From Policy Framework to Practice Real Work: exploring knowledge mobilisation within a complex adaptive system

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Abstract

Successful implementation of evidence-based innovations has been identified as offering the likelihood of better outcomes for service users, communities, and organisations. A widening understanding of structures, processes and resources essential to the successful adoption of innovative practices has informed the development of implementation frameworks that seek to support the sharing and application of new knowledge. Despite these efforts, research knowledge is still difficult to translate into innovations in practice at scale, requiring the investment and co-ordination of resources across interconnected social structures that can be resistant to change.

However, some changes *do* take hold and lead to new practices becoming integrated into organisational routines. Mobilising individual and collective knowledge have been identified as a key factor in delivering organisational changes. Research in this area has highlighted the role of complex, context dependent and power-laden organizational structures in relation to the spread and use of knowledge while the role of the individual as the agent of change within these organisational structures has received less attention.

This study adds to the conceptual and theoretical literature by focusing on the individual as the agent of change and the role of knowledge as a catalyst for the implementation of changes in practice.

Drawing on literature on the creation, sharing and use of knowledge and employing the principles of complexity theory to construe the context as a series of complex adaptive systems, the study seeks to gain an understanding of how a Government policy framework transforms into individuals creating, sharing and actioning knowledge to secure changes in practice.

Study Context

This study considered how the ambitions of a Scottish Government Policy, Ready to Act (R2A) were implemented within the organisational setting of an NHS Scotland health board. The participants in the study were a group of Allied Health Professionals (AHPs) which included physiotherapists, occupational therapists, speech & language therapists, podiatrists and dieticians along with their leaders and representatives from the Scottish Government who

had been instrumental in setting the overall direction of service redesign. The R2A policy aimed to break down professional silos to create a more integrated service delivery that focused on early intervention and prevention approaches.

The overarching research aim was addressed in this context through the following research questions:

What are the underlying mechanisms that enabled individuals to create, share and action knowledge to reconfigure services towards early intervention-prevention service delivery within this context?

What underlying mechanisms facilitate and maintain the momentum and direction of change across diverse and dynamic agents within the system?

Study Design

The qualitative longitudinal study adopted a realist approach to consider what works for whom and in what context in relation to implementing practice change in line with policy ambitions. Participants' understandings of the change process and their attributions for successful changes were explored over a 17-month period.

Context-mechanism-outcome (CMO) theory configurations were constructed and refined through three tranches of focus groups (4) , interviews (23), observations (50 hours) and documentary analysis (16 documents) to provide a robust explanation of how knowledge drawn from a learning activity was mobilised across a complex adaptive system of health and social care.

Theoretical Framings

Employing concepts from complexity theory and the knowledge mobilisation literature, the health and social care context is construed as a complex adaptive system (CAS), where interconnected entities adapt and self-organise in response to stimulus or feedback from their environment. Considering outcomes as an emergent quality of the system rather than a product of mechanistic stimulus and response, enabled the unpredictable and uncontrollable aspects of the context to be viewed as potential assets to the knowledge mobilisation process.

Main Findings

The study considered two workstreams of AHPs who were collaboratively designing changes in practice which aligned with the ambitions of the R2A policy. The groups had different starting points in relation to their workstream tasks.

These different starting points, and the resources and histories of the participants had continuing impacts on how the individuals within each workstream group responded to knowledge presented within the learning activity and to the policy ambition of a move to a proactive approach to service provision. The policy implementation process progressed in unanticipated ways across different parts of the AHP system. Various outcomes occurred, some supporting the ambitions of the R2A policy, and creating changes in practice, while other outcomes resisted change and maintained the *status quo*. The pattern of outcomes also varied over time.

Employing a complexity theory lens provided a useful analytical frame for surfacing and explaining differences in the nature and pace of change across contexts. Key constructs from complexity theory (self-organisation, feedback loops, emergence and interconnectivity) provided a useful way of explaining differences across the system and brought attention to elements of the change process which were unforeseen, forgotten or hidden in plain view.

The study also identified distributed leadership and the cultivation of an allocentric disposition, where individuals were willing to engage with the knowledge from other professional groups and disciplines, as necessary antecedents of knowledge mobilization. The importance of feedback loops in maintaining the trajectory and momentum of change across the system and over time was another important finding. Feedback loops were observed manifesting as epistemic artefacts in the forms material objects, social routines or linguistic behaviours, which were created, refined and often replaced by individuals and groups as the system adapted and evolved. The detailed longitudinal nature of the study revealed incremental changes which were important, but which were largely unacknowledged by the measures of change adopted by local management and the Scottish Government.

Theoretical Contribution

The study revealed how the attributes of complex systems were harnessed to mobilise knowledge and deliver desired outcomes.

Drawing together the literature on epistemic artefacts and the attributes of complex adaptive systems, this study provides a greater understanding of the role of artefacts within feedback loops in the sharing and application of knowledge.

The nature of feedback loops has not been explored fully in previous studies. This study sheds light on how linguistic, social, and physical artefacts are created and employed within the process of knowledge mobilisation to support sustainable changes in practice.

Empirical Contribution

This research provides a rich, detailed account of knowledge mobilisation in AHPs, an under-researched group of key actors within health care. It provides much needed longitudinal empirical evidence to a field which has received predominantly theoretical attention and provides an inter-group observation of knowledge mobilisation within a complex adaptive system.

Practical Contribution

Employing realist methodology provided an ontologically deep exploration of the factors impacting on individuals and collectives as they sought to create, share, and implement their knowledge to deliver changes in practice. The realist methodology also provided a reflexive space for participants to review and unpack their experiences and set these within the context of how events emerged across the wider system over time. The refined CMO theories resonated with the experience of stakeholders from a wider national context who identified with the complexity-informed explanations of outcome variation across the system. The refined CMO configurations provide practical guidance on how key factors of complex adaptive system were harnessed to support the development and spread of innovation.

Implications of the study

The findings from the study suggest that where knowledge is a catalyst for changes in practice, the scale-up and spread of change across a complex adaptive system is facilitated through micro-processes of feedback. These feedback loops are highly sensitive to context. Understanding how feedback loops evolve and influence the trajectory of change within specific contexts offers an opportunity to harness the feedback loop to create virtuous cycles of change, moving the CAS in the desired trajectory of change. Understanding how vicious

cycles of undesirable change or status quo are being sustained through feedback loops offers formative opportunities to dampen the influence of these feedback loops.

The findings also suggest distributed and hierarchical approaches to leadership are both required within complex organisations. Although command and control structure are necessary to ensure the organisation is stable enough to function effectively, a distributed model of leadership is necessary to foster engagement and innovation. These different forms of leadership were not in competition but could be construed as operating as further feedback loops which influenced the direction of change.

Creating change across this complex system relied on the mobilisation of knowledge between engaged agents. This occurred within this study through respectful and empowering relationships which were based on a model of distributed leadership and an allocentric disposition. These factors took time to become established. Individuals and groups working to mobilise knowledge were supported when anticipated timeframes for projects and activities were extended to facilitate change processes, particularly in context where individuals and groups had no history of working together.

This study sought to provide a coherent explanation of the events experienced by practitioners and leaders as they addressed the shared ambitions of a government policy. The findings suggest that feedback loops which emerge from a deep understanding of how relationships are formed, managed and sustained across a system, provide key knowledge that can be mobilised to promotes the scale up and spread of innovation across a complex system.

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Glossary

Allocentric	Concerned with the interests of others more than one's own. Community minded
Conspicuous Departures	Local adaptations that result in self-organising entities to depart from the desired trajectory of change.
Demi-regularities	A semi-predictable outcome pattern relevant to realist evaluation. Similar to the basin of attraction described within complex adaptive systems.
Hermeneutic Cycle	Creating meaning by moving iteratively between the parts and the whole entity. Understanding the parts expands understanding of the whole entity and vice versa.
Positive Deviations	Local adaptations that support self-organising entities to continue on the desired trajectory of change.
Profession-centric	Concerned with the interests of a particular profession. Centred on one profession.
Trans-professional	Collaboration between two or more professions that creates new synergies across and beyond professional and disciplinary boundaries.
Uni-professional	Operating as a single professional group.

Abbreviations

AHP	Allied Health Professional
CAS	Complex Adaptive System
CMO	Context -Mechanism -Outcome configuration
D	Dietician
KBC	Knowledge Based Capital
KIO	Knowledge Intense Organisation
NHSH	NHS Heathcliff (Pseudonym of NHS Health Board)
OT	Occupational Therapist
PO	Podiatrist
PT	Physiotherapist
R2A	Ready to Act (Scottish Government Policy) 2016
SECI	Socialisation, Externalisation, Combination, Internalisation
SIS	Scottish Improvement Skills
SISCC	Scottish Improvement Science Collaborating Centre
SLT	Speech & Language Therapist

Chapter 1: Introduction

1.0 Introduction

There are concerns that efforts to use knowledge to best effect across public sector services have stalled despite the development of multiple models and frameworks to support the scale up and spread of knowledge and practice innovation (Braithwaite, 2018; Healthcare Quality and Improvment Directorate, 2018; OECD, 2018). This has led to calls for new approaches to the study of problems of innovation and improvement spread which reflect the complex and non-linear nature of the social context (Braithwaite, Churruca, Long, Ellis, & Herkes, 2018; Holmes et al., 2016; Rutter et al., 2017; Slade, Philip, & Morris, 2018) and the role of the individual as an agent of change (Horton, 2018; Slade et al., 2018).

This study considered how individuals as agents of change, created, shared, and applied knowledge to support the implementation of changes in practice in line with a government policy framework. The study followed a groups of Allied Health Professionals (AHPs) delivering services to children and young people as they began implementing the ambitions of the Ready to Act (R2A) Scottish Government policy, within one Scottish health board context.

Focusing on how knowledge was mobilised to create innovations in practice within a complex interconnected health and social care setting, this study considered how attributes of the dynamic context could be harnessed to overcome local obstacles and contribute to the scale up and spread of innovative practice, facilitating local variations while maintaining an overall trajectory of change aligned with the ambitions of the R2A policy.

Framing individuals from the policy, management and practice levels of the health care context as active agents of change and the study context as a complex adaptive system surfaced patterns within the data, highlighting factors which facilitated or inhibited the mobilisation of knowledge into changes in practice at different points within this context.

This chapter begins with a precis of the background to the study and a description of how the study contributes to current research. The following section explains the choice of conceptual lenses and methodology. The chapter concludes with the research questions, a description of the study and an outline of the structure of the thesis.

1.1 Background to the Study

There is an increasing awareness that resources are optimised and outcomes improved where interventions, programmes and policies are informed by research evidence (Haynes et al., 2017; Slade et al., 2018). The process of connecting different forms of knowledge to enable policy makers and practitioners to make decisions based on the best available information has been termed knowledge mobilisation (Swan, Newell, & Nicolini, 2016). The mobilisation of knowledge into changes in practice presents an increasingly pressing challenge across interconnected public services trying to achieve best outcomes and maximise the use of resources. A proliferation of models and frameworks to support change have yet to secure sustainable, large scale change (Birken et al., 2017; Braithwaite, 2018; Lynch et al., 2018) and many research findings are not being acted on in a timely way, resulting in sub-optimal service delivery, poorer outcomes and a considerable financial waste of research funding (Graham et al., 2018).

The current healthcare context has been described as a perpetual white water of policy changes where professional boundaries are distorted and traditional working practices disrupted (Hunter, 2015). These changes have manifested in healthcare as a move away from the tradition of the medical expert dispensing knowledge and instead presents the health and social care context as a knowledge-processing entity where success depends on a variety of interested and engaged stakeholders sharing different forms of knowledge across health and interconnected social systems (Harvey, Jas, & Walshe, 2015).

The difference in approach to healthcare provision reflects the changing needs of society, where the 21st century healthcare system is challenged by non-clinical diseases relating to life-style choices such as obesity, heart disease and many forms of cancer. These health challenges are more effectively addressed through preventative measures than through medical interventions. This represents a significantly different model from the disease orientated focus of the NHS at its inception after the Second World War. Some authors have referred to a third era of change in health systems where there is an emphasis on health promotion as a community and across the life course, and a shared responsibility for the co-design and delivery of health care by stakeholders beyond health care services (Hunter, 2015). This model of health care delivery demands the integration and application of a variety of different forms of knowledge between stakeholders with different priorities.

As individuals, we are continually sharing knowledge and adapting to change, yet within organisational contexts which are socially constructed amongst individuals, change initiatives appear to be inhibited rather than facilitated. The organisational change literature and the history of healthcare re-organisation provide many examples of how superficial structural change is achieved but the essential problems of culture and power relations which impede knowledge sharing are perpetuated (Best et al., 2012; Fitzgerald, 2017). This study considered factors which are missed or ignored in many models of change processes within complex organisations by providing a concurrent account of how different forms of knowledge became mobilised by individuals to facilitate change within one healthcare context.

1.2 The Research Gap

The dominant narratives in change literature are around methods-driven change focused on metrics, measurements and tools to secure change and the agent-driven narrative which focuses on the role of change agents in leadership. Adopting the perspective of knowledge-driven change, this study explores how change is delivered by individuals.

"It's people themselves and relationships between them who ultimately determine the shape, nature and success of improvements" (Greenhalgh 2009).

"It is not the actual programmes which 'work' but the reasoning and opportunities of the people experiencing the programmes which make them work" (Pawson & Tilley, 1998).

The Health Foundation also recognises the need to acknowledge the *'crucial contribution of adopters'* in spreading innovations across different contexts (Health Foundation 2018). This study aims to provide granular information on the experience of individual agents of change. The study provides a longitudinal observation of how the ambitions of a policy framework were implemented by participants. Rather than providing information which reflected retrospectively or from a single point, this study considered the knowledge mobilisation process dynamically, searching for mechanisms that supported or inhibited knowledge mobilisation for individuals working within different levels of the system over time.

This study challenges the notion of change as a planned, scheduled, implemented process which leads towards a pre-determined future state and instead considers the change process as an emergent experience which occurs at different rates across contexts and where the outcome or future state is open to adaptation in the light of unpredictable events and new

information. The focus of the study was to uncover mechanisms which influenced change and adaptation as they occurred within this context.

1.3 The Study Context

This qualitative study focused on the perspectives of a group of Allied Health Professionals (AHPs) within a Scottish health board who were restructuring service delivery to focus on early intervention-prevention. The study considered the impact of a learning activity intended to support practitioners as they implemented the ambitions of the Scottish Government policy. The learning activity was adopted as a tracer for knowledge, providing an anchor for the study and enabling the researcher to maintain a focus on how knowledge created within the learning activity became mobilised across the wider system. The learning activity was the Scottish Improvement Skills (SIS) Improvement Science training package. A bespoke version of this training package was prepared and delivered to a group of AHPs working within one Scottish health board, NHSH.

The policy was Ready to Act (R2A): A Transformational Plan for Children, Young people, Their Parents and Families (Scottish Government, 2016). The implementation period for this policy is a five-year period 2016-2020. This study considers one part of this implementation period, April 2017- September 2018 and focuses on the impact of the learning activity relating to improvement science which took place between August 2016 and June 2017. A realist methodology has been used to create context-mechanisms-outcome (CMO) configurations that describe several mechanisms which were triggered to deliver outcomes following the learning activity. This approach uncovers how aspects of the context impacted on the reasoning and resources of participants to produce a variety of outcomes.

Following an initial consultation process, two groups of practitioner participants were drawn from a cohort of AHPs undertaking the SIS learning activity in NHSH. The cohort of AHP's were proportionally representative of the professional mix of the AHP workforce within the health board and consisted of 6 AHP professions: dieticians, podiatrists, physiotherapists, occupational therapists, speech & language therapists and orthoptists.

The investigation was multi-layered and in addition to the practitioner participants listed above, lead AHP professionals within the Scottish Government, along with training providers and AHP managers from the NHSH health board were also interviewed and observed.

1.4 Conceptual Lenses

The study has been conducted following a realist methodology to uncover mechanisms which enabled new approaches to practice to evolve and spread across the system. These events are viewed through the lenses of complexity theory (Cilliers, 2013; Manson, 2001; Zimmerman, Lindberg, & Plsek, 2009) and knowledge mobilization theory (Davies, Powell, & Nutley, 2016; Greenhalgh & Wieringa, 2011; McCormack et al., 2002; Rycroft-Malone & Bucknall, 2010; Ward, House, & Hamer, 2009).

Framing the context as a complex adaptive system, the study considers how the dynamic features of the system (interconnectivity, emergence, self-organisation and feedback loops) supported individuals as they developed early intervention-prevention practices in response to different forms of knowledge.

1.5 Format of the Study

The study examined structures and circumstances which influenced the development and adoption of new behaviours by AHPs. These events included both deliberate activities and unpredictable emergent processes (Dixon-Woods, 2011). The study provides one explanation of how different forms of knowledge are mobilised within variable and often challenging contexts where unknown and often unknowable influences have impacted on the observable outcomes. In this study semi-structured in-depth interviews, focus groups, observations of meetings, training events and staff development days were used to explore events as they were occurring within an open real-world context. Further documentary analysis of publicly available documents relating to specific themes which arose in the data was also conducted.

Employing concepts from complexity theory, the context of the investigation is characterised as a complex adaptive system embedded within a wider context of many complex adaptive systems. This approach creates a structure that facilitates analysis of the causal mechanisms across micro, meso and macro levels of the system.

Adopting a realist approach maintained a focus on process rather than outcome, aiming to uncover the causal factors which supported or inhibited the realisation of potentialities (practice changes) in the specific context of the investigation. These causal factors are the key to understanding how successful knowledge mobilisation occurs.

"Without knowledge of the relevant causal mechanisms one cannot predict whether a successful intervention will generalise, learn much from failed interventions or successfully optimise future interventions" (Eccles, Grimshaw, Walker, Johnston, & Pitts, 2005).

The causal factors are presented in the form of context-mechanism-outcome (CMO) configurations or theories. These mid-range theories explained how multiple forces operating within a context combined or resisted each other to produce outcomes. These forces either amplified or inhibited the mobilisation of knowledge to deliver activities and behaviours which supported the R2A policy ambitions.

1.6 Research Aims and Primary Questions

The aim of the study was to provide a description of the experience of implementing a government policy framework from a variety of participant perspectives. The initial logic and ambitions of policy makers, the implementing Health Board and the practitioners were captured in a set of provisional CMO configurations which provided the starting point for the study. These provisional theories were then explored and refined through three tranches of data collection. The realist approach to interviews formed a hermeneutic cycle where the researcher presented theories and ideas to the participants who then expanded the researcher's understanding of the context by providing comments and further information. This enabled the researcher to refine the CMO theories to provide a better explanation of the mechanisms that underpinned the observed phenomenon. The realist evaluation approach provided an understanding of what worked for whom in what context rather than a search for a universal truth.

The following research theme was identified:

What underlying mechanisms explained the processes of creating, sharing and actioning knowledge that enable individuals to reconfigure services within this context?

The final refined theories suggested factors which were antecedents and sustaining factors of successful knowledge mobilisation within this context. These factors were distributed leadership, an allocentric distribution and communication between levels of the system. Each of these factors is discussed in relation to the wider literature on organisational change. Aligning these factors with the complex adaptive systems attributes of self-organisation,

interconnectivity and feedback loops provided an explanation for the diverse range of outcomes experienced across the AHP context in relation to the learning activity.

The findings suggest that harnessing the attributes of the complex system to create adaptation and change delivered more successful outcomes than command and control approaches in this complex knowledge-intense setting. Adopting this knowledge-related perspective on change provided a more nuanced understanding of change processes than process or outcomes led approaches and offered a more appreciative explanation of the performance variations that occurred within the complex system.

The findings from this study resonated with the experience of AHPs as they sought to implement the policy ambitions in other health boards across Scotland, suggesting the findings have application beyond the context of this study.

1.7 Organisation of the Thesis

This thesis is presented as six chapters. Following on from this introduction, chapter two presents a review of literature on the first conceptual lens of knowledge mobilisation. Chapter three presents literature informing the second conceptual lens of complexity theory. The choice of a realist methodology for the study and the key principles underpinning this theory-based approach are discussed in chapter four, before moving on to describe the stages of the study and how data collection and analysis were conducted. The following chapter five explores the findings, beginning with a description of how the provisional CMO theory was developed and concluding with a revised configuration of CMO theories which emerged from the empirical data. Chapter six discusses the implications of the refined theory, and considers theoretical, empirical and practical contributions before concluding with some personal reflections and potential areas for further research.

1.8 Summary

This study uncovers some of the mechanisms which enabled a group of allied health professionals from a Scottish health board to deliver practice changes in line with a government policy framework. These mechanisms were involved in mobilising different forms of knowledge to create and deliver changes in service that focused on the provision of early intervention-prevention models of delivery. Construing the policy-practice context as a complex adaptive system and the study participants as the active agents of change, this study

describes how key attributes of a complex adaptive system could be harnessed to support or inhibit mobilisation of knowledge to deliver changes in practice. The following chapter explores the nature of knowledge and the practice of knowledge mobilisation.

Chapter 2: Literature Review 1: Knowledge

2.0 Introduction

This chapter, the first of two literature chapters, discusses the nature of knowledge. It begins with discussion of the nature of knowledge before moving on to discuss constructions of knowledge as a possession to be accrued and construction of knowledge as a practice which is conducted. This is followed by a discussion of the gap between these two epistemologies and the impact of the gap on the application of research knowledge into practice arenas, referred to as the research-practice gap. This discussion leads on to consider how knowledge can act as a disruptor or catalyst for change. This process has been referred to as the mobilisation of knowledge. Factors known to contribute to successful knowledge mobilisation between professional groups include leadership, dialogue, dispositions, and the use of artefacts. These factors are explored in relation to health and social care contexts and the chapter concludes with the idea of a system level approach to knowledge mobilisation. This final section concludes the literature review of knowledge mobilisation theories and introduces ideas relating to complexity theory, the topic of the following chapter 3.

2.1. Understandings of Knowledge

"For knowing is spoken of in three ways: it may be either universal knowledge or knowledge proper to the matter in hand or actualising such knowledge."

(Aristotle)

The 21st century has been described as the 'knowledge era', where the digital revolution has provided access to knowledge or information on an unprecedented scale. Terms such as 'knowledge economy', 'knowledge intense organisations' (KIO) and 'knowledge-based capital' (KBC) appear frequently in public media, referring to the creation, sharing and utilisation of knowledge to create wealth, social goods, or societal change. Knowledge has been identified as the main driver of economic growth in the current century, replacing land, labour and materials which were the drivers of the industrial era (Wyckoff, 2013). Within this study, knowledge has been recognised as the catalyst for changes in attitudes, beliefs, behaviours and practices which contribute to the integration and dissemination of innovations in practice (Greenhalgh, Robert, & Bate, 2004).

Despite continuing attention to the role of knowledge within change processes and the rise of the knowledge era described above, there continues to be a lack of consensus around what constitutes knowledge. Attempts to develop an abstract classification of different forms of knowledge have proved unsuccessful (Pawson, 2003; Swan et al., 2016).The following section summarises some of the discussions on the contested nature of knowledge.

2.1.1 The nature of knowledge

Three forms of knowing have been broadly defined as empirical information, principles arrived at through analysis (episteme), practitioner skills or accumulated experience related to arts, craft, and science (techne), and practical wisdom, knowledge related to ethical, value driven deliberations (phronesis) (Tooman, Akinci, & Davies, 2016). These three definitions provide a concise description of knowledge based on how the knowledge is used. The purpose of episteme is to provide explanation or wider understanding. The purpose of techne is to produce materials or artefacts. The purpose of phronesis is to produce knowledgeable value-driven actions (praxis). But the clarity provided by these definitions of forms of knowledge is not borne out in relation to lived experience. Polanyi stated the problem:

"abstract systems ultimately encounter experience – the messiness, complexity and imperfections of the real world is inevitably mediated by human judgement" (Polanyi, 1974).

Knowledge can be categorised in terms of the methodology employed to develop the knowledge, whether it is qualitative or quantitative and can also be categorised based on levels of human processing employed in creating knowledge (Greenhalgh, 2010). Greenhalgh suggests knowledge can be broadly understood as moving through a spectrum of cognitive effort from data as facts, to wisdom as the synthesis of information with wider forms of learning and experience.

Some interpretations of knowledge suggest that it forms observable, measurable components, while other interpretations suggest knowledge is created and evolved through social interaction and dialogue, transforming as it moves between people and contexts. Further forms of knowledge may never be consciously known, operating as instincts or intuitions.

Explicit and tacit forms of knowledge

Discussions on knowledge frequently refer to explicit and tacit forms of knowledge. Explicit forms of knowledge refer to corpus or bodies of information or data, either written or verbal

which can be shared overtly within or across groups and can be categorised according to the values, beliefs and political intentions of the creators or potential users of the knowledge (Nonaka & Takeuchi, 1995). Tacit forms of knowledge include practice skills, knowledge about the history of localities or organisations (Polanyi, 1974) and personal knowledge by acquaintance (Moller, 2018). Tacit forms of knowledge can be perceived physically or emotionally rather than described through language or quantified, relating to embodied ways of knowing 'how' rather than embrained ways of knowing 'that' (Blackler, 1995). Descriptions of embodied knowledge include having a 'feel for the game' (Bourdieu, 1977) or practical wisdom (Nugus, Greenfield, Travaglia, & Braithwaite, 2012).

Knowledge within practice involves both tacit and explicit forms of knowledge. Practice is a process of knowing 'that' something is of consequence and knowing 'how' to conduct specific task and behaviours. It has been described as

"the individual capability to draw distinctions, within a domain of action, based on an appreciation of context or theory, or both" (Tsoukas & Vladimirou, 2001).

There is a complex relationship between tacit and explicit forms of knowledge. Some authors suggest that tacit knowledge can be converted and shared as explicit knowledge in a multi-layered model of knowledge creation (Nonaka & Takeuchi, 1995). This knowledge creation model builds individual knowledge into collective or shared knowledge through a set of interaction processes defined as socialisation, externalisation, combination and internalisation (SECI).

Other authors suggest tacit knowledge is intrinsically inaccessible to language and can only be shared through experience (Polanyi, 1974). Tsoukas described tacit and explicit knowledge as being different sides of the same coin (Tsoukas & Vladimirou, 2001).These different ontologies give rise to questions around whether knowledge can be considered separately from the knower (subjectivity) or whether it remains embedded within people and therefore tied to social contexts. Differences in these perspectives or epistemologies are discussed in the following sections.

2.1.2 Knowledge as a possession

Some considerations of knowledge are founded on the notion that knowledge is an external entity which can be given or shared between individuals or groups. This notion links the holding or sharing of knowledge to issues of power and status. Experts have status and value

attached to their knowledge which is recognised by others as competence, emphasising the individual or group holding the knowledge as the owner of the knowledge. Knowledge can be held by both individuals and groups concurrently (Lam, 2000) and links closely with social identity and affiliation to a professional group (Billig & Tajfel, 1973). This also links with Bourdieu's ideas of cultural capital (Bourdieu, 1977; Nash, 2010).

Externally collated bodies of knowledge which can be easily shared across different locations are a convenient basis for professional judgements (Carel & Gyorffy, 2014; Greenhalgh, Snow, Ryan, Rees, & Salisbury, 2015). These forms of knowledge can present as part of a 'chain of codified knowledge' where locally collected data, performance standards or organisational policies or procedures are partly informed by research and seen as credible, acting as a proxy for formal evidence (Kislov et al 2019). Creating knowledge products that can be shared across different contexts aligns with an epistemology of possession (Cook & Brown, 1999) and implies that knowledge can be transferred or shared unproblematically into different contexts.

However, organisational and management theories have demonstrated the institutionalisation of new practices always involves a complex interplay between explicit codified knowledge and tacit embedded knowledge (Kislov, 2014).The following section will explore the idea of these different forms of knowledge interacting through social processes conducted between individuals and groups.

2.1.3 Knowledge as a practice

One epistemology of practice (Cook & Brown, 1999) implies that knowledge is never absolute or complete and becomes transformed as a result of socio-cultural interactions. Individuals can conceptualise and create thoughts and understanding about their experiences. Understandings of knowledge shape and are shaped by the social and physical world. This is described as the 'double hermeneutic' (Giddens, 1990), where knowledge becomes shared between contexts, and at the same time becomes transformed as it is combined with existing knowledge and re-embedded within a new context.

Ontological and philosophical differences between individuals, professional groups and fields of practice can result in the same knowledge being valued, shared and interpreted in different ways in different contexts, resulting in variations among how groups and individuals respond to new knowledge (Ferlie, Crilly, Jashapara, & Peckham, 2012; Greenhalgh, 2010).

Endorsements of the validity and utility of any knowledge are often determined by the perceptions of potential users of knowledge. The knowledge created by social researchers, for example, may be employed by others to create consequences for individuals and society. This links with Bourdieu's ideas of social capital (Bourdieu, 1977; Nash, 2010). The influence of context in terms of physical environment and potential users of knowledge makes objective judgements around the value of any knowledge problematic.

The extent to which knowledge is accepted and utilised can depend a great deal on the context, in relation to how the knowledge either maintains or challenges the local status quo, as well as the nature and origins of the knowledge itself (Pettigrew & Roberts, 2003). Knowledge can also be construed as creating consequences and actions as it flows through a system or network. This is the topic of the following section.

2.1.4 Knowledge as a disruptive influence

Knowledge brought into the system may challenge the existing culture of values, behaviours, and beliefs. Where established practices or behaviours are inconsistent with new knowledge, one of several outcomes are triggered. Discomfort or disruption often acts as the catalyst for changes in practice or behaviour and enables new organisational routines to become established (Jarzabkowski, Kaplan, Seil, & Whittington, 2016). In other contexts, discomforting knowledge can have little impact. Groups or individuals may choose to ignore or disbelieve the new knowledge, or new knowledge may be re-interpreted to align with current practice. Resistance to embracing new knowledge and innovation has been referred to in implementation contexts within health care as 'conspicuous departures' (Dixon-Woods, 2016; Horton, 2018). Conspicuous departures are most likely to occur where new knowledge challenges the status or self-efficacy of the group or individual and where new knowledge is not recognised as reliable.

Positive outcomes occur when groups or individuals can combine new knowledge with existing knowledge to expand their understanding of an issue or situation. This combined knowledge can then be employed or mobilised to create and implement innovations in practice that deliver desired outcomes (Brehaut & Eva, 2012). Oborn et al refer to achieving 'organisational ambidexterity' (Oborn, Prince, & Barrett, 2016) where there is a balance between exploration, seeking out new knowledge to ensure the system is open to potentially radical new ideas which could disrupt the status quo, and exploitation, where existing

knowledge within the system is utilised to ensure the system continues to function effectively by refining and extending existing processes and competencies to reduce variance.

Functional refinements or adaptations that address local needs and contextual pressures without affecting the core elements of an intervention or innovation have been defined within health care contexts as 'principled deviations' (Dixon-Woods, 2016; Horton, 2018). These positive adaptations to practice, which seek to overcome local obstacles, can be linked to ideas of positive deviance, where solutions to problems are implemented directly by the individuals closest to the problems (Baxter, Taylor, Kellar, & Lawton, 2016; Bradley, Curry, & Ramanadhan, 2009; Lawton, Taylor, Clay-Williams, & Braithwaite, 2014; Lindberg & Clancy, 2010). The resulting positive deviations evolve through a combination of research and practice knowledge. Securing the integration of research and practice knowledge requires bridging the gap between the understanding of knowledge as a possession and the understanding of knowledge as a practice, frequently referred to as the 'research to practice gap'. This problem is considered in the following section.

2.2 Bridging the gap between epistemologies of possession and practice

Securing maximum benefit from knowledge has been recognised as an important step in developing effective solutions to complex social problems (Head, 2019). The synthesis of new or acquired knowledge with existing knowledge available within a context can then be applied to problems to create solutions. Harnessing knowledge to create maximum impact on public policy and professional practice has been referred to as 'knowledge mobilisation' (Phipps, 2012).

The difficulty faced by research and practitioner communities as they try to share knowledge to secure best outcomes can be summarised as the difference between research communities' epistemologies of possession, which understands knowledge as an entity to be shared, with other communities, particularly practice communities', understanding of knowledge as a social process, conducted amongst individuals and groups.

Multiple models have been developed to support the understanding and use of research knowledge in practice. Initially, models of knowledge sharing focused on the dissemination of knowledge from research communities, broadly referred to as knowledge transfer (Best & Holmes, 2010; Grandos et al., 1997). Adopting a linear approach to sharing knowledge through established academic routes such as conference papers and journals has meant that

research knowledge was not always accessible to practice communities (Best & Holmes, 2010; Foster, Worrall, Rose, & O'Halloran, 2015). Using knowledge brokers and boundary spanner to support knowledge translation between research and practice communities was one approach to addressing the issues of integrating different forms of knowledge (Long, Cunningham, & Braithwaite, 2013). In many cases however, these approaches have perpetuated a uni-directional flow of knowledge from research to practice communities whilst limiting the flow of knowledge from practice to research. The development of a conceptual model of determinants of diffusion, dissemination and implementation of innovations in health service published in 2004 (Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004) presented in figure 2.1., highlighted how factors beyond the nature of knowledge itself impacted on the flow of knowledge between different stakeholders.

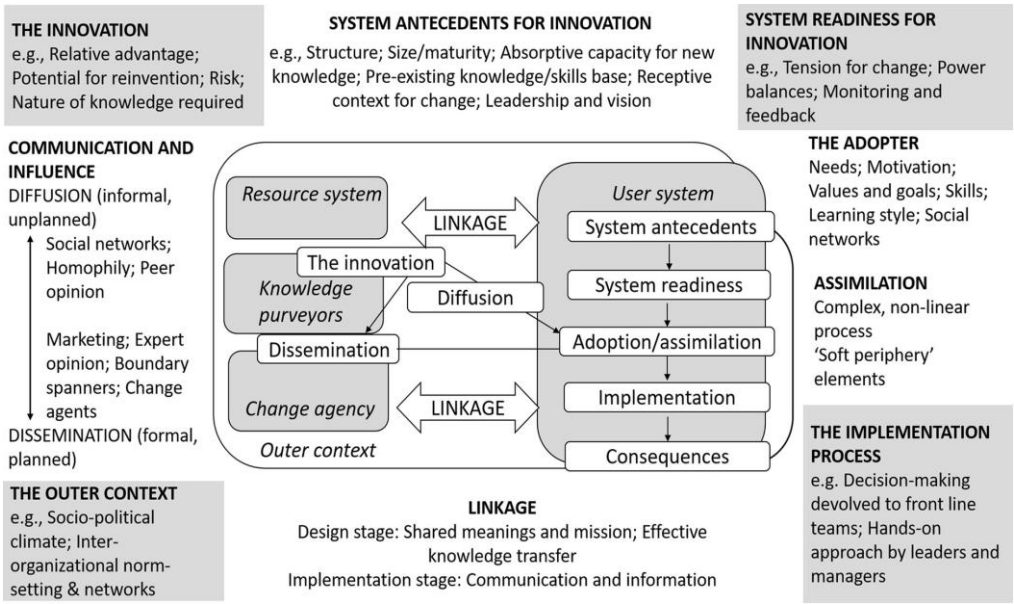


Figure 2.1 Conceptual Model of Determinants of Diffusion, Dissemination and Implementation of Innovations in Health Services (Greenhalgh et al 2004)

This model identified both a resource system and a user system as being involved in knowledge mobilisation. The themes examined in the current study would be included in the area identified by Greenhalgh as the 'user system'. The wider context of the resource system, the outer context, remain influences in the knowledge mobilisation process but are not key areas of interest within this study.

Further models of knowledge mobilisation have built on specific aspects of the conceptual model identified by Greenhalgh. These include Promoting Acton on Research Implementation in Health Services (PARHIS) (Rycroft-Malone, 2010; Rycroft-Malone, 2004) and the Knowledge to Action Framework (Graham & Tetroe, 2007a). Each of these models recognise the important role played by context in relation to the mobilisation of knowledge (Bate, Robert, Fulop, Ovretveit, & Dixon-Woods, 2014).

A further consolidated framework for advancing implementation science was developed by Damschroder et al in 2009 (Damschroder et al., 2009). This framework was based on over 500 published sources over 13 fields of research which identified five major domains of influence on implementation. In addition to the inner and outer contexts identified by Greenhalgh, Damschroder and colleagues identified three additional domains of influence on implementation. These were intervention characteristics, such as strength and quality of evidence; the process of implementation including planning, evaluation and reflection, and a key area of interest for this study, the characteristics of the individuals involved in implementation.

The varying emphases of the models developed to support mobilisation of research knowledge into practice have improved understanding of the nature of knowledge mobilisation and have resulted in the development of new approaches to sharing research, including academic and practitioner partnerships (Chew, Armstrong, & Martin, 2013), and embedded researcher models (Vindrola-padros, Pape, Utley, & Fulop, 2016). However, the development of these models has not yet resulted in combining research findings and practice knowledge to deliver optimal outcomes for individuals (Powell et al., 2016).

Findings from an international survey conducted by Davies et al (Davies, Powell, & Nutley, 2015) explored the relationship between knowledge mobilisation as presented in the academic literature and the practice of knowledge mobilisation conducted by a group of major research funders, producers, and intermediaries. In addition to the importance of context discussed previously, these authors also identified the need to build productive relationships between researchers and research users, and the need to test and evaluate interventions and subsequently use this knowledge to improve future practice. A set of eight key archetypes, idealised building blocks of knowledge mobilisation practices, were derived

from this study. These eight knowledge mobilisation practices are discussed in the following section.

2.2.1 Knowledge mobilisation practices

The knowledge archetypes identified by Davies, Nutley and Powell emerged inductively as patterns of practice across agencies. The archetypes provided a basic architecture from which macro-level research producers, intermediary agencies and major funders created, conducted, and sustained knowledge mobilisation activities (Davies et al., 2015). Presented in Table 2.1., these archetypes link to key literature-based debates surrounding the complex and shifting practice of knowledge mobilisation, and demonstrate how multiple and often competing ambitions of participants may be involved in knowledge mobilisation activities. The archetypes offer a useful description of a suite of core practices of knowledge mobilisation which may be achieved through a variety of observable activities.

Archetype	Function	Knowledge Type	Purpose and Goals
A	Producing knowledge	Explicit, codified, theoretical or empirical	Knowledge-driven; problem solving; often instrumental
B	Brokering *own* research	Explicit, produced externally to point of use	Knowledge driven; problem solving; sometimes interactive
C	Brokering *wider* research	Explicit knowledge; diverse sources and kinds	Knowledge driven; problem solving; sometimes interactive
D	Advocating for the use of evidence	Theoretical and empirical	Emphasises problem-solving, enlightenment and conceptual use
E	Facilitating implementation of instrumental evidence	Emphasis on explicit knowledge and externally produced research	Direct change through project implementation; some problem solving and interactivity
F	Research and Implementation combined	Broad, inclusive; includes locally produced knowledge	Knowledge-driven, problem solving; interactive use. Shapes a wide range of outcomes
G	Facilitating collaborations and networks around research evidence	Multiple types of internally and externally produced knowledge.	Knowledge-driven; problem solving interactive use.
H	Advancing knowledge mobilisation	Theoretical; empirical	Enlightenment; conceptual use

Table 2.1 Archetypes of practice in knowledge mobilisation (Adapted from Davies, Nutley, and Powell 2015)

The knowledge archetypes described above also link with five components relating to the translation and mobilisation of knowledge in practice described in the Conceptual Framework of the Knowledge Translation Process (Ward, Smith, House, & Hamer, 2012) presented in Table 2.2.

	Component of Knowledge Translation and Mobilisation
1	Problem identification and communication: the issues being addressed
2	The development and selection of knowledge or research
3	Analysis of the context where the knowledge is to be mobilised
4	Creation of activities or events where knowledge is shared
5	The utilisation or use of the research within practice

Table 2-1: Conceptual Framework of the Knowledge Translation Process (Ward, Smith, House & Hamer, 2012)

The steps of this conceptual framework describe a multi-directional flow of knowledge among producers, users and other stakeholders, suggesting processes or mechanisms that enabled knowledge to flow in different directions across a system.

Together these models help to conceptualise how ideas from research and policy can influence practice, and capture how knowledge from practice and learning contexts can influence the world of research and policy, utilising knowledge from different contexts to catalyse change. The impact of variations between contexts on how knowledge becomes mobilised is discussed in the following section.

2.2.2 The role of context in knowledge mobilisation

The conception of knowledge-sharing as a one-way flow of knowledge from one community where knowledge is produced, to a different community who then employ that knowledge, has had variable and limited success. It has produced positive results in straightforward contexts where there are strong incentives and cultural support for change (Freeman & Sweeney, 2001; Lomas, 2000). In more complex contexts where diverse forms of knowledge are held by stakeholders operating at different levels, effective knowledge mobilisation requires partnerships between researchers, policy makers, practitioners and other stakeholders across the macro, meso and micro levels of a context (Leykum et al., 2014).

In contexts where different forms of knowledge are used to inform approaches to planning and practice, attending to the social and relational aspect of knowledge allows individuals to share their praxis-based knowledge against a background of empirical findings. This approach to knowledge mobilisation aligns with socio-cultural theories of learning which states that learning is social process occurring firstly through interaction with others and then becoming integrated into individuals' mental structures (Lave, 2009; Salter & Kothari, 2016).

The synthesis of research-based knowledge with knowledge already embedded in a social context enables individuals and groups to perceive how new knowledge relates to the values,

beliefs and culture of their context (Graham & Tetroe, 2007b). This is achieved through a process of two-way communication and close collaboration between knowledge stakeholders. Gabbay & Le May describe a three-sided pyramid where technical skills or knowledge integrate with personal skills of communication, assertiveness and people-reading skills to form the collective learning skills sets required to deliver successful outcomes (Gabbay, le May, Connell, & Klein, 2017).

There are multiple models of social relationships and professional interactions manifesting across the health and social care system. These have significant effects on how knowledge is mobilised to create changes in practice across systems. The following section explores some of these models.

2.2.3 Multi-disciplinary, inter-disciplinary and transdisciplinary knowledge mobilisation

Different forms of knowledge are held collectively or individually. Knowledge which forms part of a professional or group identity can be particularly difficult to share beyond the social boundaries of the group (Lam, 2000). Relationships between practice contexts facilitate, but do not secure the adoption or use of knowledge within practice, particularly in organizational structures where high status is given to the knowledge held by individuals. The privileging of individual knowledge as the power and status of the expert can be a barrier to creating innovations founded on shared knowledge. Developing trust and respect for collectively held knowledge requires Individuals to adapt to the social behaviours of the group. This is more likely to occur in contexts where flexibility, autonomy and experimentation are enabled (Oborn, Prince, & Barrett, 2016). The sharing of knowledge across professional boundaries can be situated as points on a continuum between uni-disciplinary and trans-disciplinary working, presented in Figure 2.3.

In both uni-disciplinary and multi-disciplinary working, knowledge from different disciplines remains within professional boundaries, operating as silos even when the professions are co-located. Knowledge shared across professional groups is limited, in these cases, to co-ordination of solutions to operational issues. Inter-disciplinary working occurs when different professional teams co-ordinate working practices. The transdisciplinary approach is a further evolution where knowledge transcends boundaries, synthesising and creating new knowledge which allows novel approaches to understanding and resolving problems (Choi & Pak, 2006).

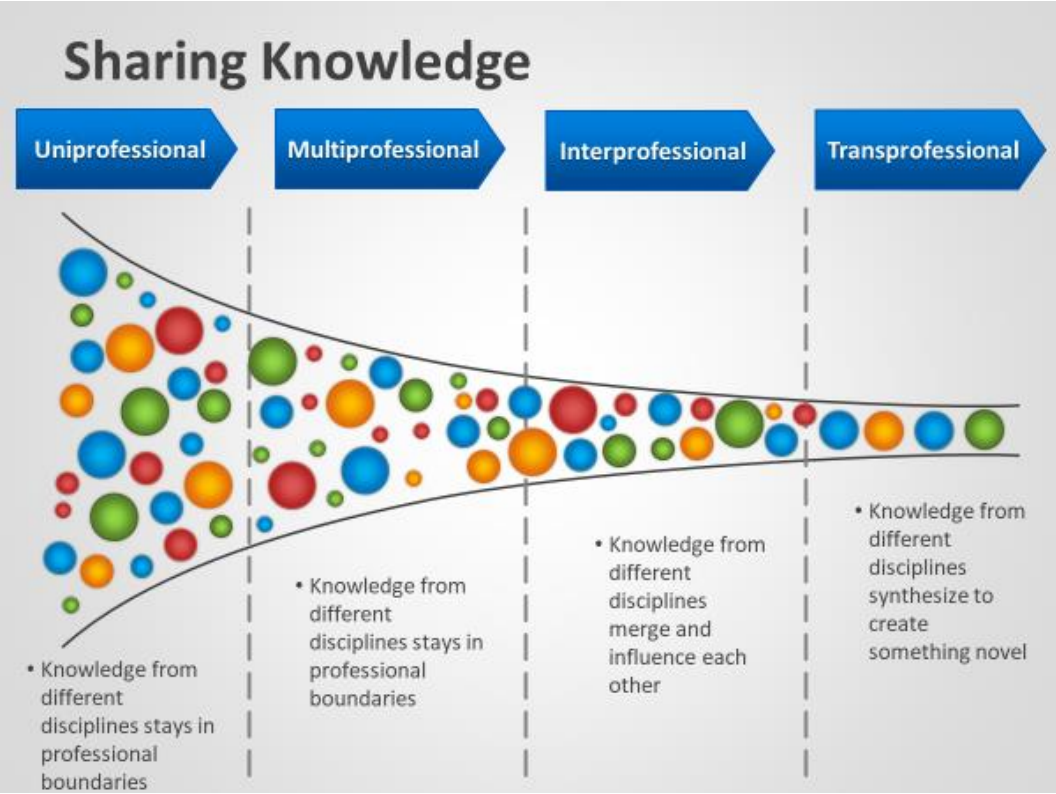


Figure 2.3: Models of uni, multi, trans and inter disciplinary working (drawing on the work of Choi & Pak 2006)

A trans-disciplinary approach to learning provides potential to generate innovative ideas but also creates tensions, defined as unaligned engagement, where individuals remain accountable to different communities and cultures with differences in ways of thinking, different uses of language and different approaches to valuing knowledge. These difficulties need to be negotiated and a shared focus established (Wenger-Trayner, Fenton-O'Creevy, Kubiak, Hutchinson, & Wenger-Trayner, 2014). In hierarchical organisations this focus is frequently achieved through the influence of those individuals occupying positions of authority within a context. This point leads to a discussion of the role of leadership in relation to the mobilisation of knowledge.

