CHIEF SCIENTIST OFFICE

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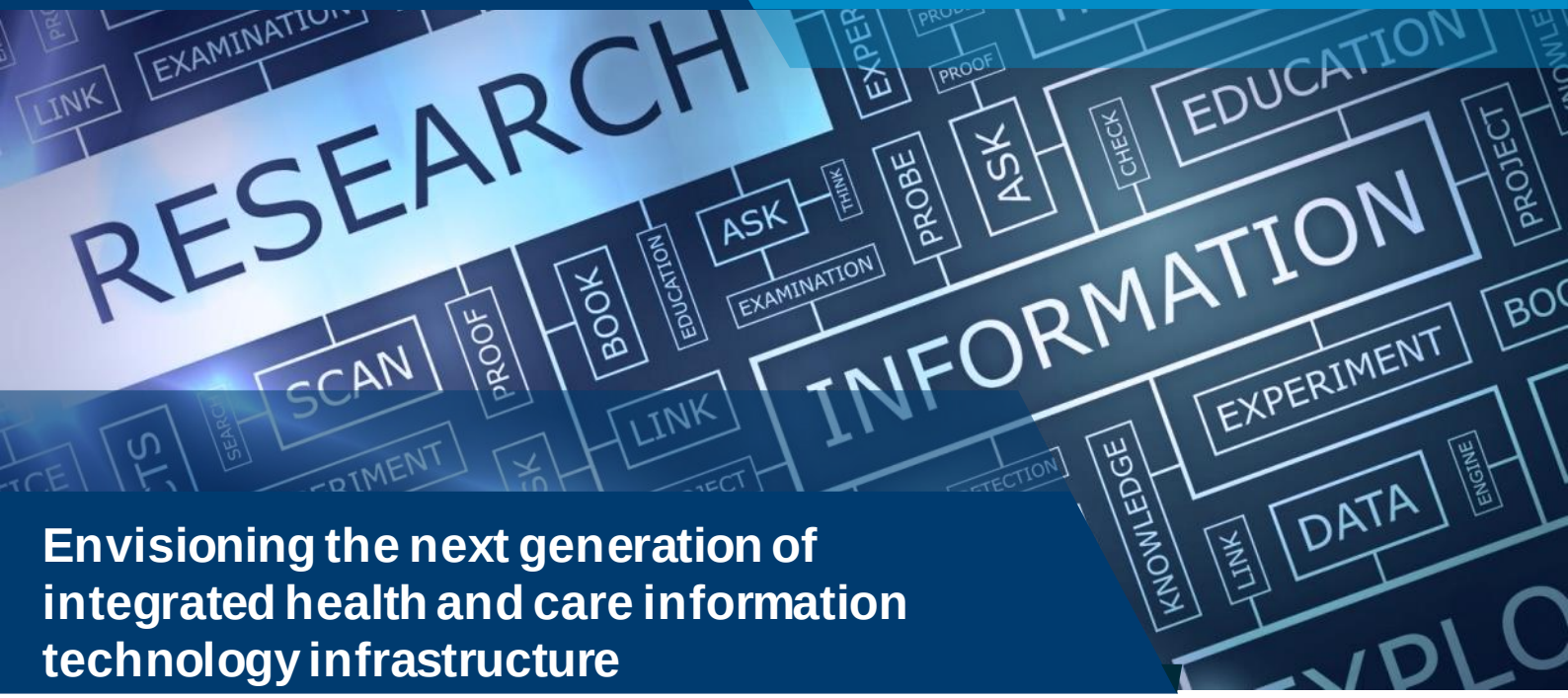
RESEARCH PROJECT BRIEFING



Envisioning the next generation of integrated health and care information technology infrastructure

BACKGROUND AND AIMS

- Many technological innovations in healthcare are abandoned or fail or scale. This is because they can disrupt existing work and organisational practices, in some instances leader to risks to patient safety.
- This work sought to identify features of next generation personal, health and social care technologies and to develop a roadmap to inform ongoing Scottish (and international) deliberations on the procurement, implementation, adoption and exploitation of these systems.
- This will help to ensure that technologies are implemented maximising their benefits and minimising potential risks.

