Contact Tracing Technologies Prototype Research Programme

Programme Summary

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Document Consultation

The following stakeholders (internal or external) have been consulted regarding the content of this document.

Name	Role	Date
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Contents

1. Acknowledgements

The success of this kaupapa is due entirely to the great effort from a number of committed, dedicated people, who came together with one aim in mind … to make the future a better and safer for our Maori and priority (often vulnerable) communities throughout the pandemic. We acknowledge the following people as key contributors to that success:

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Finally, due acknowledgement needs to be accorded to Te Arawa for partnering in the Te Whatu Community Field Trial as Te Arawa but also on behalf of te iwi Māori.

2. Document Purpose

In early 2020 a group of NZ businesspeople known as the Public Private Partnership group (PPP) produced a report recommending the Government consider nationally deploying Bluetooth-enabled 'CovidCards' to improve contact tracing. Following the release of this report and as directed by Cabinet [CAB-20-MIN-0175], the Government Chief Digital Information Officer (GCDO) and the PPP led cross-agency work to independently trial the CovidCard and assess the potential benefits for contact tracing. This initial trial found the prototype CovidCard performed under controlled conditions.

On 3 August 2020, Cabinet agreed to further testing and a field trial of the CovidCard to test whether it could improve contact tracing [CAB-20-MIN-0370]. Cabinet also noted the need to explore the potential value of other digital technologies in our contact tracing system and that there were broader issues to consider regarding the deployment of digital solutions, such as:

a) the importance of maintaining social licence and buy in across diverse communities

b) the interoperability of digital technologies across platforms, and their fit within the wider contact tracing system.

A joint initiative, the contact tracing Technologies Prototype Research Programme (the Programme) led by the Ministry of Health (MoH) in association with the GDCO was initiated to investigate the viability of a nation-wide roll out of a Bluetooth contact tracing card and to provide some answers and recommendations in line with the broader questions.

This document represents a whakakao (gathering together) of the various reports derived from the Programme and an overall assessment of the findings and conclusions presented in them.

Included are a brief and conclusions from the following Programme deliverables:

1. Programme Equity Assessment
2. Te Whatu Co-design Assessment
3. Te Whatu Research
4. Interoperability – Non-Close Contact Management Approach
5. Contact Tracing Technology Market Research
6. Privacy Impact Assessment
7. DTA Pre Trial Assessment
8. DTA Technical Assessment

3. Programme Overview

As a result of a Cabinet directive the Programme was put in place to ensure that key questions can be answered, and appropriate advice given regarding contact tracing Technologies. The collective ambition of the Programme was to prove the value of bluetooth digital technologies and their effectiveness in enhancing COVID19 contact tracing for the benefit of all New Zealanders.

The goal of the Programme was to provide coherent advice to Cabinet on the potential impact of different bluetooth digital contact tracing aids being considered for Aotearoa including such devices as the covidcard, the NZ COVID Tracer app and other associated bluetooth technologies. This has been delivered through evidence-based answers to questions on bluetooth digital contact tracing aids that were trialled as well as drawing on international case studies, peer-reviewed literature, empirical research (trials), modelling studies, and privacy and regulatory impact assessments.

The guiding principle for the Programme was a commitment to upholding the principles of Te Tiriti o Waitangi – Our efforts reflect the commitment to partnering with Maori as tangata whenua.

4. Programme Outcome (Summary)

All in all, the Programme delivered the outcomes that were expected. Technical assessments were done, field trials were completed, market research was delivered and the required Cabinet Paper was completed including the requested advice. To this end, the Programme has delivered to scope, however it has been the approach rather than the deliverables that have been its greatest success.

Through an equity lens, the Programme was able to assess how responsive it was to Māori and priority (often vulnerable) communities in Aotearoa New Zealand, recognising first and foremost that when we lift up vulnerable members of communities, we lift up the potential for everyone to succeed as the best versions of themselves.

The partnership with Te Arawa has been a significant highlight, along with the leadership in completing trials, by the community for the community. The effectiveness of the approach, with the guiding principle of commitment to upholding the Te Tiriti O Waitangi (our efforts reflecting commitment to partnering with Maori as tangata whenua) and the alignment to key elements of Whakamaua (Maori Health Action Plan), clearly demonstrated that acting on these principles does in fact result in far better outcomes. In doing so, the Programme has also opened up the opportunity to look to do things differently in the future, further developing a framework for taking a genuinely co-designed community based approach to further work in the contact tracing area as well as the possibility of using the same approach for other initiatives.

In terms of co-design, the Programme made significant leaps in the understanding and implementation of true partnership and an intent to change the way things are done. Whilst far from perfect and due to sometimes rushed timing, the Programme missed one of the important steps in starting the co-design process, that being establishing the problem statement with and from within the community. However, from the outset, it maintained a level of reflexivity that supported the by the community, for the community approach as the trial proceeded.

Te Arawa Kaumatua appropriately named the community trial Kaupapa ‘Te Whatu’. A Whatu is a talisman once used by tohunga to host a deity that would protect a house, canoe, and garden. For humans however, the Whatu is intangible, internal, and known widely as ethos [for example; the beating heart of a person is akin to the Whatu]. In the context of the trial, replicating the Whatu through the Card so that it becomes tangible, accessible, and used as a measurement of mauri, ensured an understanding in the community that would not otherwise have been in place. The use of ‘te Whatu’ heightened the individual's awareness of any extrinsic forces and acted as a signpost to any risk and potential dangers. Taking this approach for the likes of a vaccination program, will go a long way to helping ensure understanding and success within Māori and priority (often vulnerable) communities.

As referenced by both universities, underlying Kaupapa Maori in the co-design was He Piki nga Ora elements of:

1. Community Engagement
2. Culture-Centred Approach
3. Integrated Knowledge Translation, and
4. Systems Thinking

Unwritten in an emerging ‘Te Whatu Protocol’ appeared learnings and pai arahi guidelines that sat virtually alongside the Otago University research protocol including aspects of tikanga, manaakitanga and kaitiakitanga. Being reflexive, pros and cons emerged including organic gains as opportunities arose that challenged the rapid rollout of the trials.

In the end, with true partnership, a commitment to co-design and maintaining an equity lens across the Programme, the successes achieved, particularly in the community trials, spoke for themselves.

The Te Whatu trial research aimed at measuring acceptability and aspects of efficacy of the card, in particular around the value to whanau, the effectiveness of the card technically and whether end users saw value in digital contact tracing. The University of Otago conducted a cohort study examining the efficacy and acceptability of the card among a community in Ngongotahā, Rotorua. All participants, of which there was 1,191 in the cohort, received one card. The trial showed high uptake is possible through effective on the ground planning and community-led co-design.

The cards had a high level of consistency demonstrating that technically they worked, that uptake is a critical element of effectiveness and that a single eco-system approach is key in addressing overall uptake and equity for any proposed technologies.

Compliant adoption is a serious concern suggesting any future strategy will need to consider stronger measures to improve compliance e.g. opt out models. At some level, almost all clinically relevant close contacts were detected, indicating that digital contact tracing technologies are well-placed to deal with casual contacts and assist with close contacts in outbreak scenarios.

The trials showed high acceptability of the technology by participants when its purpose was understood, though less so with younger participants. The major concern about the technology from participants was around Government use and protection of their data, particularly for Māori participants.

End-users of digital contact data i.e. Contact Tracers, raised concerns over increased workload, issues with public communication and the operational model. There was wide agreement within the focus groups, that if implemented, the technology would not replace any of the core case investigation processes related to close contact identification, notification or monitoring.

Key to success and to be truly effective with the use of technologies to support contact tracing, is that they must be interoperable. Solutions that are independent of each other, will detract from the overall efficacy of the pandemic response. The use of a de-centralised (user owned and controlled) data model and interoperable technology, such as smart phones and different types of wearables, will have a positive effect on being able to more rapidly get control or outbreaks, especially in situations where multiple instances might be the case. These could also include other features, such as temperature, heart rate and other health related capabilities, with the possibility for use outside of as well as within contact tracing.