2.2.4 The role of leadership in knowledge mobilisation

Public sector contexts including health and social care tend to be highly hierarchical organisations where the defining characteristic is formal authority (Tsoukas, 2017). This authority is conducted through positional leadership where management and leadership roles and responsibilities are overtly specified. This approach to leadership is rooted in the needs of the manufacturing sector and relates closely with characterisations of management

theory and transactional leadership theory identified by Van Wart (Van Wart, 2013) shown in table 2.3.

Theory	Leadership focus	Characteristics
Management theory	Leading for results	Manages resources, reporting and budgeting. Believes high expectations deliver results
Transactional leadership theory	Leading followers	Creates productivity through give -and take joint decision making. Delivers incremental change. Believes fidelity to a mutually agreed process is key to success.
Transformational leadership theory	Leading organisations	Focuses on organisational change through interaction. Provides influence, inspirational motivation, intellectual stimulation, and considers the needs of individuals
Horizontal leadership theory (distributed leadership)	Leading systems	Emerges through interactions. Competencies are dispersed across the organisation or system. Fosters engagement, commitment and flexibility. Believes that systems can work well alone, responding quickly and flexibly to events.
Ethical leadership theory	Leading with values	Employs prudence and practical wisdom to address the competing values and demands with integrity. Believes leadership to be a moral obligation rather than a right.

Table 2.3: Van Wart's Characterizations of leadership (adapted from Chapman et al 2013)

Evidence collected by the Organisation for Economic Co-operation and Development (OECD) suggests that the positional approach to leadership does not address the needs of knowledge intense organisations, where the assets of the organisation are the skills and resources of the individuals (Elmore, 2008). Within knowledge-intense contexts positional leaders and

managers have no direct influence over the performance of the individuals who are the creators of value and wealth for the organisation (Blackler, Reed, & Whitaker, 1993).

Within a knowledge-intense setting, more effective models of leadership are the ones with less focus on accountability and more focused on building trust, managing relations, connecting people and facilitating collaborative activities and processes (Chapman, van Amersfoort, & Watson, 2017; Elmore, 2008). Key leadership skills which appear to contribute to collaboration and consequently the mobilisation of knowledge have been identified as: good communication and networking skills; strategic thinking, ability to identify how different partners can contribute to the overall ambitions and capacity for creative problem solving (Sullivan & Skelcher, 2002). This would suggest that the horizontal model of distributed leadership characterised by Van Wart in table 2.1 as spreading responsibilities and influence horizontally as well as vertically across a system or organisation offers the greatest possibility of successful knowledge mobilisation. This has been confirmed by several knowledge scholars (Chreim, Williams, Janz, & Dastmlchian, 2010; Currie, Lockett, & Suhomlinova, 2009; Fitzgerald, Ferlie, McGivern, & Buchanan, 2013; Kislov, Hodgeson, & Boaden, 2016; Lockett & Currie, 2011; Schneider & Somers, 2006).

Although there are challenges when adopting a horizontal or distributed approach to leadership within a hierarchical organisation, due to the continuous interaction of enabling and constraining factors, a model of distributed leadership can emerge even within hierarchical bureaucracies (Tourish, 2019). However, the need to address competing interests of individuals, organisational ambitions and cultures, and emergent events suggest other styles of leadership might also be required.

Following a study of public sector partnerships in Scotland, two key elements of leadership activities that emerged were 'a spirit of collaboration' and 'collaborative thuggery' (Vangen & Huxham, 2003). The spirit of collaboration emphasized engagement, empowerment and mobilising collective resources, while collaborative thuggery suggested practices which addressed the inevitable conflicts which emerged when values, intentions and levels of commitment varied across the collaboration. These variations were referred to as 'degree of polarisation' by Contandriopoulos et al (Contandriopoulos, Lemire, Denis, & Tremblay, 2010).

References to 'thuggery' included leaders manipulating the collaborative agenda; deciding on behalf of others and adjusting priorities in order to maintain the momentum of process. These

actions present moral and ethical challenges concerning what is valued and attended to, and what is excluded. Similar issues have been raised by other authors who question whether the pursuit of collaborative forms of leadership is merely providing a smoke screen or more acceptable narrative, while the power balance of the traditional and established hierarchical models of leadership is maintained (Lockhart, Currie, & Waring, 2014).

Combining leadership styles that balance innovation with stability is likely to be necessary to secure best outcomes in relation to collaborative practice. Dobrajska suggests the development of formal and informal forms of authority to complement the distribution of the formal authority structure (Dobrajska, Billinger, & Karim, 2015). This topic is discussed further in chapter 3 in relation knowledge mobilisation within complex adaptive systems.

Leadership has been defined as an emergent outcome of the interactions between stakeholders and context, and as such is fluid rather than fixed, responding to the culture, understandings and interpretations of individuals and organisations (Lockett & Currie, 2011). Mobilising knowledge within a collaborative context requires a leadership style that is open to experimentation, secures engagement and empowers individuals to capture and share learning and knowledge, but also provides governance to ensure effective service delivery (Chapman et al., 2017). These forms of leadership are enacted through interaction and dialogue between partners enabling knowledge to be shared across organisational and professional boundaries.

2.2.5 Dialogue in knowledge mobilisation

Dialogue means interaction focused on thinking processes and influenced and pre-formed by past experiences. Significant changes occur at the level of everyday conversations (Schien, 1993). Dialogue enables processes of cognitive restructuring, resulting in a set of common meanings and thinking processes between partners.

A shared or deliberative dialogue recognises that a mix of expertise and insights are required to address problems. It requires participants to be flexible and to gain an understanding of each other's abilities and constraints (Escobar, 2014). However, different cultural repertoires which include practices, identities, values, priorities and dispositions can create barriers to deliberative dialogue and result in different parties talking in parallel rather than finding a common language (Argyris & Schon, 1996). A deliberative dialogical process begins with participants who are able to engage with the process and able to maintain an expectation of

positive outcomes over time (Tsoukas, 2009). The process of deliberative dialogue has been described as four stages, which are explained below.

The first stage of deliberative dialogue is collaborative emergence where partners make contributions and listen to each other to build a common ground or interactional frame. This leads to a second stage where the participants make contributions within the boundaries of the interactional frame. This is referred to as constrained novelty, where the contributions made by each participant are constrained by the emerging interactional frame or topic. This gives the dialogue coherence as contributions flow between participants and a logical pattern of thought emerges. The next stage is where each participant modifies the interactional frame by a small amount based on their personal knowledge or perspective. This is referred to as incremental emergence. The final stage is where participants can indicate and share material which is not overtly apparent but implicit in the interaction or relationship between them (Sawyer, 2003). This could be along the lines of acknowledgement of one participant's expert knowledge or referencing roles external to the context. This process is referred to as indexical creativity and is the process which helps to create a warrant for any actions or new knowledge co-operatively created by the group (Tsoukas, 2009).

These stages of deliberative dialogue can also be considered in terms of the activities of participants. The first stage of creating an interactional frame involves participants voicing fragments of knowledge which avoids focusing on explanations of differences. It is a superficial rather than deep level of knowledge sharing.

Creating a state of constrained novelty is achieved through participants co-creating a scaffold which provides a tentative, fluid representation of issues and ideas, allowing participants to develop a collective or allocentric orientation. The scaffold then forms an artefact or boundary object which allows participants to comment, observe or acknowledge tensions which may so far have been unappreciated. Using the scaffold or artefacts as the reference point for interaction rather than addressing tensions and concerns directly to other participants avoids creating friction between individuals, and facilitates a deeper level of knowledge sharing.

As interaction and knowledge sharing deepens, the stage of incremental emergence unfolds. Participants move the scaffold or artefact aside and engage in a more complex stage of co-creation which accounts for individual requirements and necessary adaptations to ideas and

ways of thinking. At this point interpersonal relations have become orientated to sustaining engagement throughout all the problem-solving tasks. This could manifest as the team considering how new ideas might be incorporated or add value to the team's work. This stage is the transformation of personal to collective knowledge that generates innovative ideas (Majchrzak, More, & Faraj, 2012). Another important outcome of this level of deliberative dialogue is the refinement and development of new artefacts to facilitate further knowledge sharing and discussion.

2.2.6 The role of artefacts in knowledge mobilisation

A knowledge artefact is a product created by an individual or group and adopted by others to support knowledge mobilisation (Salazar-Torres, Columbo, Silva, Noriega, & Bandini, 2008). Artefacts cross boundaries between groups and are interpreted and used in diverse ways (Bowker & Star, 1999). They may present in any material, conceptual or linguistic form which is collectively understood and shared by a community. This might include objects such as diaries or project plans, social routines such as staff meetings, or particular forms of language that convey meanings among members of a community. The development and use of a knowledge or epistemic artefact links with a creative co-production process (Jackson & Greenhalgh, 2015). The artefact itself does not cause individuals to change behaviours or practice but instead both constrains and enables them to mobilise knowledge in specific directions (Essen & Lindblad, 2013a).

Artefacts offer a potential route to research non-verbal, tacit aspects of social experience, moving beyond verbal accounts to understand intangible aspects that exist within complex social worlds (Mason, 2002). Artefacts offer an opportunity for individuals with diverse perspectives to expose and appreciate different forms of knowledge, including forms which are not amenable to language (Langley, Wolstenholme, & Cooke, 2018). Material objects or artefacts are central to sharing knowledge of the sensual, tactile and embodied aspects of how lives are lived and experienced (Woodward, 2015). The success of the artefact depends on how it links with the shared values and collective judgement of the context (Tooman et al., 2016).

Manifesting in a wide variety of forms which include objects, systems, gestures, social rituals, speech symbols and images, artefacts are the products of the creativity and inventiveness of individuals and are continually re-invented, re-employed and regenerated to support the organisation of actions and interactions in heterogenous contexts (Cetina & Reichmann,

2015). Acting as external symbols or memory devices, artefacts carry knowledge between individuals with multiple perspectives and provide an archive of the evolution of knowledge across a system. The artefact provides a link between the internal mental representations of an individual and the external shared system of societal and cognitive activity which includes language and other social behaviours (Markauskaite & Goodyear, 2017). In this context artefacts can be understood as tools for imaging rules and operations beyond those that currently exist in praxis (Markauskaite & Goodyear, 2017).

Modern professional work is a collective endeavour where individuals are highly interconnected with larger distributed organisational and professional systems (Nicolini, 2012). These systems allow individuals to act independently but also encourages them to conform to professional and corporate roles, creating tension between agency and structure, and inhibiting the development of intellectual spaces where knowledge can be created and shared. This links with the discussion of inter-disciplinary practice in 2.3.4. Patterns of interdisciplinary practice are mutually and dynamically created and sustained by tuning actions and interactions to the material structures of the context, for example in patterns of behaviour observed in an operating theatre or a routine health screening clinic. The value of artefacts is variable depending on the dynamics of the context and embodied routines which are crucial to practices. The 'quiet materiality' (Woodward, 2015) of the artefact is often unobserved within the context of use and only becomes overt when it is absent or becomes an object of enquiry or pursuit (Ewenstein & Whyte, 2009).

As an object of enquiry and pursuit, the artefact is an incomplete item or an unfinished or incomplete idea which provides feedback and drive ideas forward (Langley, Wolstenholme, & Cooke, 2018). Different qualities of artefacts are either suppressed or highlighted depending on the specifics of context. In the development of new organisational practices, artefacts provide a vision of a possible future which can mediate between individual and collective understandings and trigger a process of exploration (Miettinen & Virkkunen, 2005). Providing a means of constructing and sharing consensually agreed knowledge within a community, an artefact often represents something which is "not yet known" (Cetina & Reichmann, 2015), acting as a tool for imagining beyond what currently exists to create potential alternatives, for example through architectural models and plans.

This capability for creating a potential future state while providing an archive of significant developments in the past supports the mobilisation of knowledge across a system. Artefacts provide a form of feedback loop, supporting change through learning and adaptation (Cetina & Reichmann, 2015) .

The creation of knowledge artefacts is an iterative process where the artefact shapes and is shaped by on-going and historical practices. This linking of knowledge, symbols and practice is achieved through social agreement and collaborative practice (Markauskaite & Goodyear, 2017). The artefacts or representations are shared, but are not universal, nor are they used in the same way across different groups or individuals. Artefacts are continually re-constructed to suit different purposes.

Ewenstein & White created a typology of artefacts which is summarised in table 2.4.

Time scale	**Typology of Artefact**	**Description**
Stage 1	Artefact as a boundary object	The artefact carries knowledge across boundaries between groups and level in a system
Stage 2	Artefact as an object of pursuit	Individuals and collective share perceptions and opinions in relation to the artefact, resulting in refinements or the creation of new artefacts
Stage 3	Artefact as a practitioner tool	The artefact become an unproblematic tool utilised by practitioners and eventually superseded by new artefacts

Table 2.4: Evolution of an artefact over time developed from (Ewenstein & White 2009)

This typology of artefacts captures a pattern of evolution. Used initially as a boundary object to connect disperate groups, the artefact then evolves to become an incomplete and improvable focus of enquiry, operating as the scaffolding object described in 2.2.5 as a focus for questions. At this stage the artefact can be modified and used collaboratively to develop joint knowledge, before finally stabilising to become an unproblematic tool used by informed practitioners (Ewenstein & Whyte, 2009). The artefact supports individuals as they establish common understandings and gradually falls into disuse as other artefacts evolve. The evolution of artefacts provides a record or archive of the overall process of change.

The collection of artefacts employed within a knowledge mobilisation process can provide evidence of temporal bracketing, where periods of continuity within a process can be defined by the particular artefacts (Langley, Smallman, Tsoukas, & Van de Van, 2013). Artefacts of different forms facilitates a focus on practice rather than beliefs and draws attention to both transitions and possibilities which are present within a social context (Star & Griesemer, 1989). Blackler suggests that consideration of the role of artefacts offers an important way of combining an intellectual, critical, pragmatic and reformist focus (Blackler, 2005). This resonates with the ambitions of this study in which the SIS learning activity was one form of knowledge artefact. The role of formal and informal learning in relation to multi-professional knowledge mobilisation is now discussed.

2.2.7 Formal and informal learning in knowledge mobilisation

Working across professional boundaries to deliver services in a reciprocal and time-sensitive manner requires collaboration among the workforce. Delivering changes in practice, when services are delivered in complex and rapidly changing environments, depends on learning and interaction between stakeholders. In these contexts it is increasingly difficult to define the boundaries of social entities whether these are institutions or social groups within them (Nicolini, 2012). Learning and discussion need to take place before any new knowledge can be successfully embedded in practice. However, opportunities for interdisciplinary interactions are often difficult to secure (Nembhard & Tucker, 2011; Smith & Ward, 2015).

Interactions take place through formal and informal opportunities. Informal interactions provide opportunities for incidental or autonomous learning through experience and task repetition. Formal learning through deliberate activities to acquire and transfer knowledge described as induced learning (Adler & Clark, 1991) are often delivered as training packages, referred to as a Deliberate Learning Activities (DLA) (Nembhard & Tucker, 2011). Deliberate learning activities have been shown to facilitate the learning of new practices that are a significant departure from existing routines (Edmondson, Bohmer, & Pisano, 2001).

The delivery of DLAs as inter-disciplinary activities supports knowledge sharing and the integration of ideas across disciplines (Simons, Pelled, & Smith, 1999). It also supports the development of a trans-active memory, the knowledge of who knows what which provides an active knowledge resource to support wider learning and innovation across a system (Reagans, Argote, & Brooks, 2005).

Access to formal learning or deliberate learning activities within the workplace links to short-term knowledge sharing across an organisation and to short-term innovative behaviour, but has not been linked directly to long-term knowledge sharing or innovative behaviours (Bednall & Sanders, 2016). Knowledge does not act as a direct agent of change but through its effect on the attitudes, beliefs, and behaviours of individuals. It is through the application or mobilising of knowledge drawn from learning activities that changes in practice occur.

Knowledge mobilisation takes place through saying, doing, and interacting. It is the cumulative effort of small, routine events relating to how individuals and groups behave. This requires both contributory expertise which can develop a community's way of doing things and also on interactional expertise, where individuals can speak the language and respect the customs of each of the different professional communities. The development of these interactional behaviours requires individuals to be inclined or disposed to respect and value the knowledge and cultures present in the wider community. The nature and impact of disposition is explored in the following section.

2.2.8 The role of disposition in knowledge mobilisation

Disposition is one part of the engrained habits, skills and ways of thinking and being which are drawn from life experiences, referred to by Bourdieu as habitus (Nash, 2010). These dispositions work as principles that generate and organise perceptions, practices, and representations.

A profession-centric disposition to knowledge sharing is one in which individuals or communities hold their internal knowledge as superior to the knowledge from others (Antal & Friedman, 2008). This disposition is influenced by socialisation to professional groups and operates largely at a pre-reflexive level, where individuals are operating with a partial 'view of the game' (Lockhart et al., 2014). The transdisciplinary approach to practice described above requires participants to adopt an allocentric or community-focused approach to knowledge sharing (Bourdieu, 1977). This is where knowledge from different parties is respected and considered although not necessarily adopted. Individuals with an allocentric disposition recognise that their own ability to enact change is dependent on the thoughts and actions of others (Lockhart et al., 2014). An allocentric disposition can be fostered and links with progression through Bennet's six-stage model of working through cultural differences, presented in table 2.5.

Stage	Mode of Practice	Disposition
Denial	Uni-professional	Egocentric (Profession-centric)
Defence	Uni-professional	Egocentric (Profession-centric)
Minimisation	Multi-disciplinary	Egocentric (Profession-centric)
Acceptance	Multi-disciplinary	Egocentric (Profession-centric)
Adaptation	Transdisciplinary	Allocentric
Integration	Transdisciplinary	Allocentric

Table 2.5: Model of working with cultural differences (Bennet 1998) combined with Choi & Pak's continuum of practice (Choi & Pak 2006)

The first stage of this model begins with denial and defence of boundaries, which aligns with uni-professional working practices. This is followed by a stage of minimisation where differences are buried within familiar categories and patterns of behaviour. This acceptance at a superficial level allows some level of co-operation to evolve but avoids acknowledging deeper differences in world views. Increased familiarity with other groups leads to an acceptance of the validity of different norms and eventually a shift of frames of reference as individuals acquire knowledge of different ways of being. The final stage is where individuals forge a new collective identity.

The allocentric and profession-centric dispositions are not mutually exclusive. Individuals and groups can hold multiple dispositions concurrently. Creating an affinity between groups allows them to establish a workable covenant or good enough understanding to share meaning and information relating to a specific goal (Lo, 2010).

This understanding creates a super-ordinate group which has a sense of connection and belonging but does not challenge the unique cultural repertoire of the constituent groups. This superordinate group establishes a mechanism for dealing with problems and building trust (Giorgi, Bartunek, & King, 2017). An understanding of the meanings and values of different groups and individuals is however part of an allocentric disposition. Individuals with this disposition recognise that their ability to mobilise knowledge depends on how others respond to and share knowledge. They seek to create an allocentric disposition among others within the community by employing skills, resources and wider artefacts which make knowledge sharing more effective (Bandura, 1986; Engels, 1997). This building of an

allocentric disposition operates horizontally, connecting different professional groups and other dispersed parts of an organisation or entity. It also operated vertically in this study, underpinning the relationships between policy level, health board management and the practitioners who took part in the study. The partnerships between these macro level policy partners, the meso level leadership partners and the micro level practitioners created a system-level perspective of the process (Greenhalgh & Wieringa, 2011) which is discussed in the following section.

2.3 Adopting a system level approach to knowledge mobilisation

The system level perspective adopted in this study captures how knowledge was both shaping and being shaped by the roles and actions of stakeholders and by the dynamics of the wider system (Graham & Tetroe, 2007a), highlighting the dissemination structures and social relationships between the multiple agents that were the conduits of knowledge across the system (Best & Holmes, 2010).

System level models of knowledge mobilisation operate effectively in contexts where there is a macro level organisational change strategy, such as the R2A policy, and where there are key stakeholders ready to engage as active collaborators in developing and implementing innovative practices at meso and micro levels of the system (Graham & Tetroe, 2007a). This collaborative approach to mobilising knowledge resonates with ideas of engaged scholarship (Van de Ven & Johnston, 2006), embedded research (McGinity & Salokangas, 2014; Vindrola-padros et al., 2016) and co-production (Nutley, 2010; Rycroft-Malone, Burton, Bucknall, Graham, & Hutchinson, 2016; Wehrens, 2014). Each of the approaches named above represents a commitment to conduct a collaborative enquiry between participants with different perspectives and orientations. The participants may be academics, practitioners, service users or other stakeholders. Leveraging different perspectives generates useful knowledge which can be applied to produce desired outcomes. These approaches are founded on the premise that higher quality, relevant research comes from true collaboration integrating diverse perspectives, addressing questions that are of interest to the knowledge-users (Bowen & Graham, 2013).

The collaborative research models named above also relate to dynamic multi-directional models of knowledge mobilisation (Ward, House, & Hamer, 2009). These models have evolved in response to increasing expectation that knowledge must not only be scientifically

valid but also socially robust, attending to pertinent social issues. There are however challenges to engaging different partners in knowledge generating or research activities (McCormack, 2013). Healthcare systems are open to multiple components and dynamic relationships which can be interpreted and observed in different ways, resulting in the need to successfully accommodate different priorities, balancing the need for research rigour with the practical needs of relevance and time-sensitive problem solving.

The dynamic and changing effects of factors and mechanisms that can only be discovered as events unfold mean that past performance of a system is not a good indicator of future performance (Greenhalgh et al., 2017). Adopting an ontologically deep approach to understand relationships between components at a system level can uncover patterns of behaviour and interactions which may be irregular and not discernible through more superficial methods. Complexity theory can be useful to facilitate the discovery of non-linear patterns within social contexts including healthcare (Begun, Zimmerman, & Dooley, 2002; Paley, 2010; P E Plsek & Greenhalgh, 2001b; Thompson, Fazio, Kustra, Patrick, Stanley, et al., 2016). The following chapter 4 provides a review of the literature on complexity theory and its use within healthcare research.

2.4 Summary

This chapter explained how the definition of knowledge adopted within this research encompasses both embedded tacit knowledge, explicit recorded knowledge and further forms of knowledge relating to cultures, history, and dispositions. Knowledge is understood to evolve at different levels of a system and is shared through interaction between individuals and groups. Knowledge can act as a catalyst for change, but the mobilisation of knowledge can be problematic, particularly across diverse groups and organisations.

A discussion of how knowledge mobilises across professional boundaries explored multi-disciplinary, inter-disciplinary and trans-disciplinary approaches to practice. Facilitating individuals, groups, and organisations to learn, absorb, adapt, and modify knowledge at multiple levels (individual, group and organisational levels) creates a flow of knowledge that facilitates collaborative approaches to problem solving. The impact of different aspects of context, including leadership, on the mobilisation of knowledge was explored and the value of adopting a distributed model of leadership to support collaboration, engagement and empowerment was highlighted.

This was followed by a discussion of the role of dialogue in contributing to the mobilisation of knowledge and how dialogue was supported through the use of knowledge artefacts. Such artefacts support knowledge mobilisation by carrying knowledge across boundaries and providing a focus for dialogue.

The capacity for knowledge act as a disruptive catalyst for change was discussed before considering how different forms of deliberate and acquisitive learning opportunities, and an allocentric rather than profession-centric disposition, contribute to knowledge mobilisation.

The final section of the chapter explored the need to adopt a system level approach to knowledge mobilisation and introduced the idea of complexity theory which is the topic of the following chapter.

Chapter 3: Literature review 2:Complexity

3.0 Introduction

This chapter begins by exploring the evolution of different strands of complexity theory from its origins in general systems theory before considering complex adaptive systems (CAS), the strand of complexity theory commonly applied to health care and other social contexts. This is followed by an explanation of key features of complex adaptive systems relevant to this study. Two contrasting models of complexity, dissipating systems and edge of chaos models are then explored. The final section of this chapter considers how features common to both complexity theory and knowledge mobilisation theory support innovation, and concludes with the research question addressed by this study.

3.1 Introducing complexity theory & complex adaptive systems

"Complexity theory provides the language, the metaphors, the conceptual frameworks, the models and the theories which help make the idiosyncrasies non idiosyncratic and the illogical logical"

(Zimmerman et al., 2009a)

Complexity is the over-arching title of a group of theories describing the behaviour of systems which have developed across a wide range of disciplines including ecology, anthropology, economics, and computer science. This group of theories considers fundamental questions of living, adaptable systems. Adopting a complexity approach to understanding human systems represents a move away from reductionist or linear approaches to understanding sustainability, viability, and innovation. Rather than considering the contributions of individual components, complexity science considers how these outcomes are delivered through interactions between multiple components working at different levels within a system.

Multiple threads of complexity science have evolved from its beginnings as systems science in the 1940s. Figure 3.1 shows Castellani's a map of the evolution of these multiple threads of complexity theory up to the present day (Castellani, 2018). Each of the threads are concerned with the effects of energy moving across a system.

The initial thread of complexity science relates to closed systems where the starting points and previous history of the system have no relation to the progress of the system, often

discussed as general systems theory (GST). The current study is concerned with the thread of complexity which relates to the behaviours of complex adaptive systems (CAS), referred to as complex systems theory. This thread of complexity theory relates to dynamic, open systems where the initial starting point of the system remains a continuing influence on how the system evolves, depicted in Figure 3.1 as the yellow thread.

The current study contributes to the body of applied complexity literature on public health and healthcare, highlighted in red on figure 3.1. Using this form of complexity theory as a theoretical lens has facilitated the researcher to focus on how systems behave, considering how energy or creativity gets trapped or released to create or inhibit change within a system of interacting agents where each agent is operating from their own knowledge base.

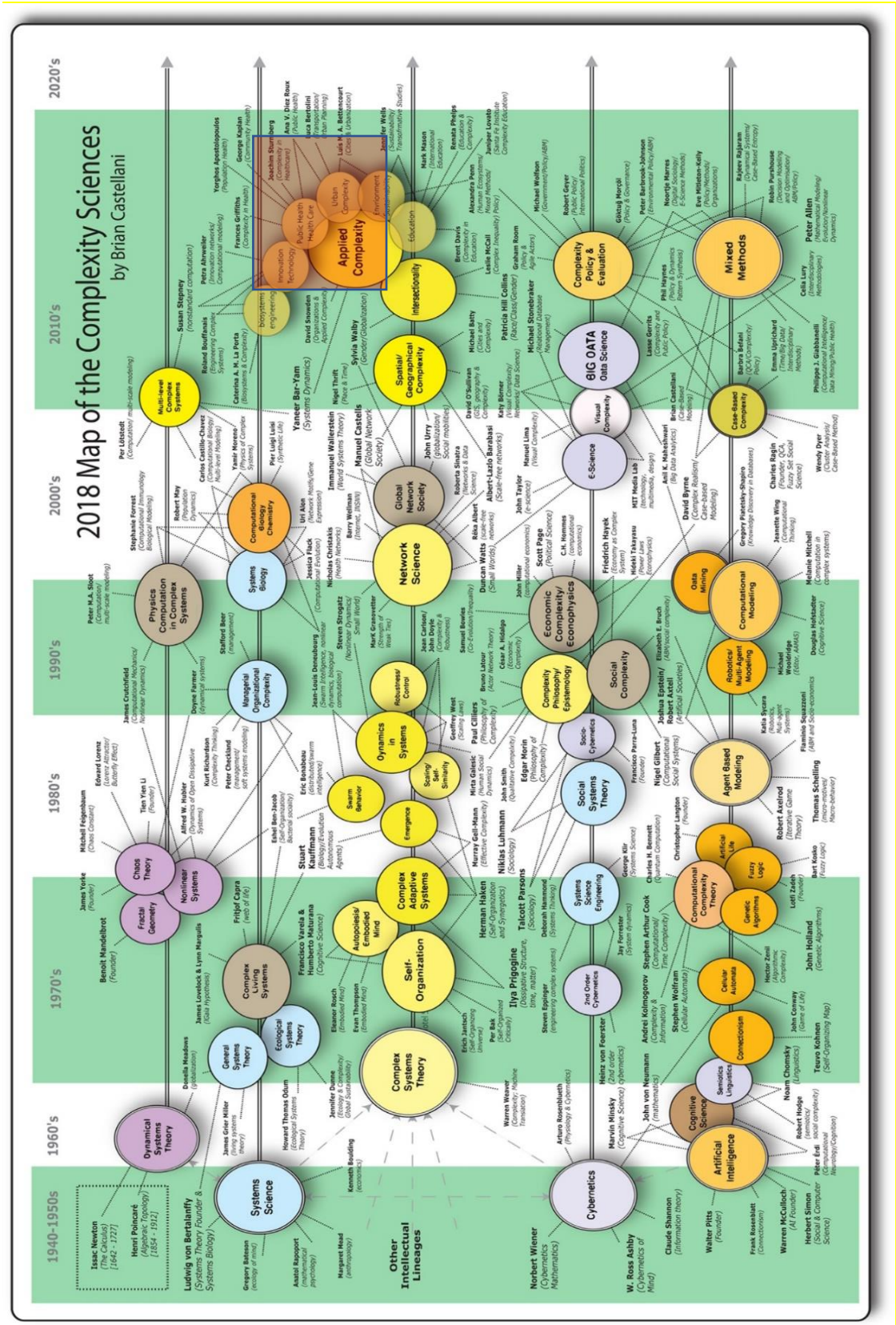


Figure 3.1 Map of Complexity Science. Art & Science Factory. (B.Castellani, 2009)

The following section begins with an examination of the application of complex adaptive systems (CAS) theory as a metaphor within human systems, then moves on to a deeper explanation of key features of this thread of complexity theory in healthcare. Some criticisms of the application of CAS theory within healthcare are then explored. This is followed by an operationalisation of CAS based on two models: Dissipating Structures Model, and Edge of Chaos Model. The final part of this section describes the roles of feedback loops and the impact of different constructs of leadership on the behaviour of complex adaptive systems.

Applying the metaphor of CAS to human systems

The idea of complex adaptive systems developed in relation to the behaviour of molecules, cells and other non-human systems and has subsequently been employed as a metaphor for the construction of conceptual models to explain the behaviour of complex human systems (Skyttner, 2005).

Employing metaphor is a cognitive process of mapping one concept or set of ideas onto another to generate fresh insights and consider ideas or sets of circumstances from another perspective. It is an effort to crystallise disconnected information into a meaningful set of relationships and ideas (Aita, McIlvain, Susman, & Crabtree, 2003). Metaphor moves beyond a specific notion or idea to a transcending conceptual understanding (Lakoff & Johnson, 1997).

CAS theory has been usefully employed as a metaphor within healthcare to develop understanding of aspects of sustainability, viability and innovation that might otherwise be overlooked by a more linear and reductive approach to investigation (Cilliers, 2013; Hawe, 2015; Kauffman, 1996).This form of complexity theory provides a framework to explore variations in outcomes across dynamic and diverse contexts (Holmes et al., 2016; Plsek & Greenhalgh, 2001a).

Addressing the problems of exploring and evaluating complex social systems requires consideration of the context of the wider system. The Medical Research Council (MRC) has recently reviewed their framework for addressing complex interventions to include wider system levels which considers disruptive system changes emerging at multiple levels of the system (Craig et al., 2019). The different foci of traditional and complex social systems perspectives outlined in the MRC framework are summarised in Table 3.1, drawn from Moore et al 2019.

Stage	Traditional stage focus	Additional considerations from an events in systems perspective
Intervention development	Identification of intervention components which have been effective in addressing similar problems elsewhere; Theorization of how components interact with one another to influence the target outcome.	Identification of how the dynamics of a particular social system perpetuate and sustain sub-optimal health outcomes; Theorization of how patterns of system behaviour might be disrupted by the introduction of new ways of working to optimize the health promoting potentials of the system.
Feasibility and pilot testing	Exploration of whether an intervention, and evaluation, approach is acceptable to key stakeholders; Short-term testing of whether an intervention can be feasibly implemented with fidelity and acceptability to participants; Refinement and testing of key methodological parameters.	Feasibility and acceptability as dynamic concepts, changing over time through positive reinforcing or balancing feedback loops; Focus on potential of an intervention to gain traction within its system; Assessment of whether intervention can be implemented with fidelity of functions (rather than form) across a purposive range of settings. Exploration of metrics for describing systems and assessment of how to sample these in a larger study of effects.
Evaluation	Testing of the extent to which an intervention 'works' and is cost-effective; Process evaluation focused on whether the intervention is implemented as intended to ensure the internal validity of outcomes evaluation.	Testing and refinements of theories about: mechanisms of disruption; intended and unintended proximal and distal consequences; and system-context moderation of these; Explicit consideration of likely outcomes over time to guide durations of follow-ups. Assessment of whether intervention was implemented with fidelity of functions (rather than form) to assess the internal validity of outcomes evaluation.
Implementation	Dissemination of research evidence to key stakeholders; Maintenance of effects from evaluation in routine practice.	Implementation, in system change terms, as a process which is understood on increasing scales throughout intervention development, feasibility assessment and evaluation.

Table 3.1: Stages of the MRC framework and considerations from a traditional and complex system perspectives (from Moore et al 2019)

Adopting a complex perspective involves conducting ontologically deep levels of observations over different parts of a system and over time in order to understand factors which are contributing to the success or otherwise of a complex health intervention. Rather than adopting the more traditional focus of considering interventions in relation to their fidelity to form, for example timing or dosage of intervention, the complexity perspective shifts the focus to consider fidelity to intervention function. The same ambitions may be effectively addressed in very different forms in different contexts.

Relating the MRC framework to the metaphor of complex adaptive systems, adopting a CAS perspective inverts the traditional change management focus of dealing with resistance and variation, and instead considers how the natural energy within the system, presenting as the emotional, intellectual, and physical effort of individuals, can be harnessed to support adaptation and innovation. The following section explains the nature of these complex adaptive systems.

3.2 Complex Adaptive Systems

The complex adaptive system model evolved from the work of scientists as the Santa Fe Institute in California in the 1980's. This model unifies core concepts of complexity drawn

from diverse strands of complexity including mathematical complexity, cybernetics and systems thinking (see Figure 3.1).

The complex adaptive system or CAS is a web of interconnecting agents, each operating from their own knowledge base, semi-autonomous and capable of directing change. These agents can be nested within a CAS or linked to another CAS. It can be difficult to predict or understand the nature of the inter-relationships between CAS until they co-evolve, creating an emerging, interdependent yet unpredictable pattern of change (Moore et al., 2019). Individual items within the CAS have the capacity to adapt and learn but each adaptation impacts on other components within the system and acts as a catalyst for further adaptations. Relationships between the components within the system are the significant features of the CAS (Rickles, Hawe, & Sheill, 2007).

CAS draw energy in through attractors (Sturmberg & Martin, 2013). New knowledge is one form of attractor (Chiles et al., 2004; Ward, House, Hamer, 2009). As discussed in the previous chapter, new knowledge challenges attitudes, behaviours and patterns of practice, enabling a system to move from its normal state of stability or equilibrium to a position of disruption or disequilibrium when the resources within the system begin to adapt and rearrange (Kauffman & Johnsen, 1991). This has been described as the 'tipping point' of the system (Mitchell, Gibb, & Works, 2015).

The resulting adaptations can be small, micro-level changes which occur over time. These changes may be difficult to capture using linear analytical methods such as quantitative measures of activity or performance (Essén & Lindblad, 2013). However, small change is not necessarily trivial change. Radical organisational change can occur as the result of small micro-level changes cumulating over time (Weick, 1995). A CAS perspective seeks to capture these changes as part of a process of constantly evolving cumulative change, a state of perpetual novelty where surprises are inevitable and are creatively embraced rather than avoided (Anderson & McDaniel, 2000).

Changes evolve and adapt in response to feedback and learning, and dissipate or give out energy to create further change or adaptation in an irregular and unpredictable but not random pattern. This pattern of unpredictable outcomes, discussed further in section 3.3.5 as a basin of attraction, has been described as a state of bounded or limited instability (Stacey,

2002). The system remains "orderly enough to be stable but full of surprises"(Kauffman, 1996).

3.3 Defining concepts in complexity

The application of complexity theory within human systems has posed some problems. One is the lack of definition around the theoretical constructs of complexity, where multiple labels describe overlapping concepts. This has created confusion when relating complexity theory to practice (Thompson, Fazio, Kustra, Patrick, & Stanley, 2016). There are however some core concepts which have been identified by multiple authors in relation to complex adaptive systems. These core concepts are: interconnectivity, self-organisation, adaptation, non-linearity, basins of attraction and emergence (Braithwaite, Churruca, Long, Ellis, & Herkes, 2018; Holmes et al., 2016; Plsek & Greenhalgh, 2001b; Wells & McLean, 2013; Zimmerman et al., 2009a). Drawing from the work of these and other authors, the following section provides a description of how each of these core concepts of CAS are being considered within this study.

3.3.1 Interconnectivity

The boundaries between agents within a complex adaptive system are open and permeable, allowing agents to operate within other systems which are either linked or nested. Changes in one system can affect other systems in unexpected ways, resulting in both positive and negative unforeseen consequences. This interconnectivity relates to the concepts of co-evolution and inter-dependant relationships (Moore & Westley, 2011). The same phenomenon has also been defined as 'system interaction' (Caffrey et al., 2016).

The behaviour of these inter-connected components is explained through the continuous interactions between the components operating at different levels of the system (Snyder, 2013). Complex adaptive systems engage in an evolution of emergent processes, disrupting existing orders or norms at different levels of the system. At key or critical points in the evolution of the system, the system has a high degree of interconnectivity, with many parts of the system active at the same time (Kauffman, 1996). Attention to the relationships between different levels of the system are linked to the process of self-organisation (Cilliers, 2013).

3.3.2 Self-organisation

Self-organisation describes the process through which these collections of individual actors create relationships and organise an overall co-ordination or order. This is a pre-requisite for evolution or adaptation. Self-organisation enables the evolution of new forms and structures through co-evolution with other components and CAS. Self-organisation generates continuous adaptations which are distributed across all components of the system rather than centrally or hierarchically organised. The advantage of this type of system is its ability to survive and even self-repair following disruption or damage. When social systems hit crises, entities which were independent can become highly interdependent (McKelvie, 2013). This enables the system to respond through an internal process of self-organisation rather than through externally applied central design and control (Oborn et al., 2013). Complex system change is inhibited by the processes and daily work of hierarchical management systems which focus on governance and control (Hawe, Shiell, & Riley, 2009; Holmes, Finegood, Riley, & Best, 2012; Holmes et al., 2016).

The process of self-organisation relates closely to constructions of leadership. Construing a form of leadership that is independent from an 'authority role' enables the system to respond to the nature and location of events and activities. The activities of health systems are delivered through individuals who have varying degrees of influence. They are often described as knowledge-intense organisations where the value of the system is held in the knowledge and skills of the participants and there is no single point of control (Hunter, 2015). These self-organising systems can exploit dynamism present within the system to deliver desired outcomes. An example of this is where independently operating professional groups, including police, traffic monitoring services as well as health care professionals come together when responding to crisis, such as a car accident. The individual professionals adopt and adjust roles as their skills, knowledge and the local context require, often moving from supporting victims with first aid to traffic management, to identifying and mitigating further risks. The individual parts come together to achieve the optimal outcome for the system as a whole. The optimisation of the system is achieved through adaptation.

3.3.3 Adaptation

Adaptation is a process or trait which increases an individual or group's fitness for an environment. In CAS, adaptation refers to interacting entities which act individually or

together in response to environmental changes or changes in the interactions between parts (Manson, 2001).

The changes or innovations that appear through this adaptive process are improvable ideas that have demonstrated efficacy and then become refined to function optimally within specific contexts, focusing on fidelity to function. This contrasts with notions of fidelity to form, where finished products are created and then become shared across different contexts (Kirshner & Polman, 2013).

The complexity construct of adaptation relates to ideas of implementation plasticity where innovations can be restructured to meet the demands of a specific context without compromising their effectiveness, and contextual elasticity where contexts can be adapted to accommodate the requirements of an intervention (May, Johnson, & Finch, 2016). These factors form the basis of the transferability, spread or scaling-up of interventions and relate to the themes presented in the MRC framework in Table 3.1 and form part of the discussion of two models of complexity in 3.5.

The pattern of adaptations in a complex adaptive system involves critical points or thresholds where the system crosses into a new phase or state. These critical points are often difficult to anticipate and are not attributable to a single cause but are the result of a cumulation of adaptations across the system.

3.3.4 Non-linearity

When systems achieves a critical point, an idea or behaviour may spread freely across them (Smylie et al., 2016). Complex systems operate on simple rules, and change processes are triggered by a range of events or factors which take hold and gain momentum. These events can be sudden and have an impact on the system which may be mild or may be devastating (Snyder, 2013).The pattern of adaptation is unpredictable and there is often an absence of intentionality. The system is not moving towards an articulated or imagined new form. It is engaged in a series of micro adaptations (Snyder, 2013) which take the system on a trajectory of change. The size of the change within the system bears no relation to the amount of input. Increasing one factor will not necessarily lead to more of another (Manson, 2001).

The behaviour or output of complex adaptive systems cannot be predicted from studying causality in detail. These systems need to be understood holistically as a collection of multi-dimensional entities which produce unpredictable patterns of outcomes. Interactions

between agents are likely to produce outcomes which fall at points within a pattern, but the exact point or outcome will be influenced by the starting points of the system, the outcomes of other interactions occurring within the wider system and other information received through feedback loops operating within the system (Farazmand, 2003; Kaisler & Madey, 2009). These patterns of outcome behaviours are referred to as basins of attraction.

3.3.5 Basins of attraction

Any CAS is a continually changing entity which is influence by events or inputs that can be described as 'attractors'. Attractors are areas of energy that draw the system towards themselves. In human systems, mental categories or knowledge can be considered attractors (Lucas, 2004). The trajectory or direction of change of a system is influenced by the strength of competing attractors operating within the contexts of the system. All contexts provide a complex multi-dimensional matrix of many parameters, making the trajectory of change unpredictable. Unlike linear systems, which follow a single trajectory to the same point, CAS do not follow the same trajectory consistently but instead follow a pattern of potential outcomes, referred to as a 'basin of attraction'.

The shape or pattern of the basin of attraction is tied to specific contexts. If the attractor appears within a different context, the range of potential outcomes, the basin of attraction, will be different within that context. Kauffman refers to this process of co-evolution and continual adaptation in terms of fitness landscapes, with the system being drawn to adapt towards a higher point or pinnacle of evolutionary success or improvement (Kauffman & Johnsen, 1991).

A minor change in the context may result in a system switch towards a different attractor, an alternative thought, image, or body of information. The range of possible outcomes from any attractor are strongly influenced by the starting points and interactions occurring within the system rather than the size of the attractor events. This phenomenon is widely known as the 'butterfly effect' where the flap of a butterfly's wings has been understood to result in massive changes in weather systems in other parts of the world. Figure 3.2 shows the basin of attraction relating to the butterfly effect, also known as the Lorenz effect.

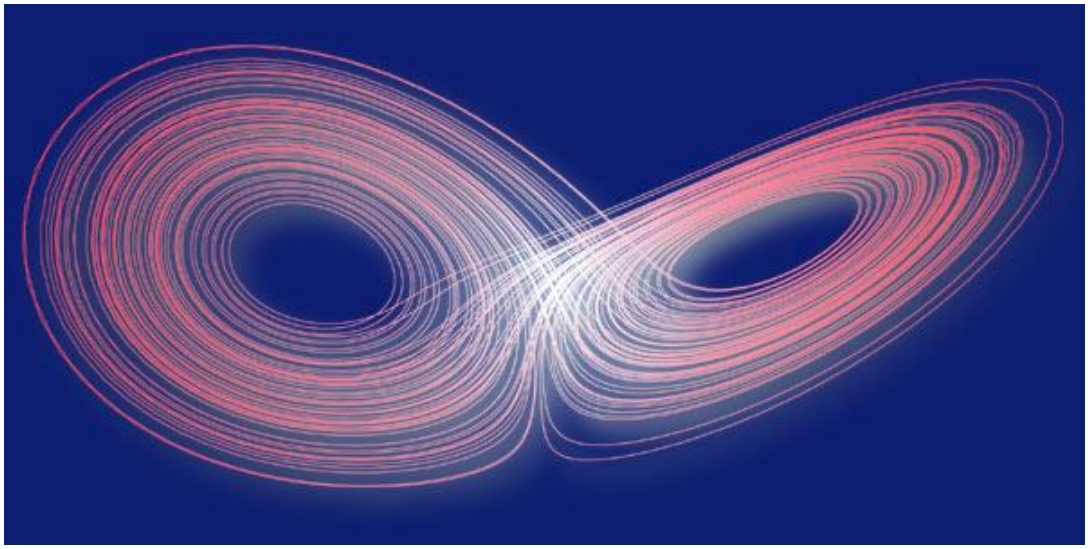


Figure 3.2 Lorenz Butterfly Effect: Basin of Attraction

The image shows a pattern of possible outcomes derived from equations created to predict the pattern of a weather system. The infinitely complex pattern of outcomes, referred to as a fractal, was created by repeatedly conducting the same simple calculations relating to the movements of air streams. The calculations never return to the same point but create endless variations proximate to the initial attractor. The patterns of potential variations of outcomes within complex adaptive systems is represented as the basin of attraction. The recombination of resources within a dynamic system creates a state of bounded instability where various potential outcomes are possible (Plowman et al., 2007). The shape of the basin of attraction is influenced by information drawn into the system through the feedback loops available to the CAS.