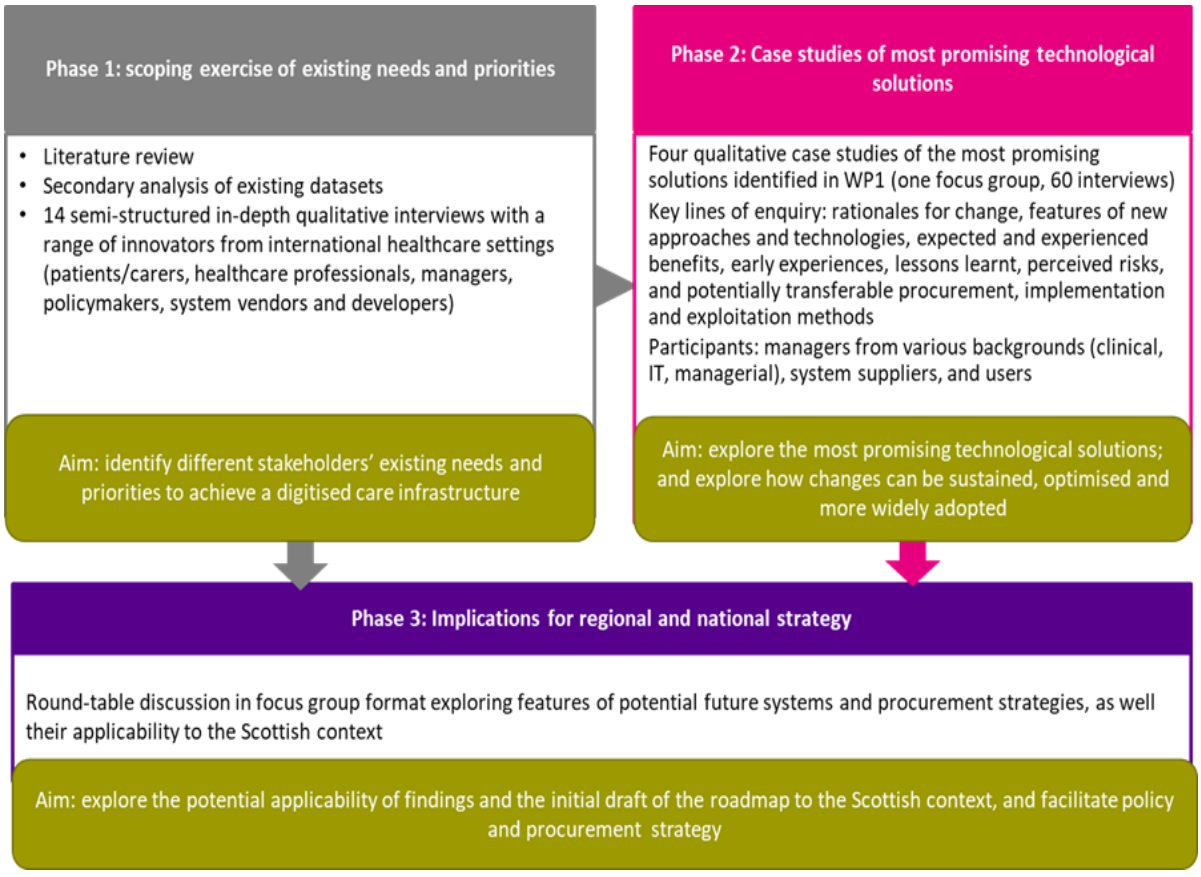
KEY FINDINGS

Health information technology (HIT) innovation has significant potential to improve the quality, safety and efficiency of healthcare. However, the full anticipated benefits of HIT innovation are likely to take a long time to materialise. This work has shown that, independent of the application, consideration of a variety of factors is important to ensure that HIT realises its potential. These factors range from wider considerations such as governmental action around incentivising collaboration, skills development, and positive risk taking; to social impacts that only emerge when the technology is used. New and emerging technologies such as robotics (the use of robots), wearables (electronic devices that can be worn) and cloud technology (the delivery of computing over the internet) need to be carefully designed and implemented considering wider scale-up strategies and use cases from the start. This needs to include mapping of potential unintended impacts before tackling large-scale implementation.

