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Designing sustainable business models for telehealthcare services adoption: A critical realism informed case study approach

Suman Bhattacharya
Northumbria University, suman.bhattacharya@northumbria.ac.uk

David Wainwright
Northumbria University (Emeritus), david.wainwright@northumbria.ac.uk

Jason Whalley
Northumbria University, jason.whalley@northumbria.ac.uk

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Suman Bhattacharya, David Wainwright & Jason Whalley

Newcastle Business School, Northumbria University, City Campus East, Newcastle upon Tyne, NE1 8ST, UK

Email for correspondence:
suman.bhattacharya@northumbria.ac.uk
david.wainwright@northumbria.ac.uk

Abstract

A rising elderly population in England, together with the prevalence of long-term chronic health conditions and higher demands for social care, raise significant issues in terms of financing the provision of telehealthcare services. These emerging technologies can potentially provide more meaningful opportunities for operational efficiency and cost savings by supporting 'ageing in place', as opposed to an increasing reliance on commissioning expensive institutional provisions such as care homes. Accordingly, policymakers advocate the provision and implementation of telehealthcare services on an increased population scale. This study employs an investigative framework that brings together two interdisciplinary and complementary theoretical frames, synthesised from the existing literature on business models and service innovation. Using the principles of Critical Realism (CR) to inform a qualitative case study research design, we empirically contextualise our value-driven investigative framework and present our findings that identify four main themes, namely (i) Nature of the service, (ii) Advocacy and collaborations, (iii) Organisational characteristics, and (iv) Technology and Information systems. These four themes emerging from the empirical investigation concern value proposition, value co-creation and value realisation within a service and inform our next stage of CR analysis – to unearth the hidden structures and causal mechanisms and to better explain the underlying reality within a service ecosystem.

Keywords: Telehealthcare, Telehealth, Telecare, Business Model, Service Adoption, Critical Realism, Technology Enabled Care, Digital Healthcare

1. Introduction

The English NHS, along with Local Authorities, face an increasingly difficult set of challenges related to the effective planning, commissioning and provisioning of telehealthcare services. NHS England budget deficit is expected to reach £6 billion by 2020-21 (Gainsbury, 2016). Over two-thirds of NHS activity and an estimated eighty per cent of costs are related to only one-third of the population, made up predominantly of older people with long-term conditions and/or disabilities, and focused on delivering expensive secondary care services in hospitals or care homes (DOH, 2006). These constrained budgetary challenges necessitate finding innovative

strategies for more efficient provisioning and delivery of care services. It is anticipated that this can be achieved through leveraging the 'preventative' role of digital health technologies and by taking advantage of the rapid development of technology innovations (TSA, 2017). Such technology-enabled services allow preventions and early actions, potentially reducing the cost of care by shifting the focus of care delivery from institutional settings to more community-based and self-directed alternatives (Benson, 2006), and supporting people to remain independent and live in their own homes (DOH, 2005; Bardsley et al., 2011).

During the last two decades, increasing shifts in the UK Government's policies related to health and social care services emphasise the importance of a person-centred approach anchoring on principles of greater personalisation, maximisation of choice and control for the patients/users (Ferguson, 2007; DOH, 2007). The potential of digital technology-based assisted living services such as telehealthcare (or also often more broadly referred to as assistive technologies), to address self-directed and complex care needs associated with long term conditions, for example, dementia is acknowledged in both academic and policy literature (Roulstone et al., 2013; Health Committee, 2014; Knapp et al., 2016).

Within the context of the rising demographics related to the elderly population and the associated increasing demand for coping with complex healthcare needs, current research provides a growing evidence base which indicates that despite the strategic visions and policy guidance conveyed in published UK government documents, the full potential of telehealthcare systems in transforming healthcare services are yet to be realised on a large scale in the UK (Barrett et al., 2015; Goodwin, 2010; May et al., 2011; Lennon et al., 2017). The evaluation of benefits and outcome-related effectiveness has often been cited as crucial factors affecting the wide-spread diffusion and adoption of telehealthcare technologies (Barlow and Hendy, 2009; Beale et al., 2010). *Health Technology Assessment* (HTA) using quantitative techniques such as *Randomised Control Trials* (RCT), an established model for the production of evidence within a Clinical medicine dominated English healthcare culture, is considered to be inappropriate for the assessment/justification of benefits and business Cases for complex and multi-stakeholder service delivery interventions such as telehealthcare (Williams et al., 2003; Barlow and Hendy, 2009). An integrated approach that investigates the sociotechnical and organisational issues that may result

in creating barriers to collaborative working and partnerships can facilitate a better understanding of the potential challenges for integrating health and social care information systems (Waring and Wainwright, 2015).

Telehealthcare has been described by Sugarhood et al. (2014) as a complex and diverse "user system" in which aligning interests across a wide range of stakeholders remains critical yet challenging. In this paper, we argue that an ecosystem approach provides a new way of conceptualising the complex telehealthcare landscape, by providing a systemic view in exploring issues related to participation, partnerships, and collaboration between all the concerned stakeholders within a broader business environment (Adner, 2017).