3.3.6 Feedback loops

Feedback loops supply energy for and control the direction of changes or adaptations within a CAS by sharing information on what is happening within different parts of the CAS. The unpredictable, non-linear nature of CAS discussed above may lead the system to expand or drift from the original intentions to deliver outcomes which could not be predicted in advance (Manson, 2001). Feedback structures help maintain the momentum and cohesion of adaptions across the CAS.

Feedback loops are indispensable to the scale up and spread of an implementation as they as they drive evolution and adaptation within systems (Clancy, Delaney, Morrison, & Gunn,

2006; Snyder, 2013). The key traits of high performing organisations (stability in inter-personal relationships; clear terms of collaboration; a shared perception of problems and co-ordinated joint decision making) are conducted and emerge through feedback loops (Nohrstedt, 2016). In social systems, feedback loops allow transformations to become established and maintain the trajectory of change across the system (B Marchal, Dedzo, & Kegels, 2010).

The nature of feedback loops can be understood as temporary structures which remain intact until a transformation is complete. These structures can take the form of basic social rules and fundamental organising principles or artefacts which support the vicious or virtuous cycles of adaptation (Weick, 1995). In the context of complex system theory, positive feedback loops move actors along the trajectory towards a desired change, creating virtuous cycles. Negative feedback loops suppress change and drive the system to maintain the status quo or move away from the desired outcomes, creating vicious cycles. These two forms of feedback can also be considered as providing amplification or control, a push-pull of processes operating on a system (Wolf-Branigin, 2013). The role of feedback loops have been recognised in a number of other studies within healthcare as aligning stakeholders through consistent feedback to support a resilient and flexible system (May et al., 2016; Snyder, 2013).

The ambition is that the constituent parts of a system respond to feedback loops to move along a cohesive trajectory towards a shared set of outcomes. The feedback loops tend to grow larger and more influential as their effects spread across the system. Feedback loops can take many forms, from seemingly trivial or difficult to perceive items or activities to more obvious planned initiatives. Manifestations of feedback loops relate to the previous discussion of epistemic artefacts in 2.2.6

The notion of feedback loops and trajectories of change within the CAS can be aligned with the principles of addressing change across a multi-level system (Kislov, Waterman, Harvey, & Boaden, 2014) presented as Table 3.2 .

Principle 1: Move from building new ideas to adapting and developing current capacity
Principle 2: Move from the notion of the workforce as passive recipients towards the idea of engaging the workforce as active partners
Principle 3: Move away from lower order project delivery to focus on higher order generic targets and lessons learned
Principle 4: Move away from single level learning to system wide multi-level learning

Table 3.2: Four Principles of Capacity Building for Knowledge Mobilisation. (Adapted from Kislov, Waterman, Harvey & Boaden 2014)

Individuals sharing procedural as well as product knowledge can be achieved through the contribution of epistemic artefacts as archives of various forms of knowledge, discussed in 2.2.6. These can be construed as one manifestation of feedback loops within CAS. The unpredictable outcomes which emerge in response to the various manifestations of feedback loops within CAS is referred to as emergence.

3.3.7 Emergence

Emergence means more than can be understood or expected from the constituent parts of a system. Described as "macro-level manifestation of the interaction of micro-level parts and agents", emergence is the force that accounts for the transformation of quantity into quality (Plsek, & Wilson, 2001). Complexity theory states that emergence is the product of interdependence of components within the system (Chiles et al., 2004; Essen & Lindblad, 2013b).

Within CAS, the continuous evolution of emergent processes occurs as a response to feedback loops disrupting the existing orders or norms in a self-organized manner. The impact of these influences can be described along a continuum of models of innovation, representing a contrast between organic grass roots momentum or micro-level activities, and highly evolved macro-level change processes implemented in a top-down fashion (Greenhalgh, Robert, Macfarlane, et al., 2004) (Mintzberg & Waters, 1985). The nature and pace of emergence is discussed further in relation to two models of complexity in section 3.5. and is influenced by the starting point of the CAS.

3.3.8 The Historical Nature of CAS

Complex adaptive systems are historical systems which are influenced by their starting points or initial conditions and the history of the agents within the system (Pycroft, Bartollas, & Wolf-branigin, 2014; Wolf-Branigin, 2009). The historical nature of the CAS and the disequilibrium

or unsettling of the status quo that precedes the process of emergence and adaptation described in 3.3 resonate with ideas of organisational ghosts, as inheritances of the past haunt the relationships and struggles of the present (Orr, 2014). The historical nature of CAS also relates to the idea of pre-context presented by Archer in her realist social theory (Archer, 1995). The idea of pre-context is discussed further in relation to methodology in chapter 4.

This sensitivity to initial conditions contributes to the inconsistencies and unpredictability of complex adaptive systems. Wells & McLean explain this variation through the influence of holarchy rather than hierarchy as an organising principle of a complex system (Wells & McLean, 2013). Holarchy suggests that past actions have brought us to this moment and the various choices we have available. The choices we make in this moment will in turn lead to a future moment and choices that are not yet accessible and therefore cannot be predicted or known. Complex adaptive systems are not supported by approaches to change management which seek to capture potential futures and linear progression over time. Capturing activity and creating accountability within a CAS can be achieved through commitment to learning, allowing individuals to have influence over the indicators of progress that are selected for attention, and the creation of iterative feedback loops to capture dynamic information on the changes being realised (Wells & McLean, 2013).

3.4 Different approaches to deploying complexity ideas

The processes of creating non-linear changes within systems have been explained using two different models:- the dissipating structures model (DSM) (Farazmand, 2003; Gemmill & Smith, 1985) and the 'edge of chaos' model (Kauffman, 1996; Kauffman & Johnsen, 1991).

The dissipating structures model of complexity relates to open systems which exchange matter, energy and information or knowledge with the external environment. These systems are in a state of reciprocal adaptation where each part of the system acts and reacts according to the actions and reactions from other components (Tiezzi, Pulselli, Marchettini, & Tiezze, 2008).

The process begins with a disequilibrium or a disruption of the extant way of doing things. The system then moves into one of two different modes which allow or inhibit the process of adaptation depending on feedback to the system. Equilibrium mode dampens the disruptions and the system returns to the status quo. Transformational mode collapses or reorganises the elements of the system in innovative configurations before stabilizing into a new structure.

Positive feedback enables the system to identify and adapt in the direction of options that are most beneficial. Some changes take hold and gain momentum while others become extinguished. The dissipative structures model describes a system that experiences periodic system-wide changes in distinct phases initiated by some external trigger.

This contrasts with the 'edge of chaos model' (Kauffman & Johnsen, 1991) which suggests that rather than phased transitions punctuated by periods of equilibrium, systems can exist in a constantly adapting, self-organising state, a perpetual fluidity.

The edge of chaos model is applied mainly to living organisms while the dissipative structures model tends to relate to assemblies such as molecular systems or organisational structures. The fluid or episodic nature of observed change may depend on whether systems are primarily designed or considered as mechanical or whether they are living systems (MacIntosh & MacLean, 2015).

It is likely that both DSM and edge of chaos models of complexity are involved in processes of organisational change when change agents are humans and the observable outcomes are changes to organisational assemblies. The outcome for both DSM and edge of chaos models of complex change is system adaptation.

The following section considers how complexity theory has been applied within healthcare, discussing concerns about the value of adopting a complexity perspective within this context before moving on to discuss the potential impact of various contextual factors on CAS, and finally considering how changes within CAS may be catalysed through the application of knowledge.

3.5 Applications of complexity theory in healthcare

In the context of healthcare, complexity theory has been applied in several different ways. Some researchers focus on the possibilities offered by employing mathematical modelling of complexity to increase understanding of how healthcare systems work (Castellani, Barbrook-Johnston, & Schimpf, 2019). Recent research in relation to attendance at urgent care has shown healthcare systems to behave in statistically similar ways to other complex systems with compliance to power laws and a pattern of uneven bursts of distribution (Burton, Elliott, Cochran, & Love, 2018).

Other researchers have been using complexity theory as a metaphor to make sense of the healthcare experience (Greenhalgh & Papoutsi, 2018). Employing complexity theory as an explanatory tool has been successful in explaining how the components within a complex system interact (Chandler, Rycroft-Malone, Hawkes, & Noyes, 2016). Although complexity theory has not yet been demonstrated as suitable for intervention design (Brainard & Hunter, 2016), it does appear to make a contribution to uncovering the mechanisms, the why or how of outcomes occurrence, which are key to the development of successful solutions (Caffrey et al., 2016).

Complexity theory takes research within healthcare systems from a closed system of theorised evaluation to an open system of real life (May, 2006). Within a complex system there is inherent uncertainty in how outcomes evolve depending on a myriad of contextual factors. These factors include levels of patient involvement and specific disease progressions as well as task-based uncertainties such as levels of customisation or interdependency of tasks (Leykum et al., 2014). These uncertainties compromise the relevance of measures collected from one context as predictors of likely outcomes or performance in a different context and can undermine effective practice (Lowe 2017, Francis 2010).

Recognising the complex nature of health and social care systems has been cited as a key feature of any successful implementation of innovations (Burton et al., 2018; Trisha Greenhalgh et al., 2017; Slade et al., 2018). There have been calls for health care research to move away from linear approaches and include more complexity-informed perspectives that recognise the impact of emergent and non-linear factors within change processes (Holmes et al., 2016; Rutter et al., 2017). Framing social systems as complex adaptive systems has been shown to be a productive approach to the use of complexity in social research, as multiple actors, objects and processes are interconnected to form a system based on function or interest (Byrne, 2013). Using a complexity framing highlights the open and dynamic nature of the social system and allows exploration of the differing values and valuations held by the actors within the system. The impact of these variations, creating different dynamics across different levels of the system, manifests as parts of the system entering periods of disruption and disequilibrium at different times. This phenomenon has been a feature in other complexity-informed research (Room, 2011). New states of equilibrium are not based on achieving consensus between the agents but occur as an emergent product of adaptation and accommodation of the reasoning and resources of agents within the system.

Several authors have identified the importance of conflicted understanding as a positive force for change (Moller, 2018). The human learning systems approach adopts this perspective, expresses the need to consider how strengths, needs and priorities are perceived from different perspectives (Lowe, 2018).

Complex systems depend on variety for survival (Walby, 1998). However some complexity-informed research within healthcare continues to pursue fidelity to implementation through non-complex approaches to managing practice variations such as the application of automation or sanctions for non-compliance (Brewster et al., 2015). There have been recent calls to adopt a more temporal focus which would provide information on how adaptations and changes gain traction within a system over time (Hawe, Shiell, & Riley, 2009b; Moore et al., 2019).

3.6 Concerns around the utility of complexity theory in healthcare

The application of complexity theory within healthcare has attracted criticisms (Brainard & Hunter, 2016; Buffardi, 2016; Reid, 2002). Complexity concepts were originally observed in relation to non-human systems, such as molecular structures or weather patterns within natural sciences. The more metaphorical use of the complexity concepts within social or human systems (Plsek, 2001; Plsek & Wilson, 2001; Westhorp, 2013) has contributed to the lack of clarity in the use of complexity terms mentioned in 3.3 above, resulting in different authors applying different interpretations of constructs. Some authors have used the language of complexity to describe systems and interventions which engaged multiple objectives, components, and strategies. These interventions could be described in terms of simple or complicated interventions (Glouberman & Zimmerman, 2002) but do not display the key features of interconnectivity, self-organisation, system history and emergence which have been consistently identified as key features of complex systems in both theoretical and empirical research (Thompson, Fazio, Kustra, Patrick, Stanley, et al., 2016).

Further concerns on the use of complexity theory within health and social care relate to the lack of strong evidence to support the effectiveness of complexity-informed health intervention and the inherent difficulty of identifying attribution within a complex adaptive system (Brainard & Hunter, 2016; Hills, 2019).

In 2008, the Medical Research Council (MRC) expressed concerns in relation to the utility of complexity theory with its focus on unpredictable outcomes (Craig et al., 2008). As discussed

in 3.1.1 above, both the MRC and NIHR recognise there have been considerable developments in the application of complexity within social systems since 2008 and have reviewed their guidelines to recognise the value of adopting a non-linear approach that includes natural experiments alongside more experimental models (Craig et al., 2019).

Applying complexity constructs provides a deeper understanding of the behaviours of complex human systems but does not provide conclusive yes/no answers and is therefore not suitable where the aim of research is to provide information to explain linear causality or to provide evidence of accountability (Hills, 2019).

3.7 Adopting leadership models compatible with CAS in healthcare

One key structural impact on how organisations evolve is the approaches to governance and leadership across the system. Despite recognition of the complex nature of public sector service provision and the capacity for self-organisation within CAS, the organisation of public sector services continues to be traditionally conducted in ways that fail to take account of complexity (Tourish, 2019). Most references to the theory and practice of organisational leadership within the public sector refer to non-complex approaches with a focus on command and control, a disjunctive approach to leadership which separates different aspects of the human experience (Tsoukas, 2017).

This does not align with the interconnected, self-organising and unpredictable nature of a CAS where a focus on the external outer context of a hierarchy and the constraints of decision-making intended to realise an ideal or imagined template of outcomes can be a major barrier to securing change (Dixon-Woods, McNicol, & Martin, 2012). Adopting a more conjunctive or distributed approach to organisational leadership which harnesses the diversity of the CAS is more appropriate (Tsoukas, 2017).

This form of leadership has been advocated within healthcare as collective or shared leadership (West, Eckert, Steward, & Passmore, 2014) and is referred to in the wider leadership literature as distributed or matrix leadership. The aim of this approach is to achieve a balance between establishing and maintaining routines that deliver consistent outcomes, and enabling adaptations or innovations that respond to the demands of a changing context (Senge et al., 1999). These processes has been referred to as exploration and exploitation, and the balance between the two referred to as organisational ambidexterity (Oborn et al., 2013).

3.8 Combining knowledge mobilisation & complexity theory

Seeing the context of the health care system as a complex adaptive system and the sharing of new knowledge within the system as the catalyst for change and adaptation combines the two conceptual lenses of this study, integrating theories relating to knowledge mobilisation discussed in Chapter 2 with the features of CAS discussed above. Combining complexity theory with knowledge mobilisation theory seeks to highlight patterns and behaviours that secure non-linear change through on-going learning and adaptation. These patterns and behaviours are the process and outcome of social interaction across the system throughout the lifecycle of the project rather than the products of discrete project phases. This approach has been referred to as human learning systems (Lowe, 2018).

Behaviours across the CAS are perpetuated or extinguished through the virtuous or vicious cycles of feedback discussed in 3.3.6 above. Both vicious and virtuous cycles occur through the amplification or dampening down of adaptations and variations. The nature of the feedback structures is key to steering systems away from vicious cycles and harnessing processes that generate virtuous cycles (Tushman & O'Reilly, 1996). Virtuous cycles provide feedback which directs the system towards progressively positive outcomes, creating a spiral of success (McKinley, Latham, & Braun, 2013).These positive adaptations can be aligned with the positive deviations discussed in 2.1.4 above, where the trajectory of the intended outcomes is maintained by overcoming local obstacles (Horton, 2018). Positive deviations depend on the mobilisation of knowledge across boundaries of practice (Greenhalgh & Weiringa, 2011).

Ensuring that feedback structure promotes virtuous cycles is particularly important where there are additional stresses impacting on the CAS. Complex systems encounter and accommodate conflicting views through a strengths-based rather than deficit-based perspective and the development of trust between agents, acknowledging the complex and often conflicted nature of social systems (Lowe & Plimmer, 2019).

Complex system changes are irreversible, a system can never return to a previous state. However, all systems are continually drawn towards a state of equilibrium. As mentioned above, CAS are historical systems and their past experiences influence the direction or trajectory of the future system (Zimmerman, Lindberg, & Plsek, 2009b).

An effective CAS maintains a trajectory of change across interconnected systems which each have a capacity for self-organisation. Successful knowledge mobilisation provides the CAS with the capacity to adapt optimally to contextual changes while at the same time functioning effectively. This is an iterative process which requires attention to interpersonal and relational components (Best & Holmes, 2010; S. Nutley, Walter, & Davies, 2009) and awareness of contextual factors which could support or inhibit the knowledge mobilisation process (Stetler et al., 2009).

3.9 Summary

Framing the context of implementation as a complex adaptive system acknowledges its non-linear and unpredictable nature. It suggests that evidence from past performance is an imperfect and contestable guide to what should be done in the future and that what holds in one context cannot be moved wholesale to another (Riley et al., 2015). However, the dynamic system properties of a complex adaptive system (interconnectivity, self-organisation and adaptation in response to feedback loops) can be harnessed to support knowledge mobilisation (Braithwaite et al., 2018).

Employing the attributes of complex adaptive systems requires the system to allow local variation. Policies and proposals need to be treated as working hypotheses rather than programmes to be rigidly adhered to and executed (Dewey & Rogers, 2012). This approach is a significant departure for the command and control approach to service delivery experienced in public sector institutions (Tourish, 2019).

This study considers how key features of a complex adaptive system influenced individuals operating within a public sector healthcare context in Scotland as they created changes in their practices in line with policy ambitions. This study aims to uncover mechanisms which were supporting or inhibiting the mobilisation of knowledge in support of service innovation across the CAS of AHP service delivery.

This study considers the following research theme:

How does a Government policy framework transform into individuals creating, sharing and actioning knowledge to secure changes in practice?

Research questions

This theme was addressed in this study through the following research questions:

What underlying mechanisms enable individuals to create, share and action knowledge to reconfigure services towards early intervention-prevention service delivery within a complex adaptive system?

What underlying mechanisms facilitate and maintain the momentum and trajectory of change across the diverse and dynamic agents within the system?

The methodology adopted to address these questions and a description of how the study was conducted are provided in the following chapter.

Chapter 4: Research Methodology & Methods

4.0 Introduction

This study sought to uncover mechanisms that enabled knowledge to act as a catalyst for change within a complex system. The previous chapter highlighted the key role of context on the choices people make on how or when to respond to knowledge as changes in practice. The demand for sensitivity to context and the need to capture a variety of perspectives and potential outcomes has determined the choice of methodology for this study. The chapter begins by exploring how approaches to evaluation have evolved to address the needs of increasingly complex and unpredictable social systems and how the choice of a realist methodology seeks to address these issues within this study. The principles and processes of realist evaluation are then explained. The second half of the chapter describes how realist methodology was applied in this study, describing the study design, data collection and data analysis processes.

4.1 The difficulty of evaluating a complex system

Evaluations offer different layers of information. At one level providing information in the form of tools, metrics and measurements increases knowledge of components of a system and allows better control, which in turn improves outcomes. Understanding the values of whole systems by seeing them as a sum of their inputs and outputs is most effective when applied to problems or systems which present bounded measurable and widely predictable outcomes, often referred to as simple or complicated systems (Glouberman & Zimmerman, 2002).

Complex systems as described in Chapter 2 are by nature unpredictable and interconnected and so linear input-output measures are of limited value. What works for one element in the system may not work for other elements in the same system. When applied in the unpredictable context of complex systems, reductionist forms of evaluation frequently show only weak or non-significant findings (Hawe, Shiell, & Riley, 2004). Accumulating knowledge about inputs and outputs does not necessarily enable better predictions and greater control of the system (Sanderson 2009).

When considering complex systems, interdependencies between constantly adapting and evolving elements create non-linear and unpredictable relationships and systemic

uncertainty. In these contexts there is no single right or wrong answer to be uncovered and it is essential to employ evaluation approaches to research that enable information to be gleaned iteratively from all stakeholders (Greenhalgh et al., 2009; Snyder 2013). Forms of evaluation devised to explain why intervention do or do not work have been construed as a 'fifth generation' of evaluation approaches (Brousselle & Buregeya, 2018).This contrasts with previous generations of evaluation approaches which focus on the more reductive objectives of measurement, description, judgement and pluralism, and measuring outcomes against pre-determined goals (Guba & Lincoln, 1989).

The 'black box problem' of evaluating how interventions operate within complex systems requires deeper methods of observation (Astbury and F L Leeuw 2010; Heaton, Salter et al. 2014). Approaches to evaluation that build and re-build theories or logic models demonstrate the connections between programme activities and expected outcomes (P. J. Rogers, 2008). Referred to as developmental approaches to evaluation (Patton, 2010), applying theory explicitly to identify contextual factors that contribute to success enables optimisation of programme design through supportive adaption and reduces the development time for innovations (Davidoff, Dixon-Woods, Leviton, & Michie, 2015; Gray & Shaw, 2019).

Evaluation of a complex system begins with a recognition that all knowledge relating to complex systems is partial and provisional rather than absolute. Complex systems remain dynamic and open to influence from other interconnected systems. The purpose of evaluation of a complex system is to offer an explanation of systemic phenomena that is relevant to a specific context (Joachim P Sturmberg & Martin, 2009). Some factors or mechanisms affecting the system may be observed at the point of influence while other mechanisms may be captured retrospectively. Some mechanisms acting on the system will never be uncovered (Pawson, 2013).

This creates challenges in relation to certainty of attribution and the generalisability of findings. An achievable aim of evaluation within a complex system should be to provide modest but contingent claims that lead to improved practice by contributing to reflexivity, learning and accountability (Ling, 2012).

The pursuit of joined-up working and co-production within the public sector is creating more complex contexts. There is therefore an increasing interest in the application of robust approaches to evaluation that resonate with the context-sensitive and unpredictable nature

of complex systems. One approach which offers a robust account of a complex social reality is realist evaluation (Pawson & Tilley, 1997; Wong, Westhorp, Manzano, Greenhalgh, Jagosh, & Greenhalgh, 2016). The following section will discuss this theory-based approach to evaluation.

4.2 Principles of critical realism

Realist evaluation is one of a family of theory-based evaluation approaches founded on the ontological basis of critical realism as defined by Bhaskar (Bhaskar, 1998; Porter, 2015; Schiller, 2016). Other related evaluation approaches are logic analysis and contribution analysis. These models stem from a perspective of ontological realism where reality is understood to exist at three separate levels: the observable empirical level, an actual level which may or may not be observed and finally an all-encompassing real level which although unobservable has an on-going and fundamental influence on observable outcomes. This model of reality has been described by Jagosh et al (2019) using the iceberg metaphor presented as Figure 3.1, where the majority of significant phenomena remain submerged, not directly observable but having a constant and significant influence on the observable aspects of reality.

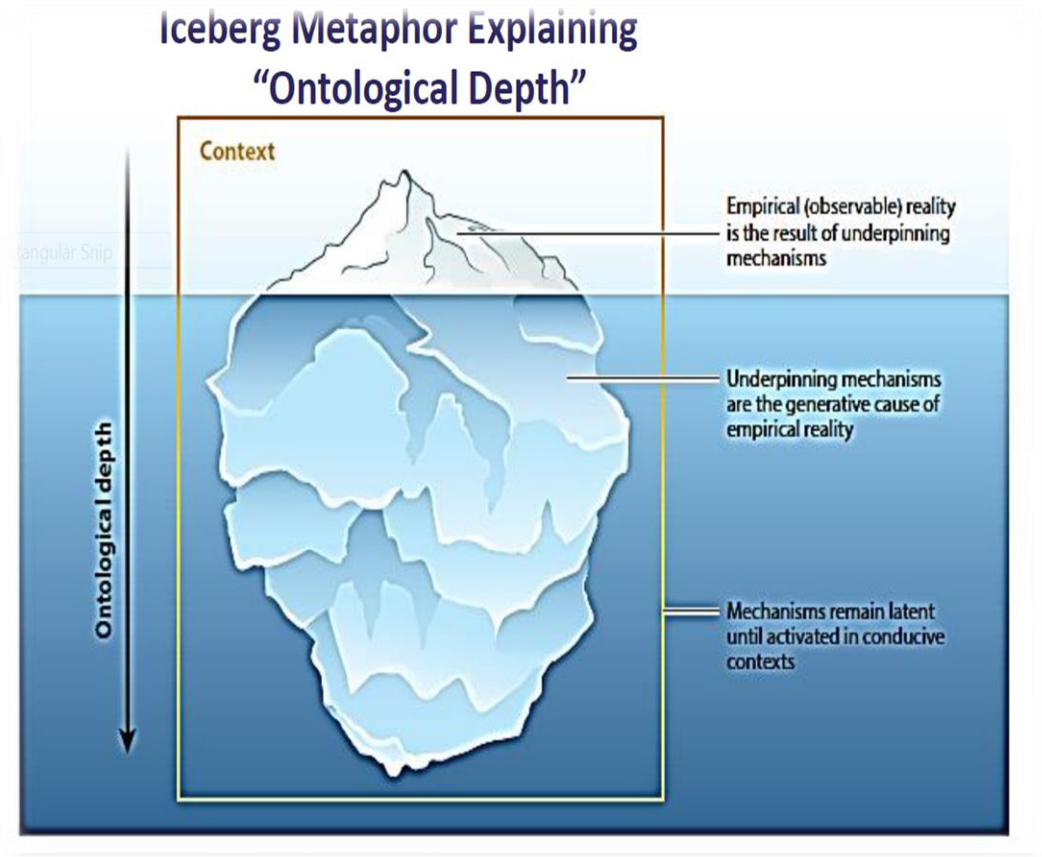


Figure 4.1: Iceberg metaphor of realist ontology (Jagosh 2019)

A further practical example of the three levels of reality is presented as Figure 4.2.

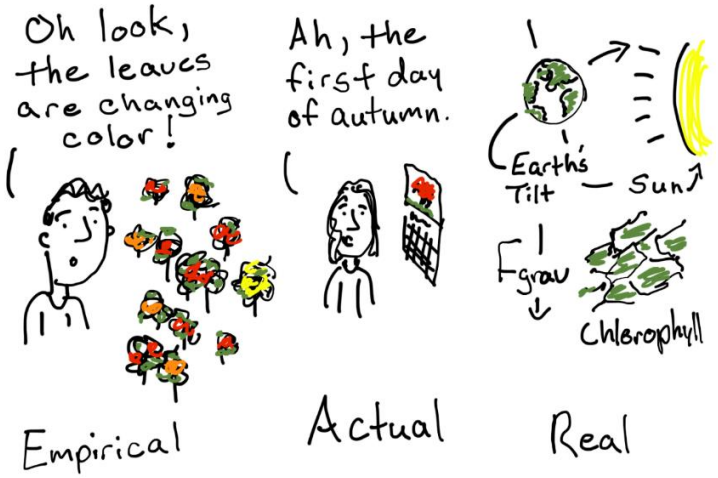


Figure 4.2: Bhasker's Model of reality (From training materials from the Rameses 11 Project)

This family of theory-based approaches to evaluation adhere to the philosophy of epistemological relativism, where knowledge is understood to have been constructed by individuals, within a specific context and with a specific purpose in mind. This philosophy holds that the value of the knowledge varies in relation to its purpose and in relation to its context. Theory and observation are never neutral. They are always mediated by the resources, experiences and practice of individuals and societies. These factors affect how observations and experiences are attended to within different contexts.

Therefore, a key feature of realist-based approaches to evaluation is methodological pluralism, considering a phenomenon from various perspectives which account for both concrete and intangible causal structures. This responds to the notion that collective decision making, constrained by context, is the underlying mechanism that creates all social outcomes (Archer, 1995). The need to consider a variety of perspectives offers the opportunity for the researcher to pay attention to voices that are "absent, marginalised or silent in the business of organising" (Alversson, 2008).

Within this study the researcher has considered mechanisms operating at organisational, managerial and practitioner levels and has sought to combine the critical element (Fournier & Grey, 2000) with a dialogue of positive organizational scholarship (Caza and Carroll 2012).

The approach is to employ Fournier and Grey's three elements of criticality (performativity, denaturalisation and reflexivity) as the critical parameters of the study. Performativity within this study relates to a range of outcomes beyond economic measures to include service development and engagement across the workforce. Denaturalisation relates to examining the historical, cultural and social aspects of the context, highlighting how established practices can be open to re-construction or reform rather than treated as inevitable ways of operating. The final critical parameter of reflexivity, an awareness of personal practice and its implications, relates to both the researcher's and participant's awareness of the impact of their attention to specific topics and events, what each party considers relevant or possible.

The critical parameters identified above are employed in this study against a background of positive organisational scholarship as espouse by Caza and Carroll (2012) in an effort to avoid the anti-managerial and anti-organisational stance often associated with critical theory and instead focus on the causes, consequences and mechanisms that bring about positive organisational outcomes such as excellence, positive deviance and positive spirals of success.

Critical realism allows an exploration behind empirical measures to understand the wider implications of aspects of life that are transient and irregular but also aspects that are predictable and routine, accepting that programmes and interventions will produce different outcomes in different contexts. Each realist case is one example of many unspecified past, present and future programmes rather than a representative sample of a finite population. Each case offers an opportunity to employ the logics of abduction and retroduction. Abduction involves moving iteratively between data, experiences, and broader theoretical concepts. Retroduction involves moving iteratively between the data and a provisional theory of an underlying mechanisms that could be responsible for the patterns or demi-regularities observed in the data, working backwards from the data to develop a verifiable model of a mechanism. This refined model explains how the mechanism could operate in different circumstances, theorizing from specific empirical cases to create a theory.

Construing theory as a system of ideas intended to explain phenomena provides an explanation of how mechanisms are engaging with the case context to deliver or inhibit outcomes. Understanding mechanisms underpinning behaviour makes a particularly strong contribution to the evaluation of policy applications. Critical realist investigation allows an accumulation of knowledge through ideas or theories that present across diverse contexts. Adopting the pragmatic view that all knowledge is partial and is improved through the slow gathering of imperfect understandings has led to the development of the empirical methodology of realist evaluation (Pawson& Tilley 1997) which is employed within this study and discussed in the following section.

4.3 The evolution of realist evaluation

Realist ideas drawn from the work of Bhaskar have been developed by Pawson & Tilley (Pawson & Tilley, 1998) to create the realist evaluation approach employed within this study. Where Bhaskar interpreted causal mechanisms as operating at the structural level of context, Pawson et al (1998) suggests causal mechanisms are situated at the level of human reasoning. These different perspectives represent different scales of explanation, with Bhaskar's interpretation being more relevant at the level of large-scale social transformation and Pawson's being more applicable in relation to the effects of specific social programmes. This awareness of the multiple levels of context and the necessity to included multiple perspectives makes realist evaluation a particularly helpful approach to considering complex

social problems that require the integration of different perspectives and different forms of knowledge (Brousselle & Buregeya, 2018).

Realist evaluation is conducted in relation to real world events and circumstances rather than experimental models. This requires a robust approach to data collection and analysis which provides legitimate information as the basis of the evaluation. Key features in this realist methodology are:

1. Incorporating multiple perspectives from different areas of activity.
2. Maintaining cognitive distance between data collection and knowledge construction.
3. Meticulous analysis of scenarios to uncover mechanisms that explain the observations (Wong, Westhorp, Manzano, Greenhalgh, Jagosh, & Geenhalgh, 2016).

These principles of realist evaluation provide a general research strategy or logic of inquiry (Rycroft-Malone & Bucknall, 2010a). Rather than focusing on associating interventions and outcomes, this approach uses theory to explain mechanisms that produce outcomes, focusing on ontological rather than epistemological questions. A variety of research methods and forms of data are necessary to develop, support, refute and refine theories that provide a plausible explanation of the influences and interactions which create the conditions for particular outcomes.

Realist evaluation provides information on how the existing social system is transformed, either through re-configuring the component elements of the system or by activating different elements (Weiss, 1997). The explanatory theories describe how mechanisms operating at macro, meso and micro levels impact on the system and explain how outcomes are generated from stakeholder's resources and activities (Westhorp, Stevens, & Rogers, 2016).

Realist evaluation has been used as the basis for evaluations within health and social care, organizational management, human relations, and education (Edwards, O'Mahoney, & Vincent, 2014; Bruno Marchal et al., 2013; McHugh et al., 2015; Rycroft-Malone, Fontenla, Bick, & Seers, 2010; Wells, Williams, Treweek, Coyle, & Taylor, 2012; Wong, Greenhalgh, Westhorp, & Pawson, 2012; Wong, Westhorp, Manzano, Greenhalgh, Jagosh, & Greenhalgh, 2016) and has been identified as offering the potential to provide useful information to explain the behaviours of complex adaptive systems (Greenhalgh et al., 2015; Marchal et al., 2010).

4.4 The components of a realist evaluation

This section explains the process of realist evaluation as created by Pawson and Tilley (Pawson and Tilley 1997) and refined by De Souza (De Souza, 2013) and Dalkin (Dalkin, Greenhalgh, Jones, Cunningham, & Lhussier, 2015).

4.4.1 Provisional theory

Following the identification of a general study design which suggests realist evaluation (RE) as an appropriate approach, the process as identified by Pawson & Tilley (Tilley & Pawson, 2000) begins with the development of a provisional programme theory. Programme theory has been defined as

" a specification of what must be done to achieve desired goals; what other important impacts may be anticipated and how these goals and impacts would be generated" (Chen, 2015).

The provisional programme theory is built on an understanding of the logic used to create the programme or intervention, and the logic employed by individuals who are involved in delivering the intervention. The process begins with understanding the intentions of the programme designers, how they think the programme is going to work and the logic and motivations for designing the programme. The provisional theory also considers how the topic areas are characterised in the current literature. These findings are used to formulate a provisional theory and to inform the design of the field study. Pawson & Tilley refer to these theories as context-mechanism-outcome configurations (CMO) which explain how context combines with the resources and reasoning of participants to create outcomes (Pawson & Tilley, 2004). The component elements of the CMO configuration are explained below.

4.4.2 Context

Context is the term used to describe the wide conditions and different social levels where programmes are introduced. In the current study there is a micro-level of practice, a meso level of internal management and a macro organisational or institutional level. Different levels of context engender different and often competing mechanisms which require different explanatory theories.

In order to create a richer picture of contextual effects it is useful to break the concept of context down into different aspects of structure, culture, agency and relations. Table 4.1 provides an indication of how these aspects of context are construed within this study. This

elaboration of the context aligns with the principles of realist social theory as defined by Archer (Archer, 1995). This theory focuses on social context itself rather than the social programme being introduced as the focus of interest. A useful refinement of Pawson & Tilley's realist evaluation approach is to apply the principles of Archer's realist social theory to describe the prevailing conditions within the pre-context, prior to the introduction of the social programme (De Souza, 2013). The benefit of adopting this approach is to create a rich and structured picture of the material resources, social structures, conventions, rules and systems of meaning within a context. These is can then be used in building the provisional explanatory theory.

Structure	**Culture**	**Agency**	**Relations**
Roles and positions	Ideas, beliefs around structure	Beliefs and reasons for action	Responsibilities and duties
practices	Ideas beliefs around culture	Beliefs and reasons for non-action	Rights
resources	Ideas or beliefs around agency		Power
processes	Ideas or beliefs around relations		

Table 4.1 Defining aspects of context

These aspects of context provide some explanation of why behaviours or practices change or remain the same. Some factors amplify the mechanisms which deliver change, while others dampen those mechanisms. The implications of aspects of context relevant to this study are surfaced and considered further in later sections of the thesis.

4.4.3 Mechanisms

Within realist methodology, the role of empirical research is to uncover possible mechanisms, which are investigated further through a series of cycles of questioning and observation, increasing the plausibility of explanations (Van Belle et al., 2016). Mechanisms have been defined as the recipient's responses to the resources provided by the programme. Mechanisms are invisible, latent and sensitive to context, operating at the real and actual levels of Bhaskar's model of reality discussed in 4.2. The impact of mechanisms manifests through the observable behaviours of individuals, groups and organisations. As Astbury and Leeuw (Astbury & Leeuw, 2010b) state, mechanisms in realism are:

"underlying entities, processes, or structures which operate in particular contexts to generate outcomes". (Astbury and Leeuw 2010)

Pawson and Tilley define mechanisms as

"the combination of resources offered by the social programme under study and stakeholders' reasoning in response".(Ray Pawson & Tilley, 1998).

One recent suggestion to facilitate the operationalisation of the notion of mechanism has been to define the constituent components of a mechanism as the resource introduced into the context and the changes in reasoning by the participants as a result of the introduction of the resource (Dalkin, Greenhalgh, Jones, Cunningham, Lhussier, et al., 2015). A copy of Dalkin's refined CMO model is presented below as figure 4.3. There is some contention that this disaggregation of the reasoning and resources competes with the intention of realist evaluation to provide holistic rather than reductionist descriptions of causal mechanisms. This conflict has been partially addressed by confirming that mechanisms will only trigger in the right conditions and that reasoning and resources operate as a pair, therefore, the original CMO formula remains valid although open to extension.

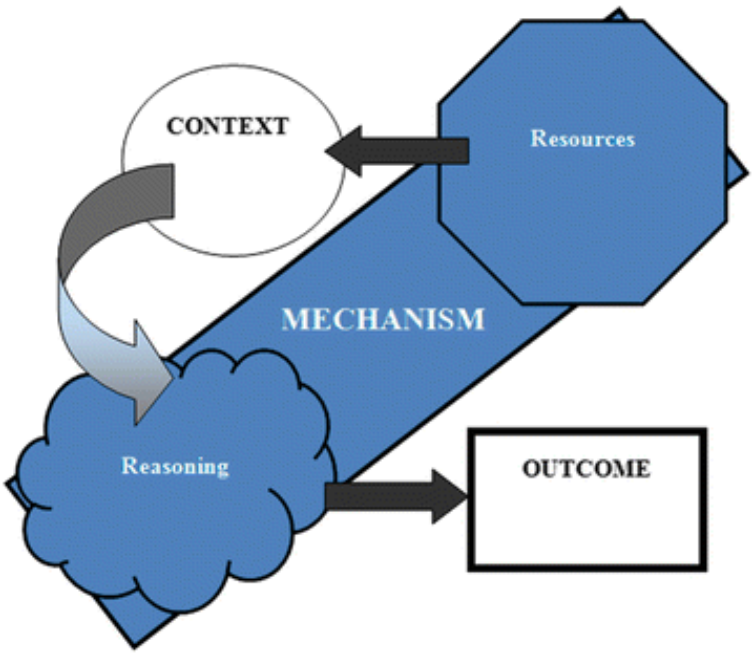


Figure 4.3: Dalkin s Disaggregated CMO Theory

4.4.4 Outcomes

Outcomes refer to the intended and unintended consequences of interventions. They are results of the activation of different mechanisms in different contexts (Westhorp, 2014).There is always an interaction between context and mechanism and it is this interaction that creates the programme outcomes (Greenhalgh et al., 2015). Since programmes are influenced by different contexts, programmes moved from one context to another will not necessarily provide the same outcomes. The theory-based understanding of how outcomes are produced (what works for whom and in what circumstances) presented here as the CMO configurations, can be transferred to new contexts. Developing theory to understand how outcomes come about offers more potential for scale-up and spread of innovation across complex systems than a focus on large scale programme development (Reay et al., 2013).

4.4.5 CMO configurations

The CMO configurations are the product of analysis of recurrent patterns in the data source. The development of the CMO configurations depends on collating information and then labelling the items as context (C) mechanism (M) or outcome (O). This can vary depending on the perspective being applied to the data. The outcome of one CMO configuration may become the context of another. This was observed within this study where the development of a distributed model of leadership was an outcome (O) which then became the context (C) for self-organisation (M) to create changes across the system (O).

Each causal configuration has a tendency or a way of behaving which depends on how these factors come together in space and time (Fleetwood, 2004). A causal configuration is a force towards an outcome. Causal configurations consist of both tendencies and counter tendencies which provide a description of the forces operating at multiple levels within a complex system. The configurations of refined CMO structures which are the product of a realist evaluation, provide one set of several potential explanations of how outcomes occur within a specific context.

4.4.6 Teacher-learner cycles of questioning

Although critical realism allows for a variety of research methods, interviews and focus groups are the most common method of acquiring data. The realist interview has several unique features which meet the requirements to produce a diverse and rich account of a range of relevant issues without being confined to pre-determined agendas.

This approach to interviews acknowledges the active role of both interviewer and participants in developing a robust and coherent account of the context. Participants share their expert knowledge of the context and issues and through the process of the interview or focus group, constructively transforms these details, being encouraged by the interviewer to explore alternative perspectives, shift position, or consider diverse and perhaps contradictory ways of knowing.

The interviewer maintains the research agenda as the topic of the interview in a non-directive manner which offers some critical appraisal of the participants account but does not suppress the role of the participant, drawing out 'information' and 'perspective' in relation to participant's accounts (Hammersley & Atkinson, 2007).Participants are experts on reasoning, choices and motivations which are mechanisms of social change. This joint process of meaning and knowledge production is referred to a "teacher–learner cycle", where participants bring their awareness and understanding to refine and develop the researcher's theory.

This iterative approach to interviewing requires the researcher to offer opportunities for reflection, and to move between a provisional or tentative theory and the participant's accounts. The researcher needs to collect and assemble the information cautiously but effectively. This requires an appropriate analytical framework to guide questions, frame answers, and suggest probes or directions of further discussions that will improve the depth and complexity of the data collected. These participant accounts are combined with other data sources such as observations and documentary analysis to provide critical scrutiny and depth.

The process hinges on the engagement of participants with the theory. Theory is the tool guiding the interaction between the researcher and participants. The realist interview provides space for reflection, an opportunity for participants to review their experience and confirm or reject researcher propositions on how events could be explained. The emerging CMO theory is used something for participants to test ideas against rather than as a tool shaping participants' interpretation (Manzano, 2016). The aim is to collect rich data on the unique experiences of specific participants within specific contexts where many influences fluctuate.

4.5. Employing the principles of realist evaluation in the AHP context

The principles of realist evaluation were employed in this small-scale exploratory study to capture the process of learning, reflection and adaptation experienced by practitioners as they made changes to their patterns of practice, aligned with the ambitions of the R2A policy framework. This study provided an account of a complex system which was continually adapting and self-organising in response to feedback about context and resources, cumulating knowledge of how contextual factors transformed practice.

This study has been constructed to align with the RAMESES 11 reporting standards for realist evaluation (Wong, Westhorp, Manzano, Greenhalgh, Jagosh, & Geenhalgh, 2016). These standards were identified by an international group of experts in realist evaluation taking part of a series of on-line Delphi panels sponsored by the NIHR. The RAMESES 11 list of reporting standards is attached as Appendix 3.

Employing Fournier and Grey's three elements of critical theory (Fournier & Grey, 2000) the researcher sought to create a novel or alternative narrative; identify measures of performance or success relevant to the context, and create a forum for joint reflexivity between participants and researcher. The intention was to focus on what was relevant within the context of the study and to ensure that ideologies, epistemologies and their consequences were made as overt as possible within the research process.

The realist evaluation process conduced in this study is presented as an eight-step model in figure 4.4. The model begins with the creation of a general study design and research question and ends with a collection of refined CMO theories.

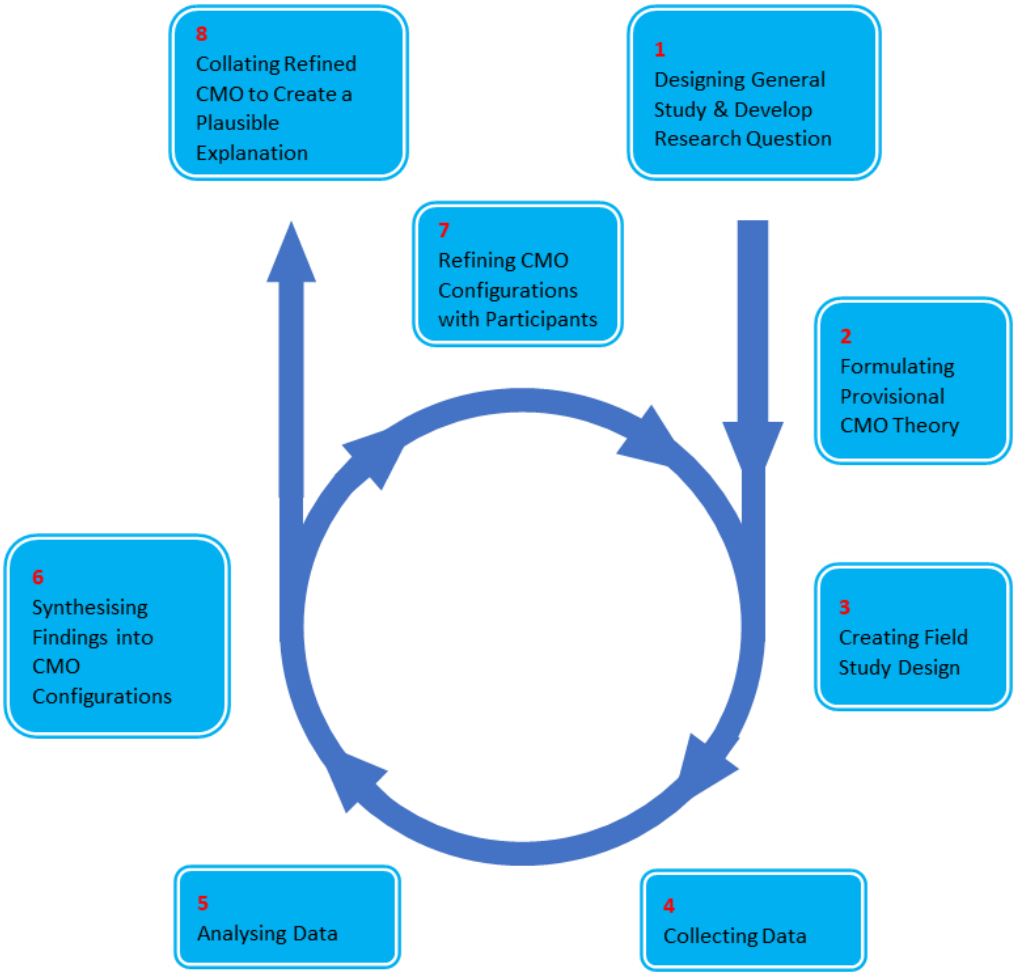


Figure 4.4 Process Model of Realist Evaluation

Once the research question has been established, the next step is to articulate a programme theory or theories as the starting point of the realist study. This development of provisional theory is followed by a data collection phase, gathering data that clarifies, conflicts with or re-defines the provisional theory. This involves interacting with the individuals who are involved in the research context to understand how the focus of research attention is being experienced. Findings are then analysed, interpreted and reviewed to form refined context–mechanism-outcome (CMO) configurations. Findings are a configuration of refined CMO theories that explain how the programme and its components respond to contextual factors to produce expected and unexpected outcomes (Jagosh et al., 2012).

