orange Sky encourages, and is rightfully proud of, the long term relationships which are formed between regular volunteers and regular visitors to their services. These existing relationships are based on trust, empathy, and non-judgement, all of which we believe are attributes conducive to an individual being willing to participate in our survey. A number of stories shared under the facilitation of a volunteer were also discovered to exhibit a conversational method of storytelling, for example the following recording is worth analysis:

VOLUNTEER : How long have you been coming down here [Friend]?

FRIEND : When you first started.

VOLUNTEER : Yeah, and have you nicknamed everyone?

FRIEND : Almost everyone.

VOLUNTEER : Tell me people's names and then their nicknames.

FRIEND : [Volunteer] 1 & 2, Soup, [Volunteer] 1.

VOLUNTEER : [Volunteer] is ...

FRIEND : Bob the Builder. [Volunteer] is Jenga [Volunteer], No Jenga [Volunteer].

VOLUNTEER : And why is that?

FRIEND : Because he doesn't bring the Jenga. Shark.

VOLUNTEER : What's Shark's real name?

FRIEND : [Volunteer]?

VOLUNTEER : [Volunteer]?

FRIEND : [Volunteer], yeah.

VOLUNTEER : And what about [Volunteer]?

FRIEND : Volunteer Banana, and Little Red.

VOLUNTEER : Who's Little Red? Me? [Volunteer]?

FRIEND : [Volunteer]!

VOLUNTEER : Yeah! Thanks [Friend]!

The fundamental content that is being shared here by the friend, specifically their passion for nicknaming all the Orange Sky volunteers, is not particularly of note. The friend's content falls well within the bounds of the types of stories we expected individuals to share through our application. Significantly though, we witness an interesting method of prompting from the volunteer, to assist in extracting this story from the friend. We recognise that whilst the friend evidently had an interesting story that he wished to share, he potentially would not have been able to do so without the explicit assistance of another party. We acknowledge that whilst our application does not explicitly facilitate this conversational type of story capture, there are no apparent hindrances in allowing it to do so. Further, progress in this space should aim to harness the potential for conversational storytelling, and more generally the idea of multiple simultaneous participants. Story content, including this friend's, will be discussed more broadly in a following section of this report.

5.2.4 Device Limitations

An inherent barrier to more widespread participation in our application was also found to be the nature of the device on which it was delivered. Whilst using the existing tablets, which are already seamlessly integrated into Orange Sky's service delivery models, enabled us to readily distribute and deliver our application, this methodology also proved to be limiting. The limitations imposed by this approach primarily arise from the inability for an individual to participate on their own device, on which they are likely far more comfortable and have a much larger window of accessibility. Compounding the lack of personal device access, is the implicit limitation of using a single instance of the application, resulting in mutual exclusivity between a story being shared and a story being listened to. Although it was not within the scope of this project, we propose that future research may enable higher rates of participation by distributing the application more broadly. It is also important for any future studies to be aware of the risks and attack vectors which may be exposed when asking participants to install an application on their own personal devices. Distributing an application would also enable participation to occur outside the geographic and temporal bounds of an NFPs services, providing the opportunity for participants to take part in a time and space that is most comfortable for them. On the other hand, we do recognise the limitations on device accessibility outlined in our review of the literature, and urge future implementations to understand the exclusivity this may have on their participants.

5.3 Technology

Although the key focus areas of this project may lie beyond the details of any technical implementations, we still believe it to be a valuable discussion in sharing any findings we may have made in this area.

5.3.1 Interface Design

Primarily, we found that modern ubiquity across mobile application design principles was an excellent enabler in allowing participation from individuals with a broad degree of tech literacy. We did not observe any instances of the visual designs of our application to be a barrier to participation for any of our actual or potential participants. It is presumed that the standardisation in many of our interface elements provided users with a familiar experience, and did not require them to become

familiarised with any elements foreign to their existing experiences. The familiarity of our design was enforced through the use of commonly used packages such as *react-native-paper*, *react-navigation*, *react-native-community/slider*, *react-native-community/slider*; we strongly recommend all of these packages in any future development, both for the simplicity they provide to the developer and for the familiarity they provide the user.

5.3.2 Hardware Requirements

We also found that the microphone, and subsequent playback quality was important in establishing trust in, and desire to utilise, our application. An individual reviewing a story they are about to share, or an individual listening to someone else's previously shared story, were anecdotally observed to have a greater experience if the microphone and speaker quality of the device were sufficient. This was observed due to the differing quality of devices upon which our project delivered our application. We also note that for certain devices and conditions, it is important to ensure the capture quality is sufficient before engaging participants in lengthy story sharing activities.

5.4 Story Sharing

Beyond the delivery strategies and technical implementations of our project, we further wish to analyse and understand the story sharing partaken through our application. We intend to provide interpretations and recommendations on the types of stories that have been shared ($n=5$), with an emphasis on the underlying motivations and contexts which encourage the respective individuals to do so.

5.4.1 Story Taxonomy

In qualitatively analysing the stories shared through our application, we propose that any given story may be categorised as one of the following:

- *Orange Sky Interaction* — 2 stories (40%)
- *On the Record* — 2 stories (40%)
- *Personal Anecdote* — 1 story (20%)

To better analyse and understand the content, motivation, and surrounding context of each of these story types, we will outline each of them in more detail, as well as providing a representative example.

Orange Sky Interaction

We identify these stories as those that are essentially a technologically augmented version of a regular interaction that an individual may have with Orange Sky volunteers or staff. For example, individuals sharing their broad appreciation or support for Orange Sky, or even sharing information about their relationship and utilisation of Orange Sky as a service. It was found that these stories generally came through the facilitation of an existing Orange Sky volunteer, and provided those experiencing homelessness with another means of interacting with the NFP's services. These stories were observed to be primarily jovial in nature, and seemingly facilitated a joyful interaction between NFP and the participant. We strongly recommend further investment in this space, by Orange Sky and the wider NFP space, as we propose our evidence suggests that the enablement of these interactions provides an enhanced experience for the users of these services.