Given there is no one size fits all technology available today, increasing the coverage through offering multiple technologies to people and communities is important, as acceptance and use of the technology will support more timely and effective contact tracing. Using different sources of information will provide Contact Tracers with data that may also contribute to identifying the source.

The market research, done by Colmar Brunton has served to inform a number of questions under consideration for contact tracing technologies, as well as providing insights into what and how people think about these types of initiatives. The research explored New Zealanders' attitudes and expectations towards contact tracing technology, in particular the use of Bluetooth in smartphones and wearable technology and generally supported the findings of the Community trials and vice-versa. Key findings showed that New Zealanders are willing to use technology for contact tracing, though have a key concern about data privacy. Apps and wearables appeal to different audiences with a tension between what is easy and what is familiar, concluding that New Zealanders need more encouragement to take up contact tracing. Focus should be on education not just information.

A Privacy Impact Assessment (PIA) was conducted to evaluate the privacy impacts of augmenting New Zealand's case investigation and contact tracing process. Key findings indicate that Aotearoa must take steps to strengthen its governance arrangements regarding

personal information management and use in the contact tracing process, regularly obtain assurance that the controls that are in place to manage the privacy risks are working properly; and provide greater transparency about how people's information is used in the contact tracing process.

Technical trials were also carried out by the Defence Technology Agency (DTA), both pre-trial, to ensure the cards would work effectively and as an overall evaluation of the card technology. Based on the testing conducted, and additional technical specifications provided, the security, privacy and stability requirements for the card used for the field trial were met. DTA's assessment of the privacy and security of the system stated that it was satisfactory for a small-scale community trial, if all personally identifiable information is stored in a separate database (as it was in the trial), however a number of recommendations were made that would need addressing to even consider rolling out on a national basis. The recommendations in the report were necessary but not sufficient to justify a national deployment.

Important additional factors for considering the advice back to Cabinet, included user acceptance, distribution channels, the possible need for a mandate, and a cost-benefit analysis of card-based vs. smartphone-based digital contact tracing systems. Interoperability was again seen as a key factor for consideration.

5. Programme Equity (Assessment)

Mana Whakaora in the title of the Equity report is an expression of maintaining the health and wellbeing of all people encapsulated in the phrase "*kia whakaora te mana o te tangata*".

The purpose of this work was to provide an equity lens across the entire Programme and in doing so, identify and evaluate opportunities for collaboration across Government (such as Ministry of Health, Department of Internal Affairs, Office of the Government Chief Digital Information, Office of the Privacy Commissioner), Iwi, hapū and whānau as partners under Te Tiriti o Waitangi, key stakeholder interest groups and partners (incl. technology suppliers). Furthermore, recommendations in the final report looked to inform the All of Government COVID response.

Through an equity lens, this work provides an opportunity to reimagine and strengthen the Māori-Crown relationship wherein the arrival of COVID-19 has highlighted, exposed (and exacerbated in some instances) the shortcomings of the current system such that to return to the pre-Pandemic conditions is not acceptable and nor should it be an option.

The Programme's guiding principle was to uphold the principles of Te Tiriti o Waitangi. It was impossible to review equity across the Programme without understanding the diversity of population and contexts in Aotearoa New Zealand; from equity in health, equity for Māori in health, equity for the disabled and Māori disabled, equity for the Elderly, equity for Pacific Peoples, equity for Asian New Zealanders and Rural New Zealanders. As a primer, the 'background' section of the full report should be read to fully understand and appreciate the learnings and recommendations.

Through an equity lens, we were able to assess how responsive the Programme was to Māori and priority (often vulnerable) communities in Aotearoa New Zealand, recognising first and foremost that when we lift up vulnerable members of communities, we lift up the potential for everyone to succeed as the best versions of themselves.

Gaining real value from this work required a depth of understanding underpinned by the principles of Te Tiriti o Waitangi to bring about opportunities to approach things consistent with *Partnership*, *Protection* and *Participation*.

It will require courage to set policy differently that privileges responsiveness to Māori and priority (often vulnerable) communities, that results in an intricate weave or lattice in the provision and delivery of services to address such complexities. Fundamentally it does not subscribe to a one-size fits all approach but highlights the need to better understand nuanced

approaches for a given situation in order to deliver fit for purpose outcomes for Māori and priority communities in Aotearoa New Zealand.

The Programme and related workstreams of the technical assessments, Te Whatu trials for community use, privacy and security, interoperability and market research are described using the evaluation framework through which an equity lense is applied. From this evaluation, 26 equity observations (refer to the full body of the report) were highlighted.

Key lessons learned with equity as a principled approach are offered as it relates to co-design, trust, data, digital inclusion and costs & benefits.

This Programme has exceeded its own scope embracing an equity dimension. In doing so, it highlighted that working in and alongside our Māori and priority (often vulnerable) communities *IS* possible and key learnings must inform the broader national contact tracing system.

Creation of Government policies grounded in equity for Māori and other communities is also necessary and such policies need to respond to ensure equitable investment for equitable outcomes.

Recommendations that inform future next steps are described under three broad areas as follows; People (Community), Process & Policy and Building Trust and Confidence in the use of Technologies.

People - Community: 'True' Co-Design

People are at the heart of community. We hear the oft cited whakataukī to illustrate the same:

Hūtia te rito o te harakeke,
kei hea te kōmako e kō?
Kī mai ki a au, 'He aha te mea nui i te ao?'
Māku e kī atu, 'He tāngata, he tāngata, he tāngata'.

If the heart of the flax is pulled out,
where will the kōmako sing?
If you ask me what is most important in this world,
I will reply, 'People, people, people'.

Taking a Te Tiriti-led approach of Partnership, Protection and Participation, it is the latter of these in meaningful participation that promotes equitable outcomes in our communities.

The Te Arawa Community Field Trial has demonstrated what is possible when co-designing a trial where a 'for Te Arawa, by Te Arawa' approach was taken. Localised, community-based and high-trust are the 'modus operandi' for success.

In the context of 'Community' it has to be noted that the great success of the broader Māori (iwi, hapū, whānau and individual responses) when the country went into lockdown alert level 4 in March 2020. The responses by iwi and hapū exercising tino rangatiratanga and mana motuhake resound today with a potential recipe for resilience supporting calls to 'protect our whakapapa' reverberating across Aotearoa.

Process & Policy - Equitable Investment for Equitable Outcomes

Partnership is at the heart of developing policies and processes from lived experiences, with a focus on equitable investment for equitable outcomes.

Simply put, this recommendation will demonstrate the prioritisation of our vulnerable peoples and communities ahead of middle New Zealand. This is encapsulated in another oft cited whakataukī which speaks to partnership and collaboration:

Nāu te rourou, nāku te rourou, ka ora ai te iwi.
With your food basket and my food basket the people will thrive.

Building Trust and Confidence – in Technology

Technology is an enabler and not the end in of itself. While it is a key focus in the equity report in terms of assessing digital technologies for contact tracing purposes, it should not be done so in a vacuum independent of the data flowing across the entire ecosystem, including pre-border controls and border management (MBIE, Immigration New Zealand, Police, Armed Services), and into the wider community (Māori - iwi and hapū), Government Digital Services, Ministry of Health, DHBs and PHUs to name a few.

Interoperability of technologies and how to extract the data in a useful way is but one part of the puzzle and has received significant attention to date. What a human does with that data is of utmost importance and highlights the real need to focus on the national contact tracing process more than technologies alone.

If a preferred technology stack is ultimately determined through community trials such as bluetooth enabled cards with Te Arawa and Contact Harald, beacon technologies pilot as with Paperkite and Rippl, EN Framework with the COVID Tracer app or other wearables, adoption in a vulnerable community must be a key determining success criteria. A one size fits all approach or a focus on servicing the same population that have devices and already have access to a range of choices is not acceptable. Nor is it an either/or choice.