The CMO configurations highlight recurring patterns, referred to as demi-regularities, which are present in a complex social reality. Demi-regularities (demi-regs) are semi-predictable patterns which appear in data relating to CAS. The influence of context creates a universal

law of variation within CAS. Within realist evaluation, rather than being discounted as outliers or a challenge to causal law, as would be the case within more linear approaches to evaluation, these variations provide further evidence of the how mechanisms operate within a specific context. The presence of demi-regularities as either a common occurrence or a rarefied incident enables policy makers and service providers to understand and cater for both a general flow and also create and apply specific contextual variations. Fluctuations are not seen as outliers to be ignored within the sample but considered as legitimate phenomena which occur in a specific social reality (Jagosh, 2019a). This is particularly useful in relation to complex adaptive systems where patterns of uncommon attraction create the irregular but not random patterns of outcomes discussed in 3.3.5. These patterns or demi-regularities can be overlooked in other forms of evaluation research.

4.6 Details of how the study was conducted

The purpose of the study was to explore what works to mobilise knowledge to deliver changes in practice, with whom, and in what circumstances. The current study is now described in terms of the steps of realist evaluation model presented as figure 4.4 above. Steps 1-5 are discussed in this chapter and steps 6-8 will be discussed within Chapter 5, Findings. These steps are discussed in a linear fashion, but the process was conducted iteratively with several cycles of coding, analysis and theory revision occurring within and between tranches of data collection.

4.6.1 General study design

The ambitions of this study are presented below as wide research aims that are translated into specific research objectives and then distilled into the two key research questions.

Research Aims

To explore the application of complexity theory to increase understanding of how change is experienced at different levels across a complex adaptive system.

To provide a robust interpretation of participants' experience of the implementation of a government framework within one context, capturing the non-linear nature of the process.

To provide generalisable observations on how mechanisms for effective change were fostered within this context.

To add to the accumulating knowledge of how 'knowledge into action at scale' is achieved within a complex health and social care context.

Research Objectives

Identify and track how a policy framework created at a macro-level impacted on micro-level practice to deliver desired outcomes.

Explore the role of leaders and practitioners as change agents and uncover mechanisms that facilitate their role in the change process.

Identify how aspects of context were harnessed to facilitate the change process.

Research Questions

The following research questions were identified:

What are the underlying mechanisms that enable individuals to create, share and action knowledge to reconfigure services towards early intervention-prevention service delivery within a complex adaptive system?

What underlying mechanisms facilitate and maintain the momentum and trajectory of change across diverse and dynamic agents within this complex adaptive system?

4.6.2 Theoretical Framework

The theoretical framework of the study combines theories relating to knowledge mobilisation and complexity theories discussed in the literature review. It employs a realist approach to understand the data. Knowledge is understood as a catalyst for change within a healthcare context. The context itself is interpreted as a complex adaptive system. All participants within the participating health board had taken part in a learning activity prior to the research study. This activity provided a common focus across the levels of the system and providing an anchor for the research process. This anchor was an important feature of the research design as different participants were coming from different starting points in the change process. The knowledge within the learning activity acted as a tracer for wider forms knowledge as they evolved across the AHP system, but was not the focus of attention for the study.

4.6.3 Identifying a context for study

The Scottish Government has a stated ambition to create policies that address local priorities, delivering policies and frameworks in consultation with local and national stakeholders (Local Government and Communities Directorate, 2011). There are also national benchmarking

standards for the delivery of outcomes that reduce inequalities. This arena provided several possible fields for research. A suite of policies designed to address the emerging needs of the health service included 'Ready to Act' (R2A), a policy framework intended to deliver the transformation of allied health profession (AHP) services to children and young people. This framework was developed in consultation with service users and their families, service providers and third sector organisations. It was introduced to AHPs working in health & social care across Scotland in November 2015. A five- year implementation process commenced across Scotland in January 2016. Since the timeline for the implementation aligned well with the timing of the PhD and the subject matter of AHPs aligned with the researcher's background of clinical and managerial experience, a search for a suitable set of participants was initiated.

4.6.4 Identifying a participant group

This search began by the researcher contacting the National Lead AHP from the Scottish Government who had responsibility for the implementation of the R2A policy. Following a meeting to discuss the nature of the research, the researcher presented a provisional proposal to the National Forum of AHP Leads from each of the Scottish health boards to gauge interest in engaging with the research. This was a useful opportunity for the researcher to gain understanding of what type and level of involvement with the study would be acceptable and deliverable for potential participants who already had significant commitments in relation to the implementation of the R2A framework in addition to day-to-day professional responsibilities.

From this discussion, four health boards expressed interest in engaging with the research project and there were further discussions with representatives from each of these health boards. One early iteration was to create a comparison of the implementation journey between an urban and a remote rural health board. However, the practicalities of structuring the research within the timeframe of the PhD, the problems of capturing emergent processes occurring in these very different contexts with no unifying structures at micro-level, and the problems of access and ethical approval across two different NHS Scotland Health Boards made this an impractical option.

Modifying this model led to a search for a Health Board that delivered services to a mixture of urban and remote rural areas. One health board met these criteria and in addition had an Academic Medical Science Collaboration who were able to support the NHS ethical

application. This health Board is referred to as NHS Heathcliff (NHSH). NHSH had also identified learning activities within their implementation driver diagram for year 1 of R2A, creating the opportunity to use one of these learning activities as a tracer for knowledge across different levels of the system. The learning activity being proposed was Scottish Improvement Science Training (SIS). This training was particularly suitable as a tracer for knowledge for this study as although there is no established theory for successful transformational change within healthcare, the use of small changes and experimental projects has been shown to deliver desired outcomes in a process of evaluation and spread (Fitzgerald & McDermott, 2017).

Initial approaches to NHSH were made through the AHP Network forum. This forum represented the 6 paediatric AHP professions within NHSH who became involved in the study. These were orthoptics, speech & language therapists, dietician, podiatrists, occupational therapist, and physiotherapists. The researcher engaged with individuals and attended meetings to present and refine a research proposal and to identify groups of AHPs willing to engage with the research. The agreed time frame for data collection was a 15-month period between April 2017 and September 2018. At this point the Scottish Improvement Science training (SIS) was already under way. A synopsis of this learning activity is provided as Appendix 2.

The SIS training focused around multi-professional groups of AHPs working as collaborative workstreams. These workstreams offered an opportunity to observe the implementation process from the micro-level perspective across several professional groups and across different geographical areas of the health board. From the workstreams that agreed to engage with the researchers, two groups with contrasting starting points were selected as the practitioner-level participants. These groups are described in more detail below. The other participants were drawn from the AHP leadership team within NHSH, from the Scottish Government, and an additional participant was drawn from the organisation providing the learning activity.

Other learning providers were also invited to engage with the research but did not respond. Table 4.2 provides a summary of the data collection activities. The details of participants are described in section 4.7.2.

	Tranche1 April -Sept 2017	**Tranche 2 Dec 17- Feb 18**	**Tranche 3 April - Aug 18**
Interviews	5	7	10
Focus Groups	2	1	1
Observations (minutes)	1540	360	1200
Documentary Analysis (Topics)	Early Intervention documents and policies	Financial Documents and Policies Operational documents	Local/ national outcome documents

Table 4.2: Data Collection Activities

4.6.5 Obtaining ethical approvals

Ethical approval from NHS Scotland through the Academic Medical Science Committee for NHSH. Ethical approval for the study was also obtained from the School of Management at University of St. Andrews in April 2017. Copies of both ethical approvals are attached as appendix 4.3 and 4.4.

4.7 Understanding the Research Context

The following section begins by explaining key aspects of national, local and individual contexts relevant to this study. Understanding the context and being able to identify the different perspectives involved supported the development of a provisional theory, the starting point for realist evaluation.

4.7.1 The Policy Context in Scotland

The R2A Policy framework discussed in this study was developed in line with the Scottish Government's policy principles and with the strategic direction of public sector reform and the National Performance Framework (NPF) for Scotland (Bynner & Terje, 2018). These principles reflect the recommendations of the Christie Commission for the reform of public services (Christie, 2011). The stated purpose of the National Performance Framework is to create a more successful country by creating an enabling state with a focus on relational government, public value for money, integrated services and prevention rather than reactive services. Service users and other stakeholders are envisioned to act as co-producers rather than recipients (Bynner & Terje, 2018) .

4.7.2 The R2A Policy Context

The R2A policy was developed in consultation with service users and their families, service providers and third sector organisations. It follows the implementation of the Children and Young People (Scotland) Act 2014 which established a legal framework for the creation of new partnerships to support children and young people, their carers and families. The Children's Act seeks to achieve wellbeing outcomes identified in terms of **SHANARRI** indicators (**S**afe, **H**ealthy, **A**chieving, **N**urtured, **A**ctive, **R**espected, **R**esponsible and **I**ncluded). The topic areas of the five ambitions of the R2A policy framework align with these indicators and are listed below in Table 4.3.

SHANARRI Indicator/ R2A issue	**R2A Ambition**
Access	All children and young people in Scotland will access AHP services as and when they need them at the appropriate level to meet their well-being needs, with services supporting self-resilience through consistent decision-making.
Partnership and integration	Children & young people, their parents, carers and families will have their well-being outcomes met at the most appropriate level through the creation of mutually beneficial, collaborative and supportive partnerships among and within organisations and communities.
Participation and engagement	Children's and young people's views will be asked for, listened to and acted upon to improve individual and environmental well-being outcomes and AHP services
Leadership for quality improvement	Children and young people, their parents, career and families will experience services that are led by AHPs who are committed to a leadership and quality improvement approach that drives innovation and the delivery of high quality, responsive, child-centred care.
Early intervention and prevention	Every child will have the best possible start in life, with AHP services using an asset-based approach to aid prevention through universal services and supportive, nurturing environments at home, nursery and school.

Table 4.3: Relating the Children and Young People (Scotland) Act to the 5 Ambitions of R2A

The five R2A ambitions were identified from information provided by families taking part in the 'Children in Scotland' survey conducted in 2014 and the open consultation process for the R2A action plan.

4.7.3 The R2A Policy

The R2A policy framework forms one of a suite of policies intended to address social inequalities, aligning with the early years agenda and the integration of health and social care services. One ambitions of the Ready to Act (R2A) framework was to support Allied Health Professionals (AHPs) to implement service models that prevent or minimise the development of harm for children and young people. The policy stated a commitment to develop skills to support this implementation process:

"We acknowledge that AHP children and young people's services in Scotland are at different starting points and accept the requirement, as part of any implementation plan, to support practitioners through a commitment to training and development in collaboration with partners and developing educational resources to support implementation of policy." R2A p26 (Scottish Government, 2016).

The R2A policy Framework was introduced to AHPs working in Health & Social Care across Scotland in November 2015, and a five-year implementation process commenced in January 2016.

Local AHP directors were intended to be responsible for the implementation and governance of the plan in collaboration with local AHP staff. This represented a model of distributed leadership, where the R2A policy stated actions intended to achieve each of the five ambitions and the national AHP Lead and national steering groups provided support rather than governance for local AHP services.

The intention of the R2A policy framework was to shift services towards a focus on early intervention-prevention and facilitate the delivery of accessible and effective services. This was to be achieved by making different levels of intervention available to meet individual needs at different times. These levels of intervention were referred to within the R2A policy framework as universal, targeted and specialist levels and are described in table 4.4 below.

Intervention Level	Intended Users	AHP Involvement
Universal Level	All children & young people	Preventative approaches providing information or direction to best evidence-based information; AHP input to activities and programmes organised by other to improve skills; increasing participation and supporting the development of nurturing environments
Targeted Level	Children & young people more likely to be identified with well-being needs in relation to the SHANARRI indicators	Specific advice; programmed interventions; workshops and learning for children, young people, families; support to improve well-being
Specialist Level	Children & young people whose well-being needs cannot be fully met through universal or targeted provisions	Episodes of direct or indirect intervention; promoting self-reliance through enhancing skills and confidence.

Table 4.4 Universal, Targeted and Specialist Levels of AHP Intervention

NHSH was one of 15 Scottish health boards engaged in the implementation of the R2A policy and is described in detail in the next section.

4.7.4. The Local NHSH Context

Initial approaches to NHSH were through the AHP Network forum who represented the 6 paediatric AHP professions that became involved in the study. Further details of the professional groups involved are provided in section 4.8.2. As the objectives and parameters of the research became more defined, groups of AHPs willing to engage with the research over a 15 month period between April 2017 and September 2018 were identified. At this point one learning activity, Scotland Improvement Science training (SIS), was under way and the utility of using this 'event in the system' (Hawe et al., 2009b) as a tracer for knowledge was recognised by the researcher.

NHSH had made a commitment to training and development as part of their 5-year implementation plan to deliver the ambitions of R2A. The ambitions for the first year of implementation were outlined within an initial driver diagram which was due to commence in August 2016. This driver diagram is discussed further in 5.5.5. One primary driver was staff

development, and a stated secondary driver was delivery of the SIS learning activity. This learning activity required 24 AHP practitioners and managers to join one of 5 multi-professional workstreams tasked with addressing issues relating to the implementation of R2A and the transformation of services. Six formal training sessions were delivered through the Improvement Academy at an NHSH hospital over 8 months, September 2016- May 2017, with each workstream committing time between training sessions to employ improvement science methodology to address an identified issue.

In discussion, managers within the health board expressed their belief that investing significantly in learning resources relating to improvement science would enhance the capacity of the workforce to implement changes in practice relating to the R2A framework.

"So I suppose recognising that to start with our focus was going to be on the workforce, not our families. That we can't help our families if we haven't helped the workforce." **AHP Lead Tranche 1.**

This commitment to staff development and specifically the SIS learning activity provided an anchor within the context of the study which facilitated the construction of the provisional programme theory, discussed in the following section.

4.8 Field Study Design

This section explains how the protocol of the study evolved, beginning with the development of a provision set of CMO theories, the identification of participant groups related to the SIS workstreams and the identification of potential participants who would be able to provide wider organisational perspectives.

4.8.1 Creating provisional theory

The basis of the realist approach to research begins with the creation of a provisional programme theory. This explains something of the logic of the developers (Scottish Government and NHSH) when putting together the programme (Pawson, 2013). From preliminary discussions and desk-top research carried out in the early stages of research, the overall programme theory describing the logic of the policy developers emerged.

Drawing on a variety of sources including interviews with participants and stakeholders, policy documents relevant to both national and local contexts and from literature on implementation science and knowledge mobilisation several themes were extracted,

analysed and synthesised. The sources of information that informed the following descriptions and the subsequent development of provisional theory are presented as Appendix 5.

The study was concerned with participants from macro, meso and micro levels of the AHP social context. At the macros level, the logic of the policy developer, the Scottish government, was to provide a mandate to transformation AHP service to children and young people to a focus on pro-active preventative intervention. Realising this ambition required the skills and enthusiasm of individual AHPs to deliver the change. Representatives from Scottish Government suggested the likelihood of success would be enhanced by providing training in improvement science methodology in line with the 3-step improvement framework for Scotland's public services (Scottish Government, 2013).

The meso level was represented by the local NHS leadership teams. These AHP leads had identified staff development as a priority to enable the staff to deliver the changes in service delivery proposed by the policy. Learning activities likely to develop skills required to deliver the intended transformation of services were identified as available through the local NHS Improvement Academy. The AHP leads saw the SIS learning activity as an opportunity for a multi-professional group to work together to address issues aligning with the ambitions of the R2A policy. They also saw it as an opportunity to capture evidence relating to the progress of R2A implementation and evidence of increases in early intervention-prevention practices.

Individual AHPs provide the perspective of the micro level of the AHP context. These participants were in some cases invited and in others conscripted into the SIS learning activity. Different levels of information about the nature of the learning activity had been provided and it was assumed by many participants to be an opportunity to take information back to practice areas that they would then share with other AHPs within their profession on an ad hoc basis.

The logics, assumptions and beliefs described above were used to inform five provisional programme theories presented in table 4.6.

System Level	Context – Mechanism – Outcome (CMO) Configuration
National Scot Gov (Macro)	Implementing the R2A framework (C) will focus AHP services on early intervention-prevention activities (M) which will produce improved outcomes for children and young people in Scotland (O).
	The RTA framework implementation will be enhanced (C) by building the knowledge, skills and confidence of local practitioners to implement change (M) turning ideas into action and applying learning to support the spread of early intervention-prevention practices (O).
Local AHP Leads (Meso)	The SIS learning activity will provide a forum for multi-professional learning (C) which will enable AHP practitioners to work together and with wider stakeholders (M) to develop collaborative early intervention-prevention practices (O).
	The SIS learning activity (C) will capture evidence of system and practice changes (M) to demonstrate delivery of early intervention prevention practices (O).
Individual Practitioners (Micro)	The SIS learning activity (C) will provide multi-professional learning which AHP services will use (M) to develop early intervention-prevention practices within their own professions (O).

Table 4.5: Provisional Programme Theories

Each organisational level had different aspirations and logics relating to the learning activity. These logics and aspirations had not been shared explicitly between the levels of the system. Using the concepts of complexity theory, these provisional theories highlighted different starting points for each of the component levels of the system. This had consequences for how the system developed and adapted.

The provisional theories were used to guide the research process, beginning with the data collection process which was centred around practitioner-leader workstreams established as part of the SIS learning activity.

4.8.2 SIS workstreams as participants

Each of the practitioner-manager workstreams established within the SIS training targeted a specific concern. The composition and areas of concern for each of the workstreams are outlined in Table 4.7.

Workstream Title	Area of concern	Participating Professions
Request for Assistance (RFA)	Improve access to support by moving from responding to referrals to wider signposting for universal interventions where appropriate.	[1]OT, PT, SLT, D, PO
Access and Awareness	Increase universal interventions. Improve awareness of wider understanding of the roles of AHP's.	OT, PT, SLT
Staff Support	Secure a consistent approach to decision making following the needs of the child/family.	OT, PT, SLT, D
Job Planning	Preceded the introduction of R2A as it was part of DCAQ[2]. Adopted within R2A to demonstrate an increase in universal/ preventative work.	SLT, OT, PT
Feedback & Engagement	Create a toolbox of tried feedback measures to deliver specific outputs for different information purposes	SLT, OT, PT

Table 4.6: Table of SIS Workstreams

Multi-professional learning has been recognised as important to the mobilisation of knowledge across different levels of organisational structure (Kislov, Harvey, & Walshe, 2011). The multi-professional workstreams relating to the SIS learning activity provided an opportunity to trace how different forms of knowledge emerging from this learning activity influenced the implementation of R2A. The SIS training focused around multi-professional groups of AHPs working as collaborative workstreams. These workstreams offered an opportunity to observe implementation processes from the micro-level perspective across several professional groups and across different geographical areas of the health board. From the workstreams that agreed to engage with the research, two groups with contrasting starting points were selected as practitioner-level participants. These were: Request for Assistance (RFA) and Job Planning.

[1] OT Occupational Therapist; PT Physio therapist; SLT Speech & Language Therapist; D Dietician; PO Podiatrist.

[2] Demand, Capacity, Activity, Queue approach to service improvement

Request for Assistance (RFA) included the widest range of AHP professions within any single workstream, with five different AHP professions represented (OT; PT; SLT; PO; D). Job planning (JP) had a different starting point to the other workstreams as it was established as part of Demand, Capacity, Activity Queue (DCAQ), a previous initiative addressing service redesign within NHSH. Both these workstreams were tasked to consider issues that impacted on the wider AHP service.

To capture the multiple perspectives that are key to realist evaluation, further participants were drawn from multiple levels of the system. These participants included members of the AHP leadership team within NHSH, policy architects from the Scottish Government and an additional participant drawn from the organisation that provided the deliberate learning activity. There was also snowball sampling of other practitioners who expressed interest in contributing to the study.

Table 4.8 provides a breakdown of the interviews and focus groups by organisational level, and indicates the labelling system used to identify the participants' contributions within this document. In addition, the wider AHP workforce within NHSH were observed on 2 occasions at staff development days. The network of AHP Leads within NHSH were observed on 2 occasions and the National network of AHPs, discussed in 4.8.5 observed on 3 occasions.

Organisational Level	**Source of Participants**	**Referenced as**	**No. of Participants**
Macro- level	Scottish Government	Macro level participant	2
Meso-level	AHP Leads within NHSH	AHP Lead	4
Micro-level	AHP Practitioners within NHSH	(OT, PT, SLT, PO, D, OR,) Practitioner / Trainer	14

Table 4.7: Summary of Participants

4.8.3 The data collection process

Data were collected through observations, semi-structured interviews and focus groups in three tranches over a period of 17 months from April 2017 (when ethical approval was obtained), until September 2018. Interviews and focus groups were recorded using a TASCAM digital recorder and transcribed in full using Express Scribe transcription software. These

transcripts were anonymised and stored under password protection within St. Andrews University files.

A field diary was employed as a stand-alone document to record experiences in situ and support reflexivity by providing observations relating to personal values and impressions. It also provides analytic memos to guide the direction of the analysis. In addition to recording thoughts relating to the data and potential approaches to analysis and interpretation, the field diary was used to record thoughts, feeling and impressions following interviews.

A chronology of meetings and contacts with AHPs was recorded (Appendix 10) and potential candidates for supplementary interviews to enrich the dataset (snowball sampling) were added as appropriate.

These data were supplemented by extensive field notes, photographs and reviews of publicly available documentary evidence as different events occurred and themes emerged within the data.

Timeframes for data collection

The initial protocol anticipated three discrete tranches of data collection, punctuated by periods of withdrawal from the field when transcription and data analysis would be conducted. The reality of creating a data set with a balance of multiple perspectives, a key tenet of realist evaluation, required securing engagement with participants from different levels of the organisation across the period of data collection. Consequently, the researcher remained engaged with different aspects of the field across the whole period of data collection. Every effort was made to conduct interviews following a schedule that allowed a similar time lapse between interviews for each interviewee or focus groups, but this was not always possible, and the researcher adopted a pragmatic approach, prioritising diversity of contribution over fidelity to research protocol.

Between tranches 1 & 2, the data collection process was disrupted by several events and although the interview and focus groups were conducted within the planned time frames, wider observations were not conducted at this time.

Adapting the research protocol to accommodate emergent events

During the time period between tranche 1 and tranche 2 of data collection, the RFA workstream effectively disbanded and it was not possible to conduct further focus groups

collectively with these participants. Several individuals who had been part of the RFA workstream agreed to be interviewed individually to discuss their continuing experience of the R2A implementation process and reflect on the role of the SIS Learning activity within this process.

There were also opportunities to interview practitioners and trainers who had not been included in the original research protocol but who could potentially offer useful insights that enhanced the value of the study. Interviews with these individuals were included in the final tranche of data.

4.8.4 Teacher-learner hermeneutic cycles of questioning

In tranche 1 of the data collection a semi-structured protocol for interviews and focus groups was developed based on the provisional theory (Appendix 6). Following preliminary coding of the tranche 1 data, a refined interview/ focus group protocol was created (Appendix 7). In this set of questions, themes that participants raised in the initial interview were reprised by the researcher to provide a longitudinal perspective. These themes included the relationship between leadership and practitioners, initially coded as 'top-down' or 'bottom up' and what was referred to by many participants as 'communication' issues but was framed in later theoretical analysis as relating to feedback loops.

Some themes had appeared initially within specific levels of the system. For example, in tranche 1 some micro-level practitioners expressed the view that the relationship between the SIS learning activity and the ambitions of the R2A framework were not explicit. This was introduced by the researcher in tranche 2 data collection. This prompted discussion uncovering some differences in the way professional groups had been responding to this tension. A summary of general themes relating to topics appearing within the data at specific levels of the system were presented to participants from the other levels to draw out any comment that could provide a richer picture of the issues.

During the second and third tranches of data collection it was important to maintain a focus on the research topics whilst providing enough open probes to allow participants to provide a full account of their experiences and interpretations of events. Some of the participants' comments prompted documentary analysis of material from a variety of publicly available sources, including the Scottish Government Special Audit Committee.

A final revision of the interview protocol was created for tranche 3. Each of the generic protocols were adapted for specific interviews to allow reflection on topics raised by individuals or groups in previous tranches of data. In a number of interviews within tranche 2 and tranche 3 the interview protocol remained as an aide memoire for the researcher and was not overtly used with participants as they were encouraged to share their experiences within a free conversational context and touched on most of the topics identified without prompting. The final question within these more fluid interactions was a catch-all question of 'Is there anything else you feel you want to add or share?'

In two interviews the researcher offered prompts to the participant when they were struggling to think of things which they considered may have impacted on the R2A implementation. On both occasions the researcher offered several suggestions, some of which had been a significant feature in other interviews or focus groups. The researcher sought to secure multiple perspectives on topics without leading the participant towards any specific view. As part of the hermeneutic cycle of teacher-learner questioning, the researcher presented the provisional and refined theories to participants for their comments. Participants frequently offered revisions of the theory, some of which are discussed within the findings section (5.5.4).

4.8.5. The national reference group

The initial contact with the National AHP Network was maintained across all tranches of data collection as the group agreed to act as a reference group for the study. This provided an unexpected external source of advice and wisdom which has added significantly to the value and robustness of the study.

As an established forum that included AHP Leaders from across each of the Scottish health boards, the AHP national network were in regular contact either in person or via videoconferencing for the more remote Highlands and Islands health boards. The network provided support and shared resources in relation to the progress of the R2A implementation across Scotland and provided valuable reflections on how issues arising within the study context were manifesting within other contexts.

The group were willing to share their ideas of early intervention-prevention practices. These often varied from the interpretation offered within the Scottish and UK policy documents which had informed the R2A policy. Key points from this discussion and from a brief literature

review conducted by the researcher were summarised and provided the basis for a document which was shared with the members of National AHP network group and informed the structure of the study.

The final configuration of the refined CMO theories was presented to the AHP national network. The presentation of the study and the refined theories prompted a lively discussion about similarities and differences experienced across each of the Scottish health boards.

4.8.6 Field Observations

Collecting field notes has been established as essential criteria for qualitative research reporting (Philippi & Lauderdale, 2017). This source of data has been particularly helpful in terms of the rich contextual information required to surface the features of context and mechanisms not readily amenable to language and therefore not well captured in the focus group and interview data. These included additional information on the wider relationships between participants, capturing how structural aspects of context were impacting on the behaviours of participants and providing evidence of where discourse provided by participants did not align with events within the context. The field notes also provided a prompt for the researcher to look for alternative interpretations and to identify and reflect on person biases, discussed in the following section on reflexivity.

The field notes also provided a reference source for the researcher, providing a record of information that was not significant at the point of capture but added weight to the development of the CMO theories as they evolved. One example of this was the development of the notion of allocentrism, which was initially presented by participants in terms of communication issues relating to different organisational levels, or as technical and resource issues. Observations recorded as fieldnotes highlighted how social relations were contributing to the communication problems. Some of these observations are presented in chapter 5 as Box 2.

The researcher experience in recording therapeutic notes was employed to ensure non-verbal information was recorded. The overall arc of the event was considered critically both in terms of the researcher's role and in terms of four categories of information which are presented as figure 4.5.

Facts:	**Sensory impressions:**
e.g. no of people; descriptions; times; agenda; location	e.g. energy levels; mood; emotions; non-verbal behaviours; sense of what's missing/ what's not being said
Artefacts:	**Ideas moving forward:**
Used camera to capture flipcharts etc; objects; topics/ vocabulary; interaction patterns	Potential interviewees/questions/topics Questions which need answers Potential stories Potential sources e.g. websites/ references

Figure 4.5: A4 Field note Sheet

The observation categories adopted were informed by Spradley's nine dimensions of observation: space, actors, activities, objects, acts, time, events, goals, feelings (Spradley, 1980). These observations accumulated to provide a picture of the research journey that increased the trustworthiness of the analysis, and proved useful when participants referred to past events in subsequent tranches of data.

Field notes were collected during observations of meetings, network events and training days. The researcher was introduced to participants at the beginning of the event, and the purpose of the research explained. No participants expressed concern or asked the researcher to withdraw from any observed events. The researcher offered to provide a summary of observations to participants, but this was never taken up. However, on some occasions in later tranches of data collection the researcher was invited by the group being observed to provide confirmation of dates and times of when events occurred. This suggests that participants felt the researcher was a source of trustworthy information.

Field notes were collected in two forms. One set of field notes was externally focused and collected data under the headings described in Figure 4.6. It was through the references to artefacts made in the fieldnotes that the link between the linguistic, physical and social artefacts and feedback loops was uncovered. This is discussed further in Chapter 5.

The second set of field notes focused internally on the researcher's reflections and observations about events, including interviews and focus groups. The value of this reflective account of the data is discussed in the following section.

Reflexivity

Critical reflexivity calls for a personal awareness of practice and its implications in both philosophical and methodological considerations. The researcher is an active participant in creating knowledge within the research process, adopting a perspective on observations and creating an account that involves decisions on what is attended to and what is omitted.

In this investigation, I adopted the role of observer rather than participant, but acknowledge my alignment and understanding of the context. I have a professional background as an AHP with experience of working within various levels in a healthcare context. I have in the past been employed as a locum within the health board involved in the investigation and worked with two of the participants. My intention is that my background and experience should add to the informative power of the data by facilitating a strong dialogue with participants, centred round established theories but responsive to themes presented by the participants (Malterud, Siersma, & Guassora, 2016).

A danger is that aligning closely with participants could compromise the integrity of the data. One approach to mitigate this has been to ensure the sample remained balanced in terms of representation of multiple levels of the system at various stages. A significant macro level contribution from the Scottish Government in the initial tranche of data collection was balanced by a focus on meso and micro level contributions in the second tranche of data collection. Additional documents and interviews have been sought to support a broad interpretation of themes expressed by individuals or groups of participants, and these views balanced with other sources of information such as publicly available documents from the health board or Scottish Government.

Fieldnote observations were transcribed and uploaded onto NVivo. This enabled the researcher to cross-reference events described in these sources with references made in interviews and focus groups. It also provided leads to potential documentary sources of information which are discussed in the following section.

4.8.7 Documentary Analysis

The use of documents within this study was guided by the other forms of data described above. The initial documents used to build provisional theory were drawn mainly from the policy arena and with some specific service documents pertinent to the NHSH context. As the study progressed, other documents were mentioned by the participants, and the researcher

obtained copies of these documents. The documents potentially offered some further detail to the study.

In the course of data collection, several events of national significance occurred in relation to NHSH. These events were not discussed directly with participants, but the researcher took opportunities to access documents from publicly available sources, to be informed of underlying financial and political issues which were impacting on the study context between the first and second tranches of data collection. During the third tranche of data collection several participants made retrospective references to these events and their impact or non-impact on the AHP context.

4.8.8 Data Analysis

The initial conversations with potential participants conducted August 2016 to February 2017 provided a descriptive 'start-list' which was combined with themes informed by the background literature on knowledge, complexity, and innovation implementation to form provisional theories presented above in table 4.6.

Data was collected and coded concurrently and iteratively over three tranches of data collection. The different forms of coding are presented as figure 4.7 below.

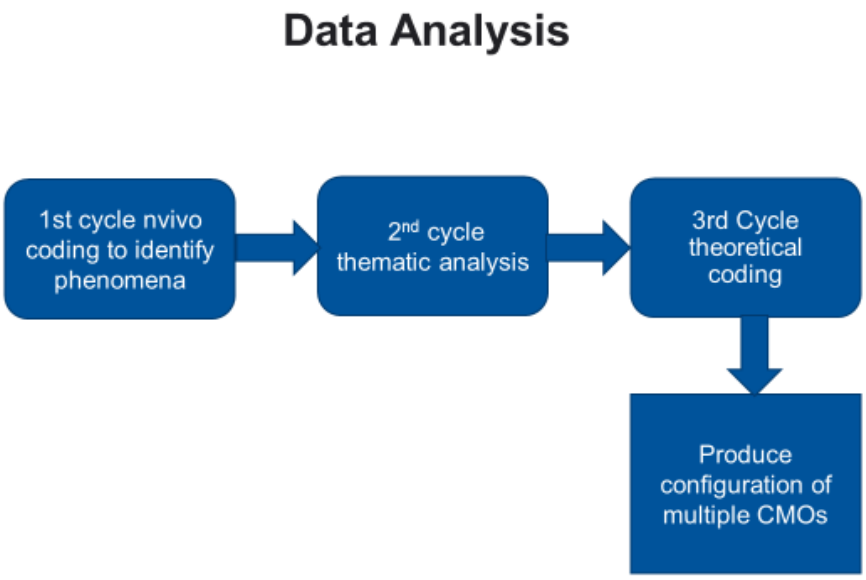


Figure 4.6: Cycles of Data Analysis

First cycle NVivo coding

Data drawn from focus groups and interviews was transcribed by the researcher throughout each tranche of data collection. The intention was to offer as complete an account of the conversation as possible while making pragmatic decisions about creating a manageable corpus of data. The process began with the researcher replaying the audio transcript and making notes on supra-linguistic parameters such as pauses, tensions, episodes where participants talked over each other, and other observations which potentially offered relevant information about interactions or contextual features.

These transcripts were subsequently coded using exploratory provisional codes related closely to the participants' words, an initial indigenous coding cycle (Saldaña, 2013). The initial coding process was conducted using NVivo qualitative data analysis software package (CAQDAS). The intention was to split the data corpus into a large number of identifiable chunks of information. This approach produced a codebook of over 200 codes during the initial tranche of data collection.

The next step was to evolve the most practical and informative way of preparing the dataset in relation to the research questions. This involved piloting different approaches to classifying and querying a small subset of the coded data from the initial tranche of data collection. Various approaches to classifying the data were considered. The data were considered in a number of different ways to explore the different perspectives expressed across four different parameters: i. across the levels of the organisation, ii. between different professional groups, iii. between the two different SIS workstreams and iv. over time. The classification system is summarised in table 4.2.

Attribute	**Labels**
Professional AHP Role	OT1 -OT5 PT1-PT6, SLT 1-SLT 6, PO 1-2, OR1, D1
Organizational Level	National Lead/ NHS Lead/ Practitioner
SIS Workstream (practitioner only)	Request for Assistance (RFA) Job Planning (JP)
Tranche of data collection	1/2/3
Interview /Focus Group/ Observation	INT/FG/OBS

Table 4.8: Data Classification Labels

Using this coding system, an interview conducted with macro level participants during the first tranche of data collection could be coded as INT 1.1 SLT4 while an interview conducted with the same participant in tranche 3 was coded as INT 3.1 SLT4, allowing the tracking of themes expressed by the same participant over time. Labelling each participant according to their AHP profession allowed the researcher to consider themes as they appeared intra- and inter-professionally. The coding approach selected had been influenced by the initial literature review conducted by the researcher and by observations recorded in fieldnotes. Participants within each focus group were anonymised but labelled in relation to professional roles.

The intention had been to employ the CAQDAS software package for all aspects of coding the data. This approach was helpful during the first cycle of coding when many coded labels emerged from the participant's language. However, when sorting the large number of indigenous codes identified in the first cycle of coding into larger groups of thematic codes, the process of 'lumping' (Saldaña, 2013), it was difficult to retain an open interpretation of what was visible in this partial dataset. There was a strong pull towards coding to the set of codes embedded in the system rather than considering a wider interpretation of possible relationships that could provide an explanation of causal mechanisms. Returning to a paper-and-pens method supported a more open and creative approach to considering the data at this stage. CAQDAS was used at a later stage to support the analysis of the completed data corpus through several different queries which are discussed within chapter 5.

Second cycle thematic coding

The next phase was a second cycle of thematic coding. This cycle identified inconsistent patterns or demi-regularities appearing within the data corpus.

At this point CAQDAS was used to query demi-regularities beginning to appear within the data. Although these queries did not provide answers to the research questions, the data source labelling system enabled the researcher to consider the data from different perspectives, looking at differences between professional groups, differences and similarities across the levels of the system, and changes over time. The demi-regularities within the data pointed to themes that were also appearing within the wider literature. Themes emerged that had not been aligned with the original theory, but were potentially involved as part of the knowledge mobilisation process. Some of these themes were presented to participants as

part of the second and third tranches of data collection and further refined in light of their comments. Although many themes emerged over each tranche of data, there were four overarching themes that emerged across all tranches and across macro, meso and micro levels of the data corpus. These themes related to leadership, uni-professional and trans-professional approaches to practice, achieving a balance between stability and innovation, and feedback loops. The significance of these themes is explored in chapter 5.

As data collection progressed, it was prudent to conduct concurrent cycles of content and process coding to consider how observable actions (creating, sharing, using, discussing) and conceptual actions (construing, adapting, transforming) changed over time (emerging, fading or becoming embedded in structure). The different approaches to coding and the use of various CAQDAS query functions surfaced the significant role of artefacts as forms of feedback loops across the wider system and captured changes in individual's' perspectives over time. These analyses prompted the researcher to progress from thematic to theoretical coding.

Third cycle theoretical coding

The move to creating mid-range theory as context-mechanism-outcome (CMO) configurations emerged from the researcher recognising that emerging thematic patterns within the data relating to knowledge mobilisation (distributed leadership, allocentrism and the creation and use of artefacts) could also be aligned with attributes drawn from complexity theory (self-organisation, interconnectivity and feedback loops). This retroductive analysis enabled mechanisms to be theoretically constructed and modelled, informing the refined CMO theories discussed in the following chapter 5.

4.9 Summary

This chapter has explained the researcher's choice of realist evaluation as the methodology for this study due to its sensitivity to context and capacity to uncover non-linear and unpredictable patterns within a complex adaptive system. The process of realist evaluation is presented as an eight-step model. Steps 1-5, general study design, development of provisional theories, design of the field study, data collection and data analysis have been described in this chapter. The final steps of the model, synthesising findings into CMO configurations, refining CMO configurations and collating CMO configurations to provide a plausible explanation of the observations are presented as findings within the following chapter. Chapter 5 has been structured around four key themes leadership, uni-professional

and trans-professional approaches to practice, achieving balance between stability and innovation, and feedback loops that were uncovered within the data corpus.

Chapter 5: Findings

5.0 Introduction

This study employs realist evaluation to uncover underlying mechanisms involved in the creation, sharing and actioning of knowledge. The study considers mechanisms that facilitate and maintain the momentum of change across a complex AHP system. This chapter begins with a description of the pre-context of the study and the development of a provisional realist theory before moving on to discuss the four key themes which emerged within the data. These four key themes link to knowledge mobilisation theories and attributes of complex adaptive systems. Although these key themes were present across all the data tranches, their significance in relation to mechanisms influencing knowledge mobilisation emerged gradually over iterative cycles of data collection and analysis. Knowledge acted as a catalyst, influencing individuals to reconfigure reasoning and resources towards early intervention-prevention service delivery within an AHP context. The implementation process did not follow any patterns anticipated by participants in the initial programme theories. However, some successful changes in practice emerged over time.

The effects of these themes on events surrounding the learning activity were experienced concurrently by the participants and the study seeks to provide a coherent understanding of co-occurring events in a complex system, highlighting factors and events that supported or inhibited the mobilisation of knowledge. Reflecting the reciprocal and dynamic process observed in the data, the following sections discuss four key themes as three sets of dyads which link concepts from knowledge mobilisation and complexity theories. These dyads are: interconnectivity and allocentric disposition; self-organisation and distributed leadership; and finally, feedback loops and epistemic artefacts. The refined set of CMO theories that evolve from the key themes are presented in relation to each of these dyads. The chapter concludes with a description of participants' reflections on the refined CMO theories.

5.1 The Pre-context

This AHP context pre-existed the R2A policy implementation programme. The ambition of the policy was to move AHP services to children and young people towards a preventative model of service delivery. Understanding the starting point of the social context of the study where the R2A policy and the SIS learning activity were introduced indicated factors that were

perpetuating the extant social system of reactive service delivery and suggested some factors that could potentially support a change to more preventive approaches to service delivery (De Souza, 2013).

These pre-existing conditions highlighted different logics and intentions operating between different levels of the system that were distilled to create the provisional programme theories presented later in this chapter.

The pre-context of the study was defined using the four parameters defined in Archer's realist social theory discussed in 4.4.2 (Archer, 1995). These parameters are presented in table 5.1 and described in detail below.

Level / Aspect of Pre-context	**National**	**Local**	**Individual**
Structure	Distributed Leadership	Hierarchical Leadership	Hierarchical Leadership
Culture	Allocentric/ AHP disposition	Ethnocentric / uni-professional disposition	Ethnocentric / uni-professional disposition
Agency	Promoted empowerment and engagement	Responded to command and control culture	Responded to command and control culture
Relations	Provided support for local implementation	Directed tasks for local implementation	Responded to requests for local implementation where possible

Table 5-1: Aspects of the AHP pre-context

5.1.1 Structure

Within the pre-context of the health board and across the wider NHS organisation there was an established structure of formal authority and accountability. Positional authority manifested as AHP professional groups being managed by a leader drawn from the same AHP profession. This pattern extended through executive levels of the health board. The AHP services to Children and Young People formed part of the Woman & Child Health Service, accountable to the Director of Medicine. This director was in turn accountable to the Chief

Executive of the Health Board, who accounted to the Health Minister and other members of the Scottish Government. One of the key features of the R2A policy was adopting a more horizontal or decentralised approach to leadership within AHP services. This ambition is a key feature of the suite of Scottish Government policies addressing social issues relating to attainment and inequality discussed in 3.7.2 and 3.7.3. The organisational change suggested by the R2A policy in moving from reactive service provision to a pro-active model of early intervention constituted a huge cultural challenge to the existing organisational structure and the patterns of interaction and accountability embedded across the study context.

5.1.2 Culture

Within the pre-context of the study, the culture among participants within the health board was orientated to working mainly within uni-professional groups. The health board involved in this study covered a wide and diverse geographical area. Some participants were operating as lone practitioners, often moving between homes, schools and clinics in rural settings while others provided services as part of multi-disciplinary teams within central urban locations such as hospitals, units and child development centres. There were few opportunities for trans-disciplinary interaction as described in 2.2.3. Meetings and networks among practitioners were generally organised around specific AHP professions with occasional AHP multi-professional workforce meetings also taking place. The multi-professional leadership team engaged in regular meetings. For the AHPs who were co-located within child development centres, schools and community health centres, the need to co-ordinate the use of resources such as treatment rooms, computers and phone access led to the prevalence of complementary rather than collaborative relationships. Services were generally delivered following a medical expert model, with deficits addressed through referral to specified professionals, which would be followed by a series of follow-up appointments.

The overall ambition of the R2A policy was to transform the delivery of AHP services to a more collaborative model of early intervention-prevention, where service users would be able to access signposting and advice at a point of concern, targeting vulnerabilities rather than deficits. The intention was that AHPs would work with a wider range of partners from other organisations and profession beyond healthcare, including education, social care and third sector organisations to offer interventions that met the needs of local populations.

5.1.3 Agency

There were limited levels of practitioner agency observed within the pre-context of the study. The formal authority of the health organisation suggested a command and control culture which had been established over many years. The local leadership team were keen to empower practitioners to make local adaptations that would deliver the ambitions of the R2A policy. These adaptations needed to be delivered within time parameters and financial and resource constraints identified by the executive levels of the health board and ultimately the Scottish Government.

Practitioners were required to address the needs of service users following the established system of reactive intervention while at the same time orientating themselves to deliver early intervention services that would reduce future need for reactive services. These competing demands created competition for available resources. This challenged existing professional priorities. These priorities were often being reinforced by individual professional bodies such as Royal Colleges and by the uni-professional nature of interactions across the study context. The move towards early intervention was accepted as a positive ideology by participants, but they often felt they had limited agency in relation to how this change was being implemented. As one practitioner explained during the initial focus group,

"You're serving patient masters, development groups masters, [3]SIS groups master and I think that's quite hard." **SLT practitioner, Tranche 1.**

Another practitioner expanded this point,

"We had shifting goalposts about what we were trying to do to meet the needs of SIS and the needs of all our departments." **PO practitioner, Tranche 1**

Few practitioners felt they were capable or empowered to make the changes in behaviours and the re-allocations of resources necessary to deliver the ambitions of the policy.