In the UK, while health and social care services are primarily provisioned as public services, using public funding and national systems of health and care (The NHS and Local Authorities), the delivery of such services are getting increasingly market-oriented (Bartlett and Le Grand, 1993; Barron and West, 2017) within an economic landscape of 'mixed-economy of supply' (Rodrigues and Glendinning, 2015). A lack of coherent and sustainable service business models has been perceived as one of the key barriers to large-scale adoption and implementations of telehealthcare systems (May et al., 2011). Our review of literature suggests that prior and contemporary research does not sufficiently address the business model and service perspectives, particularly in the UK context (Oderanti and Li, 2016; Barlow, 2012). However, we argue that these perspectives are critical for the practical justification and adoption of complex health service innovation, especially telehealthcare. Accordingly, our research study brings together two interdisciplinary and complementary theoretical frames, synthesised from the existing literature on business models and service innovation, to propose new conceptualisations of value in a service. A theoretical framework is developed in order to examine, interrogate and explain the phenomena of value creation and value realisation within a telehealthcare service ecosystem.

Initially, using an interpretive case study based approach, and then latterly a critical realist framework for analysis, this qualitative study employs a multiple case-based research design, resulting in five Case studies of telehealthcare services in the North East of England. This paper represents the first part of the findings from this empirical research, focusing on the results from the initial pilot study of telehealthcare services delivered by a major North East of England provider for social housing along with a

complex network of stakeholder organisations. A later series of papers will then focus on a comparative review of the case study findings, developing and using a critical realist framework and analytical lens.

The paper starts with an overview of relevant literature followed by a description of the research methodology employed for the data collection and case study analysis. The initial pilot study findings are then outlined, followed by discussion and conclusions focusing on the development of a new approach to developing the more relevant business model and service designs, adaptable to the context of complex telehealthcare ecosystems. It is anticipated that these findings can then potentially inform and enrich the future designs of telehealthcare service models within the context of the English health and social care systems.

2. Literature Review

2.1. Viewing Telehealthcare systems as Ecosystems

A typical telecare system (see Figure 1. below) uses a range of electronic devices (with sensors) and a base unit installed at a user's home (or worn by the user), which are connected to a remote monitoring centre through ICT network. These sensors monitor vital health status (such as falls) for elderly users and also, monitor the environment at their home (such as detection of flooding, gas leaks, smoke, or fire). In case of emergencies, these sensors trigger alarms (automatically or through manual action by the user) and send alerts to a remote telecare monitoring centre. The telecare call centre, in turn, acknowledges the alarm and responds appropriately following an established protocol as part of the service agreement. A similar technological configuration to telecare may also be used for telehealth systems, primarily used for remote home monitoring and diagnosis of vital health signs, patterns and health analytics. Telehealthcare as a term is used to refer either to telecare or telehealth systems individually or in more sophisticated cases when used in some form of combination. The predominant communications technology used for telecare is traditional analogue telephone network connections (pull cords, fall sensors, speakers and call centres), whereas telehealth may make greater use of digital communications technologies through 3G and 4G mobile telecommunications networks (primarily mobile phones). A typical telehealthcare service delivery model for remote monitoring of health and wellbeing is shown in Figure 2.

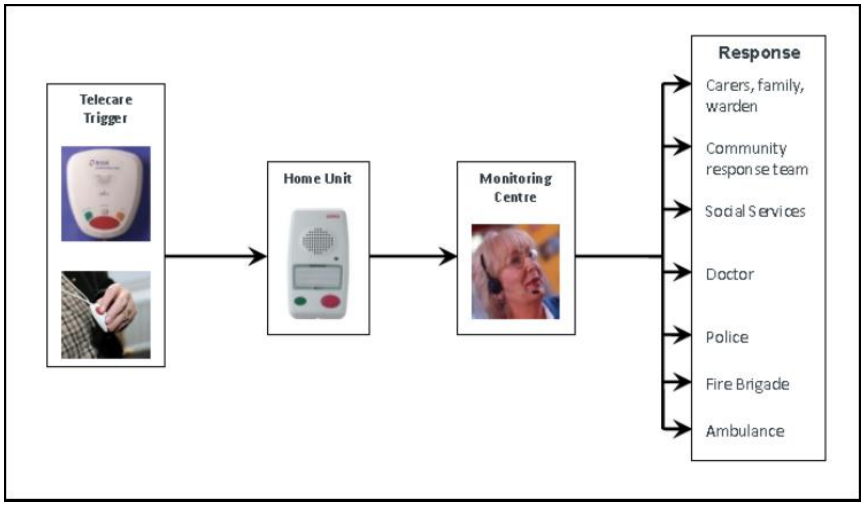

Figure 1. Basic Monitoring and Response for Telecare
(Source: adapted from Brownsell and Bradley, 2003, p. 8)

In addition to the telehealthcare service provider, this level of the service delivery potentially involves a wide range of stakeholder organisations, as listed below:

- Commissioners of adult social care services (local authorities),
- Commissioners of Health services (NHS CCG),
- Providers of other public services (such as Ambulance and Fire services),
- Providers of Housing services
- Providers of other care services, for example, Homecare services,
- Health organisations, for example, GPs, District Nurses and Hospitals and,
- Partners and Collaborators within the TECS industry such as manufacturers /suppliers, solution providers and TSA