Building trust and confidence in technologies and the role of it in enabling rapid contact tracing will require partnership (mana conversations) and meaningful participation (mahi conversations) in community settings in New Zealand and also with key partners internationally. The rapid development of the COVID Tracer app while outside the scope of this report, has drawn criticism in what was not done and resulted in a number of communities of Māori who refuse to use the app or simply cannot. Had consultation with Māori occurred early and co-design it is argued that this would not have been an issue.

The Te Arawa community trial provides an example of what a community partnership might look like and is an opportunity to carry forward key learnings into future efforts. Engaging across global indigenous networks with a focus on data privacy, security and control is an opportunity to share knowledge and lessons.

Iwi-led contributions in this sense could progress outcomes for indigenous and developing nations and peoples globally.

He rangi tā Matawhāiti

he rangi tā Matawhānui

The person with a narrow vision sees a narrow horizon

The person with a wide vision sees a wide horizon

Conclusions

1. Whilst the Programme was able to deliver a level of co-design, a key recommendation is to ensure a true co-design approach particularly covering both the problem space and implementation are co-designed by and within the community or iwi.
2. Two-way trust is a necessary component for co-design and needs to be addressed by establishing Mana and working together to build it. This application in other settings or contexts will aid in community responses in a more-timely fashion for contact tracing than what has been experienced to date.
3. Continued support of New Zealand's COVID-19 response needs true Partnership between the Government and Māori. It relies on mana conversations to be had at the beginning and in good faith, supporting the potential for reallocation of resources to be done in a way that acknowledges and supports shifts in the power dynamics for successful implementation of processes and Programme's in our Māori and priority (often vulnerable) communities.
4. Where human factors that go into a decision to activate a course of action or pull a trigger to send alerts in the instance someone tests positive, it is done so with a deeper and more

rich understanding of the communities, diversity of thought and action, and where required, training.

5. The 'and' option for technology selection needs to be explored in more detail, possibly with additional pilots to continue to explore the use of digital technologies in specific community settings e.g. within a specific rohe or across specific marae.
6. Ensure when engaging with technology platforms such as Google and Apple, doing so directly with Māori presents additional opportunities for sharing and understanding. The New Zealand Government should not be a passive user or customer in this sense. We need to be sitting alongside and informing our perspectives of what success in Māori and priority (often vulnerable) communities looks like.

6. Te Whatu Co-Design

A key objective of the Te Whatu trial was to determine whether codesign could be carried out effectively during a pandemic. As such, an evaluation of the codesign process of the Te Whatu trial between the Te Arawa Covid-19 Recovery Hub, the Ministry of Health, and the Universities of Otago and Waikato was commissioned. The He Pikinga Waiora (HPW) Implementation Framework (Oetzel et al, 2016) with its eight guiding principles, was designed to support the development and implementation of health interventions into communities. The framework contained assessment criteria to measure the extent to which each principle was applied over the course of an intervention. The HPW incorporates elements central to codesign and was used to evaluate the Te Whatu trial. Prior to the commencement of the trial, a clear and transparent definition of codesign was not agreed upon by all partners. With that context understood, this evaluation used the HPW framework to provide clarity of codesign elements and then assess the extent to which the Te Whatu trial was codesigned.

In order to achieve the evaluation aim, three objectives were developed to focus the data captured. They were to identify partner (Te Arawa Covid-19 Recovery Hub, the Ministry of Health and the University of Otago):

1. Expectations prior to implementation of the Te Whatu trial
2. Experiences of the Te Whatu trial process over the course of the trial, and
3. Strengths, barriers, and learnings of the Te Whatu trial process over the course of the trial.

The methods used within this evaluation study comprised of;

1. Observational field notes from the Lead Evaluator that captured comments from participants in both planned and unscheduled events over the duration of the Te Whatu trial. Such notes informed the questions for the codesign evaluation wānanga (focus group interviews), and guided data analysis.
2. An electronic survey disseminated to the three partners through the Te Arawa Covid-19 Recovery Hub communication team. The purpose of the survey was to capture each partner's perspectives regarding the level of satisfaction/engagement in the Te Whatu trial with participants selecting one of the following groups that best reflected their part in trial as; a Hub partner, an Academic partner or a Funding partner.
3. Codesign evaluation wānanga (focus group interviews) via zoom and kanohi ki te kanohi (face to face) were completed with each of the three partners, in separate clusters. Each of the three clusters had representatives that highlighted differing expectations and perceptions of the design and delivery process of the trial.

When assessed against the HPW implementation framework, the extent to which the codesign of the Te Whatu trial was implemented overall was deemed as, **medium**. The eight principles of the HPW framework with a description, summary, assessment rating and corresponding recommendation are:

Community Voice - Rated: Low

Community voice considers the participation of community members as end-users, or the intended primary beneficiaries of a programme/service, in contributing to the definition of the problem, and developing the solution.

Both the Academic and Funding partners approached the Hub partner with a predetermined problem definition “lack of accurate and timely contact tracing” and solution pathway “the Bluetooth-enabled contact tracing Card” (Chambers et al. 2020). Community input was prioritised as a factor for the success of the trial, though this was not a reality until the design and implementation phases of the Te Whatu trial, not during the problem identification and solution development stage.

Including community voice from the outset is critical. During the current climate of a global pandemic consideration of the local lived experiences are central to identifying problems and developing responsive solutions.

Reflexivity – Rated: Medium

Reflexivity considered how the implementation team was reflexive, which resulted in adjustments to the intervention. This assessment component examined how the power and privilege of the researcher was recognised, and to what extent this influenced the intervention team, and in turn, the intervention.

Effectively the Funding partner determined what was needed, Academic partner developed the Te Whatu Research Protocol and the Hub partner led the implementation of the Te Whatu trial. The implementation team comprising members from [each partner] made numerous adjustments to the Te Whatu trial during implementation. However, the extent to which these adjustments were as a result of reflexivity, or the implementation team’s expertise and knowledge when working with their community, was not clear.

Incorporating implementation teams during design of research interventions, providing a more accurate representation that adjustments made to interventions should be as a result of equitable sharing and reflexivity.

Structural Transformation and Resources - Rated: Not undertaken

Structural transformation and resources explored how the intervention results in significant structural transformation and resources which are sustainable over time. This HPW principle is outside the scope of this evaluation as the Te Whatu trial was not intended to be a long-term intervention, therefore a rating could not be provided.

Structural transformation is more appropriate for consideration at the wider contact tracing Technologies Prototype and Research Programme level. With regards to the evaluation, the Ministry of Health would be better suited to consider structural transformation at the broader Programme level. However, to demonstrate shared partnership, Iwi partners must be provided with equitable resourcing, budget, infrastructure, personnel/expertise, to design and implement future programmes or interventions.

Community Engagement - Rated: Medium

Community engagement considered the level of involvement, impact, and trust with community members. Central to strong community engagement is bi-directional leadership, decision making, and communication.

During the implementation of the Te Whatu trial, communication between the partners and the Ngongotahā residents was two-way. The employment of Ngongotahā residents as kaiāwhina for the Te Whatu trial enabled the partners to utilise the knowledge and expertise of the Ngongotahā residents and ensure high uptake for the trial. The leadership and expertise of kaiāwhina, the majority of whom were Ngongotahā residents, was privileged in the implementation of the trial. The time restrictions of the trial impacted the breadth of communication between the Hub partner and the Ngongotahā residents.

While a partnership was formed amongst the three partners (Hub, Academic and Funding) critical decisions were not shared amongst the community, such as the decision to change the card from CovidCard to the CTC.

Ensuring appropriate time is awarded to prioritise communication with community stakeholders; allowing appropriate engagement processes to occur, i.e. kanohi ki te kanohi with Iwi and Hapū leaders and wider whānau is foundation to effective community engagement.