5.1.4 Relations

Policy makers, leaders and practitioners were brought together through several different forums to embark on policy implementation processes. The policy itself was co-created with a variety of stakeholders including practitioners and leaders from the study context. These

[3] The Scottish Improvement Science (SIS) learning activity

relationships were maintained through the national AHP network discussed in 4.8.5. The leadership team within NHSH employed an established forum of AHP leads as a vehicle for cascading information relating to the policy implementation. This group was responsible for identifying the five topics for the SIS workstreams and allocating participants to each of those groups. This approach was a manifestation of the command and control culture which had been the prevailing approach to leadership and interaction within the hierarchy of the NHS. This was commented on by many of the participants at different levels of the system. One AHP summarised the feeling of the wider participant group,

"It was top-down last year. (Staff) were told what workstreams there were going to be in. Some managers apparently said, 'you're in that one, you're in that one', so again, staff fed back very clearly that that didn't feel good. They didn't have the ownership; the will wasn't there." **AHP Lead Tranche 2**

Following the launch of the SIS learning activity, smaller groups of practitioners who were acting as change champions began meeting informally to share information on the experience of the implementation process. The multi-disciplinary groups involved in the SIS training activity met approximately monthly at the learning session and were encouraged to collaborate to complete tasks between these sessions. The practicalities of organising meetings meant that these interactions were infrequent or conducted remotely or as an add-on to other events. Within the pre-context of the study most participants saw uni-professional clinical work as a priority over engaging in work relating to service development. As one practitioner described,

"It just seems to be this never-ending request for people to be on different things that are taking them away from clinical. And there's that expectation that we'll just fit it in." **PT practitioner Tranche 1.**

This quote highlights the tension that existed for some practitioners as time and resources they felt were needed to address personal and professional responsibilities for clinical outcomes, including the management of caseloads and waiting lists, were being diverted to tasks that supported the implementation of the R2A policy. Other practitioners held a different perspective, recognising that by investing resources in preventative models of services delivery they were most likely to improve outcomes for children and young people in the future:

"A lot of the projects will eventually lead to better quality for the service users. It's getting there that's the problem!" **OT practitioner, Tranche 1.**

These quotes represent significant polarisation of views relating to the participants perceptions of the value of investing in the R2A implementation process.

5.1.5 Summary

The different starting points for individuals and groups involved in the learning activity were observed across all levels of the system. At the macro policy level, the ambition was to align AHP services with the early intervention-prevention agenda of the Scottish Government. At the local health board level, the ambition was focused on providing evidence that AHP service delivery aligned with collaborative best practice guidelines. The individual practitioners were hoping to acquire skills to support their uni-professional delivery of AHP services. The provisional and refined CMO theories provided an expression of how structure, culture, agency and relations interacted to create social change. The study has been structured as a realist evaluation of how mechanisms which delivered these changes were triggered at different levels of the AHP context. The trajectory of changes is traced from the starting point of the provisional context-mechanism-outcome theory.

5.2 Developing provisional CMO Theories

The basis of the realist approach to research begins with the outline of a programme theory that fits with the logic of the developers (Scottish Government and NHSH) when putting together the programme. The overall programme theory was identified from preliminary discussions and through desk-top research carried out in the early stages of the study.

As multi-professional learning has been identified as having an important role in knowledge mobilisation across different levels of organisational structure (Kislov, Harvey, & Walshe, 2011), the multi-professional workstreams relating to the SIS learning activity were employed as a tracer for knowledge mobilisation across the organisation. Using the SIS learning activity as a tracer for knowledge mobilisation created a parameter for the research that facilitated the development of provisional theories and created a system boundary. This system boundary is one of the necessary elements of a complexity consistent theory (Westhorp, 2012).

The aim of this study was to uncover how the learning activity delivered in the NHSH context (C) interacted with mechanisms (the reasoning and resources of AHP participants) (M), to produce changes in service delivery (O).

As discussed in the methodology chapter, the macro level participants were Scottish Government policy makers, the meso level were drawn from the AHP leadership team within NHSH. Micro level participants were AHP practitioners who had been allocated to two of the five SIS training workstreams. These workstreams were Requests for Assistance (RFA) and Job Planning (JP). Each workstream targeted a specific task or concerns that had been identified by the leadership team in consultation with the wider workforce. The workstream tasks aligned with the ambitions reflected within the R2A policy and some of the tasks were also related to the wider organisational ambitions of NHSH.

The macro-level provisional theory was informed by Scottish Government Improvement Framework (Government & Directorate, 2018) which identified the need for a decisive move towards prevention and to invest in people who are delivering services. The SIS Improvement Science methodology training was developed adopting a non-punitive 'all teach, all learn' approach to deliver a proven improvement science methodology learning activity. This learning activity was intended to empower public sector workers across Scotland to create and drive forward locally-owned improvement aligned with wider policy initiatives and with the ambition of the Scottish Improvement journey (Government & Directorate, 2018).

The R2A policy stated the ambition for local accountability in the implementation of changes to service delivery. It recognised a need to invest in the workforce to enhance skills and capacity in relation to improvement methodology in order to secure sustainable change across services.

Leadership figures within NHSH were keen to secure collaboration between professions to create transdisciplinary early intervention-prevention service innovations. They aimed to create a forum for the collaborative re-design of service, employing improvement science knowledge across the widest possible number of professions and locations. The SIS improvement science learning activity provided an opportunity for diverse professional groups to work together. This was to promote an exchange of knowledge and ideas supporting NHSH ambitions for high quality, seamless, safe and sustainable services and care across the health and care system.

The values and approaches summarised above have been drawn from policy documents relevant to both national and local contexts and from themes arising within the wider literature. Observations from these comments were combined with a variety of sources including interviews with participants and stakeholders. These data were then analysed and synthesised to form three provisional programme theories (Table 5.2). These provisional CMO theories are related to different logics operating at the macro, meso and micro levels of the system. Notes taken from the sources of information that informed the provisional theory are presented as Appendix 5.

System Level	**Context- Mechanism -Outcome (CMO) Logic**
National (Macro)	The SIS Improvement Science learning activity (C) will provide a forum for multi-professional learning that will enable AHP practitioners to work together and with wider stakeholders (M) to develop collaborative early intervention-prevention practices (O).
Local NHS (Meso)	The SIS Improvement Science learning activity (C) will capture evidence of system and practice changes (M) to demonstrate delivery of early intervention prevention practices (O).
Local NHS (Meso)	The SIS Improvement Science learning activity (C) will facilitate inter-disciplinary working across geographical, organisational and professional boundaries (M) to maximise the benefits of knowledge mobilisation in support of the development of early intervention-prevention practices (O).
Individual (Micro)	The SIS Improvement Science learning activity (C) will provide learning that AHPs will use within their professions (M) to develop early intervention-prevention practice(O).

Table 5.2: Provisional CMO Theories

The following sections describe how ideas presenting in relation to the structure, agency, relationships and culture of the pre-context influenced the reconfiguration of reasoning and resources amongst the participants. The changes in reasoning and resources or mechanisms, were observed in relation to the learning activity and captured as the refined CMO programme theories presented in 5.2. The reconfiguring of reasoning and resources led to new patterns of interventions. The journey from provisional theory to creating the refined theories that explained the observed outcomes of the R2A policy implementation was not linear, uniform or straight forward. The following section considers key themes that emerged in relation to the implementation process across all levels of the data.

5.3. The emergence of four key themes

The iterative cycles of coding discussed in chapter 4 revealed four dominant themes in participants comments that were also present within the wider corpus of observational and documentary data. The NVivo node summary report attached as Appendix 8 demonstrates the weight of evidence relating to these themes of uni-professional versus multi-professional working, leadership, balancing structural maintenance and innovation, and feedback loops.

It was possible to set each major theme from participants' accounts against the background of features of complex adaptive systems and thus the link between complexity theory and knowledge mobilisation theories became evident. This helped to define the relationship between the provisional theory relating to the learning activity and the themes and subthemes emerging within the data. A simplified version of the relationship between provisional theory, the themes emerging within the data and the refined CMO theories is presented as figure 5.1.

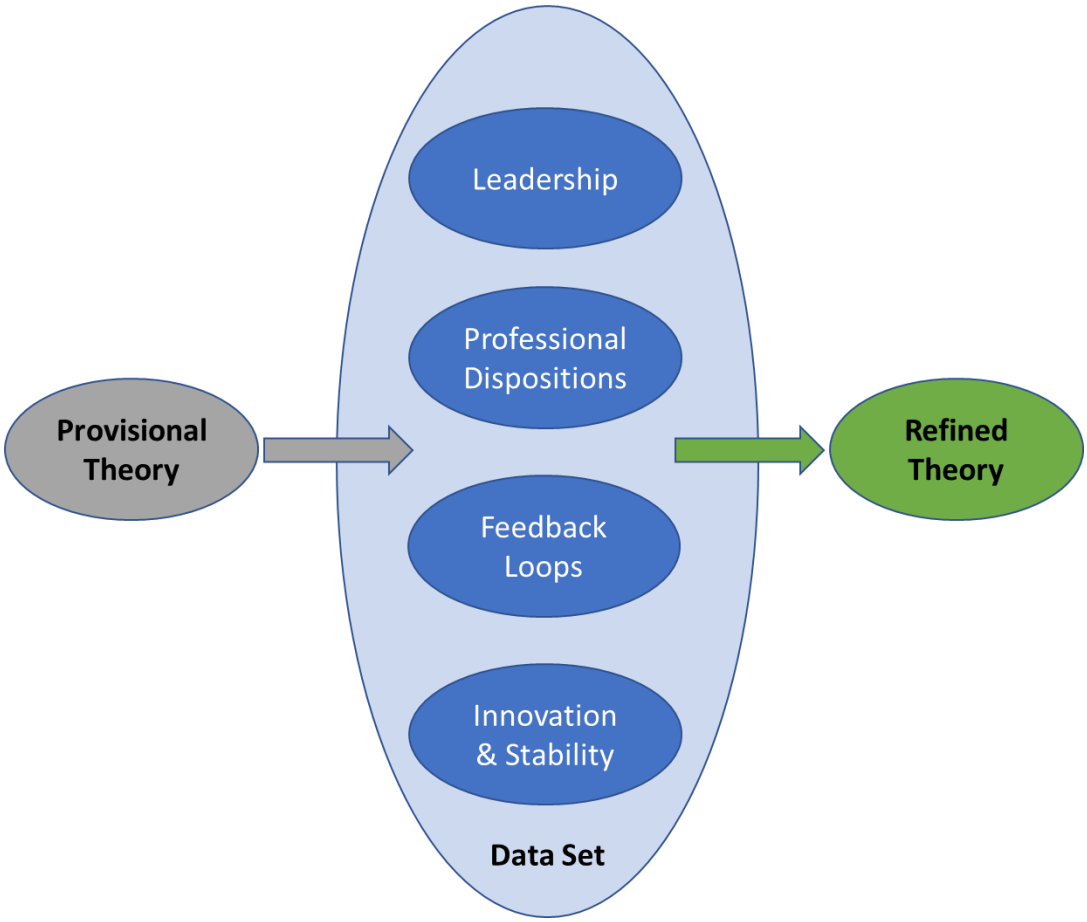


Figure 5.1: Linking the key themes within the data to the refined CMO configurations

The complex and staggered journey from provisional to final theory began with a first step to consider how participants' experience of the SIS learning activity contrasted with the aspirations for the learning activity described within the provisional CMO theories.

5.4. The learning activity and workstreams

The SIS improvement science course offered an opportunity to move towards transdisciplinary AHP working as the workforce transformed their practice towards early intervention-prevention service provision. As identified in the preceding discussion on pre-context, there were differences amongst how AHPs were addressing early intervention-prevention services prior to the introduction of the R2A policy. Different starting points had long-term consequences for how participants approached the mobilisation of knowledge from the learning activity, resulting in different outcomes for each workstream.

5.4.1 Differences within and between workstreams

The 'request for assistance' (RFA) workstream consisted of five different AHP professions from a geographically dispersed area. The group were tasked with developing a system to provide equity of access to both preventative and specialist AHP services for all children and young people across NHSH. Some of the AHPs within this workstream were strongly aligned with an expert medical model where AHP referrals were managed through a medical practitioner in response to an identified clinical threshold of deficit or harms. Other AHP services responded to concerns expressed by children, parents or carers as they arose. One physiotherapist practitioner recognised that there were differences in how ready different AHP services were to respond to the call for early intervention provisions:

"There's a feeling that we are maybe a bit behind, in that we are more medically aligned than you guys are." **PT Practitioner, Tranche 1.**

AHP practitioners operating within this context needed to consider how they could adapt existing service delivery models led by medical staff to a proactive approach to interventions. Other participants within the RFA workstream had embarked on a journey of transformation prior to the introduction of the R2A policy and were operating an open referral system where concerns from parents or others were brought directly to the AHP professional rather than through a medical practitioner. Some professional groups had already established early interventions and felt the move towards a collaborative AHP model suggested by the R2A policy was a retrograde step that ignored or devalued the uni-professional work they had

done prior to the R2A implementation. An occupational therapy practitioner was underwhelmed by the R2A policy:

"It was brought in like a brand-new shiny thing. And this will be life-changing and transformational. And I'm reading it thinking, we're doing this already" **OT Practitioner Tranche 3**

These differences in starting points between specific professional groups meant that many practitioners were unprepared for the transdisciplinary focus of the learning activity. This was acknowledged by one of the AHP Leads:

"And I think one of the challenges has been for a lot of our clinical staff is that we were channelling them into AHP work before they were getting it." **AHP Lead Tranche 1.**

This presented both practical issues for the co-ordination of meetings between training days as well as difficulty identifying a common purpose around requests for assistance for each of the five professional groups represented in the workstream. The frustration and stress this created was expressed by a speech and language therapy practitioner:

"And here all of a sudden, we were supposed to be applying these change management techniques to something that we hadn't agreed ourselves, (or) thought about." **SLT practitioner Tranche 1**

Within the RFA workstream, participants realised that searching for a single outcome to address the issues relating to requests for assistance for both individuals and professional groups was not a realistic outcome. This was shared with the wider SIS training cohort during the first tranche of data collection:

"As the (RFA) project progresses, participants recognise it is not possible to create a universal approach to RFA across all AHP professions and adapting to different professions rather than aiming to create fidelity to a generic process would be a better approach." **Comments from RFA workstream presentation Observations 1.2**

As well as different starting points within the SIS workstreams, there were also different starting points between the workstreams. The participants in the Job Planning (JP) group were an established group who themselves could see the potential to support the R2A implementation process. This group of AHPs saw the SIS training as an opportunity to

highlight the utility of adopting job planning for the system as a whole to help address the problem of practitioners' competing priorities. A member of the job planning workstream explained how they had approached this:

"(We have) lots of opportunities at staff meetings and in other discussions, where people are frustrated about lack of time to invest in other areas 'cos clinical work always takes priority. You get lots of opportunity to sell it and say 'yes, when we get the job plan, that will help'. **OT practitioner, Tranche 1.**

The JP workstream participants saw the job plan as a useful tool for leaders and practitioner to negotiate how resources could be allocated between clinical and non-clinical commitments. During the first focus group, one participant explained how the job plan might help mitigate the negative impact of absorbing additional tasks relating to the implementation of the R2A policy:

"Something else comes along and everyone is like 'I'm working at capacity; I can't take it on'. So, if we could get a tool that people have that opportunity to negotiate properly. To say well, if you want me to do a good job on anything then there has to be a limit. And there is not that opportunity at the moment." **PT practitioner Tranche 1.**

The JP workstream was built on work that commenced prior to the inception of the SIS workstreams. Both practitioners and managers had initially questioned the validity of including this work as one of the workstreams. The JP workstream participants recognised they might have a different approach to issues that would become increasingly relevant as changes in practice emerged.

"This group's perspective might be different to others. We said we wanted to do it. And it kind of got added on." **SLT practitioner Tranche 3.**

The inter-relationships between the workstream tasks became apparent as the learning activity progressed. The job planning group identified that replacing traditional 'referral' to AHP services with 'requests for assistance' would impact significantly on the nature of the work conducted by AHPs. With a 'referral system', access to services and advice are determined in terms of clinical thresholds whereas 'request for assistance' aims to deliver the most appropriate support through a range of clinical or non-clinical resources depending on the concerns expressed by the child, parent or carer. The move to 'requests for assistance'

impacts on the nature of AHP work with an increase in universal, non-specialist services that prevents harm to vulnerable groups. These forms of interventions are likely to be delivered in non-clinical settings. This move requires a review of the medical model of a clinic based AHP service. This was recognised by a practitioner working within the job planning workstream:

"The activity that we're doing is part of a bigger process to meet the ambitions, the five ambitions of R2A. But I don't know if everybody necessarily sees the link." **PT Practitioner Tranche 3.**

The outcomes of the RFA and JP workstreams were closely related and as for all five of the SIS workstream tasks, were aligned with the five ambitions of the R2A policy. However, the structure of the workstreams within the SIS training meant that they each operated independently.

The SIS learning activity seemed to prevent co-operation between workstreams. The purposes of workstreams were being interpreted by participants as tasks to be completed in relation to the learning activity rather than seeing workstreams as vehicles for delivering the R2A ambitions.

Initially the leadership team were not aware of discrepancies in how practitioners were viewing the SIS learning activity. This diversity of starting points had a persistent impact on the development of the individual workstreams and made the search for a single outcome difficult for several workstreams, including the RFA workstream.

5.4.2 Shared feelings of demoralisation and lack of progress

Approximately a year after the SIS training had commenced, the workstreams continued to engage, but were not delivering the outcomes anticipated within the predicted timeframe. Many practitioners expressed frustration and disappointment with the lack of progress. One physiotherapy practitioner indicated the frustrations of many AHPs:

"There's been a lot of time wasted because we needed a bit more on what they were looking for. I know they wanted us to kind of work it out. But it's very demoralising." **PT Practitioner Tranche 1**

There were frustrations in relation to what was perceived as 'business as usual'. Practitioner participants expressed feelings of exhaustion and being overwhelmed by the competing

demands of the SIS improvement methodology, the wider R2A implementation and the need to deliver existing services. One SLT practitioner explained how it felt for many of the participants who were trying to balance increasing demands and diminishing resources:

"We can keep going, we can keep going. And then somebody is looking at the fuel tanks, saying we can't possibly keep going. We're going to crash. That's how it felt" **SLT Practitioner Tranche 2**

These feelings of being overwhelmed also manifested as higher levels of sickness absence, cancellations of planned events and the disbanding of some of the SIS workstreams.

There were also practical and technical issues which did not support transdisciplinary exchanges. These issues related to sharing information between workstreams and participants in different locations. The practical challenges facing practitioners as they tried to deliver change were explained by one SLT practitioner:

"And even things like infrastructure. We have great ideas about how we'll take forward drop ins and hot lines and all that sort of thing. Well, there isn't a phone. We have two different systems for our PCs. That can be a real challenge. And it just becomes exhausting for a group trying to work forward." **SLT Practitioner Tranche 2**

Wider organisational issues, discussed in the following section, also contributed to a general feeling of a low point. Participants could see few tangible rewards for significant investments of time and resources which had gone into the workstreams and the wider R2A implementation. Summing up the feelings of despondency, one podiatrist practitioner commented:

"Then you go back to your day job and a week goes by. Then another week goes by. And then you kind of think oh if I never heard from these people again it wouldn't matter. I'll just get on with my job" **Podiatrist Practitioner Tranche 1.**

Many participants expressed feelings of disappointment at failure to meet targets or successfully complete tasks identified within workstreams. It appeared that the SIS improvement science learning activity was proving counter-productive and the R2A implementation was stalling. One practitioner commented:

"I think for me sometimes the SIS learning has complicated our project along the way." **OT Practitioner Tranche 1**

The structure of the learning activity reinforced feelings of a lack of agency,

"You have permission to go off and do this project but in the very same breath you will get 'why is your waiting list this length and what are you going to do about your waiting list?' It's like well, I can't be invested in this project and addressing the waiting list at the same time. We do have permission, but the reality is we are still answerable for our waiting lists" **OT practitioner Tranche 1.**

A SLT speech and language therapy practitioner shared feelings of a lack of competence in relation to the improvement work. She felt there was no opportunity to reflect and assimilate learning from the SIS activity:

"I wasn't getting the time to process both mentally and at a literal level. There wasn't the time to go, oh this is a real step away from what we're doing now. This is transformational. How can we do it? Which really impacted and felt like a lack of respect." **SLT Practitioner Tranche 2**

This had consequences for the wider implementation of the R2A policy. Spreading knowledge created within one location to another was a common issue. There were some suggestions that reluctance, resistance, sabotage or 'not invented here' syndrome were contributing to the lack of outcomes from the workstreams. Review of the progress of the SIS workstreams in terms of how much they had achieved in relation to the identified tasks suggested many had not delivered their intended outcomes. The impact of these feelings was described by one SLT practitioner.

"It took a while for that to pass and (for our group) to be productive. In some of the groups, I'm not sure if it did pass." **SLT Practitioner Tranche 2**

Another participant, an AHP lead, expressed her concern that the implementation plans appeared to be stalling:

"Doesn't sound an awful lot when you say it out loud, does it?" **AHP Lead Tranche 2**

Given the challenges in relation to resources and the feelings of demoralisation, which were evident across the workforce, the leadership team decided to delay the year 2

implementation plan to allow groups and individuals to regroup and address issues that had arisen in the wider NHSH context. The intention was not to stop the implementation process but to consolidate on-going changes, as one AHP lead explained:

"The plan was let's just take our foot off the pedal. We're going to slow down. We're going to give time to bed in the work that's been done in year 1. And just take a deep breath." **AHP Lead Tranche 2**

5.4.3 Summary: Linking participants implementation experience to complexity theory

The above discussion highlights how the learning activity had been completed and despite considerable efforts across the workforce, SIS workstreams had not delivered the predicted outcomes. There were concerns around the abilities of leaders and practitioners to sustain the efforts invested in the SIS workstreams and in the wider R2A implementation process. The implementation process was losing momentum. Participants within the study had over-lapping memberships within different groups across the AHP services. Each participant belonged to a professional group and a SIS workstream while having other operational connections. Some belonged to management teams and networks. Each group of participants experienced different starting points and progressed at different rates which had a continuing impact on progress and outcomes. This reflects the reality of public sector systems generally, where it is difficult to provide a clear and cohesive narrative that supports sensemaking across the system (Orr & Bennett, 2017). The context of this study involved multiple layers and interconnections and can therefore be understood as a complex adaptive system as described in 3.2.

Viewed from a complexity perspective, this lack of overt progress across the system as a whole suggests the system entering a dormant phase. Employing this lens offers a different perspective on the disequilibrium and demoralisation described in the above section.

Interpreting the study context as a complex adaptive system (CAS) enabled the SIS learning activity to be framed as one event occurring with this CAS (P Hawe et al., 2009). The responses to the learning activity and the contributions of the workstreams suggested the knowledge mobilisation process was progressing, but in a non-linear fashion that was difficult for participants to observe at an aggregate level.

The following sections describe how themes within the data can be aligned with attributes of CAS to explain mechanisms that were influencing the mobilisation of knowledge in different

context within the AHP system. Although the findings are discussed as separate sections, these events were taking place concurrently and were influencing each other iteratively. The following section begins with descriptions of allocentrism and interconnectivity. This is followed by discussions of leadership and self-organisation and finally the role of artefacts and feedback loops.

5.5 Allocentrism and interconnectivity

As explained in 3.2, complex adaptive systems are composed of interconnected entities. This interconnectivity facilitates the mobilisation of knowledge across the system. The AHPs observed within the study habitually worked within uni-professional cultures that had established ways of thinking and patterns of working, a profession-centric disposition. This silo approach to professional working created obstacles to successful collaborations. Exposure to other professional groups through the trans-professional learning activity allowed individuals to engage in dialogue across professional boundaries and to increase their understanding of different approaches and perspectives towards AHP service delivery, creating a more allocentric disposition over time.

5.5.1 Building an allocentric disposition

The profession-centric disposition was captured in conversations with individuals and groups in the first tranche of data, where there was a strong association between experiential viewpoints and professional roles (O.T, Dietician, Podiatrist etc). Even where participants were at some distance from professional practice, operating in roles within the Health Board or Scottish Government, a professional role remained an important part of the image they projected to the researcher. A macro-level participant introduced herself in the first meeting:

"My background is that I am a state registered dietician by trade. And I worked in services in England and Scotland." ***Macro-level Participants, Tranche 1***

The R2A Policy (Scottish Government, 2016) is notable for being the first unified UK Allied Health Profession (AHP) Policy. A macro level participant explained how important it was to create a unified policy that included all AHPs working with children and young people:

"We wanted to get cohesion across the AHP community in Scotland. We had to produce a single strategy paper that would show the direction that Allied Health Professions working in children & young people service would be working to." **Macro-level participant, Tranche 1**

However, the study found an institutional over-estimation of the level of connectivity and understanding across professional groups as the policy was rolled out across the national AHP workforce. A different macro-level participant felt the R2A policy was building on relationships between AHP practitioners that were already established:

"I think our advantage in C&YP (Children's & Young People's) services because we've got R2A is that we've really been able to bring together a cohesive leadership network. And through that we've been able to bring together on board a real community of AHPs who feel that they have commonality. Even though they're in individual professions, that they're all working to shared ambitions. And that they understand what R2A's about, why they're doing it." **Macro-level practitioner Tranche 1**

At an organisational level, there was an awareness of operational differences between professional groups. One operational lead from within NHSH recognised there were significant difference in the levels of connectivity between different AHP professions:

"I think one of the challenges (has) been this is an AHP strategy. And what we have is a range of professions within that who have and do a lot of really good uni-professional work. And some of the staff groups work together. And some of them never work together and never see each other. So why would they come together now is the question?" **AHP Lead, Tranche 1**

It was clear that professional roles were very important to practitioners, but the AHP label was less personally significant. Some participants understood AHP working as a quasi-geographical concept, a 'place' that practitioners moved to when they were in AHP groups rather than something integrated into personal working practices:

"*More like we are I suppose in AHP-land."* **PT Practitioner Tranche 1**

"You know, when everybody's in the room it's almost like that triggers the AHP thoughts. But when you're back in your own wee world, some of the things were more about uni-professional" **AHP Lead Tranche 1**

Many practitioners were unprepared for the learning activity as the trans-disciplinary learning experience intended by both macro and meso level participants and the training providers. This was expressed by both leaders and practitioners. One AHP lead observed how surprised practitioners were when faced with a transdisciplinary learning activity:

"That was quite a bolt from the blue on the day. There were some challenges in quite a lot of the workstreams because of that perception. And a bit of railing against it. And feeling like 'I've been set up here because I thought I was coming to do one thing (uni professional work) *and actually find myself in a different context* (trans-professional work*). I'm not sure I would have said yes to coming but I'm in now and I'm trapped.' That's how some felt."* **AHP Lead Tranche 2**

Another participant, an AHP practitioner, explained how different understandings of the purpose of the learning activity influenced how the workstreams were perceived:

"And I think people had very much looked at it from their own profession. And quite rightly we needed to look at across AHP services. But I think there was just something lost in the expectation of these groups, how they were set up, what they were for. "**SLT Practitioner Tranche 2**

These differences in dispositions or approaches to the learning activity, where some participants had a profession-centric rather than allocentric (AHP group) disposition, had unintended consequences both for the SIS learning activity and for the wider implementation of the R2A policy. One example of these consequences is presented as Box 1 below. This box uses the data drawn from fieldnotes to tell the story of an R2A workshop where the impact of different professional dispositions on knowledge activities was observed.

The workshop was conducted in a central health board context with the intention of identifying workstreams and activities that would form the basis of the second-year implementation plan. The leadership team recognised the top-down approach to the initial implementation plan had created unforeseen consequences in relation to ownership and empowerment to deliver change. The leadership team recognised that adopting a more horizontal or distributed approach to leadership had the potential to secure better outcomes. The aim of the workshop was to capture issues of most importance to the collective AHP workforce and to consider how these related to the needs of wider stakeholders. Their intention was to use this information to build the driver diagram for the following year. The Box 1 observations capture a spectrum of profession-centric to allocentric dispositions, highlighting some difficulties individuals and groups were experiencing in adapting to a more trans-disciplinary approach to acquiring and sharing knowledge.

Box 1: The R2A Development Day

The R2A development day provided an opportunity to discuss the progress of the SIS workstreams with a wider audience which included education partners, NHSH Leadership, and partners from the Scottish Government. The intention was to review the progress of the SIS workstreams and the wider implementation of R2A and make plans that would inform priorities for the new driver diagram for year 2 implementation.

Some participants maintained a focus on uni-professional issues. There was some resistance to exchanging knowledge. Within these groups there appeared to be much cluttering ideas with minutiae, aiming to define exact positions, and impose a hierarchy of ideas on the group. Many statements and opinions were expressed, but there was little questioning or clarifying of details or exchange of views between participants. When invited to engage in a discussion around 'what matters to me' one uni-professional group chose to remain together rather than engage with other AHP groups, and placed two flip charts boards between them and the wider workforce groups.

Other groups adopted a disposition that accommodated multiple professional perspectives. These participants' contributions were more broad-brush, working towards understanding a common purpose, and making accommodations to include all members of the group. There were participants who were 'blockers' to this process. Those individuals seemed to find other tasks i.e. collecting papers, writing notes, withdrawing and stopping making contributions to the group and appearing not to attend to the conversations.

One mixed professional group used an acronym of the five R2A ambitions, APPLE, developed by participants from another context, to maintain a focus on the group task of identifying things that were important to them as AHPs. This group worked substantially in collaboration rather than competition.

Some weeks later, a final driver diagram which captured the themes presented by all the groups attending the event was shared with all participants. The five ambitions used as structure in the final group discussion described above were adopted as the structure of the shared document and were warmly received by the wider workforce.

The workforce as a whole could see that as well as encompassing most of the key concerns discussed at the development day, this structure also related to themes and priorities that had been discussed in other fora. The relationship between these themes and the ambitions of the R2A policy was made overt and provided the diverse AHP workforce with something they could relate to collectively, inscribing a cohesive trajectory of change.

Taken from field-note observations 1.4

Box 1: R2A Staff Development Day: Profession-centric and Allocentric Behaviours

The R2A day reported in Box 1 illustrates how individuals and groups were diversely disposed towards the move to transdisciplinary working.

Orientating individual professions towards a collective or allocentric disposition was the first task of the workstreams as they engaged in the learning activity. This task was not referenced in the initial implementation driver diagram or captured through the measures tied to individual workstreams, but in retrospect, participants indicated that it contributed significantly to the implementation process. One AHP lead recognised how the changes in attitudes and relationships between AHP groups were among the key benefits to emerge from the learning activity.

"The feedback was although in the first year the staff in the workstreams found it really difficult to think about working together, they all reflected back at the end of the year the positives were around links across NHSH. Speaking to people they probably would never have spoken to. A better understanding of each other's professions. They saw all that side of it, that relationship and understanding side of it, as really positive." **AHP Lead Tranche 2**

The need to invest time to build the good working relationships necessary for effective collaborations became apparent during the second tranche of data collection. There were indications that participants from the meso and macro level of the organisation perceived that professional roles were potentially inhibiting the mobilisation of knowledge and changes in practice.

5.5.2 Resisting change

Findings suggest that established professional roles were creating barriers to trans-professional collaboration. At the AHP Annual training day in September 2017 a speaker external to NHSH addressed an audience of AHP's working within the Health board and highlighted that 'toxic' relationships were presenting a barrier to implementation. This view was supported by anecdotal reports of rivalries between geographical areas, stemming from the re-organisation of boundaries which took place several years prior to this study. These anecdotes were observed and recorded in field notes. Further observations of the differences between AHP professions came from one of the SIS improvement workstreams which had conducted a process mapping of all AHP services available across the health board. This process mapping highlighted how differently the AHP services operated. These professional

differences were surfaced by participants as obstacles to the mobilisation of knowledge and the wider implementation of R2A. As one AHP lead explained, it took time to establish a framework that enabled effective cooperation.

"And I think the message we got at first was we'd like it all to be very similar and very the same. And we spent a long time going around trying to see how that could be. And it couldn't. And I think we are accepting that. But it took a long time to get to that point". **AHP Lead Tranche 2**

All parties needed to adopt a respectful and allocentric approach to interaction, but not necessary to achieve consensus. There was reluctance to recognise or share 'expert' professional knowledge across different professional groups. As one AHP lead explained, people were supportive of the ambitions of the R2A policy and saw it as aligning with their professional values and beliefs and with existing bodies of research knowledge, but found it difficult to let go of their established patterns of working that reinforced the status of the expert:

"I don't have conversations with staff who don't get or say they don't get R2A. And not believing in it. But then there's no shift in the practice. And I think that's the bit around that letting go. That specialist role. And that gold standard. And giving something up. Just don't make me change what I'm doing here." **AHP Lead Tranche 2**

Another example of reluctance to change practice to accommodate new knowledge provided through the forum of the learning activity, was shared by one of the occupational therapy practitioners:

"I fully embrace change. I just get frustrated sometimes. We just lose all the actual real stuff that's really important. Like as a (practitioner) you would measure goals in terms of the child's happiness. And start at the end. And as a (practitioner) that is ultimately what we're here for. So, for me that's much more important than a run-chart." **OT practitioner Tranche 2**

This reluctance to change practice in the light of new knowledge shared across the SIS workstreams seemed to change over time as participants within the SIS workstreams began to engage in more productive collaborations, recognising similarities as well as differences. This transition aligns with the concept of a fluid and evolving allocentric AHP disposition among participants. Individual practitioners carved out a space for AHP joint work while

maintaining their professional roles. Groups of professionals created dialogical fora where people felt able to share and reflect on various forms of knowledge while retaining professional autonomy. This was occurring at local levels of the health board as well as at a national level as one macro level participant observed:

"And you're working across agencies and across professions. And you are trying to bring a group of people together to work together in a way that achieved a shared ambition. And some people want to pull back in professional silos. Some people want to say, "this doesn't apply to me". And other teams were just absolutely flying with it and really created what I would consider is a real collaboration." **Macro level Participant, Tranche 3**

At the project level, AHPs recognised the added value of collaborating with other professional groups:

"Now it's a much more valuable project so that's kept us going. I think we have done a lot of learning together" **PT practitioner, Tranche 2.**

Interactions between participants within workstreams appeared to move away from competition and highlighting differences, towards a more conciliatory and respectful approach**:**

"But I can see that's challenging for you. So that's something we maybe need a learning from going forward" **PT practitioner, Tranche 2**

In the final tranche of data, the influence of an allocentric disposition in building the respectful relationships necessary for effective knowledge mobilisation was highlighted in one participants epitaph comment:

"Valuing everyone's perspective, valuing what you do." **PT practitioner, Tranche 3**

This respectful acknowledgement of differences in professional approaches and priorities took some time to develop. Once a forum for interactions between professionals became established, participants were able to identify similarities and areas of common ground where positive adaptations to service delivery could be made.

5.5.3 Moving ahead on common ground

This change in perspective and in practice seems to have been prompted by the dialogical fora of the SIS training and workstreams which created a greater understanding of how individuals from different part of the service were contributing to wider R2A ambitions.

"I think we have come around to embracing the benefits of the time we spent together with the other AHP's. I personally really value the shared understanding I got from their role and the barriers they're facing. I can see what is the same about us and what's different. That has been really valuable learning." **SLT practitioner Tranche 2**

Collaborating on projects relating to transformation with participants from across the workforce were identified by participants as contributing to change.

"I think the (group) of us found it actually really, really useful because it was people on the same level talking about the things that have been difficult or the things that worked. Like I could see people's mindsets changing slightly about some things." **Podiatrist Practitioner Tranche 2**

New forms of collaborative early intervention-prevention practice were being shared with wider stakeholders such as early years providers and education partners. These new approaches to service delivery had been well received and created a spiral of success that encouraged wider collaborations. One example of this was the introduction of collaborative training activities for early years settings. Occupational therapists and speech and language therapists worked together to develop a training package incorporating key messages and ideas that early years practitioners could employ to support the development of fine motor skills and language and communication skills. The AHPs provided ideas that were linked to the established pre-5 curriculum being addressed within early years settings.

"We go out and deliver joined up AHP trainings. I think that sort of thing has supported our understanding of our roles. Which has led to a slightly different model of delivery." **PT Practitioner Tranche 3**

Evidence of the scale-up and spread of innovative early intervention practice were being recognised by stakeholders from beyond the AHP community:

"(I know) people who have gone on to do improvement projects well out-with the scope of the programme. And nothing that they've been given to do but stuff that they've saw that's a problem I need to fix it." **Trainer, QI Tranche 3**

Other observations suggested a wider group of individuals who had not been directly involved in learning activities were identifying opportunities where they could engage with the R2A implementation. One AHP practitioner commented on how support staff who were not part of the workstreams were choosing to become more directly involved in delivering the R2A policy ambitions:

"And support workers saying 'we need to be getting in there. I'm more than happy to help' and stuff like that. You would have never got that in the first year." **PT Practitioner Tranche 3**

The observations provided above support the idea of a move from profession-centric to a more allocentric disposition, which appears to have facilitated the mobilisation of knowledge across professional boundaries. The learning activity provided a common focus or platform that initially emphasised the difference between the professional groups and individual difference in attitudes to transdisciplinary approaches to working. These differences were in some cases resolved and in others accommodated to allow a working relationship that enabled sharing of knowledge across boundaries. Both the accommodations and the new approaches to service delivery were the results of mechanisms, such as the development of an open and respectful approach to inter-disciplinary exchanges, that had been activated within particular contexts, allowing participants to adapt their reasoning and resources to deliver changes in practice.

5.5.4 Summary

This development of an allocentric disposition was an over-arching theme linking several subthemes that emerged in the empirical data during the multiple cycles of coding. The over-arching theme has been linked with the theoretical concept of interconnectivity, to provide an explanation of how context interacted with reasoning and resources of individuals to produce unexpected outcomes. Participants approaching the learning activity and workstream tasks as an AHP group was a necessary step in the knowledge mobilisation process. Moving from the lived experience of operating within uni-professional silos to collaborating and co-producing early intervention-prevention practices as trans-disciplinary

teams required re-evaluation of professional boundaries and remits, and the formation of an allocentric disposition towards other professional groups.

The findings from the above section above have been drawn together to create the following refined CMO configuration:

Multi-professional learning activities (C) that are structured to allow space for the development of allocentric dispositions (M) enable transdisciplinary knowledge mobilisation (O).

This CMO configuration captured how the provision and development of transdisciplinary interactions over time enabled participants to develop an interest in and respect for the knowledge of other AHP groups. The changes in practice that resulted from knowledge mobilisation between AHP participants emerged through a process of self-organisation among the practitioners as they adapted their reasoning and resources to provide different forms of interventions, including the joint training sessions mentioned above. This process was closely related to a change in leadership style that was concurrently in progress. The following section explains these events in more detail.

5.6 Distributed Leadership and self-organisation

The organisational change suggested by the R2A policy represented a huge cultural challenge to the way services operated within the institution of the NHS. Within the NHS, behaviours and practices are aligned through management approaches developed with a focus on command and control.

A key feature of complex systems is their self-organising nature where internal resources can re-arrange to solve problems and produce a range of outcomes which can be both anticipated and unforeseen, desirable and undesirable. The analysis of data collected through interviews, observations and documentary analysis identified how delivering the ambitions of the R2A framework required a move away from a traditional top-down governance leadership model towards a more distributed model of leadership that could harness the self-organising ability of the CAS. The consequences of these changes in leadership are discussed on section 5.5.2 below.

The R2A policy was developed around ideas of decentralisation of control and co-production which are key themes within the wider Scottish Government Policy context. The driver

diagrams for the NHSH implementation plans for the R2A policy also referred to the need to empower and engage practitioners in creating innovative interventions. The narrative from macro level policy makers and meso level NHSH leadership aligned with a model of distributed leadership. However, the prevailing organisational structure within NHSH was a hierarchical model of leadership with the majority of AHP's reporting to a leader from the same professional group.

5.6.1 Disrupting established models of leadership

One finding that emerged from an early tranche of data was the impact of external challenges to established organisational structure at both operational and executive levels during the first year of the R2A implementation plan. Organisational and staffing issues meant that the traditional management structure of professional groups at the operational level was redistributed. Managerial responsibilities moved from a uni-professional line management structure to a trans-professional matrix management structure across several professional groups.

At the same time, executive roles within the NHSH structure were also disrupted with several senior executives being replaced and lines of reporting within the organisation realigned. This disruption of the established hierarchy created significant additional tensions for participants as they were continuing with workstream activities. Participants recognised the need to manage these tensions to minimise their adverse effects on delivery of services, and to preserve the empowerment and engagement of the AHP workforce in implementing the ambitions of the R2A policy. One AHP lead recognised a need to adapt her approach to ensure the most relevant information was cascaded to the operational levels to maintain stability across the system.

"It's just that balance of part of my role is to deal upwards. And to deal with the flack. And not to bring that flack down below me so that we can still function. We've had enough complexity without adding in firecrackers that potentially could de-rail things but actually don't." **AHP Lead Tranche 3**

This could be considered a conscious decoupling of operational levels from higher levels of the organisation.

A lack of connectivity between operational and strategic levels of the organisation manifested also as the wider workforce's lack of awareness of NHSH organisational priorities. These had

been published as the NHSH operational delivery plan and the 5-year Transformational plans. Despite these plans running in parallel to the R2A implementation plan and being locally rather than nationally driven, AHPs said they had little awareness of the operational ambitions of the Health Board transformational plan or of implications for service delivery.

Contrastingly, participants from SIS workstreams and the wider workforce were aware of the 5 ambitions of the RTA policy and able to comment on both year 1 and year 2 driver diagrams, which provided the plan of activities for the implementation of the R2A policy. This could be attributed in part to the higher level of engagement and ownership by participants with the R2A implementation. Practitioners appeared to focus on activities and tasks that were within their sphere of control, self-organising to secure best outcomes and trusting local leadership to keep them informed of events that fell within their sphere of interest. This was described by one participant in terms of a survival mechanism:

"While they are still manoeuvring the deckchairs on the Titanic at the top level, the people are still beavering away and getting on with their work. And I think in some respects its self-preservation. I think this is about people saying, "look this is what I've got in front of me. I can't influence what's happening at that level. I don't think they really understand my work or are influencing it, so I'll just get on with what I'm doing. And I'll let them get on with what they're doing."" **Trainer Tranche 3**

5.6.2 Consequences of disruptions in leadership

The above disruptions of the top-down leadership model had consequences for the AHP service. There was a move away from uni-professional leadership where a single professional lead managed each of the largest AHP professions to a matrix model where the leadership team addressed management tasks across all of the professions. In addition, a wider group of practitioners were invited to take on additional responsibilities relating to the operational level of service delivery. However, these changes to a more distributed form of leadership also caused problems at operational level. As one occupational therapy practitioner commented, it was difficult to move from a pattern of very directive interactions to a more empowering and consensual approach while maintaining the direction of change:

"What is the direction. What exactly do you want? I thought there would be more guidance about this, what we are aiming towards. I know they wanted us to kind of work it out, but it's very demoralising". **OT Practitioner, Tranche 1.**

The new model of distributed leadership challenged established patterns of interaction between practitioners and their managers. This change was interpreted by some participants as a lack of disclosure of leader's intentions relating to the implementation of R2A.

One participants expressed these concerns:

"I think there was feeling that there was a hidden agenda from other people, what they were wanting from us. But we were like, not quite coming up with the goods." **SLT Practitioner Tranche 1**

Some managers expressed a strong sense of responsibility for the implementation of the R2A policy within the anticipated timeframes, a process that competed with the intention to distribute leadership:

"We did it very purposefully giving us the direction to get them started on the R2A stuff. Was that a good thing to do or not? We felt we just had to have a kind of a clear focus to get us going. **AHP Lead Tranche 2**

One participant external to the AHP community recognised that there were competing approaches to addressing the SIS workstream tasks that were not helpful:

"The managers would say to that is that although they created a driver diagram which identified the overall workstreams indicating 'what' needed to be done but they would argue that they didn't say how. And the 'how' sat with the teams. The subtlety about 'this is the what, you decide the how' didn't really work." **Trainer Int 3.7**

The consequences of the move to more distributed leadership were to disrupt established pattern of top-down direction and formal lines of accountability. This change in leadership patterns increased engagement from staff in terms of sharing knowledge, embracing opportunities to create and implement new early intervention approaches, and sharing learning and ideas with colleagues from other professions and disciplines from beyond healthcare.

Within both the SIS workstreams, JP and RFA, participants were combining their knowledge of individual locations and professions with knowledge of service improvement drawn from the learning activity, to adapt the workstream briefs. These adaptations often required more effort than had been anticipated by the leadership team. However, workstream participants

identified their suggestions as being more likely to support the long-term delivery of R2A ambitions. There was clear evidence of individuals 'muddling through' to deliver changes in practice that aligned with the ambitions of R2A, but deviated from the prescribed workstream ambitions. One participant described how her group felt when they realised the extent of the task their workstream were engaged in:

"And I think we had a realisation that if we were going to do (SIS workstream) properly, we have to do it so that it will be beyond R2A and it will be beyond whatever driver (or) service priority comes along. And that moment was like (uhhhhh). A deep breath moment." **PT practitioner Tranche 1.**

Other participants also explained how they felt when it became clear that the anticipated time frame for conducting the SIS workstream tasks was unrealistic:

"I've learned there are so many factors and facets that to get (SIS workstream) right needs so much more time. I think we were given a task, those who presented it thought there would be a quick win. And we found so many strands to it that we have to get right." ***SLT*** **practitioner Tranche 1**

Having been empowered to self-organise and adopt their own approaches to address the workstream tasks, participants within the workstreams began to consider what were the most useful approaches to supporting the ambitions of the R2A policy in relation to their workstream remits. These incidences of self-organisation by workstream participants were departures from the tasks and activities the leadership team had identified as targets of the SIS workstreams. These targets were intended by leaders to act as key measures of wider R2A implementation success.