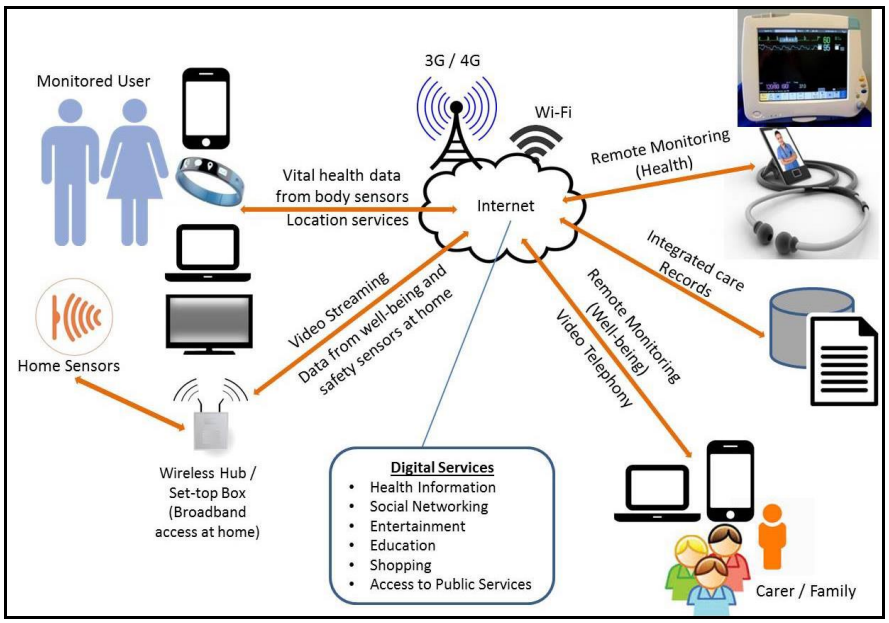

Figure 2. Remote Monitoring for Health and Wellbeing (Source: authors' own illustration)

In our study, we argue that a telehealthcare service may be better appreciated as an ecosystem, by viewing an illustration of Call Centre operations showing the multiple technology platforms, infrastructure and organisation stakeholders that may be involved in the resolution of any alarm call, in Figure 1. The metaphor of a 'business ecosystem' has been widely used in the academic literature to represent a loosely bound community of interacting entities (or actors) with varying roles and capabilities, and their relationships which determine the overall effectiveness at an aggregated level (Iansiti and Levien, 2004; Moore, 1993). Such a metaphor provides a useful lens to adopt a systemic view in exploring issues related to participation, partnerships, and collaboration within a broader business environment (Adner, 2017). Discussions made so far suggest that an investigation into telehealthcare services necessitate 'Systems Thinking' approach (Chughtai and Blanchet, 2017), to adequately capture the complexity of relationships and interactions, and diversity of the loosely coupled communities of associated actors - defined by their networks and affiliations, rather than being part of a rigid, hierarchical structure (Adner, 2017). In our view, an ecosystem approach provides a new way of conceptualising the complex healthcare landscape, as illustrated in Figure 3, and allows new opportunities for development and adoption of service models. In the next section, we contend that new perceptions and realisations of what constitutes value in the healthcare economy is critical to harnessing the potential of new technology-based care solutions and innovation to provide these new forms and types of value towards the development of user-centric care models.

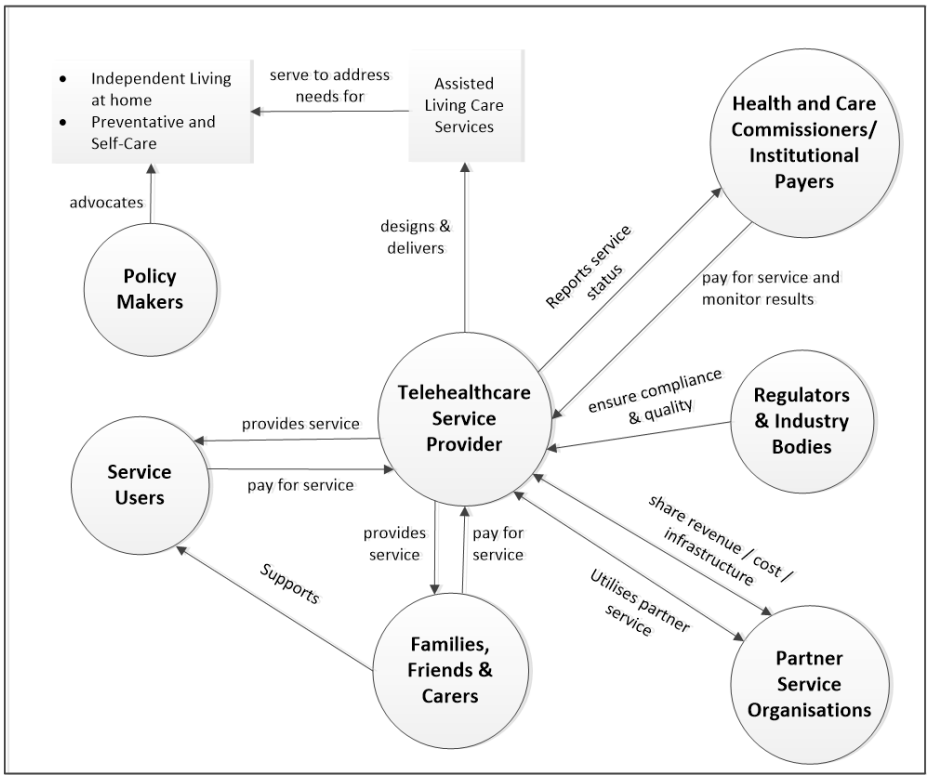

Figure 3. The Telehealthcare Service Ecosystem and Infrastructure

(Source: authors' own illustration)

As illustrated in Figure 3, a telehealthcare ecosystem and infrastructure will require a much deeper level and richness of collaboration between key stakeholders such as policymakers, service providers, commissioners, regulators, technology vendors, service users and carers that include families and beneficiaries. Such collaboration will necessitate a value-driven approach in examining a telehealthcare service model, to ensure that the interests and incentives of all the concerned stakeholders are effectively accommodated and aligned.