WHAT DID THE STUDY INVOLVE?

This work involved three phases:

Figure 1: phases of work and methods



WHAT WERE THE RESULTS AND WHAT DO THEY MEAN?

The results from Phase 1 were grouped into two main areas: (1) national strategies & regulatory environments, and (2) cross-sectoral collaboration (also see Figure 2 below).

National strategies and regulatory environments

> To support innovation sometimes it's better to sort of just lay out the rules of the road but let [providers] figure out what they need to take from that. (Participant 6, Academic)

Incentives were seen as an important way to stimulate competition amongst healthcare providers. For example, the stimulus package associated with the United States Health Information Technology for Economic and Clinical Health Act was seen to have attracted innovators and as helping to focus organisational efforts on technological innovation. However, there is also a risk that new technologies are adopted in order to obtain payments as opposed to improve care. Longer-term innovative activity may not be positively affected by financial incentives as acquired technology may not be effectively exploited.

We also observed a tension between need for national guidance without stifling innovation. Whilst political strategy and guidance was viewed as important to ensure interoperability and coordinated efforts, participants highlighted that nationally set certification standards should not be too restrictive. Participants suggested setting general objectives nationally, whilst still allowing flexibility and creative space to innovate.

Cross-sectorial collaboration and risk taking

> We cannot have like old time professors that never work in a company or they do some partial work there because…they are super out of the world… in the States it's a bit different [to Europe] because most of the professors work in the real world. (Participant 7, Technologist/Engineer)

We found that collaboration between public and private entities (including providers, policy, industry, patients, academia and insurers) was key to successful approaches to promote innovation.

Commercial, academic and provider relationships were seen as particularly important, and were often promoted by individuals who worked across these sectors. Here, participants gave examples of technologists with clinical backgrounds or academics who worked in commercial settings.

Organisational willingness to embrace and stimulate change, to experiment and provide a risk taking environment was key to innovation, but healthcare organisations were seen to be relatively risk-averse.

As a result, there was a perceived lack of local investment in innovation-related activities.

WHAT WERE THE RESULTS AND WHAT DO THEY MEAN?

The results from Phase 2 were grouped into two main areas: (1) ensuring that innovation in healthcare is needs-based, and (2) opportunities and challenges associated with implementation (also see Figure 2 below).

Technologies investigated in the case studies included robotics (the use of robots e.g. cleaning robots), wearables (electronic devices that can be worn e.g. Fitbits) and cloud technology (the delivery of computing over the internet).

Ensuring that innovation in healthcare is needs-based

> …you have to tell me why this is going to help me to take care of my patient better, faster and more consistently. If you can't do that, then the technology means absolutely nothing…(Participant 9, Policy/Technologist)

Innovations had to be needs-based to be successfully adopted. Participants highlighted that the hype and the promise of 'big money' for some stakeholders, and the focus on promoting innovative activity created a host of technological solutions within the healthcare field that did not necessarily emerge from existing health system needs. In other instances, technological solutions were seen to be introduced to problems that did not necessarily require technological intervention.

The disruptive nature of some technological systems to clinical work practices was mentioned by many, as was the potentially adverse impact of new technologies on the personal aspect of delivering care.

In addition, we observed reports of potentially adverse consequences for the safety and quality of care that could result from the adoption of immature technologies.

Opportunities and challenges

Overall, we observed significant potential for improving the quality, safety and efficiency of care through all of technologies studied in the case studies. Drivers included the integration of care across settings, secondary uses of data, increasing demands and shortage of healthcare staff, and increasing patient involvement. However, we also observed some common challenges that have to be negotiated to realise the potential of these technologies.