5.6.3 Tensions within leadership

The leadership were caught between the need to support the development of autonomy or self-organisation within the practitioner groups and the institutional demands of a hierarchical public sector organisation. The leadership team were required to maintain a governance role required by a hierarchical organisation and to demonstrate effective use of resources and the delivery of desired outcomes. The leadership team were also required to maintain a positive and permissive approach to the implementation plans that secured the benefits of self-organisation. There were significant tensions to be addressed in balancing the demands of the operational and executive levels of context.

One example of the challenges faced by the AHP leadership arose when one group of SIS workstream participants felt they had concluded their contribution to the learning activity and did not consider there were any further contributions they could make in relation to wider service developments. Their decision was to disband the workstream. This decision did not align with wider organisational processes and commitments and the management team had to consider how they would continue the R2A implementation process. One AHP lead was sympathetic to the practical difficulties workstream participants had tried to overcome in relation to the task, but recognised the difficulties their actions caused in relation to the wider system:

"They struggled to find the time together to really progress their workstream. But they are one that needs to continue. They're actually a given. We need that work to continue. We have to have systems and processes in place." **AHP Lead Tranche 2.**

The local leadership team were required to straddle a line between effective self-organisation and responsible governance. One AHP lead commented on how the desired move towards self- organisation was causing tensions for the leadership team:

"We're recognising people need to be making their decisions themselves. But equally it's the bit about having some leadership and direction as well. And trying to get that balance right." **AHP Lead Tranche 1**

5.6.4 Tensions among Practitioners

There were also concerns from practitioners about the delegation of responsibilities away from formal leadership roles. Some practitioners were not comfortable accepting responsibility for practice change recommendations that would impact across a wide range of services. One participant explained her feelings about being responsible for decisions around how children would gain access to a range of AHP interventions:

"*I'm really uncomfortable making decisions when they're such a small number of us. We're sitting in a group of 5 potentially making massive decisions on what is the biggest thing, the access to your service. That just doesn't sit comfortably with me."* **OT practitioner, Tranche 2**

The leadership team were also concerned about the demands of the transformation process, maintaining adequate services and the well-being of the workforce.

"It felt to me like we were on a run-away train. And if I was feeling like that, as a manager, then you know, how are staff feeling. And what messages are we giving out?" **AHP Lead Tranche 1.**

The move to a more distributed form of leadership was having some unexpected consequences for both practitioners and leaders. Although the lines of governance and accountability through the organisational hierarchy remained unchanged, established lines of decision-making through positional leaders were challenged, requiring a new pattern of interaction across and within AHP groups.

5.6.5 Moving into disequilibrium

It was clear that relationships between practitioners and AHP Leaders were changing. Some observations suggested that the move towards a more matrix leadership model and the loss of an aligned professional lead reflected a loss of trust between the practitioner and their leaders. This idea resonated with literature on prototypical leadership (Haslam, Reicher, & Platow, 2011) and was probed as part of the tranche 2 data collection (see interview protocols Appendix 7). A provisional context-mechanism-outcome configuration was created to explain this:

In a context of matrix management (C), the loss of a specific professional lead (M) creates obstacles to effective service delivery (O).

Exploring the ideas behind this CMO theory as part of the hermeneutic cycle of interviews and focus groups, both practitioners and leaders felt it was not a good reflection of what was happening within this context and rejected the theory. Instead, during the teacher-learner cycle of interviews participants stated that the SIS learning activity had provided an opportunity for managers and participants from different professional groups to form closer relationships and work together.

Practitioners expressed trust in their leaders as individuals but a lack of trust in the new organisational approach of matrix management across AHP professional groups. Developing relationships in a supportive and respectful learning context allowed the new organisational structure to be viewed in a potentially positive way. It was the approach to matrix management rather than the loss of a prototypical leader that had created anxiety for both managers and practitioners. One leader expressed her concern around leading a different group of professionals:

"So it's making that leap from a service where you are professional and you understand the complexities, then moving into a service that is not as familiar. The operational bit you can do. I think anybody can operationally manage. But it's the looking at structures. That valuing and understanding them. And what makes them tick. And what's important to them. I'm wondering if that's why I'm feeling frustrated. Because I don't yet have those relationships with those team members. They don't have that relationship with me." **AHP Lead, Tranche 2**

There were indications that the wider system was under stress, with higher levels of sickness absence and numerous cancellations of meetings and planned events. These events were identified by participants as both causes and effects of disruptions created by changes of approach to leadership and by attempts to establish more transdisciplinary ways of working. At one interview conducted during tranche 2, two participants shared how unsettling these changes in leadership and the move towards self-organisation had proved:

"So (for the last 6 months), the management was on an adhoc basis. It hadn't really hit me just how much we were in a holding pattern. And now we're sort of in ahh, oh we'll just keep on with that." **Practitioner SLT Tranche 2**

From the leader's perspectives, they were aware of how difficult the change of approach was proving to be:

"*(Practitioners) are saying this is a bit overwhelming. Because last year we told them and then all of a sudden, we've come back out on a roadshow and then asked them. So, kind of almost unsettled people."* **AHP Lead Tranche 1**

Attempts to create a collaborative approach to working where practitioners were empowered to engage in local decision-making were providing difficult to realise within an established hierarchy where continual effective service provision required to be maintained. The general impression was retrenchment into professional silos by the SIS workstreams, the wider AHP workforce and across the leadership and national levels. Using complexity theory constructs, this could be construed as the CAS being in a phase of disequilibrium. The following phase constituted a move towards a new structure or equilibrium.

5.6.6 Developing trust in the distributed model of leadership

Participants needed to test out relationships within the new structure. The balance between accountability for safe service delivery, and flexibility to create innovations in line with early

intervention-prevention practices had to be achieved. This required the renegotiation of relationships between managers and practitioners and the realignment of responsibilities to support the new model of distributed leadership. This realignment of responsibilities relates to the notion of a CAS adapting resources to form a new equilibrium. This adaptation of resources was expressed by participants as new attitudes and ways of thinking about issues such as sharing responsibility and releasing control. One AHP lead reflected how much she welcomed the realisation that there was shared responsibility for the implementation process.

"Actually, it's not me that has to deliver. It's me that's trying to support others to help the clinicians deliver. You have to step back and think. Everybody is responsible. It's a shared responsibility." **AHP Lead, Tranche 2**

Another AHP lead recognised that changing her approach and delegating tasks or asking for support, rather than diminishing her influence, had led to an increase in levels of trust from practitioners:

*"You find yourself in situations where you've got no choice but to delegate or ask for support. And then you gain more of that trust so you're quite happy to release control. (You gain) the respect as well. "***AHP Lead, Tranche 2**

The anxieties that had been expressed by both leaders and practitioners across the system diminished as new patterns of interactions and a sense of shared responsibility and understanding evolved. Practitioners expressed relief and welcomed the involvement of leaders but also recognised the increased delegation of responsibilities across the system:

"I think we've got somebody who is beginning to pull in the reigns of an overview of what's going on. Which is not the same as being in charge of it and completely driving it forward" **Practitioner, SLT Tranche 2**

Leaders were becoming more confident in allowing practitioners and the wider workforce to take local decisions and continue the R2A implementation process at a pace suitable for local contexts as one leader reflected:

"Learning that if something doesn't happen there is probably a good reason why it hasn't happened. Maybe it's the wrong thing or not the right grouping or not the right time. There

will always be a reason why it hasn't happened. Generally, people have a will to take things forward." **AHP Lead Tranche 2**

Another leader noted that warmer and more relaxed relationships between operational levels of the system were becoming noticeable:

"So definitely not top down dictating. Being there to hold the coats is really what we need to be doing." **AHP Lead Tranche 3**

Trust in the process was further enabled through participants sharing and acknowledging different challenges and perspectives that were impacting on individuals as they sought to establish new patterns of interaction and practice. The need to realign both leadership structure and to create an allocentric AHP disposition were tasks that had not been considered within the initial implementation plan, but had consequences for the timeframes of implementation. This could have been construed as a lack of success, but instead was adapted by the workforce as an opportunity to take stock and mobilise knowledge from across the workforce to inform the pace of implementation going forward. One AHP practitioner recognised that timeframes for implementation, which leadership had been focused on driving forward became more flexible:

"*My reflection would be they started at the beginning of year 1 thinking they had a 5-calendar year project. But they're been able to say it might not be 5 calendar years. And we're going to say year 1 won't finish and year 2 start straight away. Because we recognise that that is maybe too much."* **SLT Practitioner, Tranche 3**

There appeared to a be a change in the way leaders referred to work being conducted in relation to R2A implementation. Rather than interpreting a lack of adoption or progress as due to lack of will, leaders seemed to consider lack of progress as lack of capacity:

"It isn't that they don't want it because it's not their idea. But actually, they maybe can't (adopt it) cos they don't know what to do. Because where they're at with their understanding of the 5 ambitions and where (they) sit with that universal and targeted interventions is completely different". **AHP Lead Tranche 2**

This presented as a change in thinking around progress or lack of progress across both SIS workstreams and wider professional groups, acknowledging that practitioners were often starting from different positions and moving at different paces in relation to implementation

of the R2A policy. Leaders acknowledged that implementation processes need not be driven by arbitrary timeframes:

"But actually, it's not a race. And we're probably more likely to achieve the better outcomes if we just keep the pace that's going to suit the staff." **AHP Lead Tranche 3**

This decision to follow the pace of change across various workstreams and wider workforce contributed to an increasing trust in the process among both leaders and practitioners and a feeling of cohesion that was absent in the first tranche of data. A number of events indicated participants' successful self-organisation and an established pattern of distributed leadership. These changes demonstrate a shift in approach within the AHP service, which facilitated multi-directional exchanges of knowledge between different levels of the system.

This exchanges of knowledge were captured in the second driver diagram which was produced towards the end of the data collection period. The driver diagram provided a summary of the year 2 implementation plan. The 5 ambitions of the R2A policy that had been used by one of the practitioner groups described in Box 1 to structure their discussion, was then adopted by the leadership team as the structure for the implementation plan and the driver diagram for year 2. Practitioners commented on how adopting this structure made it easier for them to link the activities in the diagram to the ambitions of the policy:

"I think makes much more sense. I do think having the ambitions as primary drivers, it just then links cos the rest fall out of those. So, you can see that it's R2A it's not the obscure thing that it was when we were all trying to work out where we were. **Podiatrist Practitioner Tranche 3**

This was a significant difference from the original driver diagram for year 1, which had been presented in conjunction with the SIS improvement science learning activity. The same practitioner explained what had changed:

*"(When the first driver diagram was developed) R2A was still bedding in. And people were still not 100% sure what R2A was and what it would mean for them. I think it was very easy for people to just go 'you carry on'. Whereas this time round, we had our discussions at our staff meeting and there was much more understanding around it."***, Podiatrist Practitioner Tranche 2**

These driver diagrams captured key features of cultural change. The first driver diagram (figure 5.1) developed by the leadership team in 2016, focused on the processes and activities that would form the implementation plan for R2A.

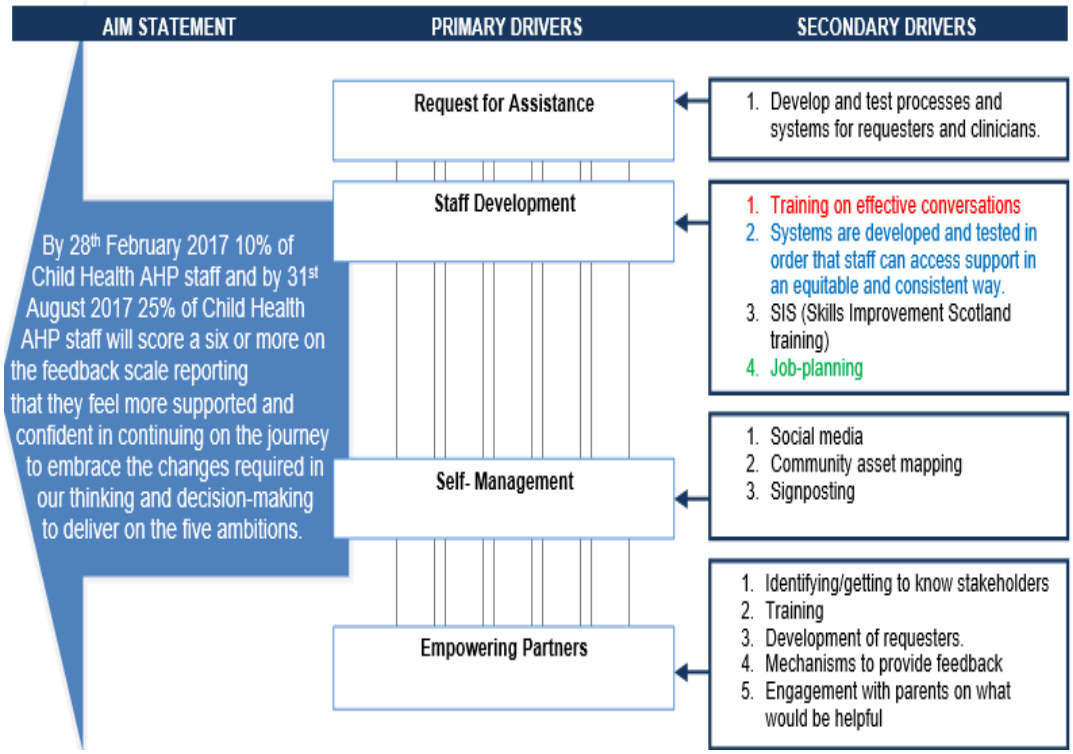


Figure 5.2: Driver diagram Year 1 2016-17

This was shared with the wider workforce who addressed these activities as tasks to be completed in addition to routine activities, rather than drivers for change. During the first tranche of data collection one group of participants shared their puzzlement over the use of the term 'driver diagram' in the following conversation:

PT: *I think they put people's back up a bit (laughs). Just the whole general idea of a driver diagram. I don't know if that just the way stuff's being presented.*

OT: *Yea. It suddenly comes out of nothing. And everything's in a driver diagram.*

SLT: *It's flavour of the month isn't?*

PT: *Yes, yes!*

SLT: *Would a logic model do the same thing. Or is that about process?*

PT: *I don't know.*

OT: *But it is the way our service has worked. Whatever is flavour of the month, everything has to become about that. And you can absolutely see why people are like, 'why is it in this format?'*

SLT: *We were looking at one yesterday. And what I'm noticing is a disconnect between what I, as a member of the team need. I don't really need to know all that (information on the driver diagram) cos I'm just working out how I can fit all these kids in clinic tomorrow.*

OT: *I think a driver diagram…. There has to be some kind of visual representation to help staff see that all they are doing is feeding into something (bigger). Because it's easier if I don't need to give my brain space to try and understand what those guys (other AHPs) are doing, I can just give all of my brain space to work out what I'm doing with my caseload. But when there is something visual to see and to be able to talk it through, I think it's easier for people to go 'Ok I need to listen and take on board that information'.*

The above conversation and the driver diagrams bring together the three dyads of key findings. The interaction quoted above demonstrates how a more allocentric or AHP focused disposition was emerging alongside the dominant profession-centric disposition. The second driver diagram developed in 2018 and presented as figure 5.2 demonstrated how different organisational levels had become more integrated.

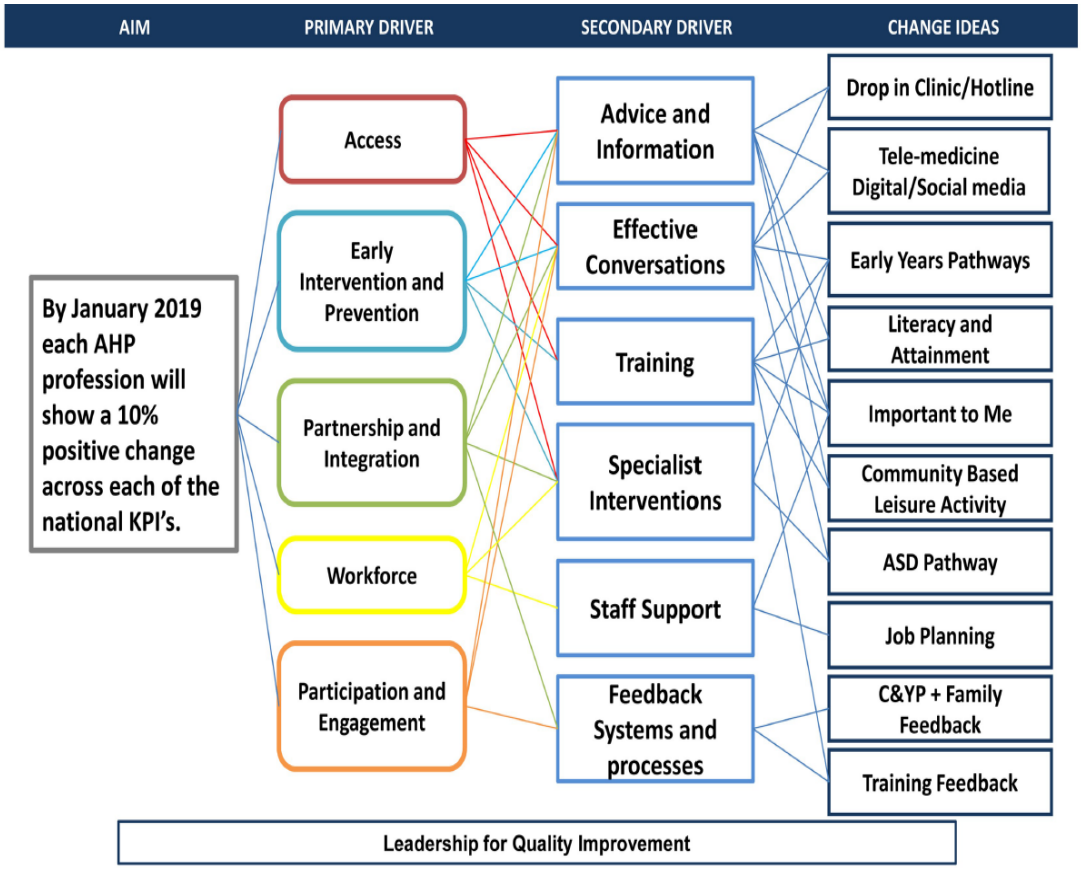


Figure 5.3: Driver Diagram Year 2 2017-18

This second driver diagram was received more warmly by practitioners. One practitioner explained how this driver diagram had helped practitioners to understand their role in the implementation process, capturing the move to more distributed leadership and demonstrating how the capacity for self-organisation had been harnessed to support change.

"I feel this year we have much more opportunity to look at the strands and say what we are doing now; what we want to keep; what to get rid of; where we can wave the magic wand and come up with something completely different. We know what we are doing. We understand this. It's no longer a case of this is something being imposed on us. It's something we work to and with" **SLT practitioner, Tranche 3**

Practitioners were able to recognise their contributions to the R2A implementation while allowing individual variations across services. The driver diagrams helped to maintain the trajectory towards a focus on early intervention-prevention across different service contexts. This is the topic of the final dyad of findings discussed in section 5.6, which considers how

feedback loops and different forms of artefacts are employed to create cohesion and carry knowledge across the system.

5.6.7 Summary

The cultural shift towards more distributed leadership across the AHP service led to more engagement and a sense of empowerment among the wider workforce. Despite a narrative of distributed leadership being present within the discourse of the R2A policy and within the local leadership, the capacity for self-organisation among the components of the CAS was inhibited until the distributed leadership style was embedded in practice. The move from hierarchical leadership resulted in disequilibrium between and within organisational levels of the system. The participants rejected the proposed CMO that suggested the loss of a prototypical leader was the cause of anxiety and disequilibrium, and instead provided the researcher with an explanation which suggested trust and respect between practitioners and individual leaders had been maintained throughout the change process.

The observations from this section have informed the following refined CMO configuration:

Multi-professional learning activities (C) conducted in a context of distributed leadership (M) empower staff to self-organise resources to create changes in practice **(O).**

Although there were positive contributions of self-organisation and distributed forms of leadership in relation to the creation, spread and utilisation of knowledge, maintaining the trajectory of change across a distributed system requires the cohesion of these self-organising components through feedback loops, including artefacts such as the driver diagrams discussed in section 5.5.5. These feedback loops are discussed in the following section.

5.7 Feedback loops and epistemic artefacts

Within this study context there was an initial impression among participants that providing feedback on progress across all the workstreams would eventually lead to a homogeneous spread of activities across all locations and services. One practitioner explained how members of their workstream thought the intention of the RFA task was to bring all the AHP service to the same idealised point in an imagined future:

"And the purpose of that is to bring everybody to the same level." **OT practitioner Tranche 1**

Participants felt that the SIS workstreams were expected to achieve a specific future outcome within the timeframe of the year 1 driver diagram. Working with this target in mind created an impression within the workstreams that they were failing to meet predicted timeframes. Observations from other perspectives suggested that the pace and scale of change varied across the AHP system, as would be expected in a complex adaptive system. Focusing on nominal and aggregate measures of progress masked significant pockets of progress and channelled attention towards competition rather than collaboration. This approach to collating feedback on how the system was functioning also embodied a premise of deficit, which contributed to the feelings of demoralisation referred to in 5.3.2.

Alongside aggregate and quantitative measures of progress, which were being collected to provide information on how early intervention-prevention services were developing, participants were attending and responding to different forms of feedback loops. These feedback loops took the form of social, linguistic and material artefacts such as group meetings, which provided a forum for dialogue and exchange, changes in vocabulary use that facilitated a common understanding, and posters and diagrams which acted as scaffold objects for discussions. These artefacts provided more granular information about how the system was functioning. These forms of feedback, which were often not being formally observed or collated by the AHPs, influenced the behaviour of individual CAS and due to the interconnectivity of these CAS, impacted on the direction and momentum of the trajectory of change for the entire AHP system. The local nature of these feedback loops enabled them to capture the progress of individual parts of the system without reference to external standards. One leader commented on the different rates of progress emerging across the system:

"And so, recognising as time goes on, that not everybody is doing what it said on the tin yet. And actually, is that a problem or is that not a problem?" **AHP Lead Tranche 1**

This recognition of the inevitability of different rates of progress within a complex adaptive system was received positively by participants. As one practitioner commented:

"I think everyone was really supportive. I think that is a real credit to us. It's not a case of oh we failed. Or we've not produced something. It's just taken longer" **SLT Practitioner, Tranche 2**

Participants began to attend to feedback loops that provided opportunities to consider both intended and unintended consequences of changes within the complex adaptive system, highlighting both positive and negative impacts of change. This enabled participants to learn from events within the system, amplifying positive adaptations and dampening events and circumstances that did not support the trajectory of change. Taking information from feedback loops as an opportunity for learning and adaptation reinforced the self-organising nature of the system, responding to local events while also helping to maintain an overall trajectory of change. As one AHP lead explained:

"And you plan. Don't you. And you've got five years to implement the five ambitions. But then life throws stuff in. And it takes you off on a different course. Different challenges. And it's about still trying to stay on that path." **AHP Lead Tranche 2**

Different forms of feedback loops carrying information about which activities contributed to the delivery of wider ambitions enabled the system to be orientated towards desired trajectories of early intervention-prevention outcomes. These positive feedback loops enabled knowledge of what was helpful or useful to be used within the system to create positive adaptations.

Not every change within the SIS workstreams led to improvement or moved the system towards the desired outcomes. One example of this was a set of run-charts created by the RFA workstream. These charts were created to demonstrate the group's knowledge and understanding of improvement science methodology and were used in a presentation to the SIS cohort. However, the RFA group felt these charts did not contribute to their task of creating a universal approach to request for assistance. The group identified that it had been useful to develop the improvement methodology skills and that these skills had been applied in other areas but in relation to the RFA workstream task, most of the benefits of the learning activity had emerged through the opportunities for dialogue and exchange. Individuals from this workstream moved on to secure other opportunities for dialogue and exchange within different fora resulting in collaborative interventions such as early years training packages, and drop-in clinics that could be linked to R2A policy ambitions. These outcomes have been captured through a variety of social, physical and linguistics feedback loops such as the AHP network, poster presentations and dialogical fora.

The various forms of language, social behaviours or physical creations that were employed in different ways by participants to carry various forms of knowledge across the system are considered here as epistemic artefacts. Some artefacts, such as routine administration data were created for purposes not related to the R2A implementation. Other artefacts, such as posters and leaflets, evolved in relation to specific early intervention practices. A diverse range of artefacts were adapted, maintained, ignored or abandoned by participants as the system evolved. The artefacts provided tangible evidence of the evolution of change as it was experienced across different participant groups.

The idea of artefacts to convey knowledge between groups and to provide an archive of participants change journey emerge from observational field notes from the network, AHP Leads and development day meetings which were observed over the three tranches of data. The 'apple' mnemonic described in Box 2 recurred in several different contexts. This prompted a search for other potential artefacts within the data corpus. It was interesting to find different linguistic and social artefacts in plain view which had not been observed in the earlier analysis of the data.

The following sections provide some examples of linguistic, social and physical artefacts as they appeared at different times and different levels across the study context.

5.7.1 Linguistic artefacts

Linguistic artefacts refer to changes in language use and the development of different forms of language to create shared meaning between groups and individuals. Two examples of linguistic artefacts observed within this study were changes in vocabulary use from 'referral' to 'request for assistance' and from 'management 'to 'leader'.

"Referrals" to AHP services aligns with a deficit model of intervention. The referrer identifies an area of concern to a professional. If the professional identifies that a threshold of delay or deficit has been reached, then interventions or treatments to address the deficit can begin. References to "request for assistance" align with a model of early intervention-prevention as the response is to provide support, advice and signposting to address potential concerns, bolstering skills and confidence of both potential service users and their carers to address issues before harms arise. An analysis of the corpus of data from tranche 1 and tranche 3 gave a general indication of an increase in the use of the term 'request for assistance' by micro level participants.

Another observed linguistic change was a move away from the use of the term 'manager' when referring to meso and macro level AHPs observed in tranche 1 data. This word aligns with the established model of hierarchical leadership. Within tranche 3 there were more frequent references to 'lead' or 'leader', which co-occurred with the move to distributed leadership. This appears to link with a change in attitude that was discussed in section 5.5.5 and also relates to the epitaph comments discussed in 5.7.

Box 2 describes the development of a further linguistic artefact, a mnemonic one group of participants created to support recall of the 5 ambitions of R2A.

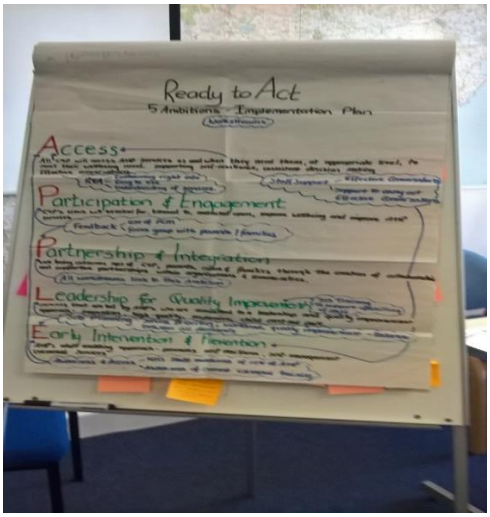
Box 2: A Linguistic Artefact: The APPLE Mnemonic

During a network meeting to discuss the progress of the SIS workstreams, participants commented on the problems of recalling the 5 policy ambitions. The group recognised that the implementation of the policy was being considered as an additional task for most practitioners and that many had difficulty relating the terminology used in the SIS learning activity to R2A. There was also a suggestion that that using the idea of "SIS" workstreams rather than referring to "our" workstreams was a way of avoiding ownership of the activities.

The group decided to create a visual representation of how both uni-professional and AHP workstreams and activities fitted within R2A ambitions. When creating this diagram, the group realised the ambitions could be re-arranged to make the world APPLE (Access; Participation & Engagement; Partnership & Integration; Leadership; Early Intervention & Prevention).

This acronym was not only used by different groups of participants as a mnemonic to recall the five ambitions but also as a tool to structure discussion within AHP and uni-professional groups and eventually was employed as the basis for the Year 2 driver diagram.

In the final tranche of data one participant commented that this mnemonic was no longer being used, that the 5 ambitions were by this time embedded in the structure of the discourse across the workforce. This observation provided more feedback on how the workforce was continuing to integrate knowledge from a variety of sources to progress the R2A implementation process.



Box 2: Development of a mnemonic to support the R2A ambitions

Linguistic artefacts such as the mnemonic and the changes in vocabulary use described above acted as building bricks of a common language exchanged between individuals.

5.7.2 Material artefacts

In addition to physical artefacts in the form of the R2A policy, resources from the SIS learning activity, the driver diagrams mentioned above and other objects such as posters, all supported the exchange of knowledge across the CAS. These artefacts appeared to perform different functions within different contexts. Sometimes the artefact was the catalyst for discussion or reflection. In other contexts, the artefact provided a record of progress made in relation to SIS workstream or wider R2A implementation. On the R2A Staff development day posters relating to specific AHP initiatives across the NHSH area provided tangible evidence of the successes of individual AHP groups to be shared and celebrated.

Measures such as administrative data on waiting times, levels of attendance, sickness and vacancy levels and paediatric care measures also provided feedback on the performance of the system and were material artefacts that captured changes in practice. The run-charts and other improvement science methodology developed within the SIS learning activity were further material artefacts that supported knowledge mobilisation. One macro level measure suggested an increase in access to early intervention provisions related to decreases in requests for specialist AHP intervention in several health board areas:

"And that's reported and been really interesting. So that people are understanding their demographic and are then able to make more informed decisions about how they are using their resource." **Macro level Participant Tranche 3.**

Material artefacts were able to offer a tangible record of the implementation process which could be considered or interpreted from multiple perspectives by individuals who were removed from the context of the artefacts' development.

5.7.3 Social artefacts

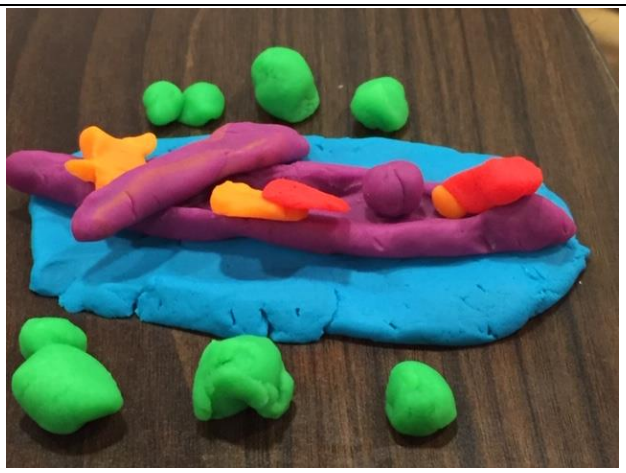
A third form of artefacts that were uncovered within the data related to the social aspects of context. Staff meetings, local NHSH Leads Networks and the National AHP Leads reference group all facilitated the exchange and cascade of information at local and national levels. These events provided opportunities for discussion and exchange of wider knowledge and experiences. The SIS learning activity and the affiliated workstream groups were also fora that provided feedback that influenced the direction of adaptations.

Social artefacts are patterns of behaviour, including rituals and interactions. These have been captured through observation across the different tranches of data collection and some have

already been shared as Box 1, where behaviours observed during the tranche 1 staff development day provided a spectrum of uni-professional to allocentric dispositions. The environment for the staff development day in tranche 1 had been a large room within a hospital complex, laid out in rows similar to lecture theatre. This layout limited interconnections between participants. The room was clearly 'borrowed' for the purpose of the meeting, with poster and ephemera such as model skeletons and posters relating to medical topics around the walls of the room. The patterns of interactions observed in the tranche 1 meeting were mainly uni-professional until participants were prompted to move into the multi-professional discussion groups described in Box 1.

These observations contrasted with the behaviours in the staff development day observed in Tranche 3, where participants engaged in a wider pattern of social interactions between different professional groups. The environment this time was a community space within a local church complex. Posters and photographs relating to different AHP early intervention projects were placed on the wall around the room. The chairs had been arranged in a 'café-style' room layout where conversation sized groups of 6-8 chairs surrounded each table. The layout and the proximity between tables encouraged people to move between groups. The content of the day had been structured to include several opportunities for interaction and co-production. These included the playdough making task presented in Box 3.

Box 3: Playdough Co- production



One of the speakers at the staff development day in tranche 3 encouraged participants to find a partner they had worked with on a task which supported R2A implementation. People were free to move around the room to find someone they would not normally have worked with before the R2A implementation. The researcher was invited to join the task by one of the participants.

Each group was given a small pot of playdough and asked to quickly create a model of what the process of working together had meant to them. The AHP participant suggested using a river to represent a journey. The researcher suggested the idea of a canoe. Both decided the canoe would carry the knowledge of theory and practice brought on the journey. The AHP participant also suggested adding something to represent the many questions that surrounded the process. The researcher added a starfish as something to represent adaptation and change. The AHP participant added a paddle to represent the work done to maintain the momentum of the change process and also several 'rocks' or obstacles that had to be either navigated through or overcome.

Following the playdough making task, participants engaged in discussion. The model photographed above, and the models created by other participants prompted wider discussions with other AHPs. The general mood of the activity was engaged interest in how different perspectives of the implementation journey were being shared. The researcher and AHP participant were aware of how the co-creation of the model has surfaced some important aspects of the experience that had not been overtly considered before. One example of this was the realisation that research interviews and focus groups provide an opportunity for participants to reflect on their experiences as part of a timeline going backwards as well as forwards. This contrasted with the forward-focus of implementation discussions in other contexts.

Observations from fieldnotes of Staff Development Day 2.

Box 3: Playdough Co- production

This example demonstrated a significant change in approaches to interaction adopted by leaders and practitioners which emerged during the implementation period. The inclusion of tasks that focused on co-production and the focus on sharing ideas and successes to enable learning were a significant contrast to the top-down cascading of information with limited opportunities for discussion and contributions from practitioners that were observed in the previous development day described in Box 1.

There were also observable changes in interaction patterns within established meetings. The AHP Lead network had moved to have a rotating Chairperson to ensure meetings went ahead even when key personnel were not available. This also had the effect of changing the emphasis of discussion within the different meetings and meant that a wider range of topics were brought to the table. There was also a more flexible attitude toward the timing and location of meetings, with the group quickly achieving a consensus agreement to accommodate individual needs. Previously observed meetings had been unable to respond to a request for adjustment due to wider staff commitments. One participant commented that this change was consequent to the impact of a more distributed pattern of leadership that provided leaders with space to address wider issues rather than "continually fire-fighting".

The move to a more distributed leadership allowed individuals to self-organise, making decisions and changes not initiated by a central authority. This provided an opportunity to increase resilience in the system, enabling prompt responses to events occurring within the context of individual CAS. However, these responses did not always align with the trajectory of change intended by the R2A policy. The following section describes events that deviated from the intended trajectory of change.

5.7.4 Conspicuous departures

As discussed above, the self-organising nature of the system itself means that adaptations made across a complex adaptive system do not always produce desirable outcomes. Mechanisms that harness the energy within a CAS system can move towards or away from a desired trajectory of outcomes and the same mechanism can produce different outcomes within a system. Maintaining feedback across levels of this system in times of stress was difficult. Systems undergoing stress seek to return to a known or familiar equilibrium, maintaining or restoring the status quo. In this context, this represented a return to silo profession-centric working, resisting AHP collaboration, and also a desire to maintain

established patterns of practice rather adopting the early intervention-prevention approaches to service delivery. One example of this response to new knowledge within the system, described in section 2.1.4 as a conspicuous departure from the intended outcomes, is described in Box 4.

Box 4: A Conspicuous Departure from the R2A Trajectory

Following an event intended to create cohesion and a child-centred focus across AHP services, one AHP professional group indicated that the event offered nothing new to them. They had interpreted the event as supporting their current reactive approach to practice. A macro -level participant made the following observations:

"So in essence their practice was staying the same. And in some ways what they were using the principles to create another barrier." ***Macro level Participant Tranche 3.***

Within the local health board, the lack of change in practice was interpreted as a lack of understanding of the purpose of the AHP event:

"We could see behaviours. But maybe didn't completely understand what was going on for those staff. And we're putting it down to the change curve and all those behaviours that go on around that. But actually, there was more around them not being clear why they were there in the first place, where they were in their own jobs. And lack of clarity in their roles." ***AHP Lead Tranche 2***

This non-adoption of the new approach to practice was highlighted to the wider AHP workforce through the trans-disciplinary discussions and fora, fostered initially through the SIS workstreams. The reports from other AHP services provided a contrast that catalysed learning and reflection within the target group around their approach to interventions. Following some difficult interactions amongst leadership, the wider workforce and the practitioner group, the target group were able to make adaptations to their practice that aligned more closely with the ambitions of the new practice approach and the R2A policy. This initial step led to more cohesion with other practitioner groups which then resulted in wider collaboration, creating another spiral of success and providing wider opportunities for feedback loops. This contributed to the adaptation of the wider system.

A further learning point from these diverse outcomes within the CAS was the need to dilute the 'ask' in relation to the reasoning and resources available in a specific context. Parts of the CAS system, as with the practitioner group discussed above, were not able to make a dramatic or discontinuous change but re-orientated their patterns of practice to align more closely with the ambitions of the policy in response to feedback from other professional groups. These small cumulative improvements resulted in positive outcomes aligned with the ideas of an early intervention model of service delivery.

Box 4: A Conspicuous Departure from the R2A Trajectory

5.7.5 Positive Deviations

The intention of the R2A implementation was for AHPs to self-organise and make positive deviations or adaptations, overcoming local obstacles and maintaining the trajectory of change in the direction of early-intervention-prevention models of service delivery.

As discussed in 2.1.4, new information from the learning activity had different effects on the CAS. Individuals within some CAS groups were able to respond to new information in the intended way, combining new knowledge with their existing forms of local and professional knowledge and practical wisdom to adapt thinking and behaviours, and overcome local obstacles in ways aligned with the intended trajectory of change. These actions are positive deviations.

One positive deviation observed in the study was the creation of local AHP fora which resulted in joint OT-SLT training packages being delivered to early years settings. Another was the development of a community-based leisure activity. A diverse group of AHP and other stakeholders identified an opportunity to address a number of overlapping policy agendas relating to obesity, social inclusion and building stronger communities. The project aim was to develop training and resources to support sports coaches working with young people with additional physical or emotional needs.

This project was fostered through an informal discussion between some AHPs and community sports coaches who were aware of young people having difficulties sustaining engagement in sports activities. This initial collaboration led to a more formal project that developed to include a number of other individuals and groups, including psychologists and sports clubs. The resulting project has been included as one of the change ideas cited in the year 2 driver diagram for R2A implementation, demonstrating the evolution of multi-directional knowledge sharing across the system.

5.7.6 Summary

The study context provided examples of different forms of feedback loops related to the vicious and virtuous cycles of change discussed in chapter 2. Positive feedback loops, for example multidisciplinary work to deliver a community-based leisure project, created adaptations that can be described as positive deviations. These positive deviations supported the direction of the desired trajectory of change while negative feedback loops resisted the

desired trajectory of change, maintaining the status quo or facilitating maladaptive or undesirable changes that moved away from the desired trajectory of change.

These observations around feedback loops have been incorporated into further refined CMO theories reflecting the potential for different directions of adaptation.

Multi -professional learning activities conducted in a context of distributed leadership (C) support agents to self-organise and create changes in practice (M) that deliver the wider organisational ambitions (O).

Multi -professional learning activities conducted in a context of distributed leadership (C) support agents to self-organise and create changes in practice (M) that challenge the wider organisational ambitions (O).

Artefacts as feedback loops, provided an infrastructure that supported interactions and the flow of knowledge across boundaries. Artefacts also provided a focus for collaboration that enabled differences and similarities between groups to be surfaced in a non-threatening way, acting as a boundary object or point of discussion.

These artefacts supported positive deviations, where the CAS adapted local resources to overcome obstacles but remained engaged with the wider system and maintained a trajectory of change. This is summarised in the following CMO theory:

Multi -professional learning activities conducted in a context of distributed leadership (C) led to the creation of feedback loops including artefacts (M) that maintain the trajectory of change across interconnected CAS (O).

Participants made multiple references to patterns of continual learning, many of which occurred incidentally and could be captured through the evolution of artefacts such as the development and discarding of the APPLE mnemonic or the developments of the year one and year two driver diagrams. This pattern of continual learning and other reflections made by participants in relation to the refined CMOs are discussed in the following section.

5.8 Participant's reflections on the CMOs

The continual pattern of learning referenced by participants resulted in changes in reasoning which informed adaptations to practice and the re-allocation of resources. The mechanisms that led to these changes could not be directly observed. Instead, an epitaph question was

employed to collect data to track changes in attitudes and beliefs of individuals and groups over time.

Within each interview and focus group, participants were asked to summarise how they wanted to be remembered for their contribution to R2A as an epitaph. Some comments aligned with the key themes that presented in the wider corpus of data. The epitaph comments are presented as Appendix 9. These epitaph observations captured something of how attitudes and patterns of social interaction between participants changed over time.

One consistent theme within the epitaph comments was the ambition to deliver positive changes for children and their families. As one AHP lead put it:

"Making a difference to families and their outcomes." **AHP Lead, Tranche 2**

This remained present across all the tranches of data collection and was expressed by participants from all levels of the system.

Linking with this was evidence of an external rather than internal focus. Participants appeared to consider the impact the implementation process was having on others (i.e. workstream, workforce, children & families) rather than just personal impact. One practitioner reflected on her contribution in terms of representing her colleagues,

"At least I've been there as a voice" **AHP practitioner, Tranche 3**

This orientation to the needs of others may relate to the professional orientation of AHPs as agents of rehabilitation, and possibly facilitated the development of an allocentric (AHP) disposition.

Despite setbacks, there was a continuing commitment to engaging in the tasks over a longer period than initially anticipated and a recognition that the implementation process would continue long term. One participant acknowledged a need to be patient and celebrate even small successes.

"That realisation that it's a long process. It's a long culture shift process. And we need to be patient. And grab the successes" **AHP Practitioner Tranche 3**

The comments also captured a trusting, enabling relationship between leaders and practitioners, valued by both parties. The leadership team recognised their role in guiding the

process but recognised that the fluid nature of the context meant that things didn't always go to plan.

One leader's reflection was

"Having learned and done things differently and been open. I would want to be remembered that I've done an OK job. Because I know I didn't get it right. But that's improvement." **AHP Lead, Tranche 1.**

One of the practitioner's also felt that her contribution was related to maintaining positive relationships across the system,

"I've tried to sort of keep it supportive" ***AHP Practitioner, Tranche 3.***

Participants relied on humour to diffuse tensions, maintain relationships and share both positive and negative experiences. One of the participants suggested the following epitaph for their group as a whole:

"We came. We did. And we are nearly conquered!" **AHP Practitioner, Tranche 1**

The epitaph comments also captured the change in focus from task orientation to relationship orientation across all participant levels. In the initial tranche of data, comments from some of the leadership team focusing on delivering tasks but in the final tranches of data, leadership epitaph reflections were more about relationships and personal attributes.

One AHP lead wished to be remember for her commitment to the implementation process.

"And staying passionate through it all" **AHP Lead, Tranche 3.**

Participants commented on the value of the reflective space provided by the research. Several participants saw the interviews and focus groups as a useful opportunity to reflect on their personal and collective experience, to revisit past events and consider how things had evolved over time. The research experience could be construed as providing the 'headroom' for social sensemaking (Reed, Howe, Cathal, & Ball, 2018).

Several participants recognised that their initial interpretation of the SIS workstream activities as tasks to be completed and followed by a return to previous practices had been challenged. They now recognised changed as a constant within their practice. As one participant observed,

"I just feel 'and so it goes on'…Keep moving, keep trying" **AHP Practitioner Tranche 3.**

The National AHP Network who had been acting as a reference group for the study also commented on how the issues presented within the data resonated with experiences in other Scottish health board areas. When asked to comment on the refined CMO theories, feedback loops and the ideas of conspicuous departures and positive deviations particularly resonated with experiences in other settings. Several members of the network group contributed anecdotes from their own health board areas that described similar themes. This suggests that there is some generalisable value in the refined CMOs constructed in relation to this study.

This group and other participants mentioned how the constructs of complexity theory that had been presented within the hermeneutic cycles of interviews and focus groups had been a useful tool for practitioner and leaders to use in explaining the causes of variations in levels of progress in relation to the implementation of the policy. An appreciation of difference in starting points, difference in relationships and the inter-connected nature of services appears to have provided a positive language for discussion with a focus on progress rather than deficit.

5.9 Summary

This chapter began by describing key features of the starting point or pre-context of the study in terms of structure, culture, agency and relations. From this starting point, a set of provisional theories were developed that explained the logic of the participants from macro, meso and micro levels of the systems in relation to the SIS learning activity.

Observations on the mobilisation of knowledge across AHP service were framed in relation to attributes of a complex adaptive system. Viewed across three tranches of data, mobilisation of knowledge to create change in practice was observed as a social process that was dependant on the context of distributed leadership, the allocentric disposition of the participants and was catalysed by the context of the SIS learning activity. The direction and momentum of the process was maintained through points of contact or feedback loops between different CAS. Feedback loops took different forms and included either linguistics, social or physical artefacts that contributed to a cohesion of purpose. Positive feedback loops supported adaptation in the direction of the ambitions of the R2A policy while negative

feedback loops stifled adaptation, maintaining the status quo. These findings are summarised in the following CMO theories:

Multi-professional Learning activities (C) that are structured to allow space for the development of allocentric dispositions (M) enable transdisciplinary knowledge mobilisation (O).