2.2. Service Business Model for Telehealthcare: An Investigative Framework

A conceptualisation of a telehealthcare service ecosystem, presented in the previous section, concerns a complex sociotechnical innovation (Sugarhood et al., 2014); in which sharing of risks and the alignment of interests and incentives across a diverse range of stakeholders remain critical (Arrow, 1963; Christensen and Remler, 2009). Therefore, it can be argued that any transformation agenda in harnessing the potential of new technology-enabled care solutions and innovations will necessitate a value-driven approach (Porter and Lee, 2013), in order to effectively capture the complexity of relationships and interactions, diversity of the social and economic actors connected by shared institutional logics, norms and mutual value creation (Lusch and

Nambisan, 2015). Such an approach demands a new way of conceptualising value propositions and opportunities for value co-creation for all the concerned stakeholders within a service ecosystem.

Business model-driven thinking has predominantly been applied to traditional, commercial business sectors and especially digital businesses (Baden-Fuller and Haefliger, 2013; Zott et al., 2011). Business models are conceptualised as the underlying core economic logic and strategic choices that seek to explain how an organisation could create and deliver value to its customers and network of partners (Magretta, 2002; Chesbrough and Rosenbloom, 2002) and importantly, can capture value within the 'value network' or 'activity system' of the business (Shafer et al., 2005; Teece, 2010; Zott and Amit, 2010). While there are divergent views on what constitutes a business model, in this paper, we adopt a framework developed by (Al-Debei and Avison, 2010), which identifies four fundamental components of a business model and provides a reasonably comprehensive ontological structure of the construct. These four elements of a business model are described as: i) value proposition, which explains how an organisation creates value for its customers through target customer segment based product or service offerings (Osterwalder et al., 2005); ii) value architecture, which comprises physical resources such as technology infrastructure and assets, organisational forms and practices as well as human resources employee skills, a knowledge base that needs to be configured and organised in a manner to facilitate a competitive value proposition (Hedman and Kalling, 2003; George and Bock, 2011); iii) a value network that depicts the perspective of cross-organisational collaboration, partnerships, and relationships in creating and delivering value (Shefar et al., 2005; Andersson et al., 2006); and finally, iv) value realisation, which essentially defines the revenue-earning logic to be profitable (or sustainable) and describes monetisation aspects of a business model.

2.2.1. Re-conceptualising Value Co-Creation in Healthcare Service Context

Value remains as one of the most ill-defined and elusive concepts in the academic literature (Grönroos and Voima, 2013). Conventional business model-based thinking emphasises on the realisation of value, primarily in terms of traditional economic currencies, through a revenue logic that defines 'how a company makes money' (Afuah and Tucci, 2001). While such monetisation aspects demand essential considerations for designing sustainable telehealthcare service models, a

reconceptualization of value might be necessary to accommodate the non-financial, intangible elements linked with healthcare services, which are more prevalent in healthcare organisational cultures and discourse. For instance, there would be a much greater emphasis on citizens' wellbeing support for independent living and quality of life measures (equated to consumer satisfaction perhaps), as well as contributions to better 'lived' experience at social/society and community organisation levels (Goodwin, 2010; Lluch, 2011; Greenhalgh et al., 2013).

Traditionally, business model-based thinking adopts a narrower role of customers in the value proposition and/or value creation process that views customers as part of a commercial 'market segment' (Chesbrough and Rosenbloom, 2002). The majority of telehealthcare service users are older adults with physical, cognitive, and sensory limitations; and perceiving such vulnerable people as fully informed, empowered, and rational consumers could be problematic (Daly, 2012). Research on service innovation discipline, grounded on service-dominant logic (Vargo and Lusch, 2004), offers some useful insights that espouse a broader, systemic level of engagement with the service users and other stakeholders) in the co-creation of value, (emphasising social as well as economic factors) through stakeholders' resource integration within the entire service ecosystem (Vargo and Lusch, 2008).

In pursuit of innovation in healthcare services, patient-centric care is considered as a major transformative goal (Berry and Bendapudi, 2007; Bitner and Brown, 2008). The themes of patient (or user) engagement (also referred as 'participation' or 'involvement') and empowerment have drawn increasing attention in the academic literature (Bedcott, 2005; Armstrong et al., 2013) and policy discourses, with advocacy around 'patient-centric care' service design (NHS Five Year Forward View, 2014). Service innovation thinking and concepts could provide a complementary way to examine and develop new business models that embraces the ideas of user-centeredness, 'co-production' and value creation through 'combinative resource configuration' (Joiner and Lusch, 2016; McColl-Kennedy et al., 2012; Nambisan and Nambisan, 2009; Wherton et al., 2015). Such an integrated approach could potentially broaden the application possibilities of business model thinking in healthcare services, through infusing service logic in designs of new telehealthcare business models that are focused around needs of users', other stakeholders, and also adaptive to their organisational, social and political contexts (Greenhalgh et al., 2016).

Healthcare services often fail to achieve patient (user)-centric value creation owing to the health policies that are focused on costs and efficiency improvements (Wildavsky, 1977; Wenzl et al., 2017). While a business model based thinking focuses on the configuration of organisational resources to maximise on efficiency gains, a customer (user)-centric and relational view of service logic complements by affirming the importance of achieving effectiveness over efficiency gains (Lusch and Vargo, 2014). Following the above arguments, we bring together the perspectives from two distinct yet complementary theoretical frames; synthesised from the relevant literature on business models and service innovation, to develop a conceptual framework (see Figure 4). The framework illustrates how different components of a telehealthcare service business model work together in proposing value, co-creating value, and also, capturing some part of the created value. In this paper, we used this investigative framework as the basis of a case study research in a Social Housing provider of telecare services, as outlined in the following section.