When the community are involved in the inception of interventions as an equal partner, these actions will go toward avoiding or effectively mitigating potential issues of mistrust and suspicion that could arise during community engagement.

Integrated Knowledge Translation – Rated: High

Integrated knowledge translation explored the process of bi-directional learning that resulted in information tailored to knowledge-user needs.

The bi-directional learning evidenced across the three partners and the kaiāwhina, resulted in a tailored Te Whatu trial for Ngongotahā residents. The incorporation of the kaiāwhina into the trial implementation, had positive impacts in regard to trial participant recruitment. Though there was a gap in supporting the training of the kaiāwhina team due to time constraints, it was recognised that this could be mitigated in the future by ensuring adequate training is prioritised.

Involving knowledge users, such as the local community, in the design of the interventions, will result in far more successful outcomes. By doing so, information can be tailored at the conception of research as opposed to during the implementation of an intervention.

System Perspectives – Rated: High

System perspectives examined multiple standpoints, world views and values within an intervention. Central to system perspectives was the extent to which the intervention considered multiple causes, had a broad focus, and offered multiple solutions.

Each of the three partners provided a systems perspective in the implementation design of the Te Whatu trial, which was then applied in the trial. Both the Academic and Funding partner considered multiple causes and solutions to the problem, “lack of accurate and timely contact tracing”, and proposed a solution with high equity considerations for Māori and priority (often vulnerable) communities. Led by the Hub partner, these considerations were applied throughout the trial and evidenced by the multiple perspectives, world views and values of the three partners. The inclusion was evident despite the absence of contribution from the Hub partner or Ngongotahā residents at the initial stages of the research design for the Te Whatu trial. Commitment of the Hub and Ngongotahā to ensure the success of CTC positively contributed to this area.

Involving multiple perspectives in design for interventions will ensure that multiple world views and values underpin entire initiatives from the outset and not just the implementation stage.

System relationships – Rated: Medium

System relationships examined whether an understanding of the complex relationships between the variables in feedback loops, time delays and multi-level effects, were considered for the Te Whatu trial.

A moderate understanding of system relationships was evidenced. For instance, time constraints resulted in a lack of clear and accurate communication amongst the partners. Details about the Te Whatu trial to kaiāwhina (recruiters) was incomplete, and consequently trial participants were at times misinformed.

The critical decision to change the card supplier from CovidCard to Bluetooth-enabled contact tracing Card (CTC) resulted in delays communicating with Ngongotahā residents and extended the Te Whatu trial start date.

Incorporate the use of an inclusive assumptions and risk register and ensuring variables such as feedback loops, time delays and multi-level effects are identified, and clearly documented, during the design and development of interventions will result in far higher success rates.

System Levels – Rated: High

System levels consideration related to the ways in which the intervention targeted change across the macro, meso and micro levels (Oetzel, 2016).

Throughout the entirety of the Te Whatu trial, including the design, development and implementation phases, the intervention targeted change at the macro level (Iwi and national), meso level (Hapū and wider community) and micro level (whānau/family and individual).

Ensuring future interventions continue to consider the complexities of the different macro, meso and micro levels and demonstrate how these factors will impact the implementation will maximise the effectiveness at all levels of an initiative.

Conclusions

1. On the basis of the findings provided in this report, the Te Whatu trial codesign process was not an accurate representation of true codesign. However, the learnings from the Te Whatu trial codesign process can be implemented into future health, pandemic and other interventions for authentic codesign to be achieved.
2. Immersion of Iwi and by extension community, as equal partners, demonstrated by providing Iwi with equitable resourcing budget, infrastructure, personnel/expertise and sovereignty, to design and implement any initiatives following on from the Programme. During the current climate of a global pandemic consideration of local lived experiences and the nuances are central to identifying problems and developing responsive solutions.
3. Immersion of Iwi and by extension community, in the design of future health pandemic interventions; reinforcing the inclusion of multiple world views and values to underpin entire initiatives, and not just implementation stage.
4. Ensure appropriate time is awarded to communicate with key stakeholders in the lead up to an intervention; allowing appropriate engagement processes to occur, i.e. kanohi ki te kanohi with Iwi and Hapū leaders and wider whānau.
5. Ensure future interventions continue to consider the complexities of the different macro, meso and micro levels and demonstrate how these factors will impact the implementation.

7. Te Whatu Research

As part of the Programme, the community field trial of the card took place in Ngongotahā, Rotorua. The trial was a partnership between the Te Arawa COVID-19 Response Hub, University of Otago, University of Waikato and the MoH. The trial's objectives, design and implementation were aimed to be conducted through a codesign process that placed community members at the heart of the intervention. The aim of the research was to measure the acceptability and aspects of efficacy of a Bluetooth contact tracing card in a public field trial. Specifically, the research sought to investigate:

1. Do whānau see value in and use the Bluetooth contact tracing card?
2. How effective is the card at capturing contacts and enhancing contact tracing?
3. Do end-users see value in digital contact tracing?

The University of Otago conducted a cohort study examining the efficacy and acceptability of the card among a community in Ngongotahā, Rotorua. All participants, of which there were

1,191 in the cohort received one card. Nested within this cohort study, a small trial was conducted comparing the card data with case investigation data collected by trained case investigators at three Public Health Units (PHUs). The study also compared case investigation data to card contact data from the same participants.

To assess the acceptability of the card by participants and end-users, the study conducted quantitative and qualitative evaluations. Quantitatively, the study distributed an exit survey to participants after they had participated in the study with 23% of the overall participants signing up. Qualitative interviews and focus groups allowed for an in-depth exploration of the experiences of those who had worn the card and those who deal with the data PHU case investigators and the National Investigation and Tracing Centre staff.

In total, 753 participants had valid data for the study period (63% of all participants). Consistency checks of the valid card data showed there was a 96% consistency level between cards, that is, the interaction between card A and card B is reciprocated on card B. Most inconsistencies were for interactions between two and five metres and between two and five mins - interactions of limited clinical relevance. In contrast, consistency checks for case investigation data had a consistency level of 64% at the day level, showing that participant recall is potentially subject to substantial recall bias (accuracy or omission of information).

There were 119 participants that completed case investigations and also had associated card data. Case investigations reported 2,970 close contact events, of which 436 could be directly linked to the registration database (15% of close contact events). This proportion gives an indication of the quadratic dependence of uptake, whereby, the ability to detect close contacts is a factor of the uptake (e.g. 40% uptake results in a 16% detection of close contacts, 40%*40% = 16%).

Initial analysis of card and case investigation data concordance revealed the card data had a 35% match rate for close contacts defined as <2m & >15mins (“close contact definition”) and 63% for contacts defined as <5m & >2mins (“casual contact definition”). However, it is estimated that the majority of the non-matched contact events at the casual contact level was attributable to 1) participant non-compliance - that is, one or more participants not wearing a card; and 2) inconsistencies in case investigation data - participants recalling the wrong day of interaction (recall bias).

Adjusting for participant non-compliance and case investigation inconsistencies, the estimate is a match rate of 55% applying a close contact definition and near 100% using a casual contact definition. In all analyses, the card was significantly more likely to detect household close contacts compared with non-household contacts, perhaps demonstrating limited added value when arbitrary spatial-temporal parameters (time/proximity) are imposed. However, these findings show that the application of the data to inform casual contacts would almost certainly pick up a case’s clinically-relevant close contacts and contacts that are at risk but are not typically notified within the current contact tracing process.