Common issues across applications included concerns around data quality and a perceived lack of regulation of new data flows; the need for the development of standards, concerns surrounding privacy, confidentiality, and data ownership; the transformation of workflows and practices of healthcare professionals; potential adverse impacts on healthcare professional/patient relationships, and skills shortages surrounding technology development and implementation.

WHAT WERE THE RESULTS AND WHAT DO THEY MEAN?

Phase 3: Roadmap for next-generation healthcare technology

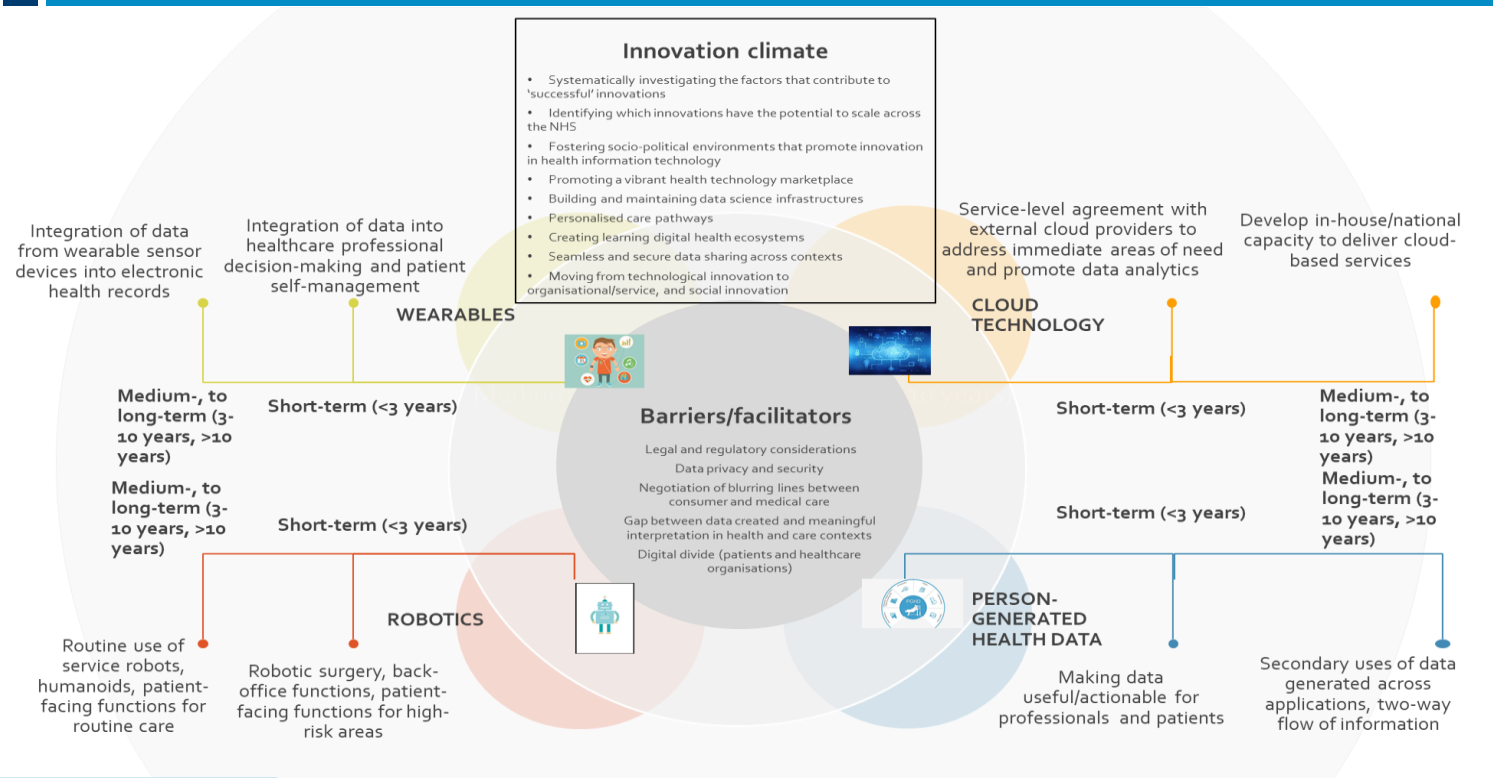
Based on these findings, we have developed a roadmap for next-generation healthcare technology. Although we identified many specific features relevant to each type of technology (detailed accounts of these can be found in our publications), we will focus on the cross-cutting themes here and map out what could be achieved within short-and longer term timeframes (Figure 2).