The friend sharing nicknames story, included in an above section of this report, is an excellent example of this type of story.

On the Record

An unexpected type of story that emerged from our analysis revolved around the seemingly novel experience that participant's saw in having the ability to simply record themselves. Whilst it may not be uncommon for individual's to have their voice transmitted digitally, usually over the phone or the internet, it is apparently more uncommon for voices to be recorded and stored more permanently. Having the ability for your voice recording to be distributed across not just space, but also time, encouraged participants to share things that they are passionate about, or things that they want other people to hear at some point in the future. These stories ranged from opinions on the nation's sporting landscape, to point-in-time updates about the current state. These point-in-time updates were seen to be used almost as a record-keeping mechanism, enabling future users of the application to reflect on a previous time. Lastly, we saw this type of story utilised to push forward an idea, or a call to action. By providing an application with no real limitations on content, we saw the emergence of a variety of different utilisation approaches from our participants. It is proposed that future work into this collaborative collection

of user input, with limited restrictions, may provide diverse insight into the use cases which may materialise organically. We also commend our participants in their ingenuity in understanding the potential of our application beyond that of our own intentions.

The below example outlines a few aspects of this type of story, in its inclusion of its advertisement for a specific Orange Sky service, as well as a record of the point in time that it was recorded. Also, noteworthy is the desire to participate in our application as an Orange Sky volunteer, showing that the scope of participants out on shift was not limited solely to those utilising services.

VOLUNTEER A : So, Beenleigh's back Joseph?

VOLUNTEER B : Yes, Beenleigh's back every Thursday 6 til 8, showers and laundry.

VOLUNTEER A : And how long has it been since we were here?

VOLUNTEER B : Months, too long. Maybe ...

VOLUNTEER A : How many months?

VOLUNTEER B : 4 months, 5 months.

VOLUNTEER A : And would you say it's pretty quiet compared to March?

VOLUNTEER B : Yes, very quiet, I'm looking forward to the full meal set-up coming back, and a few more friends coming back, but it's nice to see the regular faces again.

Personal Anecdote

Lastly, we acknowledge the type of story that we incorrectly presumed would comprise almost all stories. These stories are those primarily shared as a way for an individual to express their own experiences, and to disseminate their feelings, learnings, and emotions that have come as a result of these experiences. It was found that these stories were the lengthiest of all story types, likely as a result of the details and context that an individual can provide when sharing their own experiences. As has already been acknowledged, the environment present in Orange Sky's current COVID-19 response operating model is not overly conducive to the collection of this type of story. By providing a more private or comfortable environment to our participants, it is presumed that the collection ability of this type of story would be enhanced.

The examples we include here are representative examples of this type of story. Note that the entirety of the second example story is not shared and has been

paraphrased for brevity; this story can be found in totality, along with all other stories, in Appendix B.

A friend's story:

VOLUNTEER : Alright, [Friend], do you have a story for us?

FRIEND : Yes. The Orange Sky has been here since last year, until the COVID hit, and they're awesome.

VOLUNTEER : And then what's been happening since we've been away?

FRIEND : I got a job.

VOLUNTEER : Where'd you get a job at?

FRIEND : Near my place.

Another friend's story:

FRIEND : My name's [Friend] and this is my story to share that nothing is impossible and that anything can happen and nothing is insurmountable for us to pull through.

FRIEND : I was driving my first motor vehicle and I fell asleep behind the wheel.

FRIEND : I spent two and a half weeks in induced coma.

FRIEND : If I lived, at best I would be a vegetable in a wheelchair.

FRIEND : If I was supposedly lucky enough to get out of hospital in '95, I would be back in hospital by the end of '95 to have my leg amputated.

FRIEND : Since I've been out of hospital, I've had no pain anywhere in my body and haven't once needed to be on any medication because of it, anything whatsoever, and I have all my limbs and nothing's been amputated or changed. The only downside, I can't smell, but the way life and society is well bloody hell, I can live with that! So cheers!

Taxonomic Limitations

We emphasise that the taxonomy of our stories outlined above should only be considered as representative of our sample participants. We recognise that our delivery

strategy may induce certain biases in our selection of participants, particularly towards those who have existing relationships with Orange Sky, or who have an existing willingness to participate altruistically in these types of projects. It should also be recognised that the environment in which our project operated was potentially not conducive to the sharing of more personal or intimate stories; a barrier which may be mitigated through the personal device distribution discussed earlier.

Chapter 6

Conclusions

After reviewing and distilling the existing literature, and subsequently heading out into the real-world with an established NFP, our study has been able to observe, uncover, and recommend a number of key points of knowledge within this field. Despite being hindered by the presence of COVID-19, as well as some of our own oversights, we are pleased to present a number of concrete findings, as well as the potential foundations of future work.

6.1 Findings

By undertaking a generalised approach towards our investigation into the real-world implementation of a DST-based approach to connecting NFPs to those experiencing homelessness, we were able to produce a broad range of findings. These findings built upon our review of the existing literature, as well as our own interpretations of the theory underpinning our work. All findings and recommendations have been outlined more immediately in other parts of this report, however we intend to aggregate the broader discoveries of our work in this section.

Initially we set out to investigate the impacts of the evolving technological and societal landscape on those experiencing homelessness, particularly with respect to the connections between these individuals and the supporting NFPs. Our investigation aimed to validate and further investigate key theories through practical field work, as well as to develop increased empathy in the area. The key areas in which we claim to have made findings are *technology delivery strategies for NFPs*, *design principles when targeting those experiencing homelessness*, and *the potential for user defined purpose in NFP technology*.

6.1.1 Technology Delivery Strategies for NFPs

We have recognised a number of factors that may lead to successful delivery strategies for NFPs to integrate technology into their existing service and connection models.

Firstly, we reveal that the *network effect* must be considered when initially delivering technology where the value of a user's experience is intrinsically proportional to the number of users. In mitigating this effect, we suggest organisations invest in a strategy that will allow for an initial data set, or user base, to be cultivated prior to commencing delivery.