Exit survey respondents felt positive about wearing the cards and signalled they would be happy to wear them in the future (97% of respondents). However, participants would be more likely to want to wear the card when there were active cases (reactive) than when there were no cases (precautionary). Key motivators of future use were to avoid lockdowns, seeing other people wearing cards and increasing privacy controls. The main concerns about a wider roll out of the card included the Government failing to protect the identity of people testing positive for COVID-19 or close contacts of an active case. Concerns about Government use of data were experienced by each ethnicity but Māori participants had significantly higher concerns about Government misuse of data than New Zealand European participants. Younger participants were more indifferent towards the card (neutral feelings) and less likely to want to use it as a precautionary measure than older participants.

Whānau interviews found the card was easier to use than the COVID Tracer App and less of a risk to privacy than writing down their contact details. People believed the card was more inclusive than the app for older, disabled and illiterate people. However, hazards in wearing

the card were reported for certain occupational groups (e.g. forestry) and some found wearing the lanyard awkward or unfashionable. Simple communication/education about how the card works, how it should be worn, what information is collected, and that the card does not track people, is required. Participants thought the MoH or approved health agencies should oversee card data, which should only be used for COVID-19 contact tracing purposes. Community leaders (kaumātua, churches, schools, gang leaders) were reported to be key to gaining maximum community uptake for technology, alongside highly trained people and local community information hubs.

Focus groups with end-users of digital contact tracing data revealed there was an appreciation that digital technology could help with contact tracing, with the acknowledgement that countries like Taiwan had avoided a lockdown with strict COVID-19 response measures supported by digital contact tracing technology. However, it was seen only as a supplement to the current system, a tool to help with the [approximately] 20% hard-to-reach individuals. There were major concerns around the operational model that would be adopted (how the data would be used) and its potential adverse impacts such as citizen burden of isolating, mixed messages to public, workload of both case investigators and civil servants (reporting). Concerns around privacy and equity were also raised. However, there was little comment about the privacy and equity implications of the current model or technologies in use– e.g. differential performance of contacting Māori close contacts compared to New Zealand European close contacts. Overall, there was some value seen in producing a short list of close contacts with contact details (within a centralized system), prioritised testing and a case investigator dashboard. There was little value seen in recursive contact tracing, automatic identification or notification of *close* contacts.

Conclusions

1. The trial showed relatively high uptake is possible through effective planning and community led co-design.
2. The cards had a high level of consistency demonstrating that almost all clinically-relevant interactions are reciprocally recorded on a pair of cards.
3. The quadratic dependence of uptake was exemplified by only 15% of close contact events recorded in case investigations matching the participant registration database - our effective detection rate for close contacts.
4. Interoperable solutions are required to address the serious problems of uptake and equity to achieve efficacy with an app-based digital contact tracing strategy.
5. Compliant adoption is a serious concern for digital contact tracing technologies. Around 35% of participants did not record any data at all, suggesting any future strategy will need to consider stronger measures to improve compliance, in particular education programmes.
6. When adjusting for non-compliance and case investigation inconsistencies, the cards detected around 55% of close contacts with arbitrary spatial-temporal parameters (time/proximity) imposed, but detected at some level, almost all clinically relevant close contacts.
7. Digital contact tracing technologies are well-placed to deal with casual contacts and assist with close contacts in outbreak scenarios.
8. High recruitment, whānau interviews and exit surveys showed high acceptability of the technology by participants when its purpose was understood.
9. Younger participants were harder to recruit, less likely to be compliant adopters of the card and less likely to adopt the card as a preventative measure compared to older participants.

10. The major concern about the technology from participants was around Government use and protection of their data, particularly for Māori participants.
11. End-users of digital contact data raised concerns over increased workload, issues with public communication and the operational model. There was wide agreement that if implemented, technology would not replace any of the core case investigation processes related to close contact identification, notification or monitoring.

Ultimately, there is a place for digital contact tracing technologies in the COVID-19 response, but they require high uptake, compliant adoption and moulding around the existing contact tracing infrastructure (likely with a focus on casual contacts). Further, no one solution is likely to achieve the uptake and compliant adoption required to materially improve contact tracing, so interoperability of multiple solutions is central to any digital contact tracing strategy.

8. Interoperability

The purpose of this interoperability work was to build and share a common understanding of how Bluetooth technology and digital data could be integrated into the National contact tracing System and the contact tracing process.

The work describes the current processes and systems in place along with the strategic direction provided by Cabinet. This was then complemented with the intent of the Programme along with a summary of current evidence and intelligence from researchers and other jurisdictions.

This suggests we should consider Bluetooth as an aid to contact tracing rather than a replacement. This is largely due to the known technical limitations of the technology.

Coverage is fundamental to how the solution can support contact tracing; however, the amount of coverage should be considered as supplement to the existing process and other controls such as QR codes and third-party data, rather than in isolation.

A key question to be answered is the impact of this on the number of people managed in an outbreak. Rates of notifications for different settings in other jurisdictions appear to be driven by coverage, population density, the signal thresholds, time thresholds and the volume of social interactions (affected by lock downs).

Next, there are some key differences between a centralised and de-centralised model. In a centralised model, the relationships between the case and close contacts is known to the Contact Tracer, potentially exposing illegal acts, immoral behaviours or situations of deprivation. Exposing these may reduce participation in groups that have low trust in government. The alternate model leaves revealing the relationship in the hands of the contact. This relies on the contact participating in the contact tracing process.

As a part of the work a conceptual model (refer to the full report) has been developed to help understand the components that influence and drive the use of digital data. This highlights four aspects:

1. **Context** – understanding the outbreak, case and exposure event of interest are important when using the data
2. **Constraints** – a number of constraints need to be worked within to ensure that the notification doesn't cause more problems than it solves
3. **Risk stratifying** – understanding how we stratify groups is important as this helps us define who receives which message and call to action
4. **Messages and calls to action** – given the context and constraints, there is a need to understand effectiveness and participation when messages are determined.

Implementation planning needs to consider that this is a new tool for contact tracing. The document describes some key processes and initial settings that would apply for an interoperable Bluetooth EN implementation. Consideration was given to MoH policy and the Governments algorithm charter when implementing a system such as this.

These considerations have been summarised into three principles for implementation with an the recommended use of an operational governance group to review the use of the system through implementation in order to minimise risk and maximise the benefit to New Zealand. These principles are:

1. Use an Active Learning approach to ensure that we learn from using the system.
2. Start from a manual process before automating.
3. Start from conservative settings before choosing more aggressive settings.

The key finding from this work is that to be truly effective with the use of technologies to support contact tracing, they *must* be interoperable. Solutions that are independent of each other, whilst possible being effective in isolated instances, such as workplaces, gatherings or even isolated communities, will detract from the overall efficacy of the pandemic response. The use of a de-centralised (user owned and controlled) data model and interoperable technology, such as smartphones and different types of wearables, will have a positive effect on being able to more rapidly get control or outbreaks, especially in situations where multiple instances might be the case.

Conclusions

1. To support effective coverage and with the knowledge that no one technology will be fully effective in ensuring the level of coverage is as high as possible, the focus needs to be on technology that can operate together as an ecosystem.
2. Ongoing conversations with counterparts in Singapore, Ireland and the UK have highlighted that interoperability across systems to allow the flow of data is key to maximising coverage as combining multiple sources allows a complete picture to be built up, which in turn leads to greater efficacy.
3. To support more effective contact tracing, data used must be integrated into, and be valuable to the National Contact Tracing System. This is consistent with the model reported in Taiwan.
4. Given there is no one size fits all technology available today, increasing the coverage through offering multiple interoperable technologies to people and communities is important, as acceptance and use of the technology will support more timely and effective contact tracing.
5. Using different sources of information will provide Contact Tracers with data that may also contribute to identifying the source.

9. Contact Tracing Technologies Market Research

A key workstream within the Programme was the commissioning of a research undertaking by Colmar Brunton to understand New Zealander's perceptions of contact tracing technologies.

This research explored New Zealanders' attitudes and expectations towards contact tracing technology, in particular the use of Bluetooth in smartphones and wearable technology (e.g. the COVID card).

