

Aspects of Digital Change

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By

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Dedication

This book draws on thirty years' experience in developing and selling technology across very different sectors. It explores, specifically, the challenges of introducing digital platform technology into the health and care sector. This experience would not have been possible without the support of a great many people. However, there are a few people, who through intellectual and financial input, supported much of the learning in health and social care that is central to this book. For eight years I worked with a company called Red Embedded. Their experience in the digital TV industry had resulted in set top box technology that was used to provide remote care for people. We spent these years building and developing a service providing video communication to patients using their TV. My thanks go to Darren Granger, Stuart Griffin, Bill Hoath, Rahul Mehra, Andrew Stewart and Dave Taylor for their support and collaboration in these endeavours. It was during a project in 2015-2016, using the video service to support people with learning disabilities, that I began working with the Bayswater Institute. It was at this time I began to connect my experiences with technology development over the years, with the ideas of sociotechnical systems thinking. This was due to the support and vast experience of Ken Eason and Bill Maton-Howarth. I joined The Bayswater Institute in 2017 in pursuit of sharing my experience to help others who were trying to achieve similar improvements in care delivery. I would also like to thank Lisl Klein, the founder of The Bayswater Institute, who I never had the privilege of meeting but believe she exerted an influence through her formidable reputation. Her obsession with the relationship between theory and practice and its real-world implications for the workplace was inspirational.

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Foreword

The original working title for this book was “A Sociotechnical Approach to Complexity in Digital Health and Care Interventions: An Empirical Framework, Developmental Theory and an Approach to the Challenges and Enablers Facilitating Learning and Understanding.” This was an attempt to encapsulate the specifics of the origins of the learning and the issues addressed. The evolution of understanding employed in this book, from the empirical approach to the theory and then consideration of the practical aspects reflects issues that are seen in many instances of digital change. For the purposes of this book, digital change is any scenario where information and communication technologies are being utilised to change or develop new practice. At the heart of the work is an approach to change that includes the human dimensions and deals with the complexity of our world head-on. The book was motivated by my experience of technology use in several industry sectors and by the rapid growth and engagement with eCommerce and social media amongst the public. I perceived an opportunity to leverage my background in technology development within the care sector. This was realised in 2008 when I began working with Red Embedded developing the use of video communication in people’s homes with the TV as the communication device. Recognising the ability of technology platforms such as Amazon and Facebook to engage and communicate with people, develop services rapidly and develop person-centred experiences it seemed inevitable that care would benefit from technology with such capabilities. In this book I will draw on that experience of eight years trying to bring the flexibility of technology platforms into care delivery. Unfortunately, due to many of the issues covered in this book we closed the company down in 2016 after developing remote care services across many health and social care applications. During this time, I came into contact with many other companies trying to innovate using technology in care. Time and again I saw great examples of technology failing to scale and embed into practice. The challenges were not about the technology but rooted in the way the technology was introduced, how it went on to be developed and the mechanisms supporting its adoption including purchasing. I initially tried to tell the story of the company I joined in 2008 and went on to develop. I realised that I could not tell that story without explaining the thinking behind the approach and what was learned about the challenges. The technology moves on, but the underlying challenges remain applicable to any efforts to catalyse change through digital technologies in the care sector. In fact, the challenges are not specific to the care sector and are seen in many attempts to implement digital change. Hence the shorter and more general title-Aspects of Digital Change.

This book is therefore a synthesis of experience, theory and practice. This is reflected in its three parts which are empirical, theoretical and practical in nature. It has elements of academic research, anecdotal experience and resultant learning. This will make it part analysis and part narrative and potentially challenging in its shifts in perspective. I can only apologise for this. The reason for the approach is that the underlying theme being explored is complexity. This is a slippery beast and, as I argue in this book, requires engagement with its many facets in a holistic and systemic way. As a report on experience it can only hope to capture some of the features of the iceberg of my perceptions without exploring the vast expanse below the waterline. This means that my own background, context and prejudices are inevitably imprinted on it. To balance this, it will also draw on research that is applicable to the issues identified. Because the challenges cross many academic disciplines that are subject to their ivory towers (or less charitably their silos) this cannot be exhaustive. The work is, by its very nature, inter and intra-disciplinary. Where academic or other publications can illustrate or provide a contrast they will be cited. The tacit and explicit learning I have undertaken has led to my approach to practice. That practice has sometimes been successful and sometimes unsuccessful. There has always been more to learn from failure than success. The synthesis is therefore a discussion of practice arising from experience in consideration of how this interacts with theory. The synthesis is captured as an empirical framework which is developed into a theory. This facilitates a comparison with two other theories providing some comparative insights into the challenges of complexity and context. The theory therefore captures the empirical learning for development of technology platforms in collaboration with practice. The ultimate outcome is that the theory and approach are useful in sharing understanding about technology platform development in care. However, the final part of the analysis is where the challenges lie within the current care system in fully engaging in such an approach. The potential benefits from such technology can be glimpsed by comparison with the transformational power of eCommerce and social media. The embedding of such technology across care provision could fulfil the promise of support that is person-centred, empowering, educational, dignified and based on choice. Repeated investment of resources and effort has not generated scale and transferability of such solutions. The empirical framework, theory and analysis provide some of the explanation why.

It is worth making a stylistic note about the call-out boxes used in the text. Here I have captured the key themes of each section and provided what I believe are a series of key points. These are numbered and have two functions. The first is that they act as anchor points for what is inevitably a complex story. So, when going back to look for a key point they locate the place in the text where it was made. They are also subjective attempts to capture learning in that they

are direct observations or conclusion that I have drawn from experience. Hence, they may be contentious or challenging to some people and if so great. It is my intention to use these points to continue a conversation about the content. The website www.aspectsofdigitalchange.com will continue the discussion. I have also chosen to capitalise key terms in the text that are included in the glossary. This makes the text look untidy but serves to help with identifying terminology that I have introduced with a specific meaning.

The other stylistic convention is the use of the term “practitioner.” It is difficult to talk generically about care services as the range of job titles of front-line care workers is so vast. I have, therefore, settled on the term practitioner for anyone who provides front-line care. This covers social workers, nurses, general practitioners, secondary care consultants and many others. This will not please everyone, but it allows me to discuss the provision of care using technology as practice. Similarly, I can talk about embedding practice and diffusing practice. It is therefore more of an enabler of generic discussion than a diminishing of anyone’s professional role.

Introduction

Key Themes for the Introduction

- To set the scene for the book by explaining the empirical nature of Part 1, the theoretical development and comparisons in Part 2 and the practical aspirations of Part 3.
- To introduce the foundations of experience the book is based upon in developing technology to change practice in a range of industries.
- To differentiate between simple, complicated and complex systems and to introduce the importance of systems that are a combination of social and technical elements.
- To introduce the importance of standards and the potential to stimulate co-opetition.

Embedding and scaling digital interventions in health and social care is a notoriously difficult endeavour to undertake (Eason et al, 2012; Hoare and Eason, 2014; Hoare, 2016a; Hoare, 2016b). As digital technologies have developed apace their adoption in care has lagged behind. This book is based on the experience of developing technologies in many sectors and then bringing that understanding into the care sector. The challenges presented by the care sector are manifold and include:

- Care provided through fragmented and poorly communicating organisations;
- The impact of competition between care provider organisations;
- Fear of change and its impact on jobs and job roles;
- Highly procedural pathways, and payments aligned with activity rather than outcomes;
- Locked-in perverse reimbursement incentives in commissioning and procurement;
- Many previous attempts to catalyse digital technology uptake and the perception of past failures;
- Areas of contention such as information governance and data security.

These are only a few of the challenges but alone these are a significant drag on the potential of digital technologies to improve the efficiency and experience of care. One of the goals of this publication is to crystallise the experience gained and to offer ideas that may help to unlock some of these challenges. Another is to offer a theoretical framework around the course of action necessary to both develop and evaluate digital interventions. The theoretical space is predominantly occupied by approaches to either managing programmes and projects or ways of categorising the factors that contribute to success or failure. This book will develop a theory that can be used to guide the implementation of certain types of digital solutions. By comparing this theory with some of the established theories, insight will be sought into how theory can develop to improve learning and understanding as implementations progress. The implementation of this theory in practice requires very different skills and approach to traditional programme and project management and the practical implications of this are also explored. Finally, the approach developed will be examined in light of the types of challenges identified above. Here the enablers and challenges will be examined from a systemic perspective, and some possible solutions considered.

This publication is therefore, comprised of three parts. The aims of these parts are:

1. To crystallise a set of ideas around an empirical framework for development and evaluation of digital interventions in health and social care based on real-world experience and observation;
2. To develop these ideas into a theory and to review this theory against some of the other theories in understanding programme management and embedding of technology in practice;
3. And finally, to consider some of the practical requirements and barriers that are impeding scale and adoption of such interventions in the UK and to provide real-world understanding of the challenges of implementing digital change.