Subsequently, we show evidence that suggests a key barrier to participation in an application such as ours can be mitigated by careful consideration as to the ways in which participation is elicited and facilitated. Our work found that augmenting an existing formal process with technology had the highest rate of success, and we recommend this as an excellent approach when high response rate is desired. It has also been shown that informal participation in our application was most successful when an existing relationship was already present between the facilitator and the participant. It is encouraged that NFPs utilise their existing relationships when delivering similar technologies, particularly in the initial phases.

Lastly, we propose that our selection of a single shared device, available only on an Orange Sky shift and requiring manual facilitation, was not conducive to receiving a high volume of participants. However, we do confirm that this approach allows for tight control over parameters and evaluation, attributes that are important in a study like ours. If possible, based on the risk appetite and the nature of the technology, we suggest NFPs strongly consider the option for distributing technology directly to the devices of their end users.

6.1.2 Design Principles for those Experiencing Homelessness

As was recognised in our review of the literature, a proactive effort is required in designing technology for marginalised user groups, particularly those who are financially insecure or experiencing homelessness. Our implementation shows that through utilisation of existing standards, principles, and design libraries, it is possible to provide a simple and effective experience to all potential users. We also suggest that familiarity is important in this type of design, particularly when looking at a shared device model such as the one implemented in our project. Users of

a shared device may have limited access time, and therefore immediate familiarity plays a pivotal role in their ability to fully understand the usage and functionality of the application. It is recommended that any design by NFPs, targeting a similar group of end users, should be performed with familiarity and usability as the highest priority.

6.1.3 Potential for User Defined Purpose in NFP Technology

Our most unexpected finding comes from the ingenuity shown by our participants, in their alternate interpretations of the benefits of using our application. Although our initial intention was to provide an application that allowed users to share and consume stories throughout the community surrounding an NFP, we unintentionally produced an application that allowed sharing of arbitrary thought, ideas, and any other content our participants might imagine. We recognise that this deviation from our intended usage actually highlights a serendipitous finding in our work. This finding relates to the mechanisms with which individual participants can find their own purpose in a technological platform, given the platform provides enough freedom to do so. In discussing our results, we suggested that further exploration of the wider benefits that user's may discover through a voice sharing platform could prove to be insightful. NFPs looking to implement similarly social technologies may also benefit from limiting the restrictions that are imposed, in an effort to allow users to define their own purpose, and ultimately realise their own benefits, from participation.

6.2 Future Work

This study has endeavoured to build on existing literature and empirical evidence to highlight a technological approach to connecting people experiencing homelessness and NFPs that support them. It serves as a preliminary investigation and offers opportunities for future studies to investigate and develop further. Throughout our report we have made our best efforts to provide advice on future work as it was deemed relevant. Generally speaking, there were some key themes for proposed future studies which have emerged throughout the construction of this report.

Whilst outlining our methodology for this project, specifically our delivery strategy, we acknowledged that only a small subset of all potential delivery strategies

were to be explored. We encourage the undertaking of further work in an attempt to analyse the potential of delivery strategies that were not covered by our work. In particular, we place emphasis on our presumed potential in the delivery of similar applications by NFPs directly to the device's of those experiencing homelessness.

In any future studies following similar delivery strategies to those utilise din this project, we emphasise the importance of obtaining a larger sample size to more accurately analyse the delivery of the application. We also suggest the collection of accompanying qualitative data from participant individuals and NFPs regarding their experience. This qualitative data will enable a more rigid and structured analysis of the impacts of such an application on the real-world ecosystem in which it is delivered.

More specifically, we encourage Orange Sky and adjacent service to invest further into our application, or one similar in nature. We believe that by providing an Android application like ours, there is the potential to further expand upon the functionality and use cases that can be realised in this environment. We also encourage these NFPs to further instil technological connection into their service delivery strategies, and to invest in the mutual benefits that we have shown evidence for.

From the outset, our project aimed to analyse specifically the NFP sector surrounding those experiencing homelessness, and we therefore acknowledge the associated constraints on the relevancy of our work more broadly. Whilst we do believe that holistically our findings would be generally applicable in adjacent NFP sectors, we recommend further work is performed to test this assumption.

Appendix A

Application Design

The Figures provided on the following pages are screenshots from the later phases of the development of the final prototype.

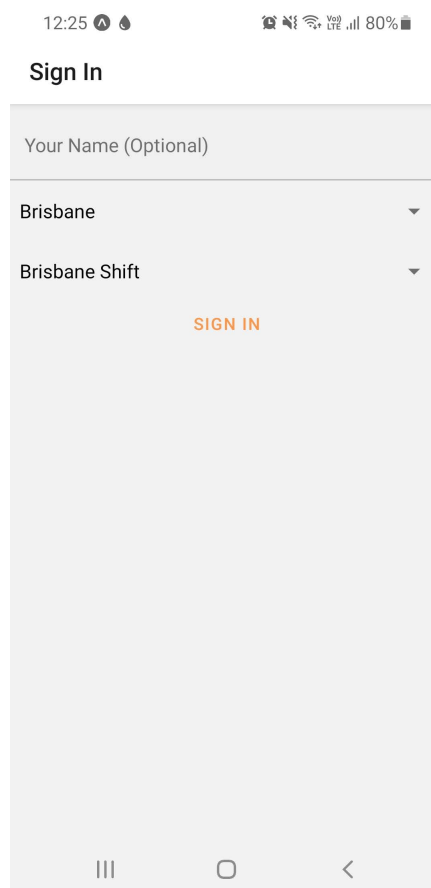


Figure A.1: Login: Basic design, pushed to the top to leave room for a large tablet keyboard.