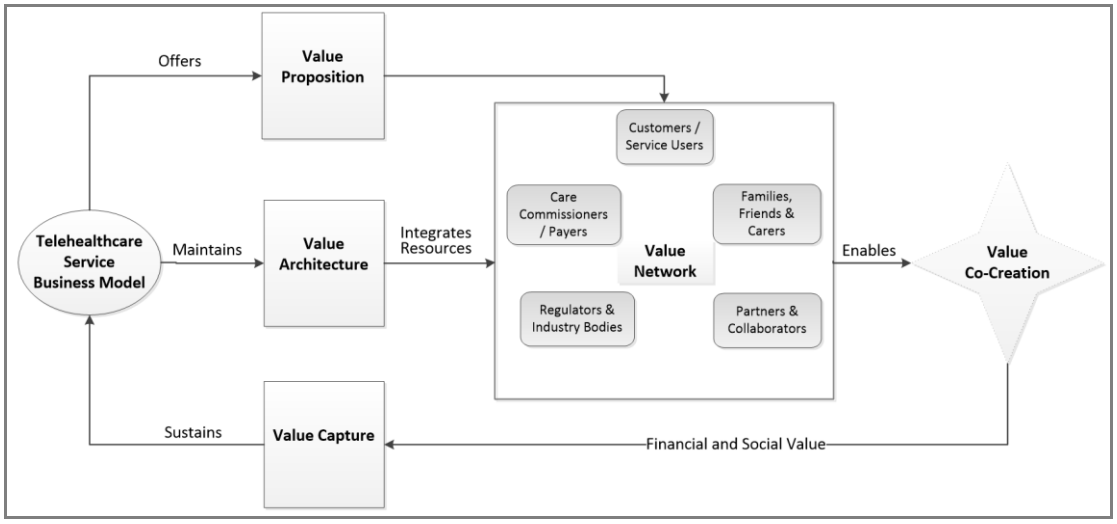

Figure 4. Investigative Framework: Telehealthcare Service Business Model (Source: authors' own illustration)

3. Research Methodology

The broader research project (Bhattacharya et al., Forthcoming) has been conducted employing a multiple case study research design informed by Critical Realism (Bhaskar, 1978; Archer, 1995; Lawson, 1997), resulting in five case studies of telehealthcare services (including a pilot) in the North East of England. A telehealthcare service ecosystem is embedded within its complex social, organisational, and technological contexts (Baker, 2011; Greenhalgh et al., 2016).

Unlike an interpretivist (or constructionist) approach that purely focuses upon the actors' subjective experience and indicates epistemic relativity in which 'there is no way to establish, beyond contention, the best view' (Stake, 1995, p. 108), a Critical Realist (CR) approach offers a lens through which we aim to examine the underlying structures exhibiting causal powers (mechanisms) within a telehealthcare service ecosystem. Through the application of CR analysis, which uses *abduction* and *retroduction* based reasoning, this research offers the opportunity to provide a broader range of plausible causal explanations for the phenomena studied. This paper focuses on the first study, where an empirical investigation was conducted at a pilot telehealthcare service provider organisation. For our case selection, we leverage previous research collaboration with a large social housing provider organisation, which, for the purpose of this study, called the Northern Social Housing Association (NSHA).

3.1. NSHA Case Context

NSHA is an Arms-Length Management Organisation (ALMO), not-for-profit, and wholly-owned by a local authority (Council) in the North East of England. NHSA acts as an umbrella organisation for a group that delivers the Community Telecare Service (CTS) to about 3,000 residents in the local authority area. Historically, CTS has been heavily reliant on the Council's public funding budget in delivering telecare service to the majority of its customers who got assessed by the Council's adult social care function as having an eligible care need for telecare and meeting a pre-set financial eligibility criteria. Cuts in public funding, at both national and regional levels, affected CTS budget in supporting adult social care services (Phillips and Simpson, 2017) and in the local authority's 2016/17 budget proposal, a recommendation was made to remove funding support (based on existing eligibility criteria) to CTS, starting middle of 2016. The financial viability of CTS, as a telehealthcare service, was perceived to be at risk by the management and NHSA management was looking for ways to keep the CTS service afloat.

CTS employs a telecare technology infrastructure and management platform powered by Jontek[1] Answerlink, which connects a range of electronic devices (with sensors) including Alarm units, Pendants, Fall Detectors, Bed Occupancy Sensors, Medication Dispensers, Door Exit Sensors, and Flood Detectors, installed at service users' homes

[1] currently a business unit of Legrand Electric Limited (www.legrand.co.uk)

to CTS control centre. The service aims to monitor vital health status (such as falls) for elderly community members and to monitor the environment at their home (such as detection of flooding, gas leaks, smoke or fire) in order to assist with a safe, secure and independent living of the people. CTS is accredited by the UK Telecare Services Association (TSA)[2] and follows the TSA code of practice, and its processes are aligned with TSA prescribed 'Reference to Response' (R2R) service model for telecare service providers (TSA, 2013). These processes cover five essential elements, namely referrals, assessment and provisioning, monitoring, response, and re-evaluation within the overall service provisioning and delivery.

3.2. Data Collection and Analysis

We engaged with NHSA during the early months of 2016, in order to conduct an empirical investigation of the telecare service (CTS). Our collection of empirical data, both qualitative and quantitative, primarily comprised key informant stakeholder interviews, documentary evidence, and observational field notes, as illustrated in Table 1.