This may seem a broad scope for a single document and that breaking the areas down would assist in understanding. A key, recurring theme of this book is that real understanding and change cannot arise out of reducing the complex world into sub-components. We must go beyond reductionism to develop a holistic appreciation of the Problem Space (Gallagher, 1999). By using the term Problem Space, we introduce the idea that the problem lives in a setting which is inherently complex. The interactions between all of the factors and their place in the continually changing setting means that there is a web of connections and influences. It is contended here that any attempt to change behaviour in this setting must engage with this complexity. The empirical framework presented is derived from thirty years' experience of developing technology in a range of private and public-sector settings. The empirical framework and theory provide a way to embrace the inherent complexity and offer tools to engage with it. The comparison with other

theories highlights areas of significant overlap and difference that are instructive in understanding why theory is not having the impact it possibly should. Finally, practical considerations and experience demonstrate that even if the approach discussed is deployed there are systemic barriers that prevent scale and transferability of adoption. By linking all of these issues together and considering them in a coherent and consistent way it is believed that some light may be thrown on how a more systemic approach could catalyse action in the adoption of digital interventions.

Key Point 1: Innovation in care requires engagement with complexity rather than a reductionist approach. The approach adopted in this book is to embrace complexity and the many challenges to adoption at scale rather than trying to tackle issues in isolation. Isolating factors or “reductionist” approaches are inappropriate because they do not engage systemically with complexity. Systemic approaches are challenging but yield a more holistic understanding of the Problem Space.

Simple, Complicated and Complex Systems

Simple systems can be thought of as isolated, easily replaced innovations such as a new type of bandage. Such innovations are sometimes referred to as “point innovations” as they have little impact on other parts of the care system. For instance, the innovation in a bandage can be high but its systemic role is relatively simple. Complicated systems consist of many, potentially difficult to implement components, that come together in a logical, predictable chain to form a system - a car for instance. Complexity is characterised by dynamically interacting human and technological components sitting in a certain context where the outcomes are not deterministic and are subject to emergent properties. Rather than a complicated system like a car, complexity is more akin to a human driving a rental car in an unfamiliar city. There are commonalities of context with past experiences and rules are being applied but the endeavour is, hopefully, undergoing constant feedback and review. There may be an overarching goal, but many sub-goals are being handled on the way. The interaction of the driver with the car is a Sociotechnical System. However, the analogy gets really interesting if we now give our driver a nervous passenger who is making comments, now we definitely have a Sociotechnical System. A combination of complex social and technical interactions undergoing constant review. Who knows what the outcome will now be?

The care system is an example of complexity as it consists of many independent sub-systems that interact. The combination of people and technology in these sub-systems mean that they are inherently sociotechnical in nature. Many of the project management tools and development approaches that have been used reliably for years are not appropriate for complex interventions. They tend to try to approach all problems as if they were complicated by reducing the intervention to a set of components and then proceeding linearly to develop them. The approach proposed here engages with complexity and develops an approach that may not necessarily produce the one best solution but provides a roadmap for an ongoing evolution of technology and practice in collaboration. The goal is to optimise technological interventions as enablers of new practice within a given context. The belief is that this can lead to better understanding of technology in practice and lead to transferable learning that can underpin scale interventions across varied contexts. The hope is that by formalising the approach that the wheel of re-learning and making the same mistakes can be replaced by the development of an improved knowledgebase and a method to share learning across interventions and contexts.

Key Point 2: People using technology in practice form Sociotechnical Systems. The introduction of digital technologies into care requires a Sociotechnical Systems perspective to understand both the technical requirements and the social aspects of changes to practice.

Complexity and Sociotechnical Systems

Part 1 of this book derives an empirical framework from experience of developing systems that are a combination of human activity and technology. The care sector presents the broadest range of challenges in adopting new technologies in practice. The study of the embedding of technology into human activity has been known as Sociotechnical Systems thinking for some decades (Eason K. 2008; Eason K. 2013). However, much of the learning that has been developed in that time goes on to be re-learned as new systems are implemented, and mistakes of the past are repeated. During those decades, technology has rapidly advanced and human systems have been subject to changes such as increased specialisation, professionalisation and outsourcing. The result is that the implementation of technology in practice has become subject to increasing complexity. Through close collaboration with customers

the author has developed and sold technology into manufacturing, digital media, health and social care and other sectors with varying levels of success. The challenges encountered in different sectors led to broad learning about different facets of introducing technology that disrupted current ways of doing things. In all cases the technology was developed in collaboration with the customer with the intent of innovating a new workflow that improved productivity.

Table 1 shows example technology developments undertaken by the author over thirty years along with their application and comments on the development process. The table also considers the market impact of the developments.

The level of success, in each case, was rarely just about the capabilities of the technology. In each sector, the drivers for change and therefore the ability to embed technology into practice were different. In the early days of video recording and playback there was a battle between three competing product standards developed by Philips in the Netherlands and two Japanese companies, JVC and Sony. The learning about standards battles went on to influence many aspects of future collaboration between technology companies (Cusumano et al, 1992) such as the shortened battle of DVD and its competitor technology. In the case of VHS tape testing, my experience was in a commercially driven environment (automated characterisation of duplicated VHS video tape) and the intervention increased productivity by automating a tedious quality control process, this presented fairly low barriers to change. However, even in this transition there was resistance to change and, in some cases, active sabotage. This reflects the fact that change is always challenging for the people impacted.

In each sector, gaining understanding of the requirements of the use of technology was followed by a period of co-design and co-development. In the case of the quality assurance of DVDs I was privileged to be involved in the introduction of a new consumer technology to the market and collaborated extensively with the predominantly Japanese and Dutch originators of the DVD standards and a major US manufacturer. A great deal was learned in this experience about international cooperation and how a relatively small group of people could catalyse the birth of a new consumer technology. In the case of the quality control equipment for the newly developed production process, input was required from the standards developer, the technology companies and the manufacturers. It was only through this multi-stakeholder collaboration that a shared vision of the requirements could be developed. Further, the introduction of the technology into practice always involved integration with workflow and reporting as these were key to embedding the technology into everyday usage. The standards battle for optical video recording and playback in the form of DVD was arguably shortened by the experience of VHS where competing products were actually brought to market. The DVD experience was my first exposure to co-opetition (Nalebuff et al 1997). Many of the companies working together to establish the standards for DVD were competitors in the consumer electronic goods market. They had sufficient vision, eventually, to realise that by standardising the product (the disc) they opened up a new market where they could compete in sales of disc players. The concept of competitors collaborating to facilitate competition is significantly under-represented in public sector procurement. This is due to many factors we will discuss in Part 3, but the fact disadvantages the public sector in not having a thriving set of private sector partners innovating on its behalf. Standards enable co-opetition and hence competition in many industries. They reduce the costs associated with changing providers of parts of a system sometimes called switching costs (Porter, 2004).

Key Point 3: Standards and collaboration promote co-opetition and lower switching costs.
Standards and collaboration enable co-opetition and therefore promote competition. Standards lower switching costs and prevent lock-in to proprietary technologies.

I brought the approaches learned through these technological developments to health and social care in 2008 in support of developing remote video communication as a way to better support, educate and manage patients with long term conditions. It rapidly became apparent that there were many differences between a purely commercially driven approach to productivity and the challenges of service transformation in the care sector. The context in care was complex and presented a significantly greater range of challenges. This provided stimulus for the development of new tools and methods in order to deal with this increased level of complexity. As the communication technology was developed to work in different care scenarios and in different parts of the care system (primary, secondary and social) the co-design and co-development provided insight into the challenges and enablers. Over eight years a solid understanding was built of how such collaboration might work. Part 1 of this book considers what was learned on that journey about the challenges that the complex environment presents.

Key Point 4: Concepts and behaviours in the private sector do not automatically translate to the public sector. Lessons learned in the commercial and private sector cannot be assumed to translate successfully into the public sector. This applies to many aspects of change including adoption, diffusion and embedding of innovation.