Specific objectives of this research were to:

- Understand how likely New Zealanders are to use a smartphone App with Bluetooth enabled, or a wearable technology,
- Identify barriers to the adoption of these technologies,
- Explore contextual factors which may influence their use,
- Clarify who these technologies appeal to, and how they may reach different audiences.

Findings reported that New Zealanders broadly believe that extreme situations require extreme measures … but the situation in New Zealand is not extreme, especially when compared to many overseas countries, reporting that:

- There is no clear sense of urgency in terms of a COVID response, even among those who are compliant.
- Overall, the qualitative research findings suggest there's a big *education* piece missing around (a) the longevity of the situation we're in and (b) that viruses will come back again, and we need to be ready … but without scare mongering.
- At the same time most people report that they are doing something and using the App (in its current form) is a key part of this.
- For the majority of people, the giving up of small freedoms is the price they are willing to pay for the benefit of protecting the health of people in their communities and to protect the economy.
- But there are some who are either jaded or non-believers and this is driving non-compliance.
- Visibility of COVID prevention behaviours serves as an important reminder and reinforcer of social norms. For the difficult and deniers in particular who are less motivated by health and economic outcomes, this exerts a social pressure to comply.

Key learnings from the market research include that:

1. New Zealanders are willing to use technology for contact tracing - A majority of New Zealanders think contact tracing is important and are supportive of using technology to make this effective and efficient. Most support the Government providing the public with contact tracing technology and are likely to use either the App or wearables. However, there still remains over a quarter who may yet to be convinced.
2. The use is directly attributable only when they feel there is a real risk - When there are active cases, compliance is likely, but not so when the risk seems further away. Compliance is more likely with older people and in places where there are people unknown to them (e.g. shopping centres).
3. There is a key concern about data privacy - This is the main reason that people don't support contact tracing technology, and this concern is greater among Māori. Barriers around the App also relate to data security, Bluetooth draining the phone battery, cost of data usage, and access for those with old phones. Barriers around wearables include the visibility, look, size and method of wearing. It can be seen as 'another thing to carry' so people remembering to take it with them is a concern. There is also a perception that wearables will cost more to the taxpayer than the App.
4. Apps and wearables appeal to different audiences - Smartphone users, the Bluetooth enabled App appeals as an easy 'set and forget' option. Having new enough smartphones is a concern, particularly for those on lower incomes. Wearables appeal as easy. Over 70's are especially positive, though assistance may be an issue. More people prefer wearables than the App.

5. There is a tension between what is easy and what is familiar - When it comes to the App, it may have shortfalls, but people know what they are dealing with. It is comfortable because it's familiar. There is a greater sense of personal control, which is important when it comes to data privacy. However, wearables are easier 'to use' and this is also important. If people are going to adopt a long term behaviour it needs to require minimal effort. People recognise this value in wearables.
6. New Zealanders need more encouragement to take up contact tracing - A third of Kiwis are highly committed to proactively using technology to support contact tracing. However, about 14% have resistant attitudes and see it as an invasion of privacy. They are unlikely to be convinced. Over 40% of New Zealanders have been identified as Fluctuators and so need more encouragement and education. They are receptive, but simply don't think that there is enough risk. The key factors that will make a difference to getting them on board is a heightened sense of risk, as well as the prospect of avoiding lockdown and reassurances around data protection. When it comes to wearables, the creation of social norms (seeing others wear one) can also provide a nudge.

Conclusions

1. People need convincing on why it's important to contact trace, even when the risk seems remote.
2. A wider education piece is needed to inform New Zealanders of the value of contact tracing when there is low or no community transmission.
3. People need to know that widespread use of these technologies before cases arise is key to avoiding future lockdowns.
4. Promoting a collective effort and creating a social norm around technologies is important.
5. Uptake will be better if people feel in control of their data and choices. With privacy and data concerns a key barrier to using the technologies, the message needs to cut through that the individual is in control. It will be critical to highlight that data is stored on the device, they need to provide permission for officials to access it, and that data is deleted in a short timeframe.
6. Reassurances about data privacy will only go so far with Māori. There are wider issues relating to trust in government that communications cannot bridge. To appeal to Māori the focus should be on manaakitanga and caring for the vulnerable.
7. It will take a collective effort to keep everyone safe. The uptake of wearables will be better if people have choice around how to wear it and are able to choose less visible ways of wearing.
8. Coverage can be maximised if multiple technologies are employed. Wearables and the Bluetooth enabled smartphone App appeal to different groups of people. While some would be able to adopt either technology, coverage will be maximized through employing both.
9. With New Zealanders more concerned about the cost of wearables, these could be targeted towards those who are less comfortable with technology, or those are unable to adequately use the App due to having an older smartphone or none at all.
10. Language is key. Minimise technical terms and refer to tracing not tracking. While some people will want to know that Bluetooth technology is used in the App and wearable, most do not need to know the detail.
11. The more technical descriptions are provided, the more likely it is that those who do not feel confident using technology will be put off by them (i.e. they think they need to learn or have specialist knowledge).

12. Some people will want this detail so referring them to where they can find out more is better than trying to cover this in mainstream communications.
13. To ensure the message is heard that these Bluetooth technologies do not store location data, it's key to refer to tracing rather than tracking. People need to be clear that tracing is about their interactions with others, and not about the Government knowing where they have been.

10.Privacy Impact Assessment

The principles assessed against included respect for privacy to ensure efforts build trust with communities and a commitment to uphold the principles of Te Tiriti o Waitangi.

The Privacy Impact Assessment (PIA) was conducted as part of the Programme to evaluate the privacy impacts of augmenting New Zealand's case investigation and contact tracing process with information gathered from Bluetooth-enabled digital technologies. The resulting privacy report should be read alongside the Mana Whakaora Equity Report to fully understand the social and cultural license considerations for contact tracing and adopting new technologies for augment contact tracing.

Potential uses to augment the contact tracing process with data collected from Bluetooth-enabled technologies, are automated notification for close contacts; pre-populated contact events; updated contact details; increase in identified close contacts; increase in prompted known casual contacts; identify unknown casual contacts; recursive contact tracing; prioritised testing; transmission source identification; and refining the close contact definition.

The data model designed for the Ngongotahā trial was very strongly driven by Te Arawa and the community in the co-design process. Te Arawa leadership provided the cultural and social license providing trust in the trial and encouraging participation.

Privacy concerns were identified in the market research as key barriers to using the technology. The main barrier was the Government failing to protect peoples identity if they did test positive, or if you were in contact with a person who tested positive. These are fundamental concerns with how the MoH and broader government agencies manage personal information in the contact tracing process.

The trial showed Bluetooth-enabled contact tracing card technology has limited real-world application for identifying close contacts but could greatly increase the ability to identify casual contacts. Designing the parameters to capture these interactions will negatively impact privacy by increasing the false positive rates. Feedback collected from participants emphasised the importance of education about what the card does and does not do, with reassurance that the card would not be used to track people's locations or movements (it is about who you've seen; not where you've been). Communications/education should be driven through community leaders and knowledgeable people, and available in multiple media formats.

Participants clearly indicated access to the data must be limited to the Ministry or Health teams involved in helping against the pandemic and only used for contact tracing.

The system works by each card collecting personal information about another person. The information about others would then be collected by the Ministry. While this is not directly from the person it is about, this collection is necessary for digital contact tracing to work. This collection is authorised by the person it is about as long as it is clearly explained to them prior to them using the technology.

Clear and non-technical explanations of how technologies work and how the information is used are vital for obtaining informed consent and for mitigating privacy impacts.

Additional user control over information use would mitigate the privacy impacts of additional or related uses, e.g. for research.

Submitting to a COVID test impacts negatively on physical privacy. Any notices generated from digital contact tracing informing a person to submit to a test should be reserved for higher risk interactions. Any compulsory testing must be directed under legislative powers.