Multi-professional learning activities (C) conducted in a context of distributed leadership (M) empower staff to self-organise resources to create changes in practice **(O).**

Multi -professional learning activities conducted in a context of distributed leadership (C) support agents to self-organise and create changes in practice (M) that deliver wider organisational ambitions (O).

Multi -professional learning activities conducted in a supportive and permissive context of distributed leadership (C) support agents to self-organise and create changes in practice (M) that challenge wider organisational ambitions (O).

Multi -professional learning activities conducted in a context of distributed leadership (C) lead to the creation of feedback loops including artefacts (M) that maintain a trajectory of change across interconnected CAS (O).

These refined theories have been shared with participants, a national reference group of AHP leads and also the wider AHP workforce as part of the hermeneutic cycle of theory refinement. The feedback from these contexts suggests that the refined theories provide a persuasive explanation of how knowledge from the SIS learning activity was created, shared and applied to create changes in practice within this context. Feedback from the national reference group suggests that there is potential value in applying a similar complexity-informed approach in other contexts.

The implication of these findings in relation to wider literatures and the potential contributions to research, policy and practice, are considered in the following chapters.

Chapter 6: Discussion

6.0 Introduction:

This study sought to uncover the underlying mechanisms that enabled individuals to create, share and action knowledge to reconfigure services within a complex system addressed the following research questions:

What underlying mechanisms enable individuals to create, share and action knowledge to reconfigure services towards early intervention-prevention service delivery within a complex adaptive system?

What underlying mechanisms facilitate and maintain the momentum and trajectory of change across diverse and dynamic agents within this complex adaptive system?

The study employed conceptual lenses of complexity theory and knowledge mobilisation to uncover two types of mechanisms. One set of mechanisms operated as antecedents of knowledge mobilisation and a second set of mechanisms sustained the momentum and trajectory of change across a complex adaptive system. These findings are now discussed in relation to the wider literature. The chapter begins by outlining the specific areas of interest of this study and summarises how the study was conducted before moving on to consider how combining the conceptual lenses of knowledge mobilisation and complexity theory facilitated surfacing mechanisms related to implementing change within a complex social system. This is followed by a discussion of how the broad themes that emerged within the data relate to the wider literature. The chapter continues with a reflection on the choices of methodology, the implications of the study findings and the contribution made to understandings of how individuals' respond to knowledge catalyses change, before concluding with some personal reflections and suggestions for potential areas of further research.

6.1 The Study

This study adopted a context-sensitive approach, to consider how the delivery of the ambitions of a Scottish government policy relating to AHP services to children and young people was experienced by leaders and practitioners within one Scottish health board. The policy, Ready to Act (R2A) was one of a suite of Scottish Government policies seeking to

address social inequalities and improve attainment for children and young people in Scotland through the introduction of an early intervention-prevention model of service delivery for AHP services.

Understanding knowledge as socially constructed and continually transforming as it moves through the open and interconnected implementation contexts of a national policy, made for a potentially wide field of observation. In order to achieve the ontological depth required to address the research questions an anchor was created around a knowledge event, the Scottish Improvement Skills learning activity (SIS).

The researcher engaged with participants from macro, meso and micro levels of the AHP context over a 17-month period, observing how groups of AHP working to implement the R2A policy responded to the knowledge provided through the SIS learning activity. Participants were interviewed and observed over three tranches of data collection, and further data were collected through fieldwork observations and desktop research. Using conceptual lenses of complexity theory and knowledge mobilisation theory, this study uncovered factors that participants perceived as salient to their adaptations of practice. The study identified planned and emergent mechanisms that were conditioning individuals' responses to knowledge as they sought to deliver changes in practice in line with the policy ambitions.

Employing a realist methodology, study findings provided evidence of an 'accordion effect' (Bhaskar, 1998), where following the single action of the SIS learning activity, several different acts were performed. These included moves towards allocentrism (discussed in 5.4); conspicuous departures and positive deviations from intended SIS tasks (discussed in 5.6.4 and 5.6.5) and the creation and use of artefacts (described in 5.6).

These findings could be interpreted as trends and countertrends that worked in tandem to determine how the system evolved, either amplifying change or maintaining the status quo. The idea of 'trend and countertrend' characterises change as a trajectory steered towards rather than a single destination point. The notion of trajectory of change has been established in literatures relating to knowledge mobilisation (Steiber & Alange, 2015; Stensaker & Langley, 2010) and also described within complexity theory, where system adaptations are recognised as falling within a definable but irregular pattern, the basin of attraction discussed in 3.3.5. The effect of combining the conceptual lenses of knowledge mobilisation and complexity theory is explored in the following section.

6.2. The effect of combining the conceptual lenses

The combination of complexity theory with knowledge mobilisation theory directed the focus of the study. Focusing on the SIS learning activity as a tracer for knowledge enabled the researcher to follow the paths of different forms of knowledge as they moved across a dispersed system. The addition of complexity theory facilitated insight into the interactions and dynamics between agents within the system as an emergent quality of the system itself. Agents within the system adapted to the stimulus of new knowledge rather than being governed by a hierarchy or responding to a preconceived design or definition of change.

The value of complexity as an explanatory frame work for complex social systems has been recognised by authors from education, ecology, and development studies as well as health and social care literatures (Chandler et al., 2016; T Greenhalgh, Plsek, Wilson, Fraser, & Holt, 2010; Thompson, Fazio, Kustra, Patrick, & Stanley, 2016; H. Tsoukas, 2017; Walton, 2014). Recognising the complex nature of health and social care systems has been cited as a key feature of any successful implementation of innovations (Burton et al., 2018; Greenhalgh et al., 2017; Slade et al., 2018). There have been calls within health care research to move away from linear approaches to research and include more complexity-cognisant perspectives that recognise the impact of emergent and non-linear factors within change processes (Holmes et al., 2016; Rutter et al., 2017).

The application of complexity theory within healthcare has also attracted criticism (Brainard & Hunter, 2016; Buffardi, 2016; Reid, 2002). Complexity concepts were originally observed in relation to non-human systems, such as molecular structures or weather patterns within natural sciences. Observations of human systems lend themselves towards a more metaphorical use of complexity concepts (Plsek, 2001; Plsek & Wilson, 2001; Westhorp, 2013). This metaphorical use of complexity concepts has contributed to a lack of clarity in the use of complexity terms, with different authors applying different interpretations of complexity constructs (Thompson, Fazio, Kustra, Patrick, Stanley, et al., 2016). There is some evidence of authors using the language of complexity to describe systems that engage in multiple objectives, components and strategies. These systems could perhaps be more accurately described as *complicated* systems. Complex systems exhibit the key features of interconnectivity, self-organisation and adaptation in response to feedback loops (Glouberman & Zimmerman, 2002).

In the past, research bodies such as the Medical Research Council (MRC) and National Institute for Health Research (NIHR) expressed concerns in relation to the utility of complexity theory within healthcare due to the theory's focus on unpredictable outcomes (Craig et al., 2008). In the light of considerable developments in the application of complexity within social systems since 2008, both these research bodies have reviewed their guidelines to recognise the value of adopting non-linear approaches that includes natural experiments alongside more experimental models (Craig et al., 2019). The MRC now consider that despite the lack of conclusive yes/no answers, applying constructs from complexity theory can facilitate a deep understanding of the behaviours of complex human systems.

Framing the context of a study as a complex adaptive system has been a productive approach to the use of complexity in social research, as multiple actors, objects and processes are interconnected to form a system based on common functions or interests (Byrne, 2013). Using a complexity framing in this case highlighted the open and dynamic nature of the social system and allowed exploration of differing values and valuations of knowledge held by the actors within the system. The influence of these variations, creating different dynamics across levels of the system, manifested as different parts of the system entered periods of disruption and disequilibrium at different times. This phenomenon has been a feature in other complexity informed research (Room, 2011).

Interpreting the data from different levels of the study context allowed the discovery of four key themes. These themes related to professional dispositions associated with uni-professional and trans-professional patterns of working; the influence of different approaches to leadership; the need to balance operationally stable structures with capacity for innovation, and the role of feedback loops. The following sections explore how these themes presenting within the data relate to existing literatures.

6.3 Linking key themes to wider literature

The four major themes emerging within the study are distilled into two types of factors, those relating to antecedents of knowledge mobilisation (leadership and professional dispositions) and those relating to maintaining the direction and momentum of change (organisational structure and feedback loops). Each theme is inter-related and emerged gradually from the data through multiple cycles of coding. These themes are now discussed as three sections. The first section discusses the role of disposition on determining the flow of knowledge

between professional disciplines; the second section is an integrated discussion of leadership and the need to maintain balance between stability and innovation; and the final section relates to feedback loops and artefacts.

6.3.1 Moving from a uni-professional to trans-professional disposition

One theme that was apparent from the very earliest stages of the study related to approaches to trans-disciplinary interactions between AHP professionals. The emerging model of distributed leadership created opportunities for AHPs to self-organise and create collaborative early intervention practices. There were difference amongst the capacities of individual participants and professional groups to respond to these opportunities to collaborate. Some participants were keen to move to a more proactive model of service provision, referring to the reactive service provisions as "working in old money" while other AHPs wanted to hold onto the model of reactive provision which provided them with 'expert' social status. The two different models of service delivery appeared to operate on two different currencies that could be aligned with Bourdieu's notions of cultural and social capital (Bourdieu, 1977; Nash, 2010).

The reactive model appeared to operate on a currency of cultural capital, where professional knowledge or expert status provided a marker of higher cultural capital. Sharing knowledge and creating horizontal lines of accountability could be interpreted as ways of subverting, perhaps as threats to individually held cultural capital. In contrast, the pro-active model of preventative service delivery appeared to relate to a currency of social capital. Building wider networks and engaging in multi-directional social interactions and knowledge sharing reflected increases in individual social capital and provided access to an increased collective knowledge to support problem solving. The move towards a pro-active model of service delivery required some individuals to make fundamental changes to their core values and career aspirations as a proactive model of intervention became established.

The impact of opening up to knowledge from different professional sources was often found unsettling, creating a challenge to established practices. This challenge acted as a catalyst for change in some individuals but remained a source of tension for others. Some participants expressed relief at returning to focus on their own professional group rather than working within the collaborative AHP context. In her ethnographic case study, Katherine Kellogg also highlighted how professionals may choose not to implement new practices or reforms where they perceive threats to their professional identity (Kellogg, 2014). Instead of creating the

anticipated scale-up and spread of knowledge and collaborative practices, in some instances, exposure to other professions perpetuated the silo approach to practice as AHP's sought to emphasise differences and focused on creating boundaries between professional groups.

The varying patterns of participant behaviours in response to trans-professional learning and opportunities for collaboration also resonated with the idea of a semi-permeable barrier to knowledge translation, intermittently influencing the flow of knowledge between individuals and groups (Rycroft-Malone et al., 2015). This idea was discussed in 5.4.1 when some contexts appeared to trigger 'AHP thoughts', described within this study as the evolution of an allocentric disposition. The idea of a knowledge-to-practice barrier rather than a knowledge-to-practice gap aligns with a realist idea of mechanisms being triggered in some contexts but not others.

Within the health board context of this study, the SIS learning activity provided a new forum for the creation of knowledge and shared meaning across the AHP system. The use of trans-disciplinary learning contexts to successfully promote an allocentric disposition has already been recognised by several authors (Currie & White, 2012; Kislov, Harvey, & Walshe, 2011; Lave, 2009; Wenger, 2000). The operating entities of the AHP system were each at different starting points in relation to collaborative working practices. These starting points had an on-going influence over how components within the AHP system responded to the learning activity as it progressed.

One of the participant workstreams, JP, was an established group before the learning activity took place. This group were already exhibiting an allocentric focus, with a pattern of respectful interaction which acknowledged the value of bringing different forms and sources of knowledge to bear on a problem. The JP group were able to collectively advocate for the contribution of their task to the ambitions of R2A. This was later acknowledged across the wider AHP community as providing a useful contribution to the ambitions of the R2A policy implementation. The ability of the JP group to come together quickly and effectively to ensure their inclusion as a SIS workstream demonstrated how more established relationships catalysed collaboration over a shorter time (Best & Holmes, 2010). The decision to include this group as one of the SIS workstreams is supported by recent work carried out by the Health Foundation, who recognised the need for job planning as a helpful approach to addressing staffing issues (J. Beech et al., 2019). The JP group's proactive actions also

provided evidence of how a local decision impacted across all levels of this interconnected system to make a significant contribution to the trajectory of desired change (Ward et al., 2012).

The notion of an allocentric disposition as an antecedent of knowledge mobilisation resonates with the works of Lockhart et al who identified that individuals who are allocentrically disposed support collective sensemaking and reduce conflict across boundaries (Lockhart et al., 2014). This observation was supported by this study, in relation to the progress of the second workstream, RFA. Following their initially unsuccessful approach to the workstream task, groups emerged from relationships formed within the SIS workstreams and moved forward to collaborate effectively across the AHP system in other contexts.

Although there were few overt references to professional organisations within the data, the influence of professional bodies on the development of collaborative interventions was also observed. Many participants made references to materials, guidelines or events produced by professional bodies including the Royal College of Speech & Language Therapists, The Royal College of Occupational Therapists, Chartered Society of Physiotherapists and British Dietetics Society. Each of these bodies has a strong professional interest in maintaining boundaries between professions that aligns against collaboration. Many initiatives promoted by these professional bodies had the potential to be mutually reinforcing but were orientated towards highlighting difference and privileging expert knowledge within professions. Other authors have also identified how the use of incompatible codes, work practices or protocols causes problems for knowledge sharing across professional boundaries, creating obstacles to effective collaboration (Kellogg, 2014). The successful collaborations achieved across AHP professions within this study suggest there is scope for adopting a more allocentric approach to creating materials that minimise professional jargon and support collaboration across professional groups to improve outcomes for service users.

Differences in professional cultures presented across all tranches of data. In later data tranches it was clear participants had come to value the learning from other professions but could not always identify solutions suitable for addressing the needs of the diverse group of AHPs. Star (2002) comments on a lack of consensus between disciplines as a “commitment to engage in disagreements”. The allocentric disposition seemed to evolve without compromising the unique contributions of each professional group. Over time, ideas relating

to knowledge sharing and co-production between professionals began to emerge through discussions with a wider AHP group. This process of emergence was catalysed through the SIS workstreams but required time to evolve before the intended outcome could be achieved.

Initially, the researcher had framed the SIS workstreams as communities of practice emerging around a shared interest (Wenger-Trayner & Wenger-Trayner, 2015). Once the nature of the workstreams was more clearly understood, it became clear that not all of these groups were functioning as communities of practice. The JP workstream, which had pre-existed the learning activity, were the exception to this. Other SIS workstreams, where individuals had been conscripted to join the domain of the SIS learning activity, were not operating convincingly as a community of practice. However, further evolutions that emerged from the SIS workstreams, where individuals chose to come together to address local issues were engaging in what Jagosh describes as 'partnership synergy', where parties engage in productive forms of dispute and negotiation to achieve mutually sustaining outcomes (Jagosh, 2019). Partnership synergy suggests that the successful resolution of conflict through negotiation, described within this study as deliberative dialogue (Escobar, Faulkner, & Rea, 2014), achieves significant benefits for both communities and research, beyond what could be achieved by individuals working alone.

Achieving these benefits across multiple levels of the AHP system required individuals to share procedural as well as product knowledge (Hawe et al., 2009b). This involved listening and respecting the view of other groups who were at different starting points in their delivery of early intervention services and who were operating under different constraints. This pattern of respectful dialogue was absent in some contexts. Some groups expressed frustration that work done to create pro-active services before the inception of the R2A policy was not valued and that national outcome measures did not capture what their uni-professional workforce had achieved. At the same time, other participants expressed feeling of 'failure', that they had not delivered the intended outcomes, or the anticipated changes had not been achieved within the defined timescales. This topic is discussed further in section 6.3.3 in relation to the nature of feedback.

As the move to a more allocentric or AHP-wide focus emerged, working as part of a diverse group of AHP professions was recognised by participants as a catalyst for thinking in different ways, recognising potentially different solutions to problems and exploring possible areas of

overlap as well as acknowledging areas of difference. This study offers further empirical evidence of the positive contribution of diversity in relation to adaption and evolution within complex adaptive systems (Moore et al., 2019).

The evidence emerging from this study appears to refute findings from Contandriopoulos et al who suggest polarisation within groups reduces the likelihood of successful adaptation (Contandriopoulos et al., 2010). In addition to the successful development of collaborative interventions emerging between geographically and professionally diverse groups, this study also uncovered examples of uni-professional groups working to resist change and support the status quo. These uni-professional groups subsequently became more amenable to adaptations of their practice when exposed to the wider AHP community through trans-disciplinary fora such as the SIS learning activity, suggesting that increased diversity or polarisation supported the successful scale-up and spread of adaptations.

From the observations collected within this study, the following CMO theory was constructed:

Multi-professional Learning activities (C) that are structured to allow space for the development of allocentric dispositions (M) enable transdisciplinary knowledge mobilisation (O).

6.3.2 Models of leadership: balancing stability and innovation

This section discusses how a model of distributed leadership evolved within the AHP context before moving on to consider the effect of this model of leadership on the stability of the system. The section concludes by considering how the stability of the system was maintained without compromising processes of innovation.

A further antecedent of knowledge mobilisation identified in this study was a structure of relational or distributed leadership. The evidence from this study supports a relational theory of leadership as expressed by Uhl-Bien (Uhl-Bien, Marion, & McKelvey, 2007), where rather than focus on the behaviours and characteristics of individual leaders, the notion of leadership is construed as a collective dynamic negotiated between parties and defined by relationships rather than roles or formal positions. This model of leadership has been identified by multiple authors as facilitating self-organisation of complex systems' components (Chreim et al., 2010; Fitzgerald et al., 2013; R Kislov et al., 2016; Lockett & Currie, 2011; Schneider & Somers, 2006). The negative influence of professional divisions and

bureaucratic structures of leadership on self-organisation and innovation has also been recognised (Burgess & Currie, 2013).

Although the narrative of distributed leadership was embedded in the R2A policy, the practice of distributed leadership was not observed in the first tranche of data collection but emerged over the duration of the study. This aligns with ideas of distributed leadership being a process constructed through the interaction of leaders and followers and embedded in contexts, over time (Lockett & Currie, 2011). The development of distributed leadership observed in the AHP Leads network and discussed in 5.5 provided an example of concertive action, where the behaviours of leadership actors changed and became institutionalised within the existing form of the Network meetings. The disequilibrium experienced by both leaders and practitioners between tranche 1 and tranche 3 of data collection provided several examples of the evolution of conjoined agency and the reciprocal influences of leaders and followers. The pattern of distributed leadership observed in the study aligns with the model of weak distributed leadership described by Lockhart & Currie (Lockhart & Currie, 2011).

In the initial implementation context of R2A, there was evidence of a top-down command and control approach to leadership in relation to the SIS learning activity. The leadership team created a template of how they anticipated the SIS learning activity would contribute to the ambitions of the R2A policy. The leadership team intended to measure the successes of learning activity and the wider R2A implementation project in relation to the success of individual SIS workstream tasks. The AHP leadership were surprised and disappointed when the targets they had identified for each of the workstreams were not realised. This suggested the overall implementation process was failing, as the leadership focus did not capture the change processes relating to patterns of interaction, changes in attitude and wider areas of progress that were occurring in AHP practice beyond the realms of the SIS workstreams. The move towards a more distributed form of leadership facilitated a wider range of measures across the system that captured activities from beyond the remit of the SIS workstreams.

Defining distributed leadership as antecedent of knowledge mobilisation across a complex system confirms findings uncovered by Trenholm & Ferlie when looking at the spread of TB across London (Trenholm & Ferlie, 2013). In common with the current study, these authors also identified that a regime of control stifled the operation of complexity features, particularly self-organisation, constraining the realisation of desired outcomes.

As the system adopted a more distributed pattern of leadership, there was wider recognition of the contributions to the R2A ambitions that evolved as participants became empowered to create locally appropriate and sustainable adaptations. Following the move to distributed leadership, participants beyond the reach of the initial SIS learning activity workstreams were able to self-organise and create local innovations across different contexts. These findings support the notion expressed by Greenhalgh and Papoutsi (2018) that there is no single, universal solution to the challenges of complex healthcare systems. Each CAS has many potential solutions that can be realised through different contextually appropriate mechanisms.

There were also unexpected negative consequences of the move to distributed leadership within the current study. Some of these related to the enduring hierarchical structure of the wider organisation and the need for leaders and managers to manage tensions created by these conflicting systems.

Within the current study, the move away from hierarchal leadership had long-reaching consequences in relation to career progression and in terms of the skills required from leaders to operate effectively within self-managed systems. Leaders were required to influence without invoking any formal authority or stifling innovation. Individual participants in this study varied in the degree to which they were comfortable with the decentralised model of leadership. This raised questions about self-organising systems and how co-ordination and cohesion are achieved in order to accomplish complex tasks across the system. Most research on less hierarchical models of leadership has been conducted within small private sector entities effectively operating as sandpits or experimental spaces where novel form of leadership evolved with minimal risk (Lee & Edmondson, 2017). The effective delivery of critical public services such as healthcare and education depends on cohesive structures being maintained across a complex system of individual self-organising entities. The option of experimentation without consequence is not available within complex adaptive systems, particularly those within the public sector, where the interconnectivity of the system causes unforeseen consequences for other entities within the system.

Observations from this study concur with authors referring to limits in relation to less hierarchical models of leadership (Fitzgerald et al., 2013; Lee & Edmondson, 2017; Lockhart et al., 2014). There are further criticisms that a distributed model of leadership creates

disconnections over distance, value and power and has the potential to reinforce existing institutional structures by creating a fantasy of empowerment (Martin, Beech, MacIntosh, & Bushfield, 2014).

Securing productive changes in the face of multiple and often competing perspectives required system flexibility to enable change to emerge across different parts of the system. Individuals within the system needed the scope to respond to emergent events, such as the SIS learning activity. However, the CAS of healthcare also required stability to deliver a reliable service that could achieve appropriate outcomes even during on-going transformation. Grimwood (2019) describes this challenge as the combination of *"top-down strategic approaches and bottom-up tactical responses".*

The findings from this study concur with those of Best, Greenhalgh et al (Best et al., 2012) who suggest a blending of designated and distributed leadership are required if large system transformation is to be achieved within healthcare. This blend of models of distributed and hierarchical leadership maintains a balance between flexibility to allow innovation and stability to maintain essential services in contexts where improvements and change are hoped to be a constant feature.

In a recent article Moore et al (2019) suggest describing complex social systems and their interventions as functioning on a continuum of stability over time. Some social systems (for example, family structures) will have more stable features over time than others (such as schools or other public sector entities). These authors suggest that the level of stability of a CAS impacts on the success of a change initiative. In some cases, stability maintains a positive cycle of change while in other contexts the stability of the system resists changes and maintains the status quo. Events described in chapter 5 of this thesis provided examples of both these outcomes occurring at the micro level of the context. Moore et al (2019) propose that the stable nature of processes occurring at micro levels offers greater potential for creating positive outcomes than macro level transformative system changes, such as legislation. Therefore, they propose that focusing on individual-level processes offers an appropriate approach to uncovering how systems function and how they may be altered.

The AHP study considered the transformation of the system from multiple perspectives and highlighted that although change occurred at the level of the individual, these individuals were positioned across different levels of the system and the interconnectivity between levels

of the system made a significant contribution to change. The initial co-construction approach to the creation of the policy delivered an artefact that embodied shared beliefs, values and ambitions of many stakeholders across different levels of the system. Creating a policy stakeholders adopted a roadmap for the direction of change was crucial to maintaining cohesion across the AHP system, particularly when different parts of the system were experiencing periods of disequilibrium.

The ambitions of the R2A policy to move AHP services from reactive to preventative interventions is part of a wider conversation on the role of health services as a wellness rather than illness focused organisation (Hunter, 2015). This move challenge beliefs, social order and institutional identity within the wider healthcare system as we aim to move service delivery away from the expert model of medical intervention toward a more relational approach that considers the dynamics of complex social systems and factors that disrupt them (World Health Organization, 2012.) The role of AHPs as wellness and rehabilitation focused professionals can often become diluted or obscured within the healthcare context, where 'expert' voices of medical professionals dominate. The R2A policy provided a point of focus or rallying point for the AHP workforce and enabled them to advocate more effectively for service adaptations that supported early intervention, including a move away from medically-led referral to a model of 'requests for assistance'.

Rycroft -Malone et al (2015) also acknowledge the role of competing drivers and preceding conditions in relation to system outcomes. In her study of CLAHRCs, Rycroft-Malone refers to a move from conceptual impacts to more direct impacts. This was observed within the current study, as changes in disposition and leadership patterns, conceptual impacts, preceded direct impacts such as the emergence of collaborative training packages. Both studies highlight the need for sustained focus on relationship building and culture change. The Rycroft-Malone study uncovered how stakeholder positions and the alignment of structure and resources were influential in directing outcomes. These factors all relate to what Greenhalgh et al described as the outer context in their conceptual model of diffusion, presented in chapter 2, Figure 2.1 (Greenhalgh, Robert, Macfarlane, et al., 2004). Although outer contextual factors were not a focus of attention for the AHP study, there were instances where these wider factors influenced the operation of mechanisms within the system, for example when external events affecting executive levels of the health board were mitigated through the behaviours of the AHP leadership team.

Secure and trustworthy relationships between individual leaders and practitioners were sustained through periods of disequilibrium. However, the need to respond to the governance requirements of the NHSH executive did result in some instances of the 'collective thuggery' described in 2.2.4 (Vangen & Huxham, 2003). The decision to realign the timeframes of the implementation plan and control the flow of information from the executive level are examples of the leadership team taking steps to maintain the momentum of the implementation process while continuing a dialogue of engagement and collaboration.

Emerging changes in leadership style towards a more distributed model of leadership linked to an increase in self-organised decision making across the AHP context. This self-organising decision-making frequently led to local outcomes supporting the ambitions of the R2A policy but on some occasions resulted in outcomes that resisted change and thwarted the ambitions of the R2A policy.

These findings were distilled into the following CMO theories:

Multi-professional learning activities (C) conducted in a context of distributed leadership (M) empower staff to self-organise resources to create changes in practice (O).

Multi-professional learning activities conducted in a context of distributed leadership (C) support agents to self-organise and create changes in practice (M) that <u>deliver</u> the wider organisational ambitions (O).

Multi-professional learning activities conducted in a context of distributed leadership (C) support agents to self-organise and create changes in practice (M) that <u>challenge</u> the wider organisational ambitions (O).

6.3.3 How feedback loops operated within the system

The role of feedback loops in aligning stakeholders through consistent feedback to create a resilient and flexible system has been recognised in other studies (C. R. May et al., 2016; Snyder, 2013).

Creating positive feedback loops that supported trajectories of change across the AHP system through 'virtuous cycles' required close attention to the events and behaviours within the system. This process is similar to the notion of "tailoring to context" described by Waltz et al (2019). These authors emphasise the need to understand determinants and barriers to implementation and consider potential strategies to address these as part of implementation

planning processes. Within the current study, clearer understandings of the mechanisms operating to support and inhibit knowledge mobilisation processes within the AHP context would perhaps have mitigated some of the feelings of demoralisation experienced between the first and second tranches of data collection. However, the emergent nature of the AHP context meant that some mechanisms could not be anticipated or appreciated until the system had moved towards a new equilibrium. Therefore, maintaining a degree of openness and flexibility regarding where attention was directed and what was identified as salient within a context over time was helpful to the implementation of the R2A policy within this context.

The work of Brewster et al also identified a need to plan for integration effort and to carefully consider how feedback loops can be employed to create virtuous cycle of change (Brewster et al., 2015). Brewster et al were considering the implementation of medical procedures within a hospital setting, where fidelity to process was a key factor. These authors recognised that sanctions and uses of automation, such as digital prompts or nudges were a useful approach to securing non-intrinsically rewarding changes in practice. The current study did not uncover any instances of the use of sanctions in relation to the implementation of new practices. Brewster et al focused their attention on top-down approaches to governance to support the implementation of novel practices, while the current AHP study focused on the use of local advocates to facilitate bottom-up adaptations to context. Both Brewster et al and the current AHP study demonstrate how the nature of the feedback provided had a significant impact on levels of engagement and consequently on the successful mobilisation of knowledge to create changes in practice.

Within the AHP study, the use of normative cues prompted individuals to think about where they stood in relation to others on a continuum of progress. This contributed to feelings of failure in relation to the delivery of intended outcomes. Research conducted in relation to the nature of feedback has highlighted that normative feedback can be perceived as a threat rather than an indication of areas for possible improvement (Brehaut & Eva, 2012; Shute, 2008). Other research also highlights that a focus on results-based approaches to reform or practice change tend to marginalise the double-loop learning of practitioners, limiting the scale-up and spread of learning and practice adaptations (Kitson et al., 2018). Further work by Burton et al (2018) on the statistical behaviours of complex systems identified that statistically high-performing entities within a complex system should not be used as

exemplars of good performance. The statistical patterns of complex systems, appearing as thick tails and corresponding bursts of activity, are features of the system itself and not necessarily an indication of practices to be replicated in other contexts (Burton et al., 2018). The findings from this study suggest a deep understanding of context provides a useful indication of approaches to practice change that might be successfully scaled up and applied to other contexts.

However, adopting a context-focused approach to reform or practice change within complex adaptive systems can create different problems. Even when a common and coherent underlying logic was applied, Moore et al (2019) acknowledged that dynamics in complex systems led to variations in outcomes. Multiple authors have highlighted that research can never uncover the almost infinite number of uncertainties within a complex system, and attention should be focused on which questions need to be answered in order to make decisions or progress the field within a specific context (Butler et al., 2010; Chandler et al., 2016; Plsek & Greenhalgh, 2001a; Sturmberg & Topolski, 2014). The AHP study observed variations in responses to the learning activity between the two SIS workstreams. These variations were described as positive deviations and conspicuous departures within the AHP study. Similar phenomena were described by Moore et al as 'reflective adaptive tailoring' and 'departing from intervention logic' (Moore et al., 2019).

This study suggested understanding the nature and content of feedback loops that prompted positive deviations was an important step in supporting implementation processes. For example, after some careful consideration, the planned launch day of the Year 2 driver diagram became a day celebrating of the progress of the implementation process to date. This signalled a rejuvenation of the change process across the system, a positive feedback loop that prompted further adaptations in the trajectory of change.

Feedback loops observed across different levels of this system depended on the creation and maintenance of positive interpersonal relationships that accommodated differences of opinion, and tolerated the unknown and incompleteness of change processes. The new states of equilibrium described in chapter 5 were not based on achieving consensus between agents but were an emergent product of agents adapting and accommodating their reasoning and resources. Other authors have also identified the importance of conflicted understanding as a positive force for change (Moller, 2018).

Due to the investments made by senior staff, participants initially felt obliged to engage with the R2A implementation process and deliver pre-determined outcomes. The decision by leadership to allocate individuals to the original SIS workstreams constrained the level of investment from individuals who felt they held less power or status within the system. Over time, participants were able to re-frame their relationship with the R2A policy, seeing the implementation process as providing opportunities to establish working covenants that recognised professional differences alongside shared ambitions. This enabled participants to consider work that was being successfully undertaken out with the context of the SIS workstreams as part of their collective experience. This resonates with the ideas expressed by Bevir, that the fate of policies depends on the way individuals understand and respond to them (Bevir, 2002).

Artefacts as feedback loops

These changes in response to the R2A policy were facilitated through the creation of artefacts. These artefacts carried knowledge across boundaries and provided an archive of the implementation journey. Individuals recognised a need for change, responding to the ambitions of the R2A policy but not necessarily having a clear idea of how this change could be achieved within their context. When unforeseen circumstances prohibited regular interactions, AHP staff commented in retrospect that this had contributed to lowered morale and decreased activity in relation to the workstream tasks. Participants identified that the feedback provided through the various social artefacts were a priority rather than a 'nice to have'. This resonated with the idea of the 'quiet materiality' of epistemic artefacts discussed by Woodward ,where the value of the artefact or feedback loop is only realised through its absence (Woodward, 2015). Greenhalgh et al (2019) also referred to this phenomenon as 'material scaffolding, backgrounded when working and foregrounded upon breakdown'. These and other authors recognise the important role of "non-human elements" or artefacts within implementation, describing how artefacts can highlight details of practice that might otherwise be overlooked (Greenhalgh et al., 2019; Mitchell, 2019). The work of Greenhalgh, Mitchell, and the current study, build on the work of work of Star (2002) , who highlighted how 'boring things'(classification systems, diaries, driver diagrams etc) inscribed the values, expectations, conflicts and power relations within and between groups. The works of these authors align with the conclusions from this study, that the creation and use of artefacts requires attention at both organisational and individual levels and over time.

Within the AHP study, the label 'request for assistance' (RFA) was initially observed within the AHP study as a label for one SIS workstream, acting as a boundary-spanning artefact to cohere a diverse group of practitioners. The functional label evolved into a epistemic object of enquiry and pursuit as the individuals in the workstream questioned what was the 'request for assistance': was it the task ? was it the object ? was it a piece of paper to be devised? was it the approach made by potential service users? As the workstream did not reach any conclusions about the nature of the 'request for assistance' before disbanding, this epistemic object remained incomplete and did not evolve to become a technical object, an instrument used in practice (Ewenstein & Whyte, 2009). The term 'request for assistance' however remained in use within the wider AHP context and became a linguistic artefact that referenced early intervention-prevention practices across the system. The taxonomy of artefacts developed by Ewenstein and Whyte (2009) has provided a useful tool to identify and explain the role of artefacts within this study.

The R2A policy is another example of an artefact operating as a boundary object, bridging the individual and organisational levels of the system in the same way as the Care Pathway was highlighted by Allan (2009) as providing a focus to catalyse engagement. The R2A policy remained constant and in use over time. Other artefacts, such as the APPLE mnemonic, emerged, were utilised for a time before becoming redundant. The evolution and use of various artefacts created an archive of the implementation process, providing tangible examples of evolution or progression across the dynamic system over time.

The need to capture changes over time within complex systems has been identified by a number of authors. Moore et al (2019) caution against short-term assessments of complex systems that may not capture the effect of emerging feedback loops. Feedback loops evolve gradually to draw in other actors. Assessing interventions before feedback loops have had time to establish underestimates the benefit of an intervention (Moore et al., 2019). Greenhalgh et al also highlight how premature evaluations can result in useful interventions being abandoned before they have time to establish and create impact (Greenhalgh et al., 2017).The empirical data provided by the AHP study, if viewed from the single timepoint of the initial tranche of data would have provided little evidence of mechanisms supporting the implementation process at different rates across the system. Within the current study, participants from the SIS workstreams returned to areas of practice and drew on relationships

to form new approaches to intervention such as the joint OT/SLT training packages discussed in 5.4.3. This pattern of scale up and spread would not be captured from a single timepoint.

Leadership as a feedback loop

From a complexity theory perspective, complex adaptive systems within healthcare can be seen to evolve and adapt to accommodate the demands of context, but there is also a need for the overall healthcare system to survive high levels of external turbulence caused by competing organizational, political or societal objectives as discussed in 6.3.1. Bounding or facilitating the direction of adaptation through feedback loops ensures alignment with wider system ambitions.

Framing the hierarchical or formal structures of the wider social context as higher-level feedback loops, supporting adaptation in one direction while thwarting adaptations in other directions, may be a useful approach to combining both formal and informal forms of leadership. This approach also offers a better explanation for the events related to the decoupling of the executive and operational levels of the study context. Framing meso-level management as controlling the flow of knowledge from the executive level of leadership to create a positive or virtuous cycle of feedback facilitated those at operational-levels of the system to continue their efforts to create novel interventions in line with R2A ambitions. This formed one of a variety of feedback loops that maintained the direction and momentum of change across different levels in the study.

The preceding comments informed the final CMO theory:

Multi -professional learning activities (C) led to the creation of feedback loops including artefacts (M) that maintain the trajectory of change across interconnected CAS (O).

6.4 Reflections on methodology

The aim of this study was to learn more of how change can be delivered across a complex adaptive system. The study sought to consider why things worked differently in different groups and different locations by cumulating data from multiple perspectives across different levels of the system. Rather than making judgement or seeking consensus, the ambition was to follow ambiguities, inconsistencies and conflicts between perspectives and to consider the impact of combinations of features on the CAS. This research ambition suggested adopting a

theory-led approach to underpin the experimental methodology. Adopting a realist methodology offered a possibility of uncovering mechanisms engaged in knowledge mobilisation processes through the development of initial and refined theories. This study provides an account of how and amongst whom change occurred within this context. It does not offer claims about the success or otherwise of the wider policy initiative. The final CMO configurations provided an explanation and interpretation of events which was persuasive and 'pragmatically acceptable' (Tilley & Pawson, 2000) to participants and critical observers.

Using the realist approach, fluctuations and patterns occurring within the AHP CAS, referred to as demi-regularities, provided information on factors impacting on the system in different contexts and at different times. The demi-regularities observed within the data were interpreted as valid knowledge of the system rather than being discounted as outliers from a 'norm' of outcomes. CMO theories were then constructed and refined to provide robust explanations of the demi-regularities observed.

Employing an ontologically deep approach to the AHP study provided a better guide to what might work within other contexts than relying on measures of performance alone. Focusing on real events as they occurred provided useful indications of how successful interventions may be adapted and spread to other contexts. These mechanisms were uncovered by observing factors supporting the implementation of the R2A policy rather than seeking to identify the performance of the system in relation to pre-determined goals. The focus on building and rebuilding programme theories in the light of emerging data was a good fit for the research ambitions in the volatile and complex context of the AHP system.

Adopting a more experimental model may have provided a summative response to measures of performance but would have been less sensitive to the changing context. There have been increasing demands for healthcare research to move away from reductionist approaches to research and instead challenge the hierarchy of evidence, to develop deeper research approaches more aligned with the analysis of stakeholder motivations, the effects of infrastructure and the influence of political or economic agendas on outcomes (Green, 2008; Greenhalgh & Weiringa, 2011; Murphy & Farfard, 2012). Being grounded in systems thinking and using real-time data, the AHP study followed the outline of a developmental evaluation as defined by Quinn-Patton (Patton, 2010) and as such offers knowledge to complement the

formative and summative assessments of the R2A implementation processes provided by other stakeholders.

Employing the hermeneutic cycle of realist interviewing captured the on-going story of the R2A implementation process from a variety of perspectives. This process is never complete, and the answers proffered in this thesis are partial and open to different interpretations. The consistent application of a realist methodology across theory, research design, analysis and thesis structure maintained epistemological consistency and created a coherent and persuasive interpretation of the data to answer the research questions. The inconsistencies between assumptions expressed in the provisional CMO theories and the realities described in the final CMO configurations are a constant feature within a realist evaluation (Greenhalgh et al., 2015). The findings described in chapter 5 and discussed in the current chapter of this thesis are one of multiple possible interpretations of the perceptions of stakeholders.

Adopting the realist methodology also imposed some limitations. Firstly, the process of identifying generative mechanisms that do not appear as empirically appreciable phenomena necessitated employing approaches to data collection and analysis at a sufficient ontological depth to uncover mechanisms that underpinned the observable behaviours. Not all the influences discussed in this thesis were uncovered in the initial tranches of data collection, but through cycles of analyses, recurring patterns of the effects of factors at different levels of the system became clear:- for example, the uncertainties about the move to a more distributed model of leadership expressed by participants at different times. Balancing the ontological depth required to address research questions with the breadth required to consider the interconnected nature of the complex adaptive AHP system is an example of the problem described by Angus & Clark as *"creating a bounded understanding of what is possible, feasible and acceptable without reducing the level of complexity."* (Angus & Clark, 2012). Other authors have suggested using a combination of realist approaches with soft systems methodology (Checkland, 2000) as a means of bounding the areas of interest while engaging participants to explore several different facets of contexts in the development and refinement of theory (Dalkin, Lhussier, Williams, Burton, & Rycroft-Malone, 2018). Within the AHP study, using the SIS learning activity as a parameter around the area of interest, and employing Archer's parameters of realist social theory to the pre-context of the study, achieved the same objectives.

The parameters required to enable an ontologically deep consideration of the context created further challenges in terms of detecting key perspectives that would illuminate alternative underpinning mechanisms. Neither the application of soft systems methodology nor the steps taken in the AHP study could totally guarantee to detect important features that have effects within the system. The researchers experiential knowledge of the field was a valuable resource in orientating the study in relation to past and current debates and potential areas of interest (Malterud et al., 2016). The role of different approaches to referral versus request of assistance, and the significant impact this move would have on patterns of practice for some professional groups, is one example of where deep knowledge of the context of study was key to sensitising the researcher to potential areas of concern or interest, where mechanisms of knowledge mobilisation could be uncovered.

A drawback of the researcher's prior deep understanding of the field was over-identification with individuals and over-interpretation of events as they were observed in context. To maintain a curious, developmental or emergent mindset in relation to the research process, the researcher continually referred back to observations, prepared different protocols compatible with events and issues captured across the data corpus, sense-checked ideas with participants from different levels, and related their comments to observations, documentary analyses, debates and ideas within the wider literature.

Another concern raised by Angus and Clark regarding the use of realist methodology is a *"potential drift from the scientific towards the political*" (Angus & Clark, 2012). This concern affects any research conducted within a social context, rather than being a problem relating specifically to realist approaches. What is attended to and what is omitted from any observation or exploration is a political act. Within this study, maintaining a multiplicity of voices within the data, engaging participants from all levels of the system in teacher-learner cycles of interviews to critique and refine the CMO theories in the light of their experience, and maintaining engagement with the national AHP forum as a reference group, were attempts to maintain a robust and transparent approach to the research process. The theories underpinning this study were developed in tandem with participants through three cycles of examination and shared with a wider reference group who ratified the appropriateness of the refined CMO structures in relation to their own experiences. Creating a balance of perspectives across the three tranches of data collection required the continuing engagement

with individuals from different levels of the context and was facilitated by using the anchor of the learning activity to maintain contact with individuals across each tranche of data.

The SIS learning activity provided an event in the CAS (Hawe et al., 2009b) in which participants were comfortable sharing their experiences of implementation processes in relation to that event. Some authors have highlighted power asymmetry within the interview context where the interviewer controls and defines the situation, asks questions, directs the conversation and seeks information in relation to their agenda and interests (Coar & Sim, 2006; Platt, 1981). This was a valid concern within the AHP study as the realist CMO theories were the core focus of interviews and focus groups, and the researcher's areas of concern were directed and bounded by this focus.

However, other authors considering the issue of power within the interview context suggest that power is held and exercised by both researcher and participants in the interview process (Alex & Hammarstrom, 2008). This was observed throughout the AHP study as participants exerting resistance. No participants declined to be interviewed, but there were some difficulties with maintaining engagement. It also presented as some participants not engaging within focus groups, avoiding responding to questions or giving standard pre-prepared responses that provided stock information repeated over time. The interviewer was aware that on some occasions interviewees felt fragile and needed reassurance at the end of the interview that the relationship and confidentiality would be preserved. As has been frequently observed in research, once the formal interview was complete and the recording turned off, more salient information was often offered as participants felt free to make extended comments.

Maintaining a balance of participant views across three tranches of data demanded both tenacity and flexibility from the researcher. This meant in some cases adapting the research protocol to maintain maximum diversity among participants. The pragmatic nature of a realist methodology proved to be a useful fit, allowing the researcher to move from focus groups to individual interviews in order to maintain the relationship with participants from across levels of the system as discussed in section 5.5.5. Maintaining fidelity to a more experimental research design would have required the researcher to adopt a more restrictive approach to data collection.

This study began with two readily identifiable collectives, the RFA and JP workstreams. As the study progressed over the three tranches of data collection, the interconnections between the defined workstreams and other CAS were uncovered, and the impact of the learning activity became dispersed across the system as more agents became drawn into the process. This made the process of attribution increasingly difficult. However, it did generate more evidence to apply to the CMO theories. The longitudinal approach enabled the researcher to reprise issues, topics and events that participants offered in previous tranches. Williams et al (2013) suggest that testing CMO's after a single cycle of data collection provided limited opportunity to observe changes. The use of three data tranches within this study was helpful in clarifying themes that were persistent across time and organisational levels.

Adopting a longitudinal approach prompted reflexivity and sustained a relationship of trust between the researcher and participants. The change to the anticipated timeframe for the data collection, with the researcher being a presence within the field for the duration of the data collection period rather than only present for the planned ' blocks ' of data collection, meant the researcher was aware of events occurring within the research context between interviews and was able to employ knowledge from other sources to frame comments, and reach deeper into the proffered descriptions or interpretations, focusing on observation and learning rather than processes and outcomes.

The reflections and analysis have all been influenced by the identity of the researcher and this has also shaped the knowledge produced in this study (Mead & Bower, 2000). Decisions on what would be included and what was likely to be important or trivial were not made until later tranches of data. The researcher made efforts to maintain the same approach to transcription across all tranches of data.

The R2A policy ambitions and the focus for the AHP study were different. The R2A policy ambitions were focused on transformative change while the AHP study captured evidence of incremental change. The evidence of incremental change as it occurred across the system provides a useful adjunct to the more quantitative measures of change instigated by the Scottish Government. The independent nature of the research, being external to the context and the ambitions of the Scottish Government, the health board and practitioners ensured the research objectives were realised. The absence of contractual demands or obligations to progress or evaluate implementation processes in relation to external timeframes or agendas

contrasts with many evaluation agendas set by sponsors (Salter et al., 2014). The realist evaluation approach adopted by the researcher may not have been acceptable to sponsors seeking evidence of attribution or accountability rather than an explanation of events.