Source of data	Method (s) applied
Interviews	**Eight face-to-face, semi-structured interviews** were conducted with CTS staff over two months. The participants were chosen to include both service managers and the front-line delivery staff to draw a wide range of perspectives. An interview topic guide was developed and employed for conducting the interviews. Each interview lasted between forty-five and seventy-five minutes and was audio-recorded after securing participants' consents.
Secondary data	NHSA/CTS Annual reports, Business plan documents, Minutes of the meetings, CTS service manuals, and promotional materials
Field observations	Field notes were taken to capture the information gathered through informal conversations with selected staff members. One of the authors attended two service review meetings conducted by the CTS management team. Participation in an interactive service design workshop organised by NSHA also aided in collecting useful information related to this case study.

Table 1. Sources and methods for data collection

Transcriptions of the interviews with CTS staff members generated a large volume of data (approximately 200 pages of transcript). To analyse the large volume of interview data that potentially can be an 'attractive nuisance' (Miles, 1979), we used

[2] Details can be found at https://www.tsa-voice.org.uk/about-tsa

NVivo[3], primarily to organise the interview transcript text, and to supplement our interpretative processes followed in manual coding. For the data analysis, we adopted a template analysis approach (King, 1998; Crabtree and Miller, 1999). In health and care-related research, the application of template analysis is gaining credibility (Waring and Wainwright, 2008; Brooks and King, 2014). We took an explorative approach by starting template analysis of interview transcripts with only a few predefined codes to allow the emergence of relevant themes from the data and to avoid blinkering of analysis with a theoretical bias (King, 2004). The purpose of the top-level a priori codes derived out of the investigative theoretical framework discussed earlier (see Figure 4.) has been to guide the analysis of the rich and voluminous qualitative data. A recursive exercise of reviewing the transcript data was followed in refining the initial template, with frequent additions and/or modifications of codes, till the 'integrative themes' which are of most central relevance to the investigation got identified (King, 2004). We worked closely in reviewing the transcript data together that helped us to exploit peer reflexivity and to maintain logical consistency in the analysis.

4. Key Findings – Understanding Telehealthcare as an Ecosystem

This section presents the key findings from the study. Analysis of data suggests the vital role of factors related to the organisational context in which the CTS service is embedded. Contextual issues such as identity and culture, how CTS is governed, and its relationship with the local authority shape the management decisions around provisioning and delivery of the CTS service. The challenges to the financial viability of the service emerge as another central theme in the analysis. It is also interesting to note how CTS's organisational dynamics affect the opportunities for growth and sustainability in the service.

It was found that CTS delivers valuable assisted living support to about 3,000 elderly and vulnerable residents, 24 hours a day, 365 days of the year. At the time of conducting this pilot study, the leading priority for the NHSA management was to keep the service viable by putting in place some short-term measures targeted at retaining its existing customers, acquiring new customers through promotions of the refashioned service brand, and also reducing operational costs through efficiency

[3] NVivo is one of the well-known *Computer-assisted Qualitative Data Analysis Software* (CAQDAS) packages available in the market

gains. The challenges facing the service were multifaceted, and so were the potential solutions to achieve future sustainability for the service. Analysis of findings from this pilot study suggests a few possibilities across a continuum of 'best-Case' and 'worst-Case' future scenarios for CTS. In order to ensure future sustainability for this service, the current service model needs to be developed to offer service packages that attract more private (self-funded) customers. Such transformation of the CTS service model would demand to address several issues, especially in the areas of investment in upgraded technology and information infrastructure; forging strategic collaborations and partnerships; and finally, a cultural change within the organisation to embrace a more commercial outlook. All these conditions require planning for scenarios and making strategic decisions about the business, although analysis of data suggests a perceived lack of independence and control for the CTS service management. Therefore, the prospects of a transformation for the service could be considered low, given the prevailing complicated relationship between NHSA and the local authority and the harsh political landscape in which CTS has been in operation.

After several iterations of coding of the data (using both NVivo tool based and manual processes), the following four broad themes emerged from the analysis.

a. *Nature of the Service*
b. *Advocacy and Collaborations*
c. *Organisational Characteristics*
d. *Technology and Information Systems*

4.1. Theme 1: Nature of the Service

Findings from the case studies reveal some important characteristics of a telehealthcare service. One of these features relates to the perception of inherent risk involved with a service of this nature that deals with primarily older and vulnerable customers. Such usage of technologies is found to produce some perceived stigmas and stereotypes about the users. It has been also felt by the some of the study participants that there are often unrealistic expectations from stakeholders with regard to application of telecare services in addressing other unmet care needs. The risk-laden nature of such applications calls for examining the issue of regulations and quality standards for the service. Furthermore, the challenges of collecting and demonstrating evidence for cost effectiveness emerge as a distinctive characteristic for a telehealthcare service.

4.2. Theme 2: Advocacy and Collaborations

This theme concerns the 'value network' element within a telehealthcare service business model (see Figure 4) and reflects the aspects of collaborations and partnerships involving the services. Analysis of data from the case study highlights some key issues concerning lack of advocacy and collaborative efforts in promoting higher adoption of the telecare services. A deep divide between the health and the social care sectors that hinders support of key stakeholders towards value creation in the services has been revealed in the analysis. The potential role of champions and intermediaries, at both local/regional and national levels, emerges as one of the key success factors for the services.

Data further suggest that low levels of awareness on telehealthcare technologies among the general public and also, the negative perceptions associated with such technologies within lay people are significant barriers for 'mainstreaming' of these services. The vital role of promotional marketing in changing people's perceptions about the services and in making them attractive to customers is also reflected within this theme.