Development	Application	Comments	Market Impact
Automated physical characterisation of magnetic parameters for recording media in a research and development project.	As part of a project developing a new magnetic recording media there was a need for fast turnaround of magnetic characterisation measurements.	This work not only involved development of the technology of automating and speeding up the measurements but also included development of new measurements as the needs of the project changed. Key was presentation of results to aid in development of new chemistries.	Research project that did not lead to a commercial product. Eventually the project and the technology were abandoned by the organisation behind the development.
Automated physical characterisation of magnetic parameters for recording media in a duplication environment for VHS video tape.	High speed thermal or magnetic duplication processes produced a magnetic image of a recording. Faults with the master could be detected by simultaneously measuring magnetic parameters of the copies.	This work displaced manual checking of the copies and therefore reduced the need for staff but also improved detection of faults as the manual task was tedious and led to inattentiveness in operators.	Took a small business from a start-up to employing around fifty people. Developed unique products for the video duplication and tape manufacturing industries. Developed a research and development team of around twenty people. Over a period of five years generated around £1m in sales.
Automated physical characterisation of optical media (CD, DVD and BluRay) in both research and manufacturing environments.	Providing quality assurance measurements according to a specification was a necessary part of the manufacturing process. More in-depth measurements were required in the early days of a new medium and when any change in manufacturing process occurred.	Being involved in the early days of any new consumer technology is exciting. Measurement of quality evolves hand-in-hand with the manufacturing process and the need for integration of data into the day-to-day running of systems.	Became a competitor in a completely new sector. Displaced a US and a Swedish company to become a key development partner for a large US corporation. Over a period of 3 years generated around £2m in sales.
Licensing and compliance testing of analogue copy protection technology in third party video semiconductor devices.	Integration of signal processing technology (on a licensed basis) into other company's chips is predominantly a communications exercise. Sharing the specifications, deciding (with the third party) on the implementation in their technology and ensuring the result is compliant requires very close collaboration.	Here the outcome was a tightly specified addition to a video signal. In implementation, the method varied between semiconductor device manufacturers. The relationship was one of co-development and co-compliance testing.	Introduced competition in an area of technology where there was one monopoly provider. Company was eventually sold to a US corporation.
Development of a communication platform connecting people at home to health and social care using video.	The approach used the TV in the home as a user-friendly interface to a video call centre approach to managing both regular support and patient generated requests for support.	The approach was developed over eight years to integrate into a range of health and social care scenarios. Each scenario was a collaboration between care providers, patients and the technologists to ensure the platform provided workflow and reporting that would help embed it into daily practice.	Over a period of eight years around £10m of public and private money was invested in developing the technology and working with partners to develop services. Services were developed in long-term conditions, support for renal patients to dialyse at home, support for people with learning disabilities, virtual visiting and early supported discharge from hospital. The inability to achieve ongoing revenue caused the investors to close down the service in 2016.
Extension of the communication platform to incorporate remote physiological measurements, ambient monitoring and evidence generation and reporting.	Once the connection into the home was established its benefits could be augmented by including a range of other capabilities into the communication pathway. Some of these extensions included weight, blood pressure and pulse oximetry. In renal care the home dialysis machines were integrated into the data pathway to increase the data available to the consultants and nurses.	Communications platforms provide a means to integrate many approaches to remote care delivery. The addition of further functionality, through Internet of Things for instance, then becomes an issue of interoperation rather than developing a new system from scratch. This idea of reusability and incremental evolution is a central theme to this document.	

Table 1: Technological developments that have informed this approach to complexity

Part 1: Empirical Framework for Dealing with Complexity Challenges in Digital Change

Key Themes for Part 1

- Consider the origins and challenges that complexity presents and to consider why reductionist approaches that try to solve aspects of a problem, in isolation, are inappropriate.
- Explore how complexity applies to technology interventions in care and why engaging with complexity is essential.
- Introduction of four Complexity Challenges experienced in developing technology interventions.
- Introduction of methods to address the four Complexity Challenges identified through experience.
- Description of the empirical framework that arises from the four Complexity Challenges and the methods proposed to address them.

When faced with complexity it is a common human coping mechanism to try to break it down into components to 'tame it.' Unfortunately work environments are complex, social and adaptive spaces where there are many social and technical links. In care, this is made exponentially more complex by the fragmentation of organisations and the interdependency between health and social care and the lack of effective coordinating mechanisms. The tendency until now has therefore been to focus on changes within small parts of the system that are seen as self-contained or bound by an organisational or departmental boundary. This has led to the term "silos" of care and this works against thinking systemically. This siloed approach has confounded many interventions as benefits and costs cross organisational boundaries making system change very challenging. A goal for many decades has been "integration." As with many aspirations in health and social care it is not often clear what is being integrated and in pursuit of what outcome. Integration is often manifested as organisational restructuring. This can be seen in the recent development of Sustainability and Transformation Partnerships (STPs) (NHS, 2018) with the intention of transitioning to Integrated Care Systems (ICSs). This is modelled on the U.S. approach of Health Management Organisations (HMOs) and Accountable Care Organisations (ACOs). This organisational transition is meant to tackle the siloed nature of care and to more vertically and horizontally integrate secondary, primary, community and social care. There is a recurring theme, however. Changing the organisational structure does not, in itself, catalyse the change required for systems to perform in a more integrated way. Many staff will potentially be transferred across to new organisations which will need to work in the same regulatory and quality frameworks as the original organisations. Services will still be put out to tender for bidders to bid for. Those procurements will specify the outcomes sought and the methods of paying for those outcomes. The underlying issue is that organisational structures are just a layer in the complexity of improving the ability of people to work together, and with technology, to develop better care services. Organisational integration does not deal with complexity it just changes the boundaries of the organisations that are operating in a particular geographical region. Changes to financial incentives through approaches such as the "Better Care Fund" (NHS, 2018) have also failed to catalyse integration. Experience on the ground was that shifting money from health to local authorities to catalyse integration resulted in arguments about the use of the money. The tendency was to entrench the silos rather than break them down. A paper published by the King's Fund in 2019 considered the latest incentive schemes to drive integration and concluded "There are significant unresolved difficulties in applying the type of incentive scheme developed for accountable care in insurance-based health systems to tax-funded health systems with state-owned providers and limited choice of provider" (Collins, 2019). Engaging with complexity requires an approach where organisations, procurement and outcomes are factors in a systemic view of services. It is only by engaging with complexity that we can begin to understand it.

Key Point 5: Integration requires engagement with complexity.

Approaches to catalysing integration, such as new organisational structures or financial incentives, are reductionist and do not address the systemic issues of complexity.

Types of Complexity Challenge

As we begin to engage with complexity it is necessary to distinguish between two types of challenge:

1. Complexity of an intervention using technology to change the way things are done in practice, and
2. Complexity of the broader setting within which the intervention sits.

The distinction between these is in the level of possible influence. The complexity of an intervention and getting technology into practice (1), is subject to some level of influence by the instigators of change. The broader setting within which the intervention sits (2) may be subject to varying levels of influence by the instigators. This ability to influence will diminish the further out we get into the broader setting. Hence, any approach to the intervention must be robust and adaptive to accommodate a wide range of environmental conditions in the setting. We will initially refer to the setting for the intervention as the environment. This represents the interaction of all of the factors that impact upon the intervention. Later in the development of the empirical framework we will formalise the discussion of the setting and the environment in the Challenge of Context.

Key Point 6: Complexity has many levels.

The environment that change happens within exhibits different types of complexity. In the Near Environment, where there is some ability to influence, complexity exists in changing the way things are done. As we get further out into the environment, where there is diminished ability to influence, complexity exists in uncontrollable factors.

Experience shows that there are at least four dominant Complexity Challenges that must be addressed to systemically change care provision using technology. The challenges represent four recurring themes identified through development of interventions:

- **Hubris** – that the problem is fully understood up front.
- **Sustainability** – how in a complex world, where everything is rapidly changing, do you develop solutions that are sustainable over time?
- **Collaboration** – that all of the actors impacted must be brought together in a constructive, cooperative way.
- **Context** – that complexity is inherently linked to the context and that different contexts present very different challenges and enablers for change.

These challenges are reviewed in Table 2 along with their character and the approaches to them proposed in this book. Subsequent sections then go on to discuss each of the approaches. It is worth noting that these challenges are all dynamically linked to each other. If you change one you change its relationship with all of the others. Again, this is a feature of complex systems.

Challenge	Character	Approach Proposed
Hubris	The assumption or desire that the solution is self-evident and just requires implementing.	The Four Pillars of: Action Research, Developmental Evaluation, Bottom-up Design and Top-down Design.
Sustainability	That changes in technology, policy or demand should not require a completely new approach.	RASP - Resilient, Adaptive Sociotechnical Platforms.
Collaboration	That technology is not developed in isolation or compartmentalised but is recognised as part of the work fabric.	POTE model – Practice, Outcomes Technology and Evidence.
Context	The need to recognise the different perspectives of different stakeholders and how this varies at different levels of the care system.	Intervention Space and Context Mapping.

Table 2: Complexity Challenges

Key Point 7: Four Complexity Challenges.