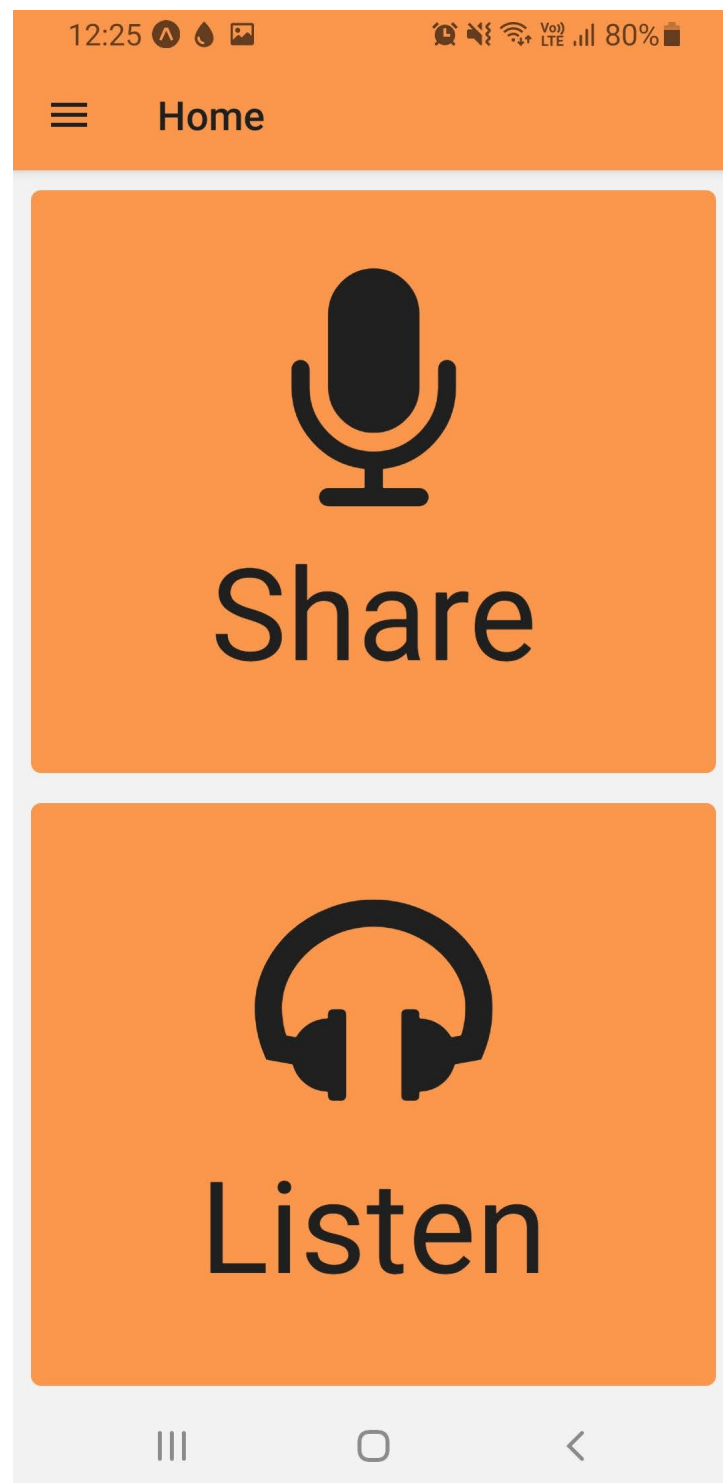


Figure A.2: Home: Intended to make it immediately apparent what the two core functions of the application are.

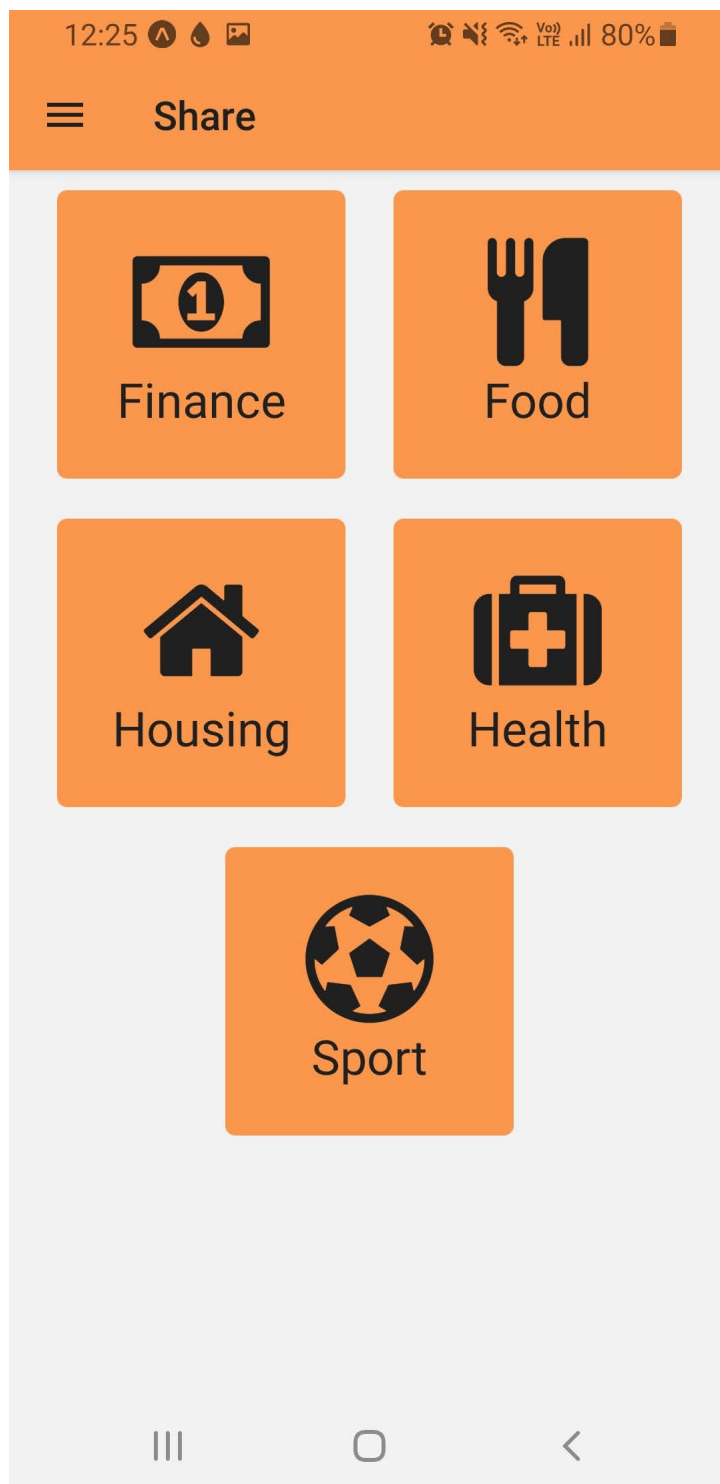


Figure A.3: Categories: A category selection screen to help prompt potential stories, as well as allow for targetted listening. The categories shown here are not indicative of those used on the final prototype.