4.3. Theme 3: Organisational Characteristics

This theme concerns organisational structural and cultural elements that influence funding, provisioning and delivery of the four case services. Three distinct categories or sub-themes can be identified within the broader organisational issues revealed by the analysis. One group relates to policies, frameworks and processes that impact value creation as well as value realisation elements with a service business model. The identity of the service provider organisation defines how organisational stakeholders view their organisation and service in terms of purpose and reveals potential tensions and constraints in pursuing business objectives. Finally, the strategic objectives outline how priorities are set for funding and provisioning the services.

4.4. Theme 4: Technology and Information Systems

Analysis of the data provides several significant findings related to application of technology within the services including the challenges of technology infrastructure, integration and sharing of information among various systems both within and beyond the organisational boundaries; reliability of technology solutions; and the fragmented nature of technology market that offers too many possibilities and choices for buyers. Such insights also cover the potential opportunities offered by future technologies,

and the digital technology infrastructure upgrade plans such as changeover from an analogue to a digital network - to drive new service models for telehealthcare.

5. Discussion

A critical realist approach espouses a stratified ontologic position which acknowledges three domains to portray the nature of reality: ***the Empirical, the Actual, and the Real*** (Bhaskar, 1978), which has been illustrated in Figure 5. The Real domain consists of structures with causal powers (mechanisms) that the researcher seeks to discover. These mechanisms may (or may not) trigger events in the domain of *the Actual*, irrespective of whether or not these events are observed by the researcher. The final domain, *the Empirical*, is a subset of the actual and consists of the events that are directly observed or perceived by the researcher from the data. Four common themes**:** 1. *Nature of the Service*, 2. *Advocacy and Collaborations*, 3. *Organisational Characteristics*, and 4. *Technology and Information Systems* have emerged from the analysis of data for CTS service. The development of these themes corresponds to the analysis of empirical data. These themes suggest that what is empirically observable is only an element of what really exists. Based on the principles of critical realism, the themes abstracted from the data can be mapped to *the Empirical* domain of the stratified reality (see Figure 5 below). Following the tenet of critical realism ontology which maintains 'what happens in the world is not the same as what is observed' (Danermark et al., 2002, p. 20), our next stage of analysis will aim to uncover the underlying structures with their associated causal powers (mechanisms) within *the Real* domain. The aim of this stage of analysis, using the processes of ***abduction***, is to re-describe the empirical data in an abstracted way, using theoretical concepts, in order to hypothesise the most plausible mechanisms that caused the events (O'Mahoney and Vincent, 2014).

Accordingly, the empirical findings are examined and explained through the theoretical concepts of a telehealthcare service business model outlined in Figure 4. This analysis aims to understand how explanations derived from empirical data converge or diverge from the explanations provided by existing theories and knowledge. The empirical findings are first examined by using the key theoretical constructs of a service business model comprising: *value proposition, value co-creation and value realisation*. Subsequently, we discuss the implications of our analysis concerning how telehealthcare service provider organisations may be able to

reframe their value propositions and to co-produce value in a sustainable service ecosystem, through innovative configurations of their internal as well as network (partnerships and collaborations) resources.

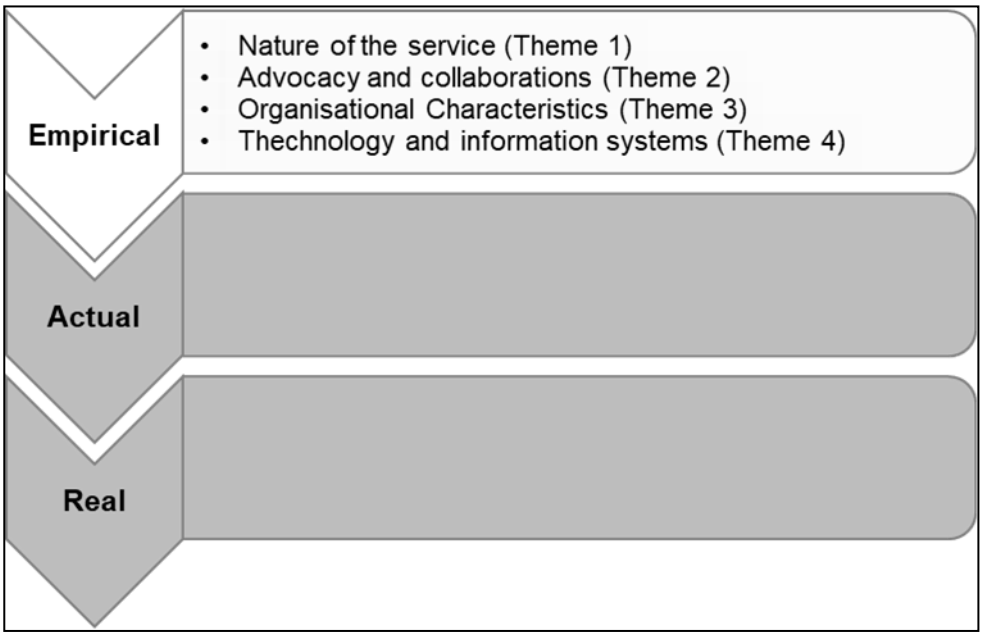

Figure 5. Illustrating *the Empirical* layer of Reality (source: authors' own illustration)

5.1. The Problem of poor value propositions of the services

Data from the case study reveals several issues related to the value proposition of the services. One of the major issues concerns the availability of choices on levels of service (or packages) for users of the services. The reactive usage of telecare solutions providing 'peace of mind' or as having insurances in the event of an emergency is not aiding customers' value perception of the service (Johnson et al., 2008). Empirical data, from this research study, further suggests that the current range of service offerings are not addressing more diverse, meaningful and life-enhancing needs of specific customer segments and thus, lack unique value propositions for them (Magretta, 2002; Osterwalder et al., 2005).