The findings recorded here provide a description and explanation of events as they were experienced by individuals within a specific context. The contrasting scales of findings from the national evaluation of the R2A policy and the findings from the AHP study are mirrored in the discussion of dissipating system theory and edge of chaos models of complex system theory in chapter two. The dissipating systems model aligned with large scale changes in non-human systems and the edge of chaos model captured the on-going small changes that occurred at the level of the organism. Similarly, the information provided by this study captures small scale changes occurring at the level of individuals which accumulate to deliver large-scale changes desired by the policy developers.

This study provides an example of how the involvement of actors operating within the context allowed the researcher to harness theories from within the system rather than impose theories from without (Moore et al., 2019). Although the study offers no claim to add to understanding of how knowledge can be harnessed to catalyse change at population level, the study findings contribute to understanding how knowledge may be facilitated to catalyse change within a small group of health professionals who are often overlooked within health service research. The implications of these findings are discussed in the following section.

6.5 Implications of the study

The findings from the study suggest that where knowledge is a catalyst for changes in practice, the scale-up and spread of change across a complex adaptive system is facilitated through micro-processes of feedback. These feedback loops are highly sensitive to context. Understanding how feedback loops evolve and influence the trajectory of change within specific contexts offers an opportunity to harness the feedback loops to create virtuous cycles of change, moving the CAS in the desired trajectory of change.

It is important to consider the nature of feedback loops when dealing with complex adaptive systems. Feedback loops created with the intention of supporting delivery of outcomes may not always be a salient influence on the behaviour of an individual CAS. Identifying which feedback loops are established within specific contexts offers useful information on how adaptations are being amplified or inhibited, resulting in positive deviations or conspicuous

departures from the planned trajectory of change. This study suggests that feedback loops that emerge from a deep understanding of how relationships are formed, managed and sustained across a system provide key knowledge that can be mobilised to promote the scale-up and spread of innovation across a complex adaptive system. Feedback loops often manifest as different forms of social, linguistic or material artefacts that can provide useful information about factors being attended to in a specific context, and how these factors change over time.

The findings also suggest that both distributed and hierarchical approaches to leadership are required within complex organisations. Although command and control structures are necessary to ensure the organisation is stable enough to function effectively, a distributed model of leadership is necessary to foster engagement and innovation. These different forms of leadership need not be in competition but operate as further feedback loops influencing the direction of change.

Creating change across this complex system relies on the multi-directional mobilisation of knowledge between engaged agents. This occurred within this study through respectful and empowering relationships based on a model of distributed leadership and an allocentric disposition. These factors took time to become established. Individuals and groups working to mobilise knowledge are supported when anticipated timeframes for projects and activities allow time for distributed leadership and an allocentric disposition to emerge, particularly in contexts where individuals and groups had no history of working together. Developing an allocentric disposition enables professional groups to share a wider pool of knowledge and resources to create a range of innovative solutions adapted to suit specific contexts rather than allowing differences to inhibit the successful implementation of innovations.

The co-produced nature of the R2A policy itself provided an over-arching roadmap for the direction of innovation that resonated with the values and beliefs of individual stakeholders from across different levels of the system. Investment in the values and ambitions of a policy facilitates stakeholders to remain engaged with each other, and with the policy implementation process through periods of disequilibrium and at times when there appears to be minimal progress.

This study sought to provide a robust explanation of events experienced by practitioners and leaders as they addressed the shared ambitions of a government policy. The use of concepts

drawn from complexity theory to explain variations across the AHP system facilitated participants to make sense of their experience of the SIS improvement science training experience and the R2A policy implementation without challenging their self-efficacy. Understanding that social systems are constructed from interconnected systems, each with its own history that remains a continuing influence, provided the opportunity to consider events as they occurred within a context, rather than focusing energies on delivering pre-defined measures and outcomes that may not be attainable within prescribed timeframes.

6.6 Contributions

The AHP participants who were the focus of this study form a small subgroup in the wider health and social care workforce where the views of medical staff, nurses and doctors, form dominant narratives. AHPs as a group of practitioners are orientated towards issues relating to wellness, rehabilitation and prevention rather than the more medical preoccupation towards illness and cure. This study provides useful evidence of how this group of professionals are contributing to creating a model of wellness and prevention within the institution of the NHS, a context where most stakeholders are experts on dealing with illness.

Highlighting the contribution of self-organisation and interconnectivity as antecedents of knowledge mobilisation, and the role of feedback loops in maintaining a trajectory of change, the current study extends discussions already taking place on how attributes of complex systems can be harnessed to support change (Braithwaite et al., 2018). The following sections describe the theoretical, empirical and practical contributions this study to understandings of how change is implemented within complex adaptive systems.

6.6.1 Theoretical Contributions

The study revealed how the attributes of complex systems were harnessed to mobilise knowledge and deliver desired outcomes.

Building on ideas of knowledge both as possession and social practice, this study considers how different forms of knowledge became mobilised to catalyse change in multiple directions across a complex system. Employing the framework of functions and tasks involved in knowledge mobilisation identified by Davies et al (Davies et al., 2015) and the multi-directional model of knowledge sharing described by Ward et al (Ward et al., 2012), this study demonstrated how knowledge impacted on the attitudes, beliefs and behaviours of individuals to deliver change. These changes were evidenced through a variety of social,

material and linguistic artefacts, which themselves became further refined as knowledge spread across the AHP system. Identifying artefacts in terms of their functions as boundary objects, objects of pursuit or practitioner tools (Ewenstein & Whyte, 2009) provides an archive of changes occurring across a system, capturing the progression from conceptual to direct impacts described by Rycroft-Malone et al (2015).

6.6.2 Empirical Contributions

The nature of feedback loops has not been explored fully in previous studies. This study sheds light on how linguistic, social, and physical artefacts are created and employed within the process of knowledge mobilisation to support sustainable changes in practice. Drawing together the literature on epistemic artefacts and the attributes of complex adaptive systems, this study provides a greater understanding of the role of artefacts as feedback loops in the sharing and application of knowledge.

The role of knowledge artefacts within this study contributes to the literature on how practice is conducted and changed within knowledge-intense contexts with epistemic objects being formed through their creation and adoption by users (Blackler, 2005; Cetina & Reichmann, 2015; Ewenstein & Whyte, 2009).

This research provides a rich, detailed account of knowledge mobilisation in AHPs, an under-researched group of key actors within health and social care. It provides much needed longitudinal empirical evidence to a field that has received more theoretical attention and provides an inter-group observation of knowledge mobilisation within a complex adaptive system.

This study responds to the calls for empirical research using complexity theory (Churruca et al., 2019; Holmes et al., 2016) by providing a deep exploration of the application of concrete improvement strategies within a complex system. The study captured indirect and direct outcomes that emanated from the SIS learning activity workstreams.

The different logics underpinning ambitions for the improvement learning activity, and the variations in outcome following the learning activity demonstrate that there are always multiple possibilities for adaptation and emergence within complex adaptive systems. The search for one single universal solution is not an achievable outcome. The unpredictable nature of the complex systems within the study highlighted the notion of a semi-permeable barrier to knowledge as one explanation for mechanisms that support knowledge

mobilisation. The notion of mechanisms intermittently becoming activated resulted in the same events producing multiple different outcomes. Understanding how mechanisms and feedback loops are operating within a system offers the potential to influence the system in the direction of positive cycles of change.

6.6.3 Practical Contributions

Employing realist methodology provided an ontologically deep exploration of the factors affecting individuals and collectives as they sought to create, share, and implement their knowledge to deliver changes in practice. The realist methodology also provided a reflexive space for participants to review and unpack their experiences and set these within the context of how events emerged across the wider system over time. The refined CMO theories resonated with the experience of stakeholders from a wider national context who identified with the complexity-informed explanations of outcome variation across the system. The refined CMO configurations provided practical guidance on how key factors of complex adaptive system were harnessed to support the development and spread of knowledge across the system.

The evolution of an allocentric disposition within this context created a wider pool of different forms of collective knowledge that could be applied to create innovative approaches to early intervention-prevention innovation. Framing variations as inevitable outcomes of a set of interconnected CAS with different starting points was also identified by the National AHP Reference group as helpful, providing a language to create a non-judgemental explanation of events that they felt could be usefully shared with wider audiences.

The study identified the need for planners to include time to establish reciprocal respectful relationships between agents as part of any implementation plan. This can also be applied to the development of policy, where time invested in developing relationships that facilitate deep processes of co-production secure the engagement of stakeholders and facilitate the development of effective policies capable of delivering intended outcomes.

Recognising the role of different forms of leadership, this study demonstrates how formal and distributed forms of leadership can be balanced to create stability without stifling innovation. Understanding leadership as a further form of feedback loop influencing the trajectory of the system facilitates considerations of how various forms of feedback can be presented to create

positive cycles of change while maintaining a coherent structure that enables ongoing service provision.

6.7 Personal Reflections

I came to the PhD task with the perspective of a practitioner, aiming to expand my understanding of complex adaptive systems and to identify factors that enable positive change processes across these systems. The role of knowledge was initially a secondary consideration, relating more to the funders interests. I quickly realised that the first tasks on the PhD journey were to understand how I understood knowledge and how I was going to apply this to a research process. The words ontology and epistemology moved from being philosophical labels to become a practical challenge.

As a novice researcher, the task of collecting a robust corpus of data was daunting. In the first instance the aim was to secure a 'perfect' data set that included multiple voices, balanced perspectives and foregrounded issues of concern and interest. However, this aim was reviewed as the hard practicalities of securing on-going engagement, ethical approval, and the time and costs related to collecting data from multiple sites all emerged. It was clear that despite my unfamiliarity with academic research, the skills I brought from other areas could be usefully employed to create pragmatic solutions that would help to construct an appropriate and adequate dataset that addressed the questions of interest appropriately.

Listening, facilitation and interviewing were other transferable skills I was able to apply to the research context. It was reassuring to recognise that these skills contributed to the quality of the data set, ensuring ideas were ratified and refined by participants from different levels of the system. There were also points where my prior roles and experience conflicted with the role of researcher. When dissenting views emerged, there was a temptation to employ skills of facilitation to challenge views and re-frame interpretations. This would have been inappropriate and would have resulted in a more limited range of perspectives and disrupted the open relationships that were emerging amongst participants. It was important to maintain a clear role of researcher observer rather than mediator or facilitator. The researcher role required me to focus on what was being said, and also to hold an awareness of what else participants were divulging about their experiences, relationships and the wide research context.

Capturing nuances of change over time was key to uncovering mechanisms supporting change within this context. Maintaining this aspect of the research role was exhausting, time consuming and required close attention to a cumulating volume of data. Providing a recap of quotes from the specific participant's previous interviews as a trigger for discussion on particular topics was a successful way of capturing how opinions or interpretations were evolving over time. In the early stages it was difficult to see the value of iteratively sifting through tranches of interviews carefully collecting observations of how ideas were emerging without influencing the conversation. In the later cycles of analysis, these data combined with small details, often collected as field notes and additional descriptions of behaviours within the interviews and focus groups, provided key signals of mechanisms operating across the system.

The emergent and unpredictable nature of the change process was a source of tension when the research process needed to be conducted to conform to prescribed timeframes relating to the PhD. Many transformations and adaptations continued after data collection had been completed. Consequently the study offers an incomplete picture of the system transformation relating to policy. This lack of completeness and the need for longer evaluation timeframes has been recognised as a feature of all complex adaptive system transformations (Hawe et al., 2009b; Marchal et al., 2013). The data collection period could have continued for several months more and no doubt would have uncovered many more interesting events, but in order to manage the cumulating volume of data and the timeline of the PhD, I decide the data collection period would end when I had engaged in three cycles of interviews and focus groups. At this point I had maintained contact with a core group of participants from across all levels of the system and felt that continuing for longer would have risked losing some of the balance between participants.

After data collection and analysis had been completed, the final refined theories were constructed and presented to the National Reference group, and then to NHSH AHP practitioners. The positive response from both groups who felt the finding provided a robust explanation of mechanisms operating within the context was an appropriate ending to the data collection and analysis phase of the research process.

It has however left many questions unanswered and highlighted the incompleteness of the research process, the on-going nature of the implementation process and the conscribed

nature of the area of interest. It also highlighted a change in my role and in my relationships with participants. During the data collection process, I had felt I was in a significant relationship with the participants, even though I saw myself as a participant observer. Following the presentation of the final refined theories, participants seemed to view my role differently. I had revealed myself as someone who thinks differently from them. It struck me with some sadness that I had become someone external to the AHP community. I had become a researcher.

6.8 Future Research

This study provides a series of snapshots of an implementation process. It would be useful to observe an implementation process over a longer timeframe or to return to this context at a later point to observe how further change has evolved, observing the evolution, stasis or abandonment of various feedback loops and their impact on the implementation journey. The current study could be construed as the starting point of further studies (Archer, 1995).

Some of the unanswered questions mentioned in the previous section relate to the views of a wider group of stakeholders. There was no scope within the current study to consider how innovative early intervention provisions were perceived by children and families and wider stakeholders such as education, social care and third-sector bodies. The views of this wider group of stakeholders would provide additional perspectives on how the impact of R2A and the move to a prevention agenda for AHP services supported the wider system in relation to other policy initiatives such as the Attainment Challenge. Collating these views would be particularly useful in relation to the Scottish Government's summative report on the implementation of R2A, and other policy initiatives addressing inequalities.

Adopting the complexity perspective to consider how integrated services were delivering provisions across the wider public sector infrastructure would be particularly pertinent in relation to Scottish Government policy initiatives such as the Attainment Challenge and the Early Years Initiatives where a range of public and third sector providers are working together to address inequalities. Creating a deep understanding of the emergent qualities of the system would be a useful complement to other measures and would offer the potential to understand how mechanisms operating within the system supporting desirable change as well as highlighting undesirable feedback loops within the system that have the potential to be counter-productive.

Identifying how materials that support the transdisciplinary development of collaborative practices develop, and recognising different forms of artefacts emerging within public sector contexts, could offer support to the integration agenda. Highlighting artefacts operating as boundary objects and those artefacts that are acting as barriers between services may facilitate the development of trans-disciplinary approaches to working, leading to creative and productive collaborations between individuals and agencies.

6.9 Concluding Statements

This investigation framed innovation implementation as an organisational knowledge processing activity. This study explored the nature of knowledge, not in relation to what it is, but for what it could do. Knowledge has been understood as a resource that individuals employ in learning and creates change across a system. Focusing on the movement of knowledge rather than the completion of tasks allowed consideration of a range of factors that impacted on the success or otherwise of the implementation of innovations to practice.

Adopting a complexity lens highlighted the complex nature of the healthcare context in which this investigation was conducted. Rather than aiming to control factors and maintaining fidelity to a pre-determined set of outcomes, the study demonstrated how employing the key features of interconnectivity, self-organisation and capacity to adapt in response to feedback, the key features of complex adaptive systems, created emergent change at different rates across different contexts. These small changes accumulated to deliver significant system level outcomes over time.

Capturing "the emergent property of change" (Hawe et al., 2009b) relied on achieving a holistic view of the system over time and from multiple perspectives. The single event of the learning activity resulting in many different outcomes delivered by individual participants making changes in their attitudes, beliefs and behaviours. These changes were prompted by the antecedents of an allocentric disposition and distributed forms of leadership that supported interconnectivity and self-organisation. The direction and momentum of change processes was maintained through feedback loops that included the creation and refinement of artefacts carrying knowledge between parts of the system.

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Appendix 1: RAMESES 11 Reporting Standards for Realist Evaluations

1	Title	Cover
2	Summary/ Abstract	Abstract
3	Rationale for evaluation	Abstract Ch4: Methods
4	Programme Theory	Ch 5: Findings
5	Evaluation questions, objectives and focus	Ch 4: Methods
6	Ethical Approval	Ch 4 Methods, Appendix 4.3 & 4.4
	Rationale for using realist evaluation	Ch 4 Methods
8	Environment surrounding the evaluation	Ch 4 Methods
9	Describing the programme policy, initiative or product evaluated	Ch 4 Methods
10	Describe and justify the evaluation design	Ch 4 Methods
11	Describe and justify data collection methods	Ch 4 Methods
12	Describe the recruitment process and sampling strategy	Ch 4 Methods
13	Describe in detail how data were analysed	Ch 4 Methods
14	Provide details of participants	Ch 4 Methods
15	Present the Key findings	Ch 4 Findings
16	Discuss the main findings	Ch 6 Discussion
17	Discuss both the strengths and the limitations of the evaluation	Ch 6 Discussion
18	Compare and contrast findings with existing literature	Ch 6 Discussion
19	List the main conclusions and offer recommendations where appropriate	Ch 6 Discussion

20	State the funding source, the role played by the funder and any conflicts of interest	Ch 1 Introduction Ch 6 Conclusions

Appendix 2: Synopsis of SIS Improvement Science Training

The Rationale for SIS improvement science training within NHSH

The following information has been drawn from materials provided by the from the NHSH Improvement Academy and outlines the principles behind the SIS Improvement Science training package delivered to the AHP participant to support the implementation of R2A the policy.

QI Methodology

It had been widely acknowledged and evidenced in the literature over the last ten years that healthcare globally has not consistently offered high quality care. This was evident in a number of well publicised cases of manifest failures in healthcare including the **Investigation into Mid Staffordshire NHS Foundation Trust** (2009) and more recently the public enquiry into Mid Staffordshire, the **Francis Report** (2013).The publication of NHS England's A **Promise to learn-a commitment to act** (2013) led by Don Berwick explores the reasons underlying these failings and sets out recommendations for changes with quality of patient-care and safety of patients being the primary aim and focus.

He recommends that the NHS should:

"Give the people of the NHS career-long help to learn, master and apply modern methods for quality control, quality improvement and quality planning."

NHSH has travelled a considerable distance in developing a culture of continuous improvement over the last ten years.

One of the core improvement methodologies used is the **Model for Improvement / PDSA**.

The Model for Improvement

Although at first glance the Model for Improvement (Langley et al 1992) appears simple in its design, it is actually quite comprehensive in its ability to achieve changes. The model has three basic questions and an implementation tool which is the Plan-Do-Study-Act cycle (PDSA) mentioned above. This tool, combined with the three questions, helps the user set the aims, set the measures and identify ideas for change. The key of PDSA is to test small changes rapidly to build knowledge through learning what works and what does not. It allows the user to test and refine in real time. A key mistake is to scale the PDSA up too quickly. For example, the idea is to test one patient within one ward/clinic with one doctor and then re-test quickly, building up to full scale implementation in small increments.

The Delivery of the SIS Improvement Science training to AHP Staff within NHSH

The SIS Improvement science learning activity was conducted over 7 sessions between September 2016 and May 2017. The 24 participants were drawn from the 6 largest AHP professions and AHP leaders arranged a proportional representation of each of the AHP professions. Some of the professional groups included in the training had a part-time commitment to children and young people, spending most of their working lives within adult services. Other professions spent their whole working commitment within services to children and young people. Three of the professionals included in the SIS training also held AHP (managerial) responsibilities. One AHP group, orthoptics, was unable to provide a representative for the SIS workstream due to low numbers of staff within NHSH.

This table reflects the SIS workstreams and participants at the beginning of the SIS learning activity in September 2016. Several participants left the training cohort and some workstreams were disbanded following the completion of the training programme without concluding the intended tasks.

AHP Profession	**No.**	**Participant workstreams**
Occupational Therapists (OT)	6	Request for Assistance (RFA)
Physiotherapist (PT)	6	Job Planning (JP)
Speech & language Therapists (SLT)	6	Feedback and Engagement (F&E)
Dietitians (D)	3	Staff Support (SS)
Podiatrists (PO)	2	Access & Awareness (AA)

Appendix 3: NHS Scotland Ethical Approval

NHS Tayside

02 June 2017

Mrs Anne-Marie Craig
School of Management
University of St Andrews
Gateway Building
North Haugh
St Andrews
Fife
KY16 9RJ

Dear Mrs Craig,

R&D MANAGEMENT APPROVAL – TAYSIDE

Title: From Framework to Real Work: Innovation Implementation through a Complexity Lens A Realist Evaluation of Allied Health Professionals implementation of changes in service delivery required by a **national policy initiative.**

Chief Investigator: Mrs Anne-Marie Craig

Principal Investigator/Local Collaborator: Mrs Christina Kiddie

Tayside Ref: 2017PS004 **NRS Ref: N/A**

REC Ref: MN12714

Sponsor: University of St Andrews

Funder: Scottish Improvement Science & Collaboration Centre

Many thanks for your application to carry out the above project here in NHS Tayside. I am pleased to confirm that the project documentation (as outlined below) has been reviewed, registered and Management Approval has been granted for the study to proceed locally in Tayside.

Approval is granted on the following conditions:-

- All Research must be carried out in compliance with the Research Governance Framework for Health & Community Care, Health & Safety Regulations, data protection principles, statutory legislation and in accordance with Good Clinical Practice (GCP).
- All amendments to be notified to TASC R&D Office via the correct amendment pathway. Either direct to the R&D Office or via the Lead Co-ordinating Centre depending on how the study is set up (http://www.hra.nhs.uk/shslsc-rd-uk-process-management-amendments/).
- All local researchers must hold either a Substantive Contract, Honorary Research Contract, Honorary Clinical Contract or Letter of Access with NHS Tayside where required (http://www.nihr.ac.uk/about-us/GCP/policy-and-standards/research-passports.htm).
- TASC R&D Office to be informed of change in Principal Investigator, Chief Investigator or any additional research personnel locally.
- Notification to TASC R&D Office of any change in funding.

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- As custodian of the information collated during this research project you are responsible for ensuring the security of all personal information collected in line with NHS Scotland IT Security Policies, until destruction of this data.
- All eligible and adopted studies will be added to the Central Portfolio Management System (CPMS). Recruitment figures for eligible and adopted studies must be recorded onto the Portfolio every month. This is the responsibility of the lead UK site. If you are the lead, or only UK site, we can provide help or advice with this. For information, contact Sarah Kennedy (01382 383882 or sarah.kennedy11@nhs.net) or Laura Stephen (01382 383985 or laura.stephen2@nhs.net).
- Annual reports are required to be submitted to TASC R&D Office with the first report due 12 months from date of issue of this management approval letter and at yearly intervals until completion of the study.
- Notification of early termination within 15 days or End of Trial within 90 days followed by End of Trial Report within 1 year to TASC R&D Office.
- You may be required to assist with and provide information in regard to audit and monitoring of study.

Please note you are required to adhere to the conditions, if not, NHS management approval may be withdrawn for the study.

Approved Documents

Document	Version	Date
Protocol	1	March 2017
Participant Information Sheet (PIS)	2.0	March 2017
Informed Consent Form (ICF)		
Invitation Letter	1	April 2017
IRAS R&D	5.4.2 (224297)	18 April 2017
IRAS SSI	5.4.2 (224297)	04 May 2017

May I take this opportunity to wish you every success with your project.

Please do not hesitate to contact TASC R&D Office should you require further assistance.

Yours sincerely

Elizabeth Coote
Head of Non-Commercial Research Services

TAyside medical Science Centre (TASC)
Ninewells Hospital & Medical School
TASC Research & Development Office
Residency Block, Level 3
George Pirie Way
Dundee DD1 9SY
Email: liz.coote@nhs.net
Tel: 01382 383876 Fax: 01382 740122

C.c. Mrs Christina Kiddie

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Appendix 4: University of St. Andrews School of Management Ethical Approval

University of St Andrews | FOUNDED 1413

University Teaching and Research Ethics Committee

13 April 2017

Dear Anne-Marie

Thank you for submitting your ethical application which was considered by the School of Management Ethics Committee and the following documents were reviewed:

1. Ethical Application Form
2. Participant Information Sheet
3. Consent Form

The School of Management Ethics Committee has been delegated to act on behalf of the University Teaching and Research Ethics Committee (UTREC) and has granted this application ethical approval. The particulars relating to the approved project are as follows -

Approval Code:	MN12714	**Approved on:**	13 April 2017	**Approval Expiry:**	13 April 2022
Project Title:	From Framework to Real Work: Innovation Implementation through a Complexity Lens				
Researcher(s):	Anne-Marie Craig				
Supervisor(s):	Professor Huw Davies and Dr Alina Baluch				

Approval is awarded for five years. Projects which have not commenced within two years of approval must be re-submitted for review by your School Ethics Committee. If you are unable to complete your research within the five year approval period, you are required to write to your School Ethics Committee Convener to request a discretionary extension of no greater than 6 months or to re-apply if directed to do so, and you should inform your School Ethics Committee when your project reaches completion.

If you make any changes to the project outlined in your approved ethical application form, you should inform your supervisor and seek advice on the ethical implications of those changes from the School Ethics Convener who may advise you to complete and submit an ethical amendment form for review.

Any adverse incident which occurs during the course of conducting your research must be reported immediately to the School Ethics Committee who will advise you on the appropriate action to be taken.

Approval is given on the understanding that you conduct your research as outlined in your application and in compliance with UTREC Guidelines and Policies (http://www.st-andrews.ac.uk/utrec/guidelinespolicies/). You are also advised to ensure that you procure and handle your research data within the provisions of the Data Provision Act 1998 and in accordance with any conditions of funding incumbent upon you.

Yours sincerely

Convenor of the School Ethics Committee

cc Supervisor

School of Management Ethics Committee, The Gateway, North Haugh, St Andrews, Fife, KY16 9SS
management.ethics@st-andrews.ac.uk

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Appendix 5: Developing Provisional Programme theory

Documentary Sources

NHSH 5 year transformation plan	**NHS 5 year transformation Plan Service Redesign** – Ensuring high-quality, seamless, safe and sustainable services and care across the health and care system in "Heathcliff"
Scottish Improvement Journey	Confidence in a proven method which delivers measurable results. The method and behaviours resonated with people, fitted with their values - non-punitive, 'All teach, all learn' approach, empowerment gives energy and motivation. Simple to learn and teach, people do not need to become experts before starting to use the method. Consistency of method across programmes. Flexibility – local flexibility, also applied to programme design itself. **Challenging** Initial difficulties with competing methodologies - programmes worked in silos due to a lack of understanding and trust in one another. Balancing leadership mandate with allowing people the freedom to design their own interventions. Ensuring good understanding of methodology before people apply it. **Successful in relation to workforce** Strong will and motivation to work towards aims –visionary aims of working together for the greater good by making care safer or improving the lives of children resonated with everyone. Empowerment to create and drive forward improvement owned locally while knowing it is aligned to the big picture (EYC, RAfA, PACE). **Challenges** Need for understanding why the reason for the programmes, and what the impact of the teams' work is, or disengagement may result. Convincing subject matter experts that there is a better way of putting evidence into practice – or even that traditional methods don't work. A lack of skill or will or capacity to reliably record the iterative steps of testing changes which are needed to articulate key interventions for national spread.
Ready to Act	Locally, AHP directors will be accountable for implementation of the plan, but it is expected that AHP children and young people's leads will be given

	authority to drive forward activities for local implementation in partnership with stakeholders. The AHP Directors will be responsible for developing implementation plans in collaboration with AHP children and young people's leads and reporting against improvement activity in relation to the five ambitions, answering the following questions. • How are we doing? • How do we know? • What can we do differently to speed up implementation? • Local implementation plans will set out proposals to develop quality information/evidence of the impact of transformation on well-being producing evidence of quality leadership in service change and activity in relation to implementation of the ambitions and actions of this plan • providing training that will help to make quality improvement sustainable across AHP services for children and young people in Scotland
3-Step Improvement Framework for Scotland's Public Services	Decisive shift towards prevention Greater integration of public services at local levels Greater investment in people who deliver services a sharp focus on improving performance using the specifics of improvement methods to provide a guide for action
Changing the World: An approach to public service improvement in Scotland, the strategic context	

Interviews

Lead AHP NHSH	"Everything will make an impact and have outcomes for families. And so, the key contributions are that we will have better outcomes for families in 5 years. It's giving us a direction of travel, a consistency across Scotland. A consistency across AHP sin Tayside, a vision, a direction to go. So, its key contribution is actually being quite clear this is what we want you to do I think for the staff group as well. If we can get there. And if people buy in to everything. Or enough o If we can work with them in different ways and embrace what they're doing. And actually, help families to engage with them in a way that's meaningful as well then, I think that's got to be a huge contributor. f it. It can make their working lives better as well. And it's how we work with our teams, how we listen to our teams. How we try to support them. How we try to involve them in the coming forward and

	actually working together. I think one of the challenges is been this is an AHP strategy. And what we have is a range of professions within that who have and do a lot of really good uni-professional work. And some of the staff groups work together. And some of them never work together and never see each other. So why would they come together now is the question? And so, I suppose one of the challenges has been a. Their understanding of each other. What role, what unique contribution all of them can bring. But also, what emm commonality there is. And what is it that any of us can do, what is it that we're all here for and why. We've worked on that over the past year with folk. We've very much as you know, focused on workforce this year. And trying to build capacity in the workforce in terms of knowledge, skills, understanding and confidence. But actually, you can't make people think in certain ways. So, you can give them opportunities, you can give them training And so, people and also, they are testing out tools and improvement methodology and things. So, I think some of the challenge has been feeling like a. they've got time to do it as well as the will to do it. But also, is what you're doing, you're making us get smaller and smaller and smaller in whatever we're testing. And is that actually going to make a difference in the end of the day for families".
Scottish Government	"Joined up delivery useful and effective services in times of austerity. Community of AHP who share commonality. Make a difference to service users, create a wider context. Help people make change".
National Lead	"I think it links into a whole lot of really deeply entrenched things that we've struggled with in the past. Like waiting times, like through put, like people accessing good evidence informed literature and strategies early on. And it's really one of the biggest impacts locally that people are reflecting is that it's really changed the conversations they're having with families but also with other people that they work with. Even in times of austerity, they're feeling that they're able to deliver something that's useful and effective. So, I think, it's benefited the workforce. I think it's easier to demonstrate the impact on service. So, I think keeping the momentum in smaller areas has been a huge challenge. I think keeping everybody focused on the key outcomes that we're looking for. Not letting folk stray off. Allowing local variation but keeping to some kind of structure has been a big challenge".
Local AHP Lead	The ambition is to employ QI strategies to RTA implementation. The local AHP lead has a background in improvement work consortium as part of national steering group. She also highlighted personal experience of failure in trying to implement a change in service delivery. Her vision was to increase improvement capacity across the organisation.

Provisional programme theories:

System Level	Context (C)	Mechanism (M)	Outcome (O)
National (Macro)	Implementing the RTA framework	will focus AHP services on early intervention-prevention activities	to improve outcomes for children and young people in Scotland
National (Macro)	Implementing the RTA framework	will be supported by building the knowledge, skills and confidence of local practitioners to implement change through a proven methodology of improvement science	to enable ideas to be turned into action and connect action to learning, supporting the spread of early intervention-prevention practices
Local (Meso)	The SIS Improvement Science learning activity	will provide a forum for multi-professional learning which will enable AHP practitioners to work together and with wider stakeholders	to develop collaborative early intervention-prevention practices
Local (Meso)	The SIS Improvement Science learning activity	will capture evidence of system and practice changes	to demonstrate delivery of early intervention prevention practices.
Individual (Micro)	The SIS Improvement Science learning activity	will facilitating inter-disciplinary working across geographical, organisational and professional boundaries	to maximise the benefits of knowledge mobilisation in support of the development of early intervention-prevention practices

Appendix 6: Semi -Structured Interview/ Focus Group Protocol Tranche 1

Theme	Logic	Questions
Warm-up	Orientation to topic Establish rapport	Can you begin by explaining about your role in NHST/ NHS Scotland?
		What impact do you think the Ready to Act (R2A) ambitions are having on your role?
Explore personal context	Set where this individual is orientated. Look for dispositions	What do you see as the key contributions of the R2A framework?
		Who do you think would benefit from these contributions?
		Are there any difficulties that you have encountered or that you predict going forward?
		Who do you think would need to be involved in addressing these issues
Explore impact on relationships	Seek observations of intra or inter professional relationships	Tell me about the relationships between AHP professionals. What about relationships within the different professions, have they been impacted in any way?
Explore impact on practice	Elicit ideas around staff experience which suggests possible mechanisms	Can you identify and changes in practice? What do you think were the key influences in delivering these changes?
		How do you feel the practitioners have coped with this process?
		How do you see it impacting on their routine practice?
Look for changes in attitudes, beliefs, values	Looks for similarities and differences across levels and over time	Can you suggest an epitaph for your contribution to R2A? How would you want to be remembered in relation to R2A?

Appendix 7: Semi -Structured Interview/ Focus Group Protocol Tranche 2/3

Theme	Logic	Questions
Warm-up	Orientation to topic Establish rapport	Can you tell me a bit about how things have progressed since we last met?
		What impact do you think the Ready to Act (R2A) ambitions are having on your role?
		Have there been changes to targets and ambitions or timeframes?
Explore personal context	Set where this individual/ group is orientated. Look for tensions and conflicts.	Have there been any changes in your roles
		Are there other changes you have noticed in terms of the delivery of R2A?
		Are there any difficulties that you have encountered or that you predict going forward?
		Who do you think would need to be involved in addressing these issues
		Can you suggest and epitaph for you in relation to RTA implementation?
Explore impact on relationships	Seek observations of intra or inter professional relationship changes. Look for further comments on how SIS is progressing.	What about relationships within the different professions, have they been affected in any way?
		How are the SIS workstreams progressing?
		How do you feel management is approaching the implementation?
Explore impact on practice	Elicit ideas around staff experience which suggests possible mechanisms	Can you identify and changes in practice? What do you think were the key influences in delivering these changes?
Look for changes in attitudes, beliefs, values	Looks for similarities and differences across levels and over time	Can you suggest an epitaph for your contribution to R2A? How would you want to be remembered in relation to R2A?

Appendix 8: NVivo Node Summary Report

11/01/2019 12:06

Source Type	Number of Sources	Number of Coding References	Number of Words Coded	Number of Paragraphs Coded	Duration Coded
Node					
Nickname:	**Nodes\\Complexity Features**				
Classification:					
Aggregated:	**No**				
Document	24	122	3,894	124	
Nickname:	**Nodes\\Deliberate Learning Activities**				
Classification:					
Aggregated:	**No**				
Document	3	3	48	3	
Nickname:	**Nodes\\Deliberate Learning Activities\Effectve Conversations**				
Classification:					
Aggregated:	**No**				
Document	19	77	4,703	77	
Nickname:	**Nodes\\Deliberate Learning Activities\SIS Improvers Training**				
Classification:					
Aggregated:	**No**				

Aggregated:	**No**				
Document	6	8	636	8	

Nickname:	**Nodes\\Structural Maintainance- Innovation**
Classification:	
Aggregated:	**No**

Document	30	399	18,126	411	

Nickname:	**Nodes\\Top down - Distributed Leadership**
Classification:	
Aggregated:	**No**

Document	27	328	15,536	330	

Source Type	Number of Sources	Number of Coding References	Number of Words Coded	Number of Paragraphs Coded	Duration Coded

Nickname:	**Nodes\\Uni-professional - AHP**
Classification:	
Aggregated:	**No**

Document	30	297	15,763	309	

Appendix 9: Participant's Epitaph Comments

The idea behind asking for an epitaph at each interview or focus group was some attempt to capture beliefs and values of individuals and groups and a sense of where they were in terms of their commitment to the work of the workstreams and the RTA implementation process. These comments referenced key themes which emerged in the wider research: allocentric disposition, leadership, feedback and variation and cohesion around the policy intention. This is a bit of a sense check to demonstrate I have identified issues that re important to the context and to the participants.

These epitaph observations capture something of the attitudes and patterns of social interaction between participants even though most of these quotes were given in a private interview with the researcher.

Key Research Themes	**Wider Social Context Factors**
Awareness, cohesion around the outcome: positive changes for children &families	
An external rather than internal focus (considering the impact on others, i.e. workstream, workforce, children & families rather than self. (allocentric disposition?)	Continuing commitment to engaging in the tasks over a long term.
Leadership	An element of humour
Variations in level of +/- feelings about the implementation/ workstream tasks	Feelings of agency.

Participant	**Tranche 1**	**Tranche 2**	**Tranche 3**
Leader 1	I've done an OK job. I know I didn't get it right. But that's improvement.	She did the best she could. Knowledge. And effort.	It's a long culture shift process. And we need to be patient. Grab the successes.

Leader 2	We made it happen. Doing what we said and delivering. Tranche 1	a leader who encouraged staff to be in a positive place.	She was a pretty good leader. Not excellent, cos I don't think I am. But actually, she was pretty good. We've had worse.
Leader 3	Articulate the story and make that change happen for people in Scotland.		
Leader 4	I suppose passion. And vision. Making a difference to families and their outcomes.	Managed to stay focused or return to focus. And stay passionate through it all. Get what they need as soon as they need it. And what they need isn't necessarily direct intervention.	I suppose what I would like them to remember is that resilience. Managed to stay focused or return to focus. And stay passionate through it all.
Leader 5	Influencing people to change practice.		Changing the way that services are delivered to meet the needs of families.
Focus Group 1	People jobs and allocating time.		Valuing everyone's perspective. Valuing what you do
Practitioner 1	If not for want of trying. Couldn't have put more in.	I feel a bit frustrated.	I just find it frustrating.
Practitioner 2	Just the recognition that this needs to be a slow win not a fast win.	Best for the children, best for the team.	I just feel 'and so it goes on'. Mush, keep them going. Keep them moving.
Practitioner 3	We tried		She was willing
Practitioner 4	We came, we did and maybe we're conquered.		I think atleast I've been there as a voice.

Appendix 10: Chronology of Engagement with AHPs

Date	Activity	Outcome
03.07.16	Initial contact with SLT2 Lead HP for via LINKEDIN	Responded and suggested meeting.
27.07.16	Meet SLT2 at CQ2 Glasgow and present initial idea for PhD proposal talking about knowledge mobilisation, innovation implementation, Klein & Sorra innovation climate, Margaret McCartney realistic medicine	Lead HP suggested presenting to AHP forum to gauge if there was interest in being involved in this research.
19.08.16	Present initial proposal to AHP forum. Lots of interest, questions and positive responses. Requested interested groups should email me to discuss further what involvement might be possible.	4 different Scottish HB expressed some interest in taking part.
30.08.16	Phone call with Lead AHP 1 who is likely to be interested in being involved with research and has number of possible project which would fit.	
02.09.16	Phone call with AHP Lead 2 from island community who would be interested in taking part in research.	Need to look into the practicalities of this in terms of cost and accessibility but would be good contrast.
16.09.16	Phone call with AHP Lead 3 from other area to discuss potential projects. The ideas here are less developed and the fit with the	The role of education and social care as integrated services is also a complication which might

	research objectives is less clear so this may not be the best option to pursue.	make it difficult to capture all the info that could be relevant. Seem a bit too broad for this investigation.
07.10.16	Invited to present to NHSH HB AHP implementation group. Lots of questions around what would be involved, how would it impact on their work. Observed lots of potential contexts through feedback to group on individual projects	Group invited me to attend further implementation group meetings to decide how we could progress this idea.
14.10.16	Second meeting with AHP Lead 1. Initial idea for context of investigation not likely to progress within planned timeframe as funding not secured. Discussed other potential options and thought multi-disciplinary group might be good option to focus on.	Will discuss further.
3.11.16	Attended R2A project action group for NHSH at. Identified 2 likely projects for investigation with PT and OT.	Invited to attend future meetings with this group.
08.11.16	Meet SLT2 to discuss progress so far, check ethic requirements from Scot Gov. St.Andrew's ethical approval likely to be sufficient. Discussed Early Intervention: what does this mean.	Decided I could address AHP forum to get their views.
02.12.16	Presented series of question on understanding of EI to AHP forum representatives from across all HB is Scotland (Lead AHPs) participated	Provided summary document
16.01.17	Request from SLT2 to send latest proposal for her to share with scot Gov lead AHP.	Sent copy of up-grade doc.

07.02.17	No response from SLT2	Sent copy of presentation slides for info
07.02.17	Contacted NHSH AHP Lead 4 re moving project on and identifying specific groups to include in investigation	AHP Lead 4replied with holding email so will contact again next week
09.02.17	Email from AHP Lead 1 bounced back.	Checked address and re-sent.
13.02.17	No response from AHP Lead 1	Sent further email
15.02.17	Further email to PT1 thanking her for interest.	
28.02.17	Phoned AHP Lead 1. Spoke briefly to confirm email	re-send email to address given
01.03.17	Email AHP Lead 4 to ask if I could join meeting on 7.03.17	This meeting has been cancelled but she will approach practitioners to request they contact me.
01.03.17	Email to SLT2 with reference re use of theory in implementation.	
29.03.17	Reply from SLT2 asking if there was anything she could help with	Replied to email and explained current situation re participants.
6.04.17	Met with AHP Lead 4 from NHSH	Agreed commitment to research.
19.04.17	UREC secured.	
20.04.17	Attended AHP Meeting in NHSH and secured agreement to engaged with research from AHP practitioner	Set dates to begin work with workstream groups (11& 18th May).
20.04.17	NHSH R&D IRAS forms submitted.	
25.04.17	Attended Skills Improvement Scotland Training Day at Improvement Academy NHSH for AHP improvers presentations.	Secured further engagement with, SIS trainer and Lead AHP.

11.05.17	Meeting with Job Planning workstream. Signed consent forms and conducted initial focus group.	Further focus group to be conducted Sept 2017
18.05.17	Meeting with Request for Assistance workstreams. Signed consent forms and conducted focus group.	Further focus group arranged for August 2017
31.05.17	Met with colleague from Warwick University to discuss progress.	Suggested widening scope to dynamic service setting rather than health settings.
7.06.17	Attend AHP NHSH Development Day	Secured further interview with and confirmed agreement
14.06.17	Social Research Association Qualitative Analysis training day in London.	Work on developing matrix/ fieldwork approach to analysis
27.06. 17	Interview with T1, SIS training facilitator at Improvement Academy, Ninewells Dundee.	T1 UTA. Email sent to re-arrange new time when she returns to work.
06.07.17	Interview with Service Manager, Improvement lead for Child Health, NHS Tayside	Interview recorded and transcribed
07.07.17	Interview with OT1 Service Manager, NHS Tayside	Interview recorded and transcribed.
07.07.17	Decision made to extend NHST Year 1 of implementation to Dec 2017. Plans for yr 2 will begin Jan 2018.	Need to consider the impact of this on timing of focus groups/ interviews. Are more required? Does this

		impact on ethical approval? Should I change timings ?
14.07.17	Interview with D1 Scottish Government.	Interview recorded and transcribed
01.08.17	Interview with SLT1	Interview recorded and transcribed
24.08.17	Interview with SLT2	Conflict with dates. Postponed until 1/09/2017
24.08.17	RFA workstream meeting (? focus group 2)	Jan 2018
01.09.17	Interview with SLT2 in Glasgow	Asked for contact with other potential participants
05.09.17	AHP Study day NHS Tayside	JP workstream meeting for 20.11.17 cancelled. This should perhaps move to Jan 2018.
14.09 .17	Emergency Leave of Absence	
07.11.17	Contact with participants to arrange meetings and focus groups for Jan-March 2018	
5.12.17	Meeting with RFA group cancelled	Re-arranged for 08.01.18
5.12.18	AHP network meeting cancelled	Participants will contact with new date
	Cycle 2 Data Collection	
31.01.18	Interview 2 OT1	Interview recorded and transcribed
02.02.18	Interview 2 PT1	Interview postponed till 13.02.18
05.02.18	Focus Group 2 JP	Group recorded and transcribed
08.02.18	Focus Group 2 RFA	Cancelled. Postponed indefinitely. Contacted

		individuals to request interviews.
13.02.18	Interview 2 PT1	Interview recorded and transcribed
15.02.18	Interview OT3	Interview recorded and transcribed
24.02.18	Interview 2 SLT1	Interview recorded and transcribed
24.02.18	Interview 2 SLT2	Interview not recorded. Field notes
02.03.18	AHP Network meeting	Cancelled due to weather
08.03.18	SLT Scotland Hub Day: Transforming SLT Services	fieldnotes
15.03.18	Interview SLT4	Interview recorded and transcribed
27.03.18	Interview PO1	Interview recorded and transcribed
06.04.18	AHP Network meeting	cancelled
04.05.18	Annual review presentation to K&P group	satisfactory
12.05.18	Contact with participants to arrange meetings and focus groups for May-Aug 2018	
31.05.18	Interview OT1 3.2	Interview recorded and transcribed
01.06.18	AHP T Network meeting	Field notes
04.06.18	Interview SLT1 3.5	Interview recorded and transcribed
18.06.18	Interview PT1 3.1	Interview recorded and transcribed
20.06.18	Focus Group 3.1	Interview recorded and transcribed
06.06.18	Interview SIS Trainer 3.6	Interview recorded

07.06.18	Interview EC Trainer	No response to further enquiry
29.06.10	Interview 3.7 D3	Interview recorded and transcribed
22.06.18	Present to National AHP Forum	Postponed to Aug 2018
05.07.18	Interview 3.2.3 PO1	Interview recorded and transcribed
12.07.18	Interview 3.2.2 OT3	Interview recorded and transcribed
19.07.18	Interview 3.2.3 SLT4	Interview recorded and transcribed
30.07.18	Interview 3.5 SLT2	Interview recorded and transcribed
03.08.18	Invitation to join NHSH AHP Network	Observed meeting and updated group on research progress
19.12.18	Present findings to National AHP Network	Lively discussion, recognised mechanisms described within various HB contexts
17.01.19	Present findings to NHSH workforce at Staff Development Day	