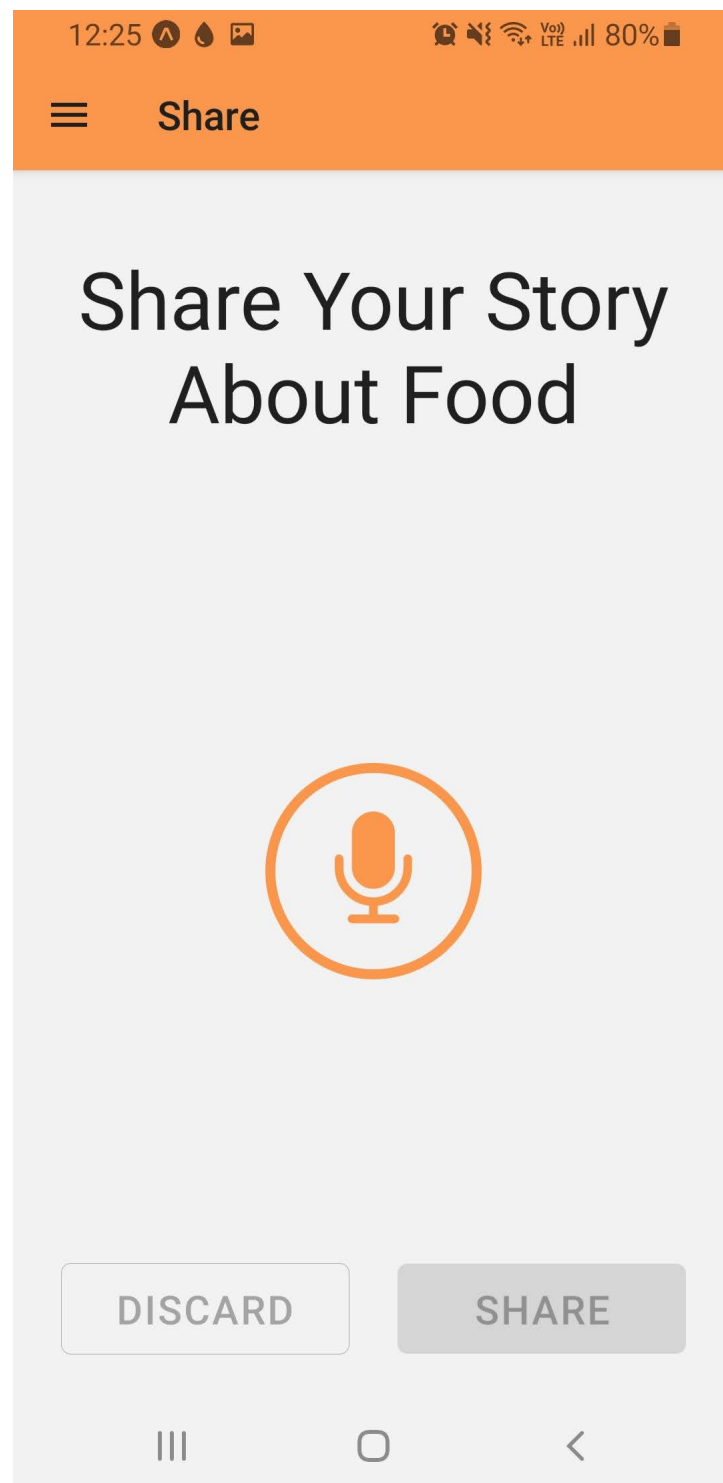


Figure A.4: Share: A screen for capturing audio recordings, similar in design to most voice memo applications that users may have familiarity with.