Retaining interaction records collected at testing that are not used for contact tracing has a negative impact on privacy. Undefined retention periods and disposal requirements increase the risks to privacy.

The level of inaccuracy in the collection of interaction records must be considered when designing the recommended interventions. People should be able to easily challenge or correct a notification if they have a reason to believe it is inaccurate.

Additional or unexpected use and disclosure of personal information has a negative impact on privacy. These are currently insufficiently defined. Digital notifications and being able to better identify close and casual contacts by interaction with an infected person could reduce current privacy impacts of the contact tracing system.

An approach is recommended for any future use of digital technologies to mitigate the privacy impact and manage privacy risks. The recommendations focus on activities designed to develop trust in the contact tracing process. If MoH intends to use Bluetooth-enabled digital technologies to support the contact tracing process, it must take steps to:

- strengthen its governance arrangements regarding personal information management and use in the contact tracing process;
- regularly obtain assurance the controls in place to manage the privacy risks are working properly; and
- provide greater transparency about how people's information is used in the contact tracing process, and explanations of the MoH privacy practices and improvements to manage personal information.

Conclusions

1. A devolved data governance model for identifiable information based on a strong community partnership be explored for nationwide use of technologies.
2. Policies are required to clearly set out:
    - The approved or authorised purposes the information can be used for, requirements for disclosing information, and oversight activities.
    - Decision-making criteria for consideration and approval of future enhancements to the contact tracing process, including new technologies and use of algorithms.
    - Decision-making criteria for consideration and approval of research proposals.
    - Requirements for the retention and disposal of records, reflecting the need to routinely dispose of interaction records collected but not required for use in the contact tracing process.
3. The MoH governance arrangements should include Māori as Te Tiriti partners and actively involve an external stakeholder reference group to provide a 'community view' input into Ministry initiatives using people's data and independent oversight of activities.
4. Existing performance indicators for the contact tracing process should be updated to include quality and trust/engagement criteria.
5. MoH should undertake a risk analysis of the privacy risks in this report.

6. An assurance programme to regularly obtain assurance the controls in place to manage the privacy risks are working properly, should be developed.
7. The assurance programme focus on authorised uses and disclosures to provide confidence these are occurring only within acceptable parameters. Regular reviews of use and disclosure activities must also occur.
8. The adoption of any new technologies must be supported by a comprehensive and sustained communications/education strategy providing clear information about what the information collected will be used for and plain language explanations of how the technology works.
9. Moh should provide a single source of information about privacy and security for the end-to-end case investigation and contact tracing process.
10. MoH must be transparent about algorithms used. Explanations of decisions – and the analytical activities behind them – should be in clear, simple, easy-to-understand language.

Privacy is ultimately about maximising the opportunities for individuals to determine how they engage with agencies and managing information to meet their expectations. High levels of transparency about what information is needed and what it will be used for is essential. Providing individuals with ways to control their data is one mechanism to enhance privacy. MoH, to achieve its public health goals in relation to COVID-19, must address the information management expectations of Aotearoa New Zealand's diverse people and communities.

11.DTA Pre-Trial Assessment

The Defence Technology Agency (DTA) carried out a rapid assessment of the cards and software for the CovidCard Bluetooth contact tracing system, to ascertain whether the system was satisfactory for a short field trial involving several hundred participants.

Specific system requirements for the field trial were:

- Encryption on the cards to protect the interaction logs in the event a card is lost,
- A rotating random identifier, unique to each card, so that the cards cannot be tracked,
- Firmware tested and guaranteed to be stable for the duration of the trial,
- A means for secure over-the-air download and decryption of data from cards at the conclusion of the trial.

Based on the testing conducted, and additional technical specifications provided, the security, privacy and stability requirements of both cards tested for the field trial were met.

A selection process was initiated between the CovidCard platform (Virscient) and the Contact Harald Platform (Safedome), with the Safedome platform being successfully selected for the trial.

12.DTA Technical Assessment

DTA carried out an initial assessment of the Contact Harald (CH) contact tracer platform, to ascertain whether it was satisfactory for a seven day community field trial. Subsequently DTA asked what further development and testing would be needed for a population wide deployment of this technology.

The cards transmit Bluetooth Low Energy advertising packets containing an encrypted identifier allowing other cards to detect and record the interaction. If a peer card is detectable for more than two minutes continuously the contact is stored on the card for later retrieval.

When needed, contact logs can be downloaded from the card using an iPad app and then uploaded to a server. User identifiers in the contact logs can be decrypted and matched to people registered with the system. Contact Harald is intended for use in the workplace, and at the time of the trial was deployed at a number of sites in Australia.

DTA reviewed the technical aspects of the CH system, including card hardware, cryptography, server components and the handling of personally identifiable information.

The review was undertaken based on documentation provided by the vendor, an evaluation kit containing sample cards, and access to a CH web application set up for DTA. Where additional information was required the vendor was contacted via email and/or teleconference.

DTA's assessment of the privacy and security of the CH system stated that it was satisfactory for a small-scale community trial, if all personally identifiable information is stored in a separate database.

Conclusions

1. Unique AES-128 tracing keys be used for each card and stored in volatile memory
2. All personally identifiable information is held in a local database operated by the New Zealand government
3. Confirm that accepted certificate management protocols are observed
4. Card firmware, including key material, be loaded prior to registration by trusted agents in New Zealand
5. Over-the-air updates of firmware should be disabled following registration
6. A random variation to the rolling proximity identifier (RPI) change interval should be investigated. This may further mitigate risks of an attacker correlating RPIs across transitions
7. Visitor sign in/out functionality should be disabled in both card firmware and the iPad app
8. Cryptography and data protection be reviewed by an independent security expert
9. An option to view low confidence RSSI contacts should be added in the web application
10. Physical robustness testing is performed
11. The potential for an accelerometer to extend battery life is explored.
12. Any modifications to the system should continue to ensure that:
    - There is no mechanism for a user to access their data for viewing or modification after registration
    - Uploads are one way with a simple acknowledgement of receipt. No inspection or modification of uploaded data should be possible, even to direct administrators of the central database.

The recommendations in the report were necessary but not sufficient to justify a national deployment of the CH contact tracing platform. Important additional factors for consideration included user acceptance, distribution channels, the possible need for a mandate, and a cost-benefit analysis of card-based vs. smartphone-based digital contact tracing systems. Interoperability was seen as a key factor for consideration.

13.Next Steps

Improving Efficacy of Contact Tracing Technologies

Trials have concluded that coverage, uptake and correct use are all critical to ensuring the efficacy for contact tracing technologies.

Maori and priority (often vulnerable) communities are most affected by the lack of coverage, but without their inclusion, the overall efficacy across Aotearoa New Zealand is adversely affected. This was proven in the trial by confirming for instance that a total 60% population uptake of the Card will only produce 36% effective coverage.

This definitive 'gap' between those with access to technology and those without, creates a significant issue for contact tracing efficacy due to this group being excluded from use of the App and QR scanning.

The focus of follow-on work from the programme will include how this gap can be filled to ensure equitable inclusion in our overall contact tracing capability.

Technologies that are interoperable with the App, along with strong community partnerships, will deliver the greatest level of efficacy for supporting contact tracing as well as strengthening other COVID responses e.g. MIQ and testing.

Achieving equity across all communities is critical for supporting the governments COVID objectives, as well as supporting better outcomes for ongoing initiatives.

A network of [differing] communities with the ability to learn from each other should be considered as a critical element for future success in COVID related and potentially other equity-based work.

Equity and Bridging the Digital Divide

Immediately following the completion of the programme, a working group was formed to look at where the findings from the Programme, in particular around equity and codesign, could be used to increase opportunities to improve current approaches in delivering initiatives to Māori and priority (often vulnerable) communities in Aotearoa New Zealand. The group included represetitives from Te Arawa, Ngati Toa, Ngati Porou, Porirua Pasifika, Waikato University and MoH.