Short-term developments surrounding wearables and patient-generated health data are likely to include data into healthcare professional decision-making and patient self-management. This is because healthcare professionals are already overloaded with data, and there is a lack of work surrounding negotiating/identifying what makes data actionable, and when patients need to consult healthcare professionals and in what instances they can make their own decisions. In the medium to long-term we are likely to see more effective inclusion of data from wearable sensor devices into electronic health records, secondary uses of data generated across applications, and two-way flows of information between patients and healthcare professionals.

With regards to cloud technology, short-term developments are likely to consist of service level agreements with external cloud providers to address immediate areas of need and promote data analytics, whilst in the longer term organisations are likely to develop in-house/national capacity to deliver cloud-based services in order to be more independent from external suppliers.

Healthcare robotics will likely focus on optimising back-office functions and robotic surgery, as well as patient-facing functions for high-risk areas (e.g. COVID-19 infections). The routine use of service robots, humanoids, and patient-facing functions for routine care is likely to be some time off as these have more difficulty integrating within care environments.

Figure 2: the Roadmap



WHAT IMPACT COULD THE FINDINGS HAVE?

The results of this work have been identified as being of benefit for three main groups of people:

- People in need of and/or providing care: This work will help to promote better quality, more effective and more efficient health care by helping to ensure that benefits of health and care technologies are maximised and negative impacts are minimised. This will require clear involvement of patients/carers and users in future discussions and implementation.

- Policy makers: We have fed back the results of this work to Scottish policy makers, informing digital strategies to facilitate better quality, more effective and efficient health care.

- Commercial sector: The commercial sector can draw on this work by developing technologies that are likely to fit within existing environments and create value for all stakeholders.

HOW WILL THE OUTCOMES BE DISSEMINATED?

We have published the results of our research in nine articles in peer reviewed journals (see https://scholar.google.de/citations?user=8BTXpqYAAAAJ&hl=en).

Several follow-on grant applications building on foundational work based on this grant have been submitted or are in preparation. These include working with commercial companies and partner universities to design and evaluate specific applications.

We have also fed back the results of this work to senior stakeholders at Scottish Government and are continuing to engage with senior policy makers and patient representatives.

CONCLUSION

HIT has significant potential to improve the safety, quality and efficiency of care. When designing, planning, implementing and optimising HIT innovations, it is however important to pay attention to the context of use as this can determine if a technology's potential benefits are effectively exploited. This also reduces the risk of innovations failing and being abandoned.

As the full anticipated benefits of HIT innovation are likely to take a long time to materialise, long-term strategies are needed to support putting infrastructures in place. These include both technological infrastructures and social infrastructures (e.g. leadership and digital skills) to support innovation. Doing so, can help to contribute to sustained advances in Scotland surrounding health and social care data architectures, the refreshed Digital Health and Care Strategy, and the realistic medicine agenda.

Although the COVID-19 pandemic has increased the use of and drive towards implementing HIT, these tensions remain and are more important than ever, especially considering the continuing proliferation of innovations that are taken to market.

RESEARCH TEAM & CONTACT

Kathrin Cresswell

Usher Institute, University of Edinburgh, Old Medical School, Teviot Place, Edinburgh, EH8 9AG

Kathrin.Cresswell@ed.ac.uk

07502 154 328

Additional Information

The project was completed on 01/12/2021. The amount of funding received was £ 172,645