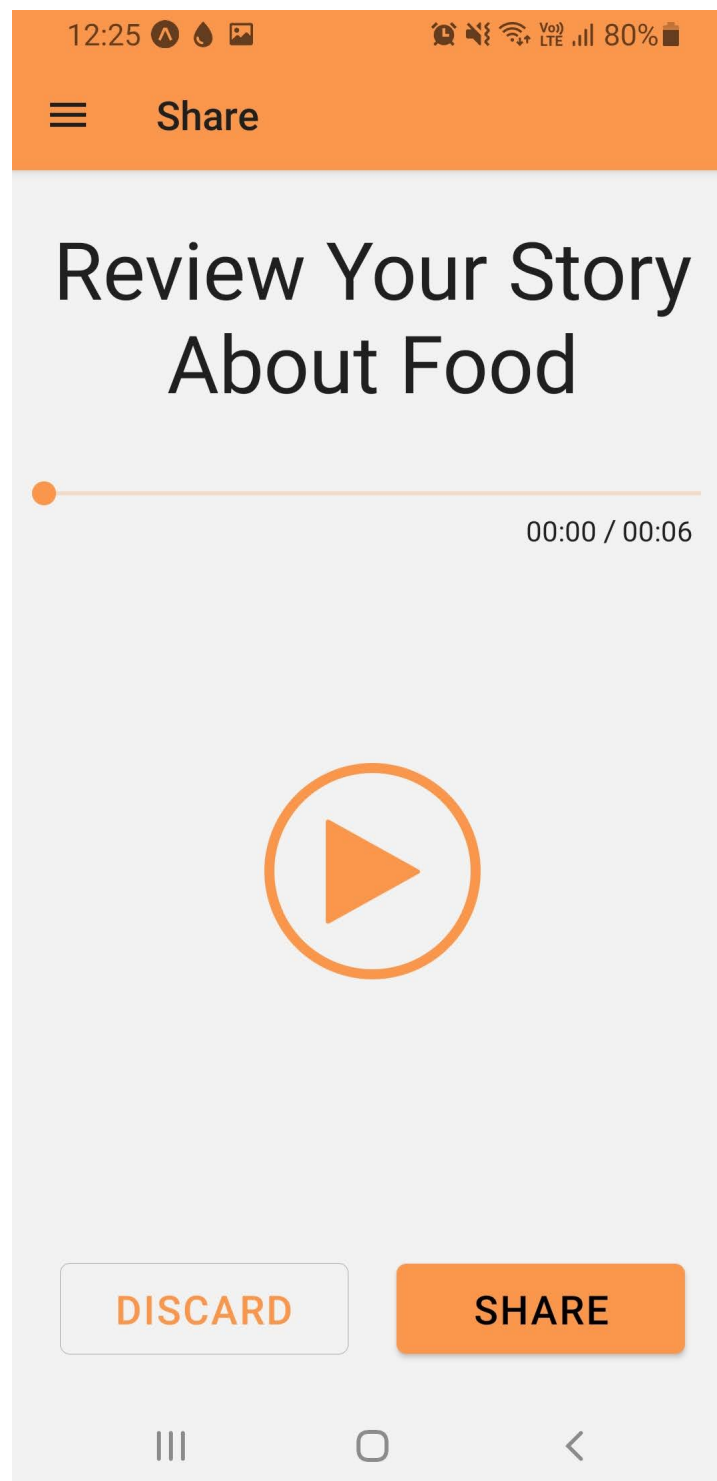


Figure A.5: Review: A screen to provide the user with the ability to review their story before sharing

12:25 80%

☰ Share

Finalise Your Story About Food

Duration: 00:06

Food ▼

Title

Your Name (Optional)

Description (Optional)

CANCEL **SUBMIT**

III ○ <

Figure A.6: Finalise: Giving the user the opportunity to provide supporting textual information alongside their story, as well as to review their previously provided information such as name and category.

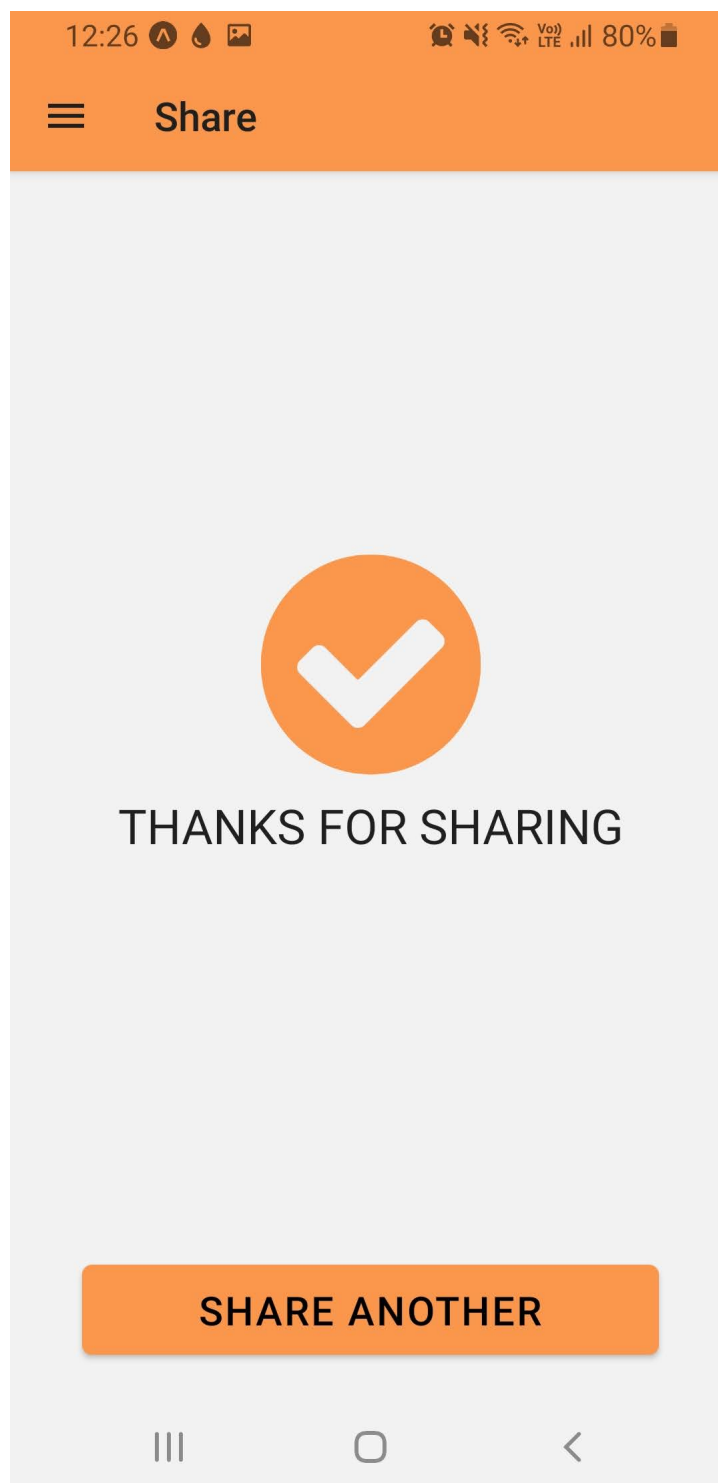


Figure A.7: Thanks: A thank you screen for user's who share their story, also a clear indicator of a successful share.