There are at least four Complexity Challenges that need to be addressed for any intervention that is attempting systemic change. These are:

1. The Challenge of Hubris
2. The Challenge of Collaboration
3. The Challenge of Sustainability
4. The Challenge of Context

The next sub-sections will address each of the challenges and discuss an approach derived from the experience discussed earlier.

The Challenge of Hubris

Key Point 8: The Challenge of Hubris.

Hubris - Excessive pride or self-confidence. (Oxford English Dictionary)

The first challenge is in moving away from a “presumption of wisdom.”

This oddly titled challenge comes first because its tenets underpin the whole approach. It can be characterised as a “presumption of wisdom.” Many projects start with the assumption that everything is understood upfront and that it is a matter of implementation. It is based on the misconception that, for complex interventions, there is an off-the-shelf solution out there. This is often allied with an approach that sees technology as a “black box” that sits in a current care pathway and generates productivity in isolation. This leads to a focus on the technology and too little consideration of how the technology becomes embedded in practice or how the benefits are evaluated. This is best understood through several negative examples and observed behaviours:

1. The National Programme for IT in the NHS did not pay enough attention to the workflow for a range of key stakeholders that would be using the technology (Eason, 2009).
2. The Whole System Demonstrator project prompted concerns by general practitioners that the technology was more related to economic pressures than patient outcomes. There was also some concern about the technology impacting upon professional autonomy and diagnostic skills (Newman, 2013).
3. Consumer technologies often prove the workability of an approach but will not on their own, generate system change. For example, because Facetime and Skype exist it does not mean that their incorporation into practice will spontaneously occur. There are systemic barriers to adoption and these barriers constantly shift. Hence, the absorption of many technologies requires a wraparound service to maintain their capabilities and to manage them.
4. A lot of investment in technology development for care has not been matched by investment in system change and workforce development. For example, £50m per annum is spent on the Academic Health and Science Networks (AHSNs) supporting the bringing together of small and medium sized enterprises, Universities and health partners. Whilst, at the same time, the annual spend on research and development in the NHS, including the National Institute for Health Research, in 2014-15 was £1.2bn (Collins, 2018).
5. The evaluation of complex interventions is often inappropriately rooted in models of evaluation from the pharmaceutical industry such as randomised control trials.
6. In evaluation, aspects such as social or environmental value are afterthoughts and do not form part of the core outcomes.
7. The focus on isolated innovations at the expense of taking a systemic view.
8. Experience indicates that there is often a weak link between policy and what actually happens on the ground.

Key Point 9: The “right” solution for a particular context does not already exist.

Any solution that works in a particular context is unlikely to translate to another context without adaptation of both technology and practice.

Adoption of technology into practice is almost seen as an inevitable consequence of discovering or developing “the right” technology. Remarkably the very benefits that make digital technology attractive:

- Connectedness and networking;
- Reusability of solutions across applications;
- Cost benefits of scale;
- Including training in the technology solution so that it trains as it is used;
- Integration across organisational boundaries;
- Connectivity to patients, their carers and families.

Are all reasons why a rigid, process driven system struggles to adopt them. The key to adoption is not the technology but the adoption process. It would seem that, if such benefits are to be realised, the Challenge of Hubris requires a

different approach to incorporating technology into practice. The starting approach proposed here is called “The Four Pillars.”

The Four Pillars

Overcoming the Challenge of Hubris requires that the approach adopted focuses on learning and understanding and iterates the solution. The origin of this need is in the fact that to understand a complex system you need to perturb it. The complex interconnections of social and technical links in the system are not observed until they are disturbed. This makes every context unique. This also means that any evaluation strategy must be developed in sympathy with the intervention and support both the bottom-up and top-down needs for evidence. Experience shows that such an approach can be based on The Four Pillars in Table 2. The use of The Four Pillars will now be explored along with their justification.

Key Point 10: The implementation of an innovation is a negotiation.

Implementation is a negotiation between the intervention and the context. It is only by changing current social and technical linkages that the impact of the intervention can be truly observed. The Four Pillars provide an approach to undertaking the negotiation.

Pillar 1 – Action Research

By removing the assumption that the optimum solution is known, upfront, an approach is adopted that iterates the solution engaging with the stakeholders who will be impacted. The recognition that we are dealing with a Sociotechnical System is the first big step. We do not try to separate the social from the technical we embrace the fact that it is a system and in order to understand how the technology will work it must be developed as a collaboration between the technology and the practice. This not only provides the best route for the solution to converge on something that satisfies the widest range of stakeholders (some of whom may have competing interest) but also builds engagement with the solution by the people who will utilise it in action. Inherent in this development however is iteration. We need to learn about this Sociotechnical System and understand (as with the driver of the car) what impact the context is having. This implies a process that engages stakeholders, collaborates through participation, acquires knowledge and leads to social change. These are the features of an Action Research approach. An approach that undertakes a spiral of planning, acting, observing and reflecting (Zuber-Skerrit, 1993). Hence, pillar 1 is that we will learn through iteration and develop the technology in collaboration with practice using an Action Research approach.

Key Point 11: Iteration through Action Research develops understanding.

Pillar 1 is Action Research and underpins the iterative nature of the negotiation. It is through Action Research that learning and understanding develop.

Pillar 2 – Developmental Evaluation

A recurring issue in care interventions is that an approach that is successful in one context may not achieve the same level of success in another. This reflects the fact that the care system is highly variable in structure across regions and is locally, dependent upon many social connections. This makes evaluation a complementary aspect of the intervention not a standalone prescribed approach because it must be sensitive to the context. Realistic Evaluation (Pawson, 1997) expresses this as:

Mechanism + Context = Outcome

Typically, approaches to evaluation are summative assessments, at the end of a program, where the question being addressed is “did it work?” This approach seeks to control for the context and other factors to see whether the mechanism gave the desired outcome. The experience in care shows that, without consideration of context, it is not possible to know whether:

- The mechanism works but the implementation failed or
- That the mechanism worked, and the implementation was successful, but the data collection failed or

- That the mechanism only worked in the first place because there was a specific champion who made it work and they were absent in this context

And a thousand other variations. Realistic Evaluation changes the question from “did it work?” to “what works for whom, in what ways and under what conditions?” This strongly cross-links with pillar 1 in the observational and reflective stages. Developmental Evaluation takes this a step further by adding a dynamic dimension in recognition that “what works” is subject to change under conditions of complexity (Patton, 2010). There are many different points of view of “what works.” Given that we are proposing to develop technology and practice in collaboration understanding “what works” from different perspectives becomes central to the collaboration. Many evaluations in care focus on the outcomes for the system and not the patient, their carers or family. This pillar proposes that the approach to evaluation is integral to the development of the intervention and is therefore formative. It becomes part of the learning and understanding of what is happening. A summative evaluation may still be appropriate but what is learnt in the formative assessment will greatly increase the value and insight provided by any summative evaluation. Therefore, we will adopt a developmental approach to evaluation.

Key Point 12: Understanding through Developmental Evaluation.

Pillar 2 is Developmental Evaluation and considers “what works” from each stakeholder’s perspective. It then evaluates under what conditions and in what ways the solution “works.”

Pillar 3 – Bottom-up Design

As part of the Action Research approach there is required to be interaction with practitioners who will use the technology on a daily basis. This has been found to reveal many unmet issues of the requirements of their work that can be addressed using the technology. Again, a tight focus on current processes leads to systems that are rigidly tied to what management think the problems are and result in front line staff using work-arounds. Taking a systemic view also requires that the patient/client, their informal carers and family are recognised as part of the support network. Further, any engagement with an intervention by the patient/client must be seen in terms of a biopsychosocial system (Engel, 1978). There are the medical aspects of the intervention (bio,) there are psychological aspects (psycho,) and there are impacts upon the support network (social). In order to be person-centred any intervention must be able to deal with a range of contexts that originate out of this biopsychosocial model of care. We will revisit this aspect several times during the book. Pillar 3 recognises the importance of the input from front-line users of the technology into the iterative development.

Key Point 13: Interventions must be developed with impacted stakeholders.

Pillar 3 is Bottom-up Design and requires collaboration with front-line staff and other users of the technology. A systemic view requires that the intervention is developed as a biopsychosocial model of care that is person-centred recognising the biological, psychological and social factors for patients/clients.

Pillar 4 – Top-down Design

There is often a debate about bottom-up versus Top-down Design – we contend that both are essential. Bottom-up provides engagement and understanding with the front line. Top-down ensures that the concerns of policy and local guidance are incorporated into the system. Pillar 4 incorporates top-down thinking into our approach and considers how we bridge bottom-up to top-down systemically. The link between Bottom-up and Top-down Design develops out of the Action Research and Developmental Evaluation approaches. How this bridge operates in practice will become clearer as we consider the Challenge of Context shortly.