The existing literature acknowledges a vital role for social and relational marketing efforts in healthcare technology adoption (Giuseppe and Geisler, 2009; McGuire, 2012; Wright and Taylor, 2005), which appears to be missing to a large extent in the empirical evidence and findings from this research study (see Theme 2). Findings from the data further indicated that there is a limited value proposition of the service to other stakeholders of the service ecosystem (Stähler, 2002; Andersson et al., 2006)

in the absence of any meaningful collaborations and partnerships concerning the services (see Theme 2).

5.2. Missing opportunities for value co-creation in the service ecosystem

The literature on business models and service logic suggests that value co-creation in the service ecosystem happens through the integration of interactional resources, primarily consisting of knowledge, technology, and institutions (Akaka and Vargo, 2014). Such co-creation of value relates to all the participating actors in an 'activity system' (Zott and Amit, 2010) that form a 'value constellation' (Normann and Ramirez, 1993). From a telehealthcare service provider's standpoint, interactional resources such as information infrastructure and governance, skills, and knowledge of the staff; business processes, and policies; relationships with the Councils and other partners are vital constituents of its value architecture (Al-Debei and Avison, 2010). Empirical evidence from the CTS service has shown only token interactions between the service provider and with the NHS or other health organisations. While the provider maintains mutually beneficial relationships with other public services, namely Fire, Ambulance, and Housing services, the interactions mostly relate to reciprocal signposting /referrals and lack formal collaborative partnerships in any delivery of the telehealthcare service. The lack of such collaborations points to a weak value network and challenges the co-creation of value in the service ecosystem (see Theme 2). Future technology trends suggest the availability of a superior broadband infrastructure providing ultra-fast network connectivity and access to users (Frontier Economics, 2017) and also the proposed (and planned) changeover to digital networks from the current analogue system in England (McCaskil, 2018). Such Switchover to digital connectivity could potentially alter the technology landscape for the telehealthcare services through opportunities for innovative service designs and new value co-creation within the service ecosystem (Theme 4).

5.3. Inadequate realisation of value from the services

The literature on business models emphasises the monetisation of value from service through various revenue streams (Osterwalder et al., 2005), and also the importance of the role of profit or surplus generation (Johnson et al., 2008) to the growth and sustainability of service. Data from the case study, in this research, suggests that organisational constraints (see Theme 3) such as a lack of commercial focus, and rigid procurement policies and guidance of local authorities do not favour the telecare

service providers in terms of maximising their revenue sources and also, managing their cost structure to compete effectively in the market.

Empirical evidence, from this research, demonstrates that a 'lack of evidence' remains one of the critical challenges in drawing any advocacy and acquiring appropriate funding from the institutional authorities (see Theme 2). Given that most of the evidence relies on anecdotal information, the absence of number-based 'hard' financial and operational evidence on cost savings, the effectiveness of the telecare services is often questioned (Henderson et al., 2013). The overall value created by telehealthcare services should not only be measured in tangible and traditional economic currencies but also in the form of long-term benefits that can be measured using intangible social currencies, such as citizens' well-being, support for independent living and better quality of life (Schwamm, 2014; Lluch, 2011; Goodwin, 2010). Social business model designs, with a 'profit with purpose' mission (Osterwalder and Pigneur, 2011), need to accommodate a type of "social profit equation" as well as an "economic profit equation" (Yunus et al., 2010, p 319). It can be argued that social contributions could be a part of the demonstrable evidence base that offers additional value propositions to the commissioners and other institutions and facilitate attracting funding support for the service. Capturing social value as generated in the service must be used together with effective mechanisms and tools for assessment, such as social return on investment (SROI) that allows reporting both tangible economic and intangible social benefit value (Ryan and Lyne, 2008; Millar and Hall, 2013; Nicholls, 2009). However, the empirical data from this research, suggests the absence of value assessment mechanisms such as SROI for the services.

6. Conclusions and Future Research

We have abstracted the empirical evidence amassed from the case study using the business model and service logic-based theoretical concepts developed earlier in our research. It is worthwhile to note from that empirical evidence derived out of the data (Themes 1 through 4) could influence and have significant impacts on the value proposition, value co-creation, and value realisation aspects in a service provider's business model. We have found that the theoretical redescription (or abstraction) of empirical evidence reflects a significant level of convergence between the explanations derived out of the data (Themes 1 through 4) and that offered by existing theories and knowledge synthesised from the literature. The review of the literature on

service business models related to the healthcare domain, however, does not reveal much useful insight about any specific characteristics exhibited by their adoption and use to develop telehealthcare services. The absence of such ideas (or explanations) can be attributed to two main factors. First, the majority of these studies discuss business model concepts concerning healthcare services (not social funded telecare services) in clinical (or medical) settings. Second, only a handful of studies that involves services in community settings, concern socio-economic and organisational contexts, which are arguably dissimilar to those in the UK. Thus, it can be reasoned that existing theoretical knowledge does not fully explain the events (or outcome) found empirically within this case study, and such gaps exposed in the explanation demands to dig deeper into the reality for underlying hidden mechanisms. A critical realist perspective treats all explanations of reality as potentially fallible (Bhaskar, 1978) as the accounts provided by the research participants' experiences and understanding related to the phenomenon of business and service models can challenge the existing scientific knowledge available in the form of theoretical perspectives, and vice versa (Fletcher, 2017). Next stage of our research focuses on identifying important causal mechanisms which can be used to provide a better understanding of reality, and subsequently, present a more rational and comprehensive explanation of the events (outcomes) observed and experienced when examined within the empirical research layer.

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