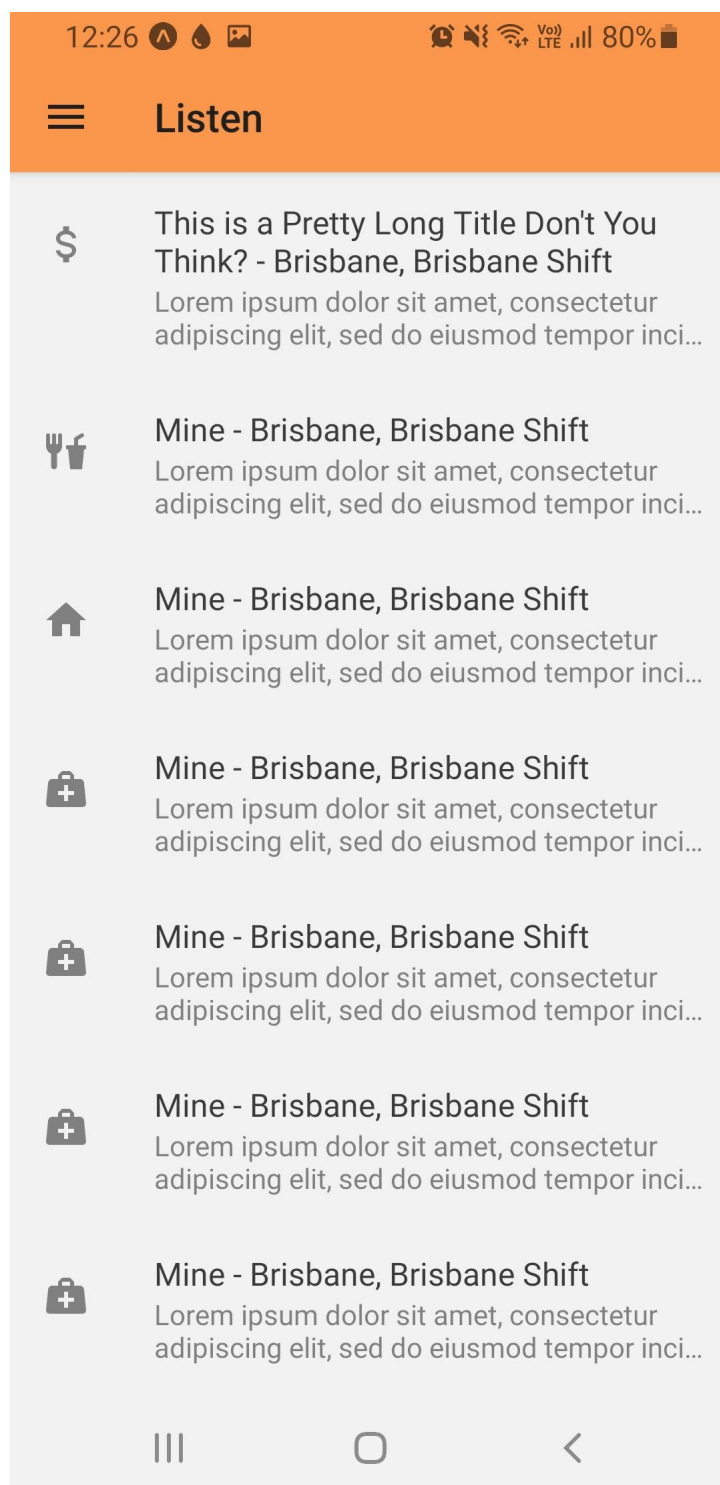


Figure A.8: Browse: An endlessly scrolling catalogue of previously shared stories, utilising the categories to provide informative metadata at a glance.

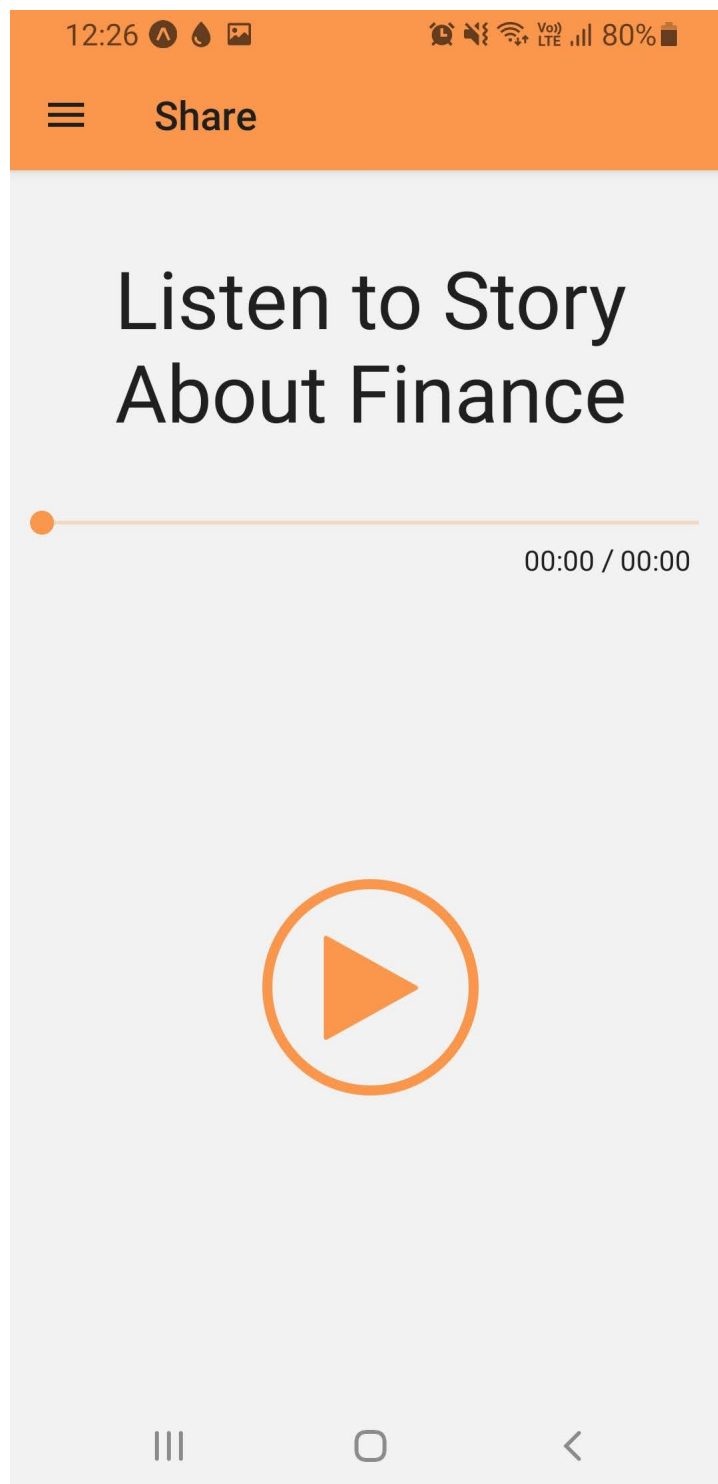


Figure A.9: Listen: A simple screen for listening to stories shared by other users, note that the functionality to comment on and heart stories was also added to this screen prior to testing.