Key Point 14: Interventions must provide links between policy and front-line activity.

Pillar 4 is Top-down Design and requires that there is an explicit linkage between the far context of policy and the near context arising from the Bottom-up Design of Pillar 3.

The Four Pillars provide guidance on any developmental approach and underpin the cross-linking of different aspects of the project. It is important that, in starting with The Four Pillars, transparency and open-mindedness are central. Action Research and Developmental Evaluation are based on learning and understanding what is happening. Hence,

documenting failure, reservations and concerns of stakeholders is essential in building a repository of understanding. Experience has shown that approaching technology developments in this way has revealed:

- That front-line staff use variations of processes that suit their way of working;
- Technology solutions are often replaced or augmented by manual or paper systems based on the technology system because the technology solutions are too rigid and/or inaccessible;
- The link between policy and local guidance and what happens on the ground is weak because of resource constraints and no immediate way of auditing practice;
- Technology is often seen as “an exercise in reporting.” This view is commonly exacerbated by the requirement to enter similar data in multiple systems. The value is often perceived as being for regulatory or process purposes rather than for the benefit of the patient/client or practitioner.

These may go some of the way to explaining aspects of the resistance to technology as it is perceived as “done to” staff as opposed to “developed with.”

By beginning a development based on The Four Pillars it is likely that much more will be learned about “what works, what doesn’t and why?” Importantly we have also addressed the issue of “what works for who?” The Four Pillars have the potential to support a repository of knowledge and understanding that is currently lacking given the amount invested over the years in technology development. Projects succeed or fail, and everyone moves on to the next big thing losing valuable learning. The Four Pillars overcome the Challenge of Hubris by not assuming everything is understood upfront and ensuring that learning and understanding are key outcomes regardless of the success of the project.

Key Point 15: The Four Pillars move to a learning approach.

Together The Four Pillars shift from a presumption of understanding to an exploration of what works for a range of stakeholders.

The Challenge of Sustainability

Key Point 16: The Challenge of Sustainability.

Sustainability - The ability to be maintained at a certain rate or level. (Oxford English Dictionary)
This is the challenge of solutions that are sustainable across continual disruption and change.

The rapid pace of change challenges our ability to develop solutions that are fit for purpose over time. Investment in technology and practice needs to be rewarded by solutions that provide desired outcomes across changing policy, demographics and demand. Resilient adaptive solutions tackle the issues of scale and transferability by considering the flexibility and adaptability of the intervention. This seeks to address the Challenge of Sustainability.

Two types of complexity were identified earlier: intervention complexity, which characterises the Near Environment and can be influenced; and complexity in the Far Environment which is subject to diminishing influence the further you get from the intervention. Any intervention development must be resilient and adaptive to complexity in the Far Environment as well as solving the proximal issues of complexity in the Near Environment. This means that the more rigid and process-based an intervention is, the more likely that factors in the Far Environment will break it. This is the origin of the current stress in which the health and social care systems exist. The systems were built on bureaucracies that implemented processes to productionise the delivery of care. As the Far Environment has evolved the processes and pathways are no longer appropriate for the unit of production – the patient/person. As people live longer, they develop complex comorbidities which require an integrated, person-centred view whereas the productionised systems still see them as a collection of diseases and needs. The learning that this provides seems hard won, extremely valuable and yet poorly recognised. Any technological intervention supporting care delivery must be based on a flexible, person-centred approach. The closer the intervention is tied to a particular pathway or process the more likely it is to be made ineffective by the Far Environment.

In adopting an Action Research approach to developing communication technology in cooperation with care providers it has been surprising how often the conversation starts with the current process. The question arises “how can the technology assist in making the current process a bit more productive?” This begs the question “Is the current process

delivering the outcomes needed by the care system or the patient/client?" The process driven focus that wants to slightly modify the current approach stifles innovation and limits the outcomes that can be achieved. The important question is "how can technology make the current process redundant?" This is a systemic question. This lies at the heart of sustainability of technological interventions, they must enable new ways of doing things without being tied to a pathway or process.

Technology Platforms

In our private lives travel, shopping, banking and entertainment have all been transformed by technology usually referred to as eCommerce. We are also familiar with social media technology such as Facebook and Instagram. In all cases the operators of these transformational services use platforms. Platforms are systems that are based on technological building blocks that are reusable and repurposeable across different use cases. Even the car industry uses platforms with tried and tested chassis, engines and other components used across different manufacturers (Muffatto, 1999). Why do apparently competing organisations use the same components? Again, we return to co-competition. In a fast-changing environment, these basic aspects of a car are no longer the differentiators that car manufacturers use to sell. By sharing the costs of development and being able to innovate using the latest technology the car manufacturers have made their products more resilient to changes in technology and more adaptive to the needs of the customers. This will be seen more and more as battery and electric motor technology take over from combustion engines. The web-based platforms underlying eCommerce and social media are all data manipulators. This may be in the form of products sold, customer preferences or streamed movies but it all comes down to moving data around at high speed.

The evidence would seem to indicate that care delivery could greatly benefit from technology platforms that are targeted at outcomes of benefit to practitioners, patients, carers and families that are not tied to current processes and pathways but enable new ways of doing things. The more flexible and adaptive the better. The learning from the eCommerce sector is to build technology platforms that will facilitate innovation and provide new services without starting from scratch each time. Another feature of technology platforms is that the back-office part is built on standardised components but that this enables great flexibility in what is seen at the margins. Different user interfaces for different classes of use, usable across different devices provides multiple services delivered through a single platform. All of this is perfectly aligned with the needs of care delivery. In fact, such a technology platform could form the heart of a range of citizen driven care solutions. Having a central technological capability would allow charities and specialist interest groups to develop their own support solutions that leverage the central capabilities but address the particular needs of the people they support. The central capability would remove all of the challenges around getting information in and out of statutory care providers and commissioners. In this way health and local authorities could become partners in service development but driven by citizen outcomes.

Key Point 17: Platforms standardise on technology at the core that can be scaled, reused and made reliable and resilient whilst providing person-centred experiences at the edge.

Examples from other industries indicate that platforms meet many of the needs required by The Four Pillars and are well suited to the broad range of needs of health and social care whilst simultaneously providing the opportunity to customise user-experience.

Platforms offer another advantage that Amazon, eBay, Expedia, Facebook and other such services use extensively. "Test and Learn" has come to be known as a way of rapidly testing how the platform can be made most effective in engaging with people. A hypothesis is formed about how a feature or capability would impact engagement with the platform. It may be hypothesised in several different versions. These different versions are tested with sub-groups of the platform's users. Data is collected and usually the version of the hypothesis that got the most engagement is rolled out across the platform. The physical parallel to Test and Learn is rapid prototyping using technology such as 3D printing. Being able to experiment without having to build a new system from scratch shortens the development cycle and reduces risk. It does however require a shift in thinking, the practicalities of which we will return to in Part 3.

Key Point 18: Always Test and Learn.

Platforms facilitate Test and Learn approaches where new innovations can be deployed and tested with sub-populations without having to completely re-develop or deploy new technology. This is a powerful facilitator of learning and understanding about many factors including behaviour change.

Moving from the Technology Platform to the Sociotechnical Platform

This brings us to the sociotechnical heart of the challenge of dealing with complexity. Technology platforms can provide all of the benefits mentioned above but will only achieve their maximum benefits if the people using them are educated, empowered and actively involved in their development. This includes all of the impacted actors from the practitioners to the patient/client and their support network. The sociotechnical platform is the interaction of people with technology in pursuit of outcomes. People are an integral part of the platform. It is only in this way that true resilience and adaptability are achieved. Often this is referred to as embedding the technology in practice. A sociotechnical view goes further and says that to develop a resilient, adaptive sociotechnical platform, practice must be evolved in collaboration with technology development. This allows the approach to evolve with the pressures of the uncontrollable Far Environment without having to start from scratch each time. Within this paradigm:

- Resilience is defined as the reliability and efficiency of the service being offered and its ability to rapidly respond to changes in demand from the Far Environment;
- Adaptability is defined as the amount of effort to develop a new service or deprecate an old service in terms of staff training and technology development.

Key Point 19: A Resilient Adaptive Sociotechnical Platform.

The ability to provide reliable and efficient service in response to changing demand leads to resilience. The ability to develop new services and close down unwanted services without starting anew leads to adaptability. The active engagement of people in the development and use of the technology in pursuit of positive outcomes underpins the sociotechnical nature of the platform.

In order to meet the sustainability challenge, all digital technological interventions should be developed as Resilient, Adaptive Sociotechnical Platforms. This provides the maximum opportunity for sustainability over time and changes in demand. Figure 1 shows a diagram of the Resilient, Adaptive Sociotechnical Platform supported by The Four Pillars.