Using a strategic logic [facilitated] approach, the group developed the basis of a framework for applying true partnership to initiaitves aimed at addressing equity in the communities in question. This framework (refer appendix 1) will target the follow on activities from the Programme, including further initiatives for contact tracing technologies.

Likely benefits in applying the approach include:

1. increased efficacy of outcomes
2. higher levels of uptake
3. increased cost effectiveness
4. faster responses from Agencies
5. more positive community outcomes
6. faster/earlier interventions (with proven solutions)
7. enhanced wellbeing, prosperity and mana

The group also identified required changes and enablers that are needed to deliver these benefits.

There has been universal agreement by the working group, that taking this approach is the appropriate next step for contact tracing technologies, including considerations aimed at bridging the digital divide through and post COVID.

Ministry of Health Officials are assessing options for several community-based initiatives aimed at improving digital inclusion for contact tracing, along with consideration for increasing technical literacy and use in Maori and priority (often vulnerable) communities.

The first step will be to identify the candidate technology that is available and meets the necessary contact tracing requirements e.g. interoperability with the App.

Any initiatives resulting from the current assessment, using interoperable technology, would be done within several communities in partnership with the Ministry of Health. Learning from the Te Arawa partnership, and aimed at building on a network of communities, initiatives would focus on enabling access to interoperable digital services for communities themselves to distribute how they know best, to improve digital literacy in supporting contact tracing from within.

The timing of any initiatives will be dependent on device availability i.e. timely development/availability of suitable devices has been completed to support them. Identifying possible community candidates is a current priority.

Further insight gained from the Programme, includes an opportunity to expand the scope of options to the government's broader digital inclusion objectives.

Digital services are estimated to be available to approximately 84% of the population. Comparing the cost of a contact tracing only solution (MoH estimate of $25 per person per annum), with a broader approach (MoH estimate of $120 per person per year), suggests a higher cost but with greater benefits.

This broader approach would use learned experiences to help shape the work being done in government around the wider digital inclusion space. Some of the difficulties already experienced in this space could also be addressed using the same approach suggested for contact tracing technologies, particularly in the codesign space. In this instance it would be recommended that the contact tracing needs be addressed through the wider digital inclusion work.

Ongoing work will be dependent on a decision by Ministers on which approach to take and the ability and timing to secure final agreement and funding for initial opportunities. Subject to that, reporting back will be ongoing, however, the initial feedback would be expected soon after any initial codesign process has concluded.

Consideration should also be given to which Agency would be best placed to lead this work, given that work directed at contact tracing is currently led by MoH, whereby the wider digital inclusion programme is led by GDCO.

In the case where taking a wider digital inclusion approach was the preserence, the contact tracing technologies work would be completed as part of the broader scope and delivery.

Overall, with the additional required planning, setup and support for a wider digital inclusion, this approach would take longer to complete compared to just that required for filling the gap for contact tracing.

The Programme experience suggests that whilst the 'what' aspect of any resulting initiatives would be firm, the 'how' will be developed through a true codesign approach with the respective communities and shared through the planned network.

The gained insights around true partnership and codesign attained from the Programme and the equity-based approach would be followed for these initiatives.

It is proposed that this approach also be used for the COVID vaccine programme aimed at increasing coverage, uptake and speed of deployment in Maori and priority (often vulnerable) communities.

Other government initiatives being considered from an equity and/or codesign perspective, may also benefit from the proposed approach.

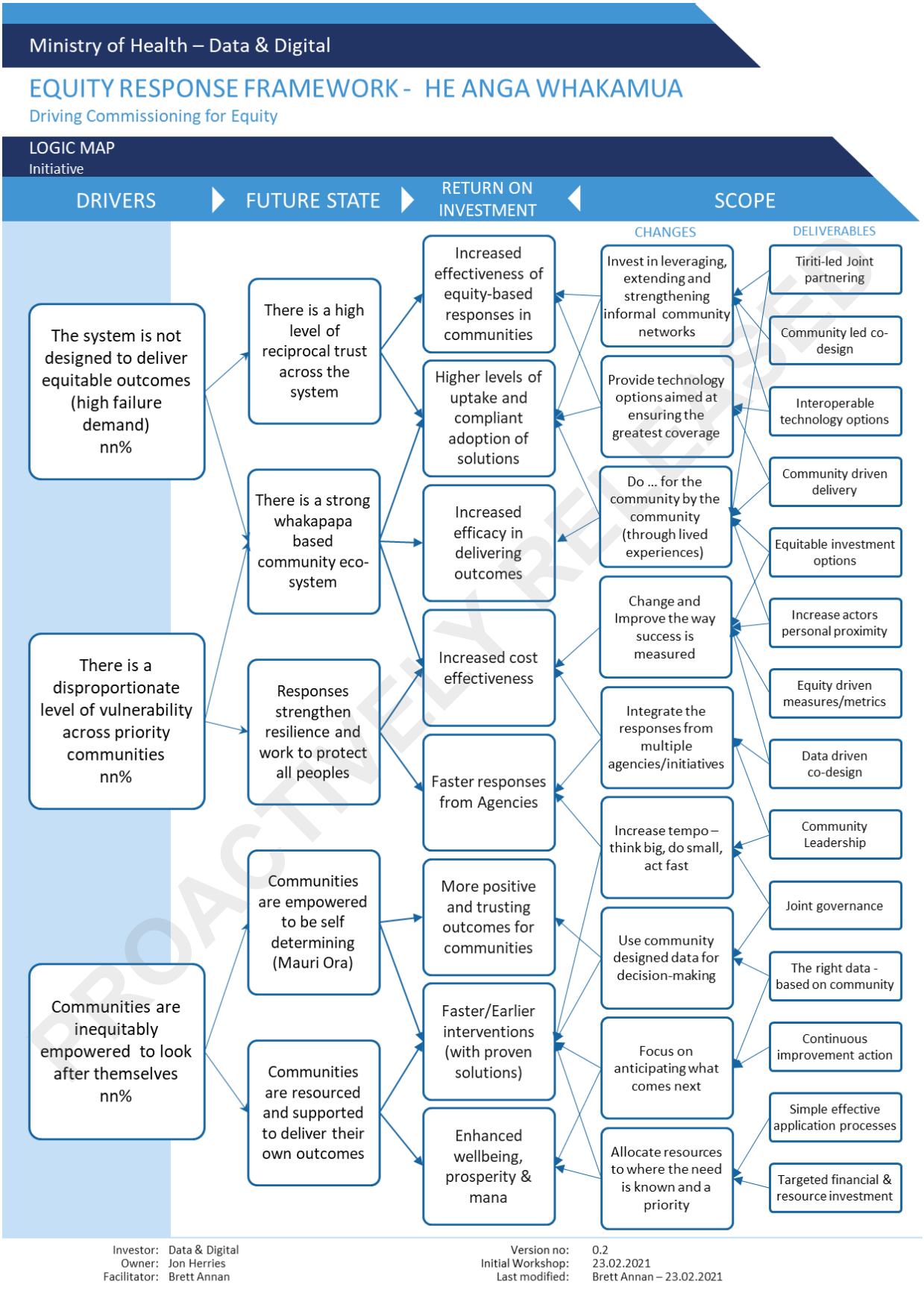
14.Postscript

A significant amount of time, effort and knowledge has resulted in this report. Hence forth, recommendations derived from the conclusions reached across the Programme, go towards informing the resulting Cabinet Paper report back to Ministers, as defined in the scope of the Programme.

Moreover, the true success of the Programme has been defined not only in answering the questions that initiated it, but in the rich source of information, understanding and earned knowledge resulting from the work that was done. There is no doubt, that when understood and applied to future interventions, the mana, trust, codesign and delivery of initiatives WILL result in far more equitable outcomes, between and across our communities, our government and ultimately for all citizens of Aotearoa.

Mutanga.

Appendix 1 – Equity Approach Logic Map



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