Appendix B

Story Transcriptions

This appendix contains transcriptions and accompanying data for all recordings collected in this study. All volunteer and friend names have been anonymised where possible.

B.1 Recording №1

Title: Go the cowboys

Date: 2020-09-06 21:06:42

City: Brisbane

Shift: Wickham Park

Category: Sport

Description: [Friend]'s thoughts on the current NRL

Duration: 00:05

Transcription:

FRIEND : Go the Cowboys!

B.2 Recording №2

Title: [Friend] sharing his excitement about [sic] orange sky coming back

Date: 2020-09-17 08:20:31

City: Brisbane

Shift: Nightlight Outreach

Category: Services

Description: First time [Friend] had seen us in 5 months and in that time! He got a job at a warehouse.

Duration: 00:23

Transcription:

VOLUNTEER : Alright, [Friend], do you have a story for us?

FRIEND : Yes. The Orange Sky has been here since last year, until the COVID hit, and they're awesome.

VOLUNTEER : And then what's been happening since we've been away?

FRIEND : I got a job.

VOLUNTEER : Where'd you get a job at?

FRIEND : Near my place.

B.3 Recording №3

Title: [Friend]'s Story

Date: 2020-09-23 07:36:55

City: Brisbane

Shift: Queens' Park

Category: Health

Description: [Friend]'s story of how there is hope in all circumstances; there is chance for the better. *[Friend] also provided some accompanying photos of his car, before and after his accident.*

Duration: 01:46

Transcription:

FRIEND : My name's [Friend] and this is my story to share that nothing is impossible and that anything can happen and nothing is insurmountable for us to pull through. Umm, Christmas '94, end of my first year out of high school, I was driving my first motor vehicle and I fell asleep behind the wheel and it mounted the footpath and I took out a power pole. Little TX Gemini '75 model, I had the power pole up the windscreen in front of me and he motor through my glove box and the power pole moved several inches in the ground. I was cut out and transported to PA hospital for the emergency stuff then under police escort out the highway and through the Brisbane PA hospital. I spent two and a half weeks in induced coma, the head specialist in PA hospital in Brisbane didn't bother doing chart up, told my parents he was too busy, I was running outta time. According to him, what they were told, if I lived, at best I would be a vegetable in a wheelchair. I spent two and a half weeks in

an induced coma, three and a half months I was in the PA hospital, which I don't remember any of. If I was supposedly lucky enough, that's the specialists words and attitude to my parents, to get out of hospital in '95, I would be back in hospital by the end of '95 to have my leg amputated. Since I've been out of hospital, I've had no pain anywhere in my body and haven't once needed to be on any medication because of it, anything whatsoever, and I have all my limbs and nothing's been amputated or changed. The only downside, I can't smell, but the way life and society is well bloody hell, I can live with that! So cheers!

B.4 Recording №4

Title: Orange sky is back

Date: 2020-09-24 08:26:20

City: Brisbane

Shift: Nightlife Outreach

Category: People

Given Name: [Volunteer]

Description: [Volunteer] tells us about orange sky being back in Beenleigh

Duration: 00:35

Transcription:

VOLUNTEER 1 : So, Beenleigh's back Joseph?

VOLUNTEER 2 : Yes, Beenleigh's back every Thursday 6 til 8, showers and laundry.

VOLUNTEER 1 : And how long has it been since we were here?

VOLUNTEER 2 : Months, too long. Maybe ...

VOLUNTEER 1 : How many months?

VOLUNTEER 2 : 4 months, 5 months.

VOLUNTEER 1 : And would you say it's pretty quiet compared to March?

VOLUNTEER 2 : Yes, very quiet, I'm looking forward to the full meal set-up coming back, and a few more friends coming back, but it's nice to see the regular faces again.

B.5 Recording №5

Title: [Friend] nicknaming all orange sky volunteers

Date: 2020-09-24 08:39:20

City: Brisbane

Shift: Nightlife Outreach

Category: People

Description: [Friend] has named all volunteers out on shift and has been coming down here before OSA starting coming out on this shift

Duration: 01:03

Transcription:

VOLUNTEER : How long have you been coming down here [Friend]?

FRIEND : When you first started.

VOLUNTEER : Yeah, and have you nicknamed everyone?

FRIEND : Almost everyone.

VOLUNTEER : Tell me people's names and then their nicknames.

FRIEND : [Volunteer] 1 & 2, Soup, [Volunteer] 1.

VOLUNTEER : [Volunteer] is ...

FRIEND : Bob the Builder. [Volunteer] is Jenga [Volunteer], No Jenga [Volunteer].

VOLUNTEER : And why is that?

FRIEND : Because he doesn't bring the Jenga. Shark.

VOLUNTEER : What's Shark's real name?

FRIEND : [Volunteer]?

VOLUNTEER : [Volunteer]?

FRIEND : [Volunteer], yeah.

VOLUNTEER : And what about [Volunteer]?

FRIEND : Volunteer Banana, and Little Red.

VOLUNTEER : Who's Little Red? Me? [Volunteer]?

FRIEND : [Volunteer]!

VOLUNTEER : Yeah! Thanks [Friend]!

Appendix C

Source Code

All source code, and accompanying documentation including this report, for this project can be found in the GitHub repository at the following URL:

<https://github.com/Alex-McLean/stories>

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