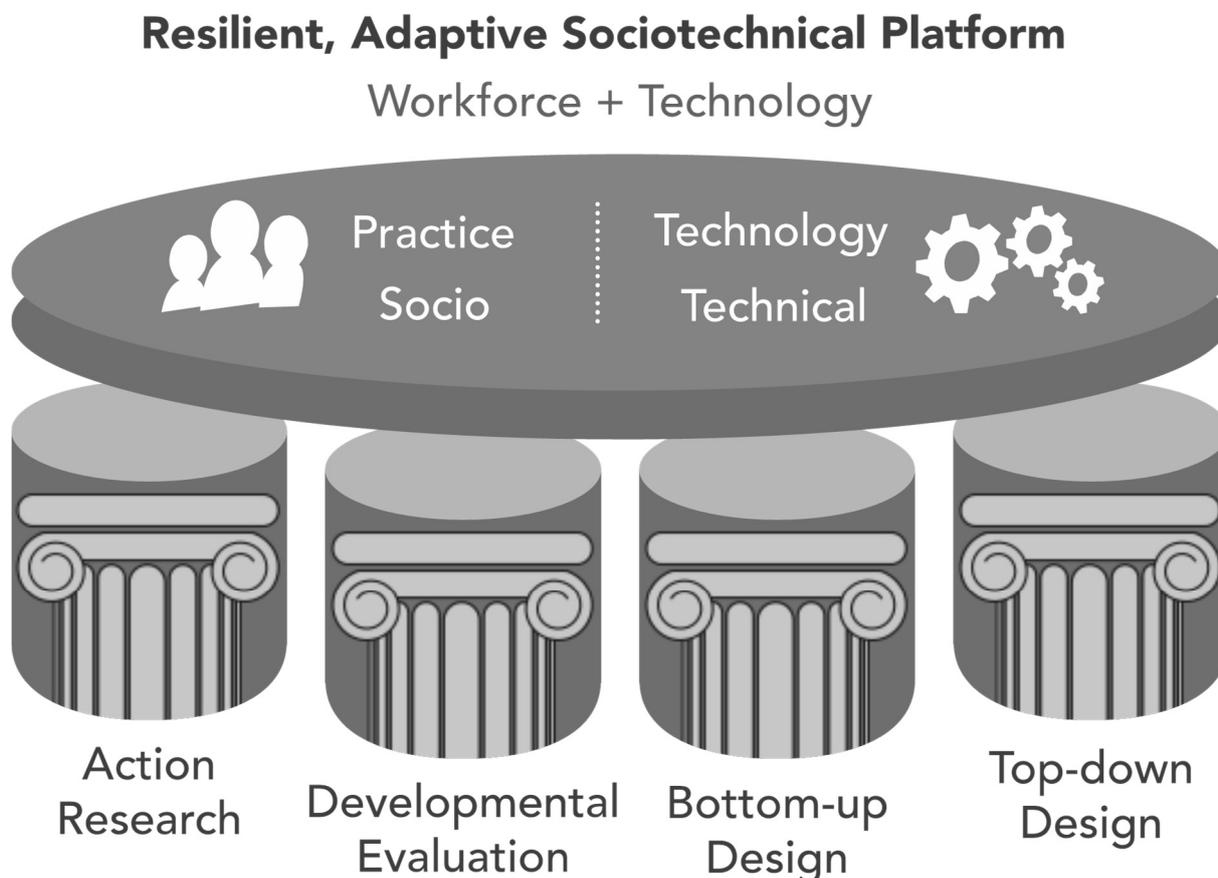


Figure 1: Resilient, Adaptive Sociotechnical Platform supported by The Four Pillars

The optimum solution would therefore be:

- A sociotechnical platform that is a combination of people and technology delivering the required outcomes;
- That the technology platform is highly reliable;
- That the sociotechnical platform is developed and evolved in collaboration with a wide range of stakeholders to deliver person-centred, biopsychosocial models of care;
- Built from standardised components that are constantly being evolved in line with the latest technologies and
- That the user-interfaces exposed to various stakeholders are appropriate, providing functionality that integrates into workflows and that for patients/clients its use is simple and does not require high levels of digital literacy.

It is worth noting that the concept of the sociotechnical platform is a radical departure from the scientific management theory (Taylor, 2003) of the production line view of care delivery. As discussed earlier the outcomes of interest in developing a sociotechnical platform are to diminish the activity in the current assembly line. Prevention, demand reduction, care at home and education have all been demonstrated in real-world deployments using technology (Hoare, 2016b). The barriers to moving to this seemingly better approach are discussed further in Part 3. The outcome sought is that the use of the technology becomes transparent to many new models of care. Overcoming the Challenge of Sustainability is through the development of Resilient, Adaptive Sociotechnical Platforms. This co-development of technology with stakeholders has many challenges of its own requiring a much deeper understanding of how technology can support practice whilst satisfying this broad range of stakeholders.

Key Point 20: A departure from the assembly line view of health and social care.

In the first Complexity Challenge we have already departed from the view of health and social care as being like an assembly line. In overcoming the challenges of Hubris and Sustainability we have moved to a Resilient, Adaptive, Sociotechnical Platform underpinned by The Four Pillars. This platform allows us to learn and understand about change rather than trying to impose a fixed perspective.

This brings us to our next challenge.

The Challenge of Collaboration

Key Point 21: The Challenge of Collaboration.

Collaboration - The action of working with someone to produce something. (Oxford English Dictionary)

The challenge of learning to genuinely collaborate through iteration by bringing together the complete range of people whose behaviour needs to change to make the intervention a success.

The recognition in Developmental Evaluation that “what works” is subject to complexity is key in dealing with health and social care. Not only are we dealing across organisations, but we are often dealing with parts of the care system that compete or that see a potential reduction in their income in doing things differently. This means that all of the actors impacted by a change in the system have different requirements that would lead to behaviour change around the adoption and embedding of technology into their practice. The Challenge of Collaboration is to understand these different requirements and address them in the overall solution.

Key Point 22: “What works” is highly susceptible to complexity.

Many factors such as competition, cross-organisational challenges and perverse financial incentives impact on “what works” from different stakeholder’s perspectives. This requires a developmental approach to evaluation.

POTE – Practice, Outcomes, Technology and Evidence

Starting with an Action Research approach and developing the intervention as a bottom-up endeavour, sets the scene for how a collaboration might progress. In its simplest form the collaboration would explore how practice could be augmented or improved through the use of technology. This implies some activity around User-centred Design (Galer, 1992; Eason, 2011). Context comes into play however as the consideration is “who is the technology for?” Does the technology empower new practice without any impact on the person being cared for? Or, is the technology

predominantly aimed at the patient/client and the practitioner is brought into their system? If we return to the discussion about improving productivity in established pathways, then the technology would be focused on the practitioner. If we are talking about encouraging self-care through education, empowerment and rapid support the technology is focused on the client/patient. This is a false choice as any technology that enables new models of care would need to interface with a range of practitioners, carers, patients/clients and family members. Therefore, the initial dimension shown in Figure 2 is subject to context in specifying who the users are in the user-centred-design.

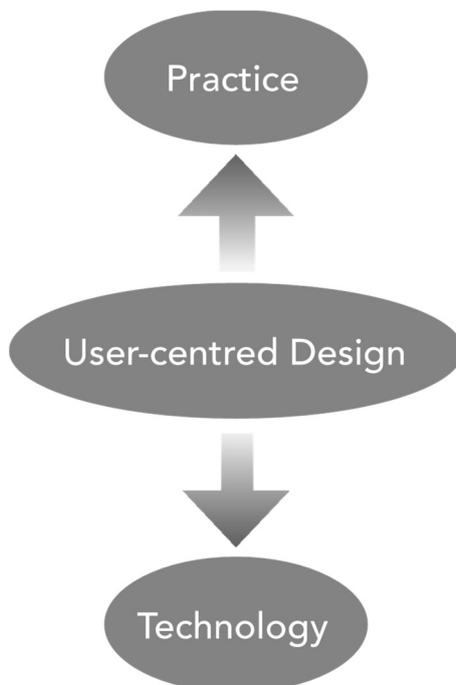


Figure 2: Development of practice in collaboration with technology through User-centred Design

The double ended arrows imply that the User-centred Design is actually an iterative process of developing, testing and refining the technology in support of new models of practice. This will consider input from a broad range of stakeholders.

This model alone is likely to result in technology-led or practice-led Feature Inflation. Feature Inflation being the addition of features because they can be imagined. The approach needs to be constrained by the outcomes being sought. If the context dictates that outcomes such as education, patient empowerment and immediate support are sought then this helps define the context of the User-centred Design. However, this opens the door to over-specifying the capabilities of the system as anything is potentially possible. The constraint is usually what the commissioner is prepared to pay for. Therefore, there is another axis that must consider what outcomes are sought but also what evidence is required to support these outcomes. An aspect of this evidence will be in support of the commissioner's concerns around what activity these new models of care replace or augment and whether the savings are available to them or to some other part of the system. In fragmented, interconnected systems it is quite likely that any savings appear in another part of the system. This reinforces the need for a systemic view and a comprehensive consideration of all of the impacted actors. When generating evidence, the concerns of all actors must be taken into account. This means that the evidence generation must include traditional economic factors but can include a wide range of other measures of value. Experience shows that the value of reduced anxiety, confidence and independence is rated very highly by patients/clients but is poorly represented in the measurements by the current care system (Hoare, 2016a). If we show this other dimension it looks like Figure 3.



Figure 3: Outcomes and evidence

Hence, any technology development that is going to meet the needs of new models of care must arise from an Action Research approach that combines these dimensions. This is shown in Figure 4.

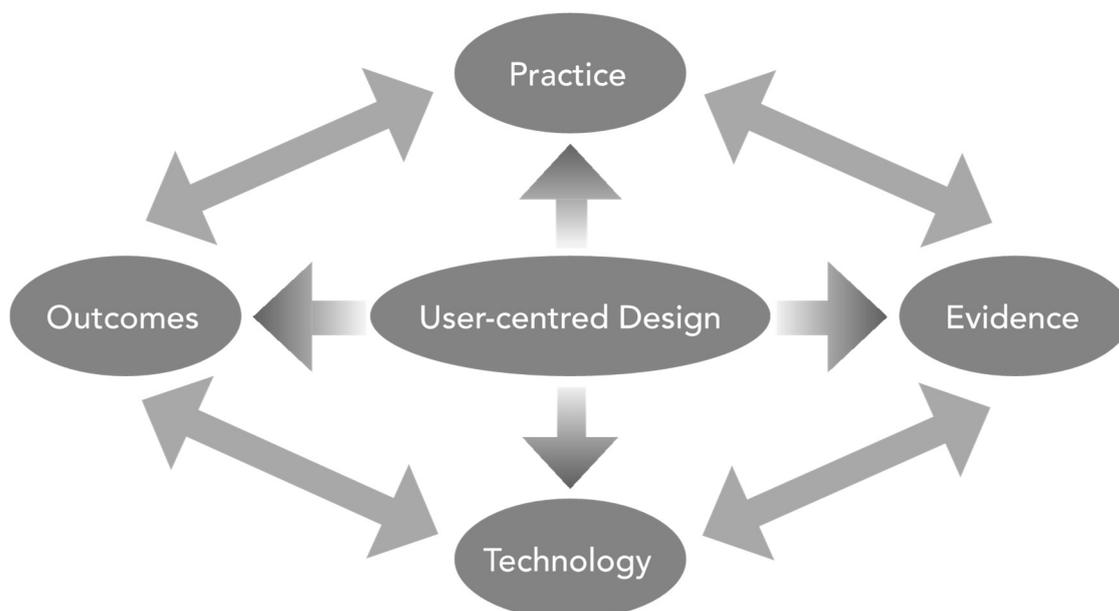


Figure 4: Practice, Outcomes, Technology and Evidence (POTE) Model

The POTE model is iterative and collaborative and requires active participation of all impacted actors. The evolution of any solution is also impacted by the context it sits within.

Key Point 23: The Practice, Outcomes, Technology, Evidence (POTE) approach to collaboration.
 This approach to collaboration dynamically links Practice, Outcomes, Technology and Evidence in an iterative approach to collaborating towards desired outcomes. At its centre is User-centred Design where all key stakeholders in the intervention are represented.

Practice Evolved in Collaboration with Technology, Generating Evidence of Outcomes Sought

This Action Research paradigm has within it some important messages. This is particularly true when the technology developed is a platform that is resilient and adaptive as discussed in the Challenge of Sustainability. Some of these features can be summed up as:

- Bottom-up Design needs to incorporate a deep understanding of the context and outcomes being sought. Single pathway or process solutions are unlikely to be adaptive and therefore resilient to change.
- A broad range of outcomes can serve to drive the development of the technology in support of many new models of care within a single approach.
- The range of evidence needed is based on a Developmental Evaluation approach providing richer quantitative and qualitative evidence of outcomes and stakeholder experience of using the technology. The volume of evidence to support learning can be helped by the technology platform generating evidence of outcomes as part of its normal operation. This is called “Instrumenting the Platform.” Automatically generated evidence provides transparency and helps embed the system in regular practice. This is augmented with other evidence collected in person. The combination then supports ongoing learning. The ability to generate large amounts of data supports the ability to Test and Learn. When developing the platform, the granularity of this data is important. Key to Instrumenting the Platform is that the widest set of data is acquired.
- All aspects of the paradigm interact. This moves away from the idea of technology as a point innovation in a pathway to a platform that enables new models of care. The model encourages evolution rather than “big bang” projects.
- The model is dependent upon technologists working with practitioners in an iterative approach to reach a common understanding of how outcomes can be generated. Presumed wisdom about what the right solution is can be very dangerous as discussed in the Challenge of Hubris. There needs to be a cycle of development and field-testing to understand the demands on the technology in practice.

Key Point 24: The POTE approach to collaboration requires broader and more open thinking than traditional approaches.

The POTE approach begins by not by assuming what the end result will be but by exploring what the intent is and what outcomes are sought. In order to support the learning and understanding required much broader evidence is required than in traditional approaches. The evidence evolves as practitioners and technologists collaborate on the solution.

We will now consider how the POTE model interacts with the context.

POTE and Context

The proposal is that technology solutions should be based on Resilient, Adaptive Sociotechnical Platforms that are developed within a POTE model of collaboration. This meets three of The Four Pillars in incorporating Action Research, Developmental Evaluation and Bottom-up Design. The missing component is Top-down Design. Traditionally this has been attempted by trying to engineer solutions as “big bang” approaches. Such approaches assume everything is known upfront and develop large and expensive programmes of projects to deliver solutions. There have been many high-profile programmes in the public sector that have failed to deliver using this approach (Eason, 2016). In health the largest was the National Programme for IT (NPfIT). The programme was estimated to cost £5bn but in the end was closer to £13bn (Savage M, 2010). More than £39.2m was spent on the legal and commercial support around the issues raised by poor delivery and cancellation of projects. It is believed that the bottom-up approach described here has much more chance of success in the long-run but should be linked to top-down strategic direction. One of the concerns in introducing this link is that many of the factors that drive the top-down demand originate in the Far Environment and are not directly influenceable. Hence the way to incorporate changing demands into the POTE model is through the outcomes. Placing the model in Figure 4 into the real-world context leads to Figure 5.

This introduces an outer loop linking changes in policy and demographics to changes in demand for care outcomes that must be met by evidence. Since the technology development within the care system has been specified to be resilient and adaptive and not tied to a particular process or pathway it can evolve, through continual Action Research, to adapt to changes in demand and understanding of public health. The input is through the outcomes specified to the care system and the system has the capability to generate higher level evidence of how these outcomes are being met. If the system is correctly specified and developed this will remove the need for most inspection (which is backward looking anyway) by producing live evidence of outcome delivery that is current and transparent.

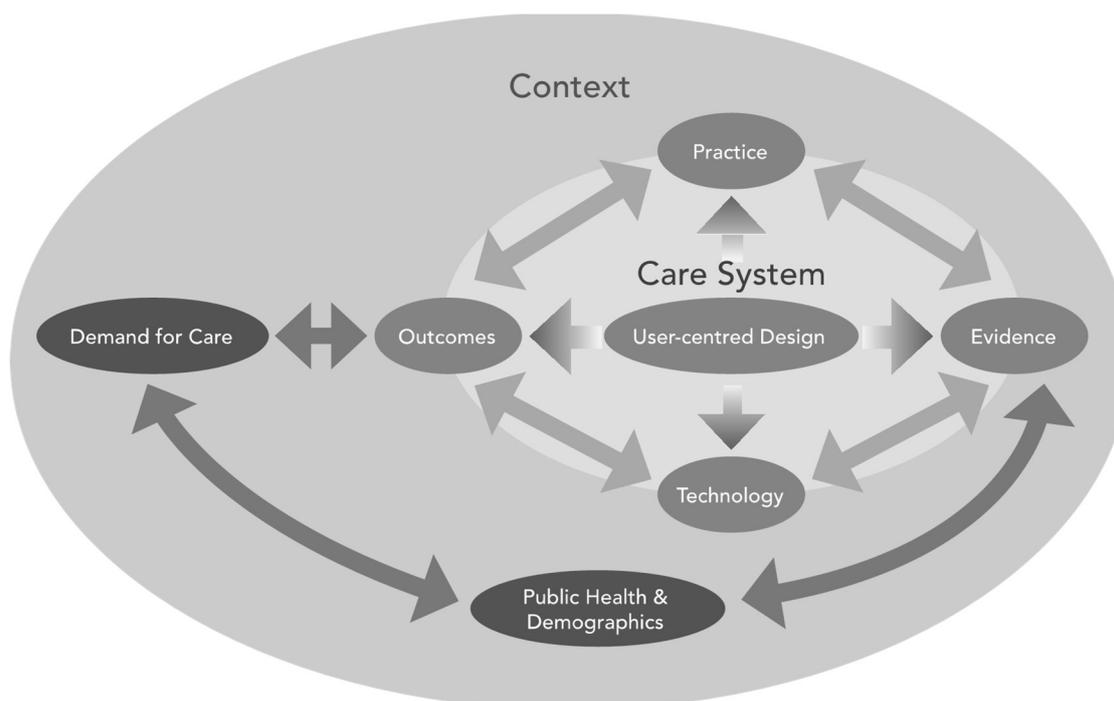


Figure 5: POTE model within the real-world context

Key Point 25: In reality Practice, Outcomes, Technology and Evidence all exist within the solution sought but are also continually disrupted by the real-world context.

It is tempting but wrong to think of each aspect of the POTE model as fixed parts of the solution. In reality they are all influenced by the real-world context and by each other. However, the Outcomes dimension is the one that connects the model to demand for care. Evidence is tightly coupled to Outcomes in the need to demonstrate positive results.

Thus far, the discussed approaches to complexity have dealt with the underlying tenets in The Four Pillars, the route to sustainable solutions and a method for collaborating and developing solutions. These approaches provide ways to overcome the Challenges of Hubris, Sustainability and Collaboration respectively. In each case there has been multiple references to the impact of the setting and the Near and Far Environment. The Challenge of Context is the most daunting. These first three challenges are most susceptible to control and management. Context is where many interventions struggle. This has been seen repeatedly in efforts to scale up or diffuse innovation. A successful intervention in context "A" fails when tried in context "B." Returning to our discussion about evaluation, it is when we try to exclude context that we fail. The power of context can be seen in the difficulties of diffusing best practice in the form of NICE guidelines (Kneale, 2016). Variations in adoption and sustainability are contextual and vary from one place to another. We contend that any attempt to engage with the complexity of digital interventions as Sociotechnical Systems requires a robust and realistic approach to characterising and handling context. The next section proposes a framework for addressing this difficult and inherently complex issue.

The Challenge of Context

Key Point 26: The Challenge of Context.

Context - The circumstances that form the setting for an event, statement, or idea, and in terms of which it can be fully understood. (Oxford English Dictionary)

The Challenge of Context engages with complexity by considering all of the people and factors that impact on the setting for the intervention.

Once again, the temptation when addressing the context of an intervention is to try to tame it. When considering context there is a desire to draw boundaries around components and try to constrain their operations to mechanistic functions. This returns to our reductive and inappropriate machine-based view of complicated systems. This neither reflects the interconnected nature of the organisations in the system or the fact that we are talking about a sociotechnical system that requires people to interact with technology in pursuit of outcomes. One of the great advantages of the technology is that it has the potential to transparently cross organisational boundaries. The sociotechnical result however is driven by people's behaviour that may be a result of many other issues such as fear, lack of technical capability, lack of training and competition between connected organisations. Therefore, there is the sociotechnical nature of the context. There is also another issue that we have touched upon in our discussion of the Near and Far Environment adding to the complexity. Before we can draw a boundary around any part of our system and consider that component to be self-contained, we must decide whether that kind of closed system thinking is appropriate. A systemic view will often differentiate between an open and closed system (Ackoff, 1999). Closed systems have a boundary beyond which they are not influenced by the external environment. We will work on the principle that health and social care is an open system that must consider disruption in the Near Environment all the way out to the extremes of the Far Environment. That means that we cannot draw boundaries around any of our organisational components and our context must capture all of the complexity of the sociotechnical nature of the intervention and the environment from the near to the far. Health and social care and indeed wellbeing are not products of a machine or single organisational structure. They are outcomes of a system and also aspects of the people's lives that work within and fund that system. This means that the system is open and influenced by the farthest reaches of the Far Environment including public health, public finances, demographics and individual choice. This makes health and social care very special as everyone in the UK is both within and outside various aspects of the system and this situation is dynamically changing. The machine view of care also ignores a key recurring theme, that we will consider as a systemic factor in Part 3, people are different. We will discuss here many aspects of changing practice using technology. However, expecting all receivers of care to engage equally with such changes is also reductionist. The biopsychosocial model of care introduced earlier, recognises that from the patient/client perspective interventions have biological (the medical model,) psychological (related to mental health,) and social aspects (engagement in the collaboration by the patient/client and family). When addressing complexity, we must see the engagement with the patient/client as a systemic aspect of the context. This all serves to introduce complexity that is

challenging to engage with and defeats reductionist approaches to change. The business perspective that organisations exist in a marketplace where they compete using their resources and capabilities in the same external environment (Grant, 1991) is not appropriate to the connected and interdependent nature of care provision. Again, commercial sector concepts do not simply transfer into public sector settings. In health and social care, the organisational structures that deliver care in a geographical region do so in a set of embedded contexts. Hence, the analysis of care delivery is more related to the study of contexts than any reductionist approach to organisational structure or operation.

We established two types of complexity earlier, differentiated by the level of influence we have. In fact, complexity is more complex than that, unsurprisingly. In the near context, perhaps defined by the department or organisation we work in, we have some influence. The further we go into the far context the less influence we have. The ultimate example of the far context may be characterised by climate change where we can individually have a minor impact and we must act as large groups to have a significant impact. Climate change is a good example of complexity as the number of interacting factors and the dynamics of those interactions confounds simple causal analysis. This gives us an insight into the fact that context can be thought of as a continuum related to the ability to influence factors. In the near context we have some ability to influence. In the far context, we are influenced by factors. In order to deal with complexity, we therefore need to consider factors that originate at different levels of the context from the near to the far. This begins our study of embedded contexts.

Key Point 27: Context is a continuum.

Context is the setting for our intervention. If we are to use context to embrace complexity it must contain factors that are both local to our solution in the Near Environment. It must also contain factors that are distant to our solution in the Macro Environment. It must also include important factors in between. Hence, context is a continuum that goes from locally influenceable factors to uninfluenceable factors in the Macro Environment.

Stakeholders and Gateholders

It is common when attempting change or when developing an intervention to consider the stakeholders impacted. Stakeholder theory has evolved out of organisational thinking and sees the organisation at the centre of the analysis i.e. a stakeholder has a stake in the organisation (Phillips, 2003). So, we have a set of organisations that contain stakeholders. This perspective immediately causes problems with our study of embedded contexts. Interventions based on digital technology may impact on many organisations and individuals. Individuals such as patients are not within organisations, but the outcomes sought impact directly upon them. Many organisations in care have complex relationships such as those between commissioners and providers. Organisations that are impacted by an intervention may compete. An organisational perspective runs into problems such as:

- A constantly shifting landscape of organisations as contracts are re-negotiated and providers change.
- A constantly changing policy framework at the local and national levels altering the goals and guidance at different levels of the system.
- Changes in the regulatory environment.
- Changes in the structure and content of health and local authority management.
- General practitioners are independent businesses that operate autonomously under guidance and financial incentives from the NHS.

Thus, it is inappropriate to draw boundaries around organisations and the concept of a stakeholder is not helpful. When dealing with “complexity in context” it is therefore necessary to adopt a more pragmatic approach based on participation in the intervention. Each person that is impacted by or has impact upon the intervention is therefore seen as someone who would have to change their behaviour to engage positively with it. We will refer to these people as Gateholders. Their engagement in behaviour change, gates whether the intervention progresses. Therefore, a Gateholder is not a representative of an organisation but represents a particular role in impacting upon or being impacted by the intervention. Gateholders may have organisational concerns and roles but the move from stakeholder to Gateholder frees us from the assumption that participants in an organisation hold homogeneous views that can be attributed to the organisation. Since we are considering a Sociotechnical System the move to Gateholders provides better representation of the social aspects of any Gateholder’s involvement in the intervention. By identifying all Gateholders impacted we begin to map the necessary cohort that have a say in the success or failure of an intervention. In order to make any learning generalisable we assign Gateholders to groups. The sorts of Gateholder groups we have encountered in developing technological interventions in health and social care delivery include: