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## **Data for outcome payments or information for care? A sociotechnical analysis of the management information system in the implementation of a social impact bond**

### **Abstract**

Social Impact Bonds (SIBs) have emerged as a new policy tool that are designed to link the outcomes of social interventions to payments. Despite what appears to be a mandatory requirement to support their operation and activity, there is a lack of evidence in relation to the informational characteristics and features of SIBs. Applying a multi-dimensional sociotechnical lens to a case study of a SIB established to focus on the Social Determinants of Health (SDH), the convergence of public management and information technology is analysed. It reveals that an information system within a SIB is introduced and adapted in order to produce outputs that prioritise payment over documenting or improving care provision. The findings of this paper also suggest that SIBs forgo their innovative premise in favour of emulating existing New Public Management practice, manifested by how they design and use the data they produce.

## **Introduction**

A Social Impact Bond (SIB) brings together a network of actors - including social investors, commissioners and delivery organisations - to facilitate, enact and account for specific social interventions which will make a calculable financial saving to the state. Many UK SIB projects create a new legal entity, called a Special Purpose Vehicle (SPV), as third-party organisations to manage the contracts between the investors, commissioners and service providers engaged in the definition, funding and delivery of the service intervention. A feature of the SIBs approach is that stakeholders engaged in all levels of their operation must create explicit links between measurable outcomes and financial payments (Warner, 2013; Fraser et al, 2018; Lowe et al., 2018; Sinclair et al, 2019; Carter, 2019). This is implemented in accounting mechanisms which in turn implies some form of information system to support the operation of a SIB funded activity. Despite the universality of this requirement, and recent calls for the widening of perspectives on SIBs (Tan et al., 2019) there is little evidence regarding the informational aspects of how SIBs are operationalised in practice. The unique contribution of this article is to explore these information systems aspects within their wider sociotechnical contexts. To do this we will make use of a three-dimensional view (3D) approach to sociotechnical systems in digital government (McLoughlin and Wilson 2013).

In this paper, the SIB funded intervention we examine is associated with a Social Determinants of Health (SDH) programme with the aim of improving the wellbeing of cohorts of adults with health risks in an economically deprived area of a city in the North of England. The main purpose of the intervention was to provide link-workers to offer coaching and support ('social prescriptions') to clients (with specific chronic conditions) based on referral from local primary care organisations (Dayson et al., 2019). The social investment provided working capital, combined with grants from other UK government sources, on the premise that, as the outcomes of the intervention were delivered, the public service beneficiaries would repay the investor at an agreed rate of return. These payments would be released on the submission of sets of accounts which provided evidence that the service delivered had achieved the planned outcomes defined by a basket of measures. These measures included the reduction of unplanned admissions to hospital for the identified cohort of service users.

Before turning in detail to the information systems theories and the empirical context of the SIB funded SDH programme, we will examine the ways in which information and data are currently generated in public service contexts. The application of detailed and rigorous

accounting to relational services involving care and wellbeing must currently be positioned within the wider framework, by which health and social care is delivered in the UK, New Public Management (NPM). The NPM approach has been the underlying paradigm of an ongoing shift in public service provision from grant-based funding, largely founded on trust, to what Ferlie et al. (1996) have described as Management, Markets and Measurement. In order to make this work significant, changes in the use and intensification of data have been required to support the processes of disaggregation, competition and incentivisation which have drawn upon the practice's digital commerce as their principle basis (Dunleavy et al., 2006).

Dunleavy et al. (2006) recognised that a combination of the growth of the Internet and of email and the web, together with the pervasive uptake of IT, information management and diagnostics in organisational back-office systems, meant it was only a matter of time before the resulting data-driven management approaches permeated to front office practices as well. After the turn of the millennium, the rapid informatisation of public services in the UK, through a range of government initiatives and investments, led Dunleavy to propose that the informational problems NPM had created could be addressed by adopting digital-era governance, DEG (Dunleavy et al., 2006; McLoughlin and Wilson 2013; Dunleavy and Margetts, 2010). The DEG concept is comprised of three elements: reintegration of service elements, needs-based holism, and digitisation. It was claimed DEG made NPM effective in the delivery of public policy by foregrounding the technological affordances of data storage and communications. As a result of this, Dunleavy et al., (2006) claimed it made sense to characterise current public service changes in terms of these new information-handling potentialities. In parallel, attempts in the US to build the "virtual state", highlighted the fact that the outcomes of the adoption of digital technologies in public services are conditioned by the way in which public managers 'enact' these policies within and through them (Fountain 2001). However, the technological focus of both these perspectives fails to recognise the interdependence between technical and organisational change, particularly in the context of public service organisations. The complexities of motivations and of presenting problems in these contexts mean that they tend to behave as sociotechnical systems where the ambiguities, affordances and constraints of the parts interact in complex indeterminate ways to influence the whole (McLoughlin and Wilson, 2013).

The aim of this paper is to make sense of this convergence of public management and information technology by making use of a case study of a SIB focused on the SDH. Our

focus on the information systems aspects of the problem leads to the conclusion that the implementation of policy initiatives such as SIBs can be better understood from the perspective of a sociotechnical process through which context-specific outcomes are shaped (McLoughlin et al., 1995; McLoughlin, 1999; McLoughlin and Badham, 2005; McLoughlin and Wilson, 2013). To this end, the paper adopts a sociotechnical framing in the form of McLoughlin and Wilson's (2013) three dimensions of Digital Government to better understand the interdependence between the technological and human/organisational factors within the system which supports a SIB. The framework allows us to explore key issues that would otherwise be obscured by deterministic perspectives of the organisation or technology. The three perspectives relate to how the development, implementation and ongoing use of a management information system (MIS) impacts the operation and functionality of a SIB. Throughout the next section of the paper we explore the context of Digital Government and introduce the three dimensional (3D) approach proposed by McLoughlin and Wilson (2013) which moves the debates beyond the typical 'supply' or 'demand' side or 'organisational' or 'technical' analysis of much of the literature in this area. We do this with the aim of applying the 3D approach to examination of the complementarities and tensions phases of development of a MIS for a SIB-funded intervention which like much of the 'real world' activity in the delivery of health and social care blurs these neat distinctions.

### **Digital Government: Where technology, public management and organisations collide?**

In seeking to explain past and current technology and organisational factors applicable to this SIB case, the emergence of digital government - and its associated literature base - has given new emphasis to the situated interdependences of change in public organisations. However, McLoughlin and Wilson (2013), observe that research on public service organisations has tended to ignore the social aspects in the analysis of information and communications technology. Each stage in the framework we are adopting includes propositions regarding the dynamics of change and the nature of the relationships between it and ICTs that are involved. This approach supports the explicit exploration and explanation of "social dynamics" based on three views of the system which are characterised by the number of dimensions they make use of (McLoughlin and Wilson 2013).

The one-dimensional view (1D) of technology and the organisation assumes a causal relationship between the changes in technology and changes in the organisation and its behaviour. In this view, 'technology' and 'organisation' are seen as two distinctly separate entities. Within the first dimension, there is a widely held belief that technology has a

mediating - but not determining - effect on the organisation. Those operating in the technical 1D perspective do not see technology as being open to social influence. The ‘technical view’ of the 1D perspective sees technology as having an independent external impact on organisations. New technologies are regarded as coming from ‘outside’ the organisation or sector and effect the nature of management, work and organisation within it (McLoughlin & Badham 2005). This technologically deterministic perspective is often implicit in a number of theories that have been used to examine the adoption and diffusion of technology in the organisation (Grandon and Pearson, 2004; MacKenzie and Wajcman, 1999).

The second form (or ‘social view’), sees the causation being “reversed” and technology is seen as ‘socially shaped’ by the economic, cultural, policy, and the institutional context thereby influences its development and deployment within organisations. To this extent, technology is “seen as not open to social influence and is an exogenous variable not shaped by human, organisational, or other social factors” (McLoughlin & Wilson 2013). As a result, technology exists in a direct response for the organisation to exist, participate or compete alongside others. As a result, the organisation sees the introduction of technology as one of the “cost of entry” to participate within the overall system or as a direct response to remaining current with competitors and similar-minded organisations.

In direct comparison with the 1D perspective, the two-dimensional (2D) view implies a more elaborate take on the challenges of digital government. 2D emphasizes the role of system designers and the interactions between people or organisations over time. From this perspective there is a specific need to understand the “duality” between technology as an entity and how it responds to the managerial, organisational and environmental frameworks during its conception, development, deployment, implementation, and operation.

Furthermore, this view suggests that information technologies are not so much adopted or implemented but are enacted through the decisions of managers and professionals about how and where technologies should - and conversely, should not or cannot - be deployed and used (Fountain, 2002). As such, it is argued that organisational, political and institutional logics are reinforced through technology and the organisational status quo rather than acting on them (Fountain, 2001).

However, both 1D and 2D views fail to account for key aspects of the relationship between technology and the organization in particular for changes that take place in and through its use. The cause of this gap in understanding is as Heeks (2005) suggests a result of the temporal, spatial and organisational separation between the system designers, developers and

technologists who are external to the organisation, and the system stakeholders. These ‘technology creators’ are not privy to the contexts required to ensure successful representations of the organization which results in a “design-use mismatch” and “contextual collision”. This requires an additional specific focus on the what has been termed the ‘biographical’ aspects of the system (Williams and Pollock, 2008). This is crucial within the processes of a networked sociotechnical system where the complex interactions between the range of organizational and technological actors are ongoing.

The three-dimensional view (3D) perspective seeks to incorporate the observations from the first and second dimension in order to add the insight that the distinction between ‘technology’ and ‘organisation’ is itself a dynamic, emergent, malleable, and contingent sociotechnical factor (Badham, 2005). Orlikowski (2009) suggests that understandings of technology are neither fixed nor universal and instead emerge from situated and reciprocal processes of interpreting and interacting with particular artefacts over time. As such, the temporal and perspective limitations observed within 1D and 2D view are mitigated using the 3D perspective. This in turn enables improved interpretations of technology and the organisation. All three dimensions with the underlying assumptions are summarized in Table 1 below:

**Table 1: Dimensions of Digital Government**

Dimensional View	Underlying Assumptions
<b>Technical One-Dimensional View: “technological determinism” or “techno-centric”</b>	Causal relationship between changes in technology and changes in the organisation with technology are seen to having external impact on organization
	Technology is seen as socially shaped by economic, cultural, policy and institutional context;
	Technology has mediating but not determining effect on organisational outcomes.
<b>Social One-Dimensional View: “socially-shaped” (Bellamy and Taylor, 1998)</b>	Technology is itself a <i>product</i> of social, economic and political forces and dynamics; technology is an output that is delivered via the shaping process.
	The world of the ‘user’ is inscribed in the system by the ‘designer’.

<b>Two-Dimensional View: “Enactment” perspective (Fountain 2001); “Digital Era Governance” (Dunleavy et al., 2006)</b>	Moves beyond the simple cause and effect models implicit in the impact of technology and social-shaping approaches; Emphasis is on mutual shaping of the technical and the organisational through the dynamic interactions between people and technology and decisions ‘enacted’ over time;
	Outcomes are the result of a process that is mutually dependant, integrative and co-evolving
<b>Three-Dimensional Sociotechnical View (McLoughlin and Wilson 2013)</b>	The distinction between ‘technology’ and ‘organisation’ is itself emergent, malleable and contingent socio-technical entity
	Interactions occur through everyday use of the technology which involves a repeatedly experienced, personally ordered and edited version of the technological artefact being experienced differently by the same individuals depending on the time and circumstance.

As described above, 3D encompasses the full lifecycle of design and procurement through to implementation, adaptation, customisation and mature alignment (McLoughlin and Wilson 2013). The application of 3D will be used as a means to reveal, through the sociotechnical lens, an integrated and multi-dimensional view which better reflects the ‘real world’ realities of the delivery, management and governance of health and social care. In this paper we will examine the context of the SDH programme funded through a SIB intended to support link-workers in the delivery of care of clients can also provide reliable data for outcome payments. We question whether the widespread assumptions regarding the use of information in service delivery relationships and the processes used to produce data required to service the accounting operations required for SIB payments work can be one and the same thing.

## **Methods**

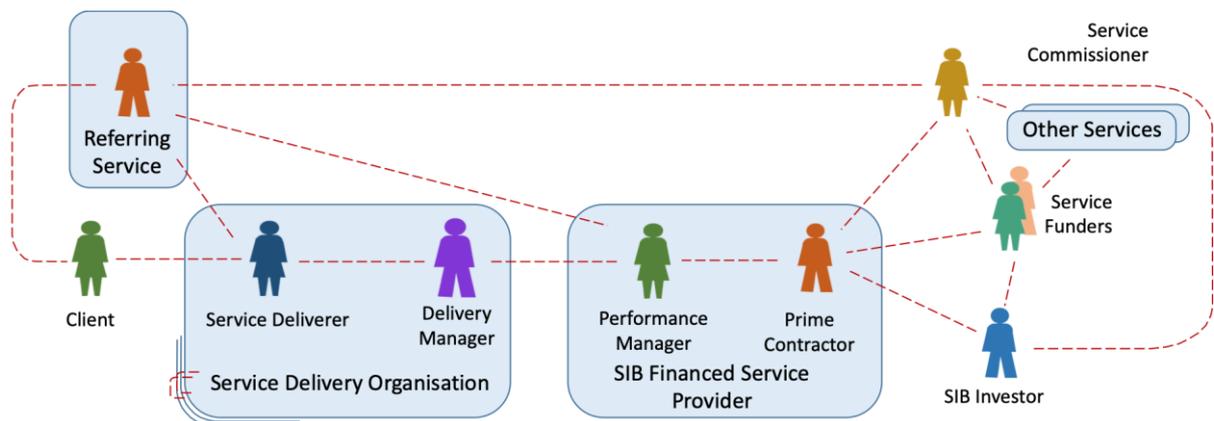
This analysis in this paper draws on a single case study research design incorporating a combination of a longitudinal ethnographic approach allied to interviews with key stakeholders commencing with the initial technology specification in 2013 through to the

mature and stable system of the present day. This was achieved primarily through ongoing interviews (5) and observation notes of meetings (7) supported by documentation provided by the actors and events involved with the specification, development, implementation and operationalisation of the MIS's of the SIB and it's wider systems environment drawing on a series of interviews with the participants (including the stakeholders – SIB participants, commissioners and service providers – 22 interviews conducted in 2015-2016).

The use of an in-depth single case study design, according to Eisenhardt and Graebner (2007), is useful in circumstances that relate to new phenomena being studied. In this case the information systems being created to support the mechanisms required for a policy innovation of SIB funding of an emerging care innovation of Link Workers providing 'social prescribing' and advice. As is the situation with other case studies and following other studies adopting a sociotechnical perspective, (see Geels, 2002; Geels and Kemp, 2007), this research adopts a multi-perspective approach in the form of the multi-dimensional account of the system - via the organisational system and corresponding MIS. Using these concepts as the basis of a thematic analysis (Miles and Huberman, 1994) to draw out any of the key developments over the biographical course of the SIB funded system and connection to the wider system throughout its lifecycle. This thematic overview is augmented with abstract projections or figures (see Figures 1-4) drawn to represent the complex web of interactions between the organisational and informational aspects of the complex sociotechnical system (see Jenkins and Wilson 2007, McLoughlin and Wilson 2013).

## Context of Case Study and the MIS phases of development

In this section we introduce the context of the programme being funded through the SIB and the biography, role and contextual factors in the development and deployment of the MIS. The aim of the SIB funding was to resource an SDH programme based on the innovation of ‘Social Prescribing’. Social prescribing is an increasingly popular intervention aimed at addressing the societal challenges posed by social determinants of health and wellbeing (see Dayson, 2007). In our case the intervention was comprised primarily to support the creation of link worker roles to build relationships with clients referred by NHS GP practices. In this relationship the work of the link worker is to broker (or ‘prescribe’) a range of relevant activities (such as community walking clubs) and/or referrals to existing local services (‘social prescriptions’). SDH began its journey toward a SIB programme through a coalition instigated by a local voluntary sector support agency, in 2011 (outlined in Figure 1 below).



**Figure 1: Organisational Inter-relationships with the SIB funded SDH programme.**

The Service Commissioner for the SIB programme is the local Clinical Commissioning Group (CCG). The investment organisation is a national body with significant activity in the social investment arena. The programme also received ongoing grant funding from central government and charitable organisations to enable readiness, deployment and operational management. The relationships between the stakeholders/organisations involved and detailed description of their roles in relation to the programme.

- Social/SIB Investor: A national investment organisation providing working capital to potential Social Impact Investments (including SIB) funded interventions.
- Service Funders: Grant funding sourced from the Government and National Charitable funder (as additional funding to unlock the funding from the Social Investor)

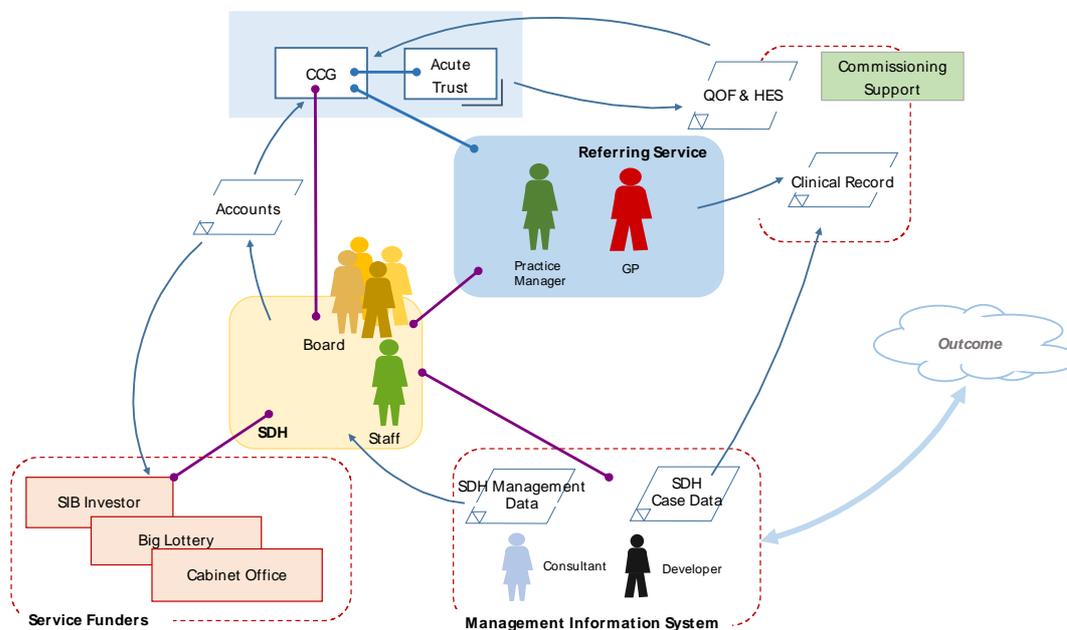
- Service Commissioner: a Northern England NHS Clinical Commissioning Group (CCG)
- Service Delivery Organisation (SDH): a Northern England charitable foundation responsible for the provision of the SDH programme;
- Service Providers: several not-for-profit health and social care providers which are sub-contracted by the SPV. Service Providers employ Link Worker staff to coordinate the Patient/Client/Service User to Social Prescribing Interventions;
- Client/Service User: recipients of the interventions coordinated by the providers contracted by the SPV;
- Commissioning Support Unit (CSU): one of the supporting ‘Other Services’, a northern-based organisation providing external services to the Commissioner such as Business Intelligence, Clinical procurement, Information Technology, and information processing and governance.

We now describe the development and implementation of the MIS with particular emphasis on the relationship between the organizational actors and the data and information issues through three phases of development.

One of the early steps in the first phase of the development of the MIS was in the design of SDH SIB itself. The requirements here for the management of data and information were driven by the emerging needs in the negotiations led by the team of social entrepreneurs proposing the SDH SIB. In parallel this had implications for the organizational framework surrounding it including establishing the SPV and the selection of tools for managing of delivery of care. A key decision here was the selection of the Outcome Star as the core tool for supporting the discussions between the Link Workers and the clients. The Outcome Star is a validated tool that supports and measures development and change in a supporting relationship by recording progress across a series of dimensions using visual representations (based on the points of a star). The Outcomes Star is intended to be used as part of an overarching co-productive approach to conversations between the parties involved which takes into account the multiple dimensions, perspectives and needs of an individual. These can then be used to determine the “distance-travelled” from when the intervention commences through to its completion. (see MacKeith, 2011).

The initial focus of the proto-SPV was on the design of the intervention and as the negotiations progressed, the implied need for data and information was an intrinsic part of the

process of setting up the instruments for a SIB. The realisation that this required a dedicated bespoke MIS emerged from a series of ongoing conversations led by the SDH SPV organisation discussing options with the various stakeholders who had a role in allocation of resources (the Service Commissioner, the Social Investor and Grant Funders). At this phase of the development prior to implementation, we observed that the following actors were involved and considered as stakeholders in the framing of the needs of the various information and data components of the SDH SIB programme. This set of relationships and proposed data flows including those within the SIB MIS and from the wider system (e.g. QoF and HES data) is shown in Figure 2 below).



**Figure 2: Resource Actors engaged in formulating the service and its management.**

Key to these discussions were negotiations around the potential target clients of the SDH intervention whose health outcomes could be improved through interactions with a link-worker. Initial conversations with the General Practices in the targeted local area had identified a range of cohorts with chronic diseases that might benefit – one group in particular were those with musculoskeletal problems.

Further discussions between stakeholders identified tensions between the underlying mission of the SPV which was to focus work on longer term population prevention activity and the requirement of the SIB funding to demonstrate outcomes in terms of short reductions in the use of services (e.g. hospital admissions). An example of this is the discussions with the CSU

which culminated in the ruling out of direct engagement with clients with musculoskeletal problems as the tariff in the existing NHS payments system at that time, for that class of disease, was considered too low to deliver the potential for resource savings needed to meet the proposed terms of the SIB.

There were also a series of challenges of recording individual client information with the need to record with whom, when and for what reason, Service Providers and Link Workers were engaging with a client. The internal actors were uncertain as to the best method to design and implement such a system so, early in this phase, an Information Systems consultant was appointed to assist with assessing these requirements. The objective was to provide a solution that would allow SDH to not only capture their patient engagements, but also to allow them to exchange data from and to NHS partners including GPs and Service Commissioners.

At the culmination of the first phase, decisions regarding how data was to be produced were made. This included the building of an MIS containing datasets proposed by the CSU and the Information System consultant. Care-related information would be input by the Service Providers and Link Workers. SDH SPV would provide exports of the accounting data to the Service Commissioners and case information to CSU.

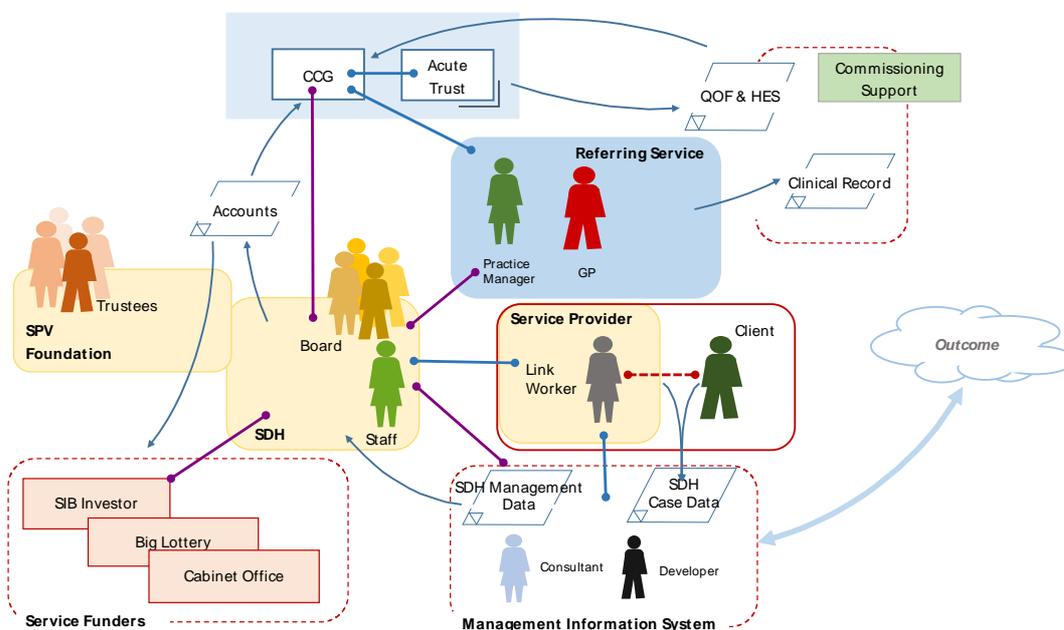
**Table 2: Initial Data and Information sources and tools in the SDH Programme**

<b>Performance Indicator</b>	<b>Data Source</b>	<b>Data Purpose</b>	<b>Data Source(s)</b>	<b>Data User(s)</b>
A patient wellbeing indicator	Wellbeing Outcome Star completed electronically using the SDH's MIS.	Records the wellbeing progress of a patient using accredited intervention tool.	SDH SPV and Service provider	CSU, Service Commissioner
A reduction in the number of unplanned hospital admissions	Hospital Episode Statistics (HES from Secondary Healthcare Providers.	Submitted to Secondary Uses Service (SUS) in relation to patient hospital admissions, Accident and Emergency attendances, and Outpatient appointments.	Secondary Healthcare (i.e. hospitals) Information Systems	CSU, Service Commissioner

A reduction in the number of GP visits	Quality Outcome Framework (QoF) Data from GPs.	Subset of data used from GP-specific reward and incentivisation scheme used to measure the quality of care delivered to patients.	Referring Services	CSU, Service Commissioner
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The original set of data sources and information tools which were to be combined by SDH in order to provide the accounts are described in the Table 2 (above).

The developments then entered the second phase of post-implementation, set-up and initial organisational/MIS changes (April 2015 - September 2016) going live at the beginning of the SDH programme. The assumptions made in the run up to the deployments led to series of issues for the initial stakeholders involved in the discussion but also for the wider network of stakeholders who now became directly involved as the SDH programme began. Figure 3 represents the summary of the set of stakeholders involved in the SIB at the point of implementation. In particular the pivotal role of the Service Providers and Link Workers in the production of data and their stake in how it is recorded and reported for payment is clear.



**Figure 3: Initial Operational SIB relationships and Data Flows**

One of the key initial targets linked to outcomes payment for the SPV and the Service Providers contracted to run the intervention was the recruitment of clients via referrals from

the General Practices in the CCG area. Early projections of a potential shortfall in recruitment meant increased emphasis was put on the recruitment of clients, in order to meet projected, contractual targets, and to ensure that Service Providers received payments for the completion of Outcome Stars. The initial MIS was unable to respond to these needs. The Service Providers highlighted that the dataset did not contain enough information for Link Workers to capture client contact – especially where explanations as to why specific, contractual Key Performance Indicators (KPIs) linked to the completion of an individual Outcome Star were missed. Service Providers were also unsure as to the number of Outcome Stars that had been adequately completed and therefore what payments were due. In response to this gap the Service Providers began to keep local records in order to have an account from their own perspective from which to show their version of the work that had been undertaken. In response to these sorts of problems, changes to the MIS were requested, and implemented. New ‘features’ included the ability to provide notifications when an Outcome Star was due to be completed, a ‘claims feature’ which tracked and progressed payment claims, and the ability to have differentiated Outcome Star payments when specific criteria were met. One example of such criteria was the recruitment of so-called ‘hard-to-reach’ clients from Black, Asian and Minority Ethnic Communities and “maintaining engagement’ with those clients that had been deemed ‘completed’ by the Service Provider but where contact was still going on between the client and link worker.

Following the second phase of development, the MIS entered a third phase of continuity and change (from September 2016 onwards) where ongoing developments occurred in response to a series of unplanned requirements with the current situation being the emergence of the SIB SDH as a ‘mature’ system. An important driver in the process was the SDH SPV initially seeking to manage the risks to outcome payments for client engagement. One of the means by which this was addressed by increasing the likelihood of success in meeting the KPIs of the programme which largely rested on the Service Providers and the Link Workers. Another source of change was the questions that began to arise regarding unintended consequences of the SDH programme. One example of this were reports, from SDH Service Providers and the wider community, that clients were being signposted to Social Services and other service providers (statutory and VCS organisations and community groups). These provider organisations found themselves filling ‘social prescriptions’ made by Link Workers without being resourced from the SDH SIB programme perhaps ironically running counter to the underlying premise of the outcome payments for reductions in use of services (these were

care and community services outside of the NHS). This was further complicated by apparently competing SDH programmes with similar aims and methods being funded in the locality who were drawing from the same client groups as part of their activities thereby further muddying the water in terms of the recruitment to the SDH and attribution of the outcomes. Later in this phase there were changes to the referral processes into the SDH programme through both self-referral and a link via specialist secondary care services working with clients with a combination of the appropriate conditions and postcodes.

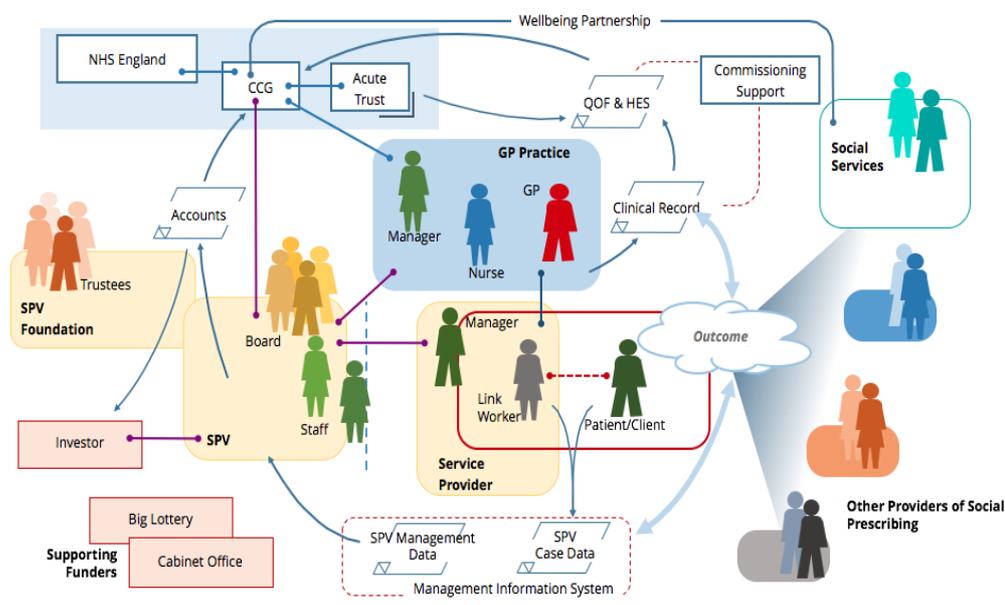
This resulted in the further increased interests and inputs from other external organisations including local government social services into the programme. The response, from the SPV, was to adjust the MIS in an attempt to assign attribution to the intervention of SDH. The extension of engagement into the wider local statutory care network led to new data capture needs including the tracking of client interactions with other services. In addition, SDH was evaluated by third-party organizations partially using data exports from the MIS (including a local university which sought to expand the dataset as a means to explore the establishment of cohort-based research).

Whilst changes were made to the MIS, the Outcome Star based functions of the system remained stable implying that the underlying basis of the SDH intervention being conducted by the Link Workers remained broadly similar. However, the volume of data items being collected by the Link Workers expanded significantly including functions specifically aimed at recording the reality of the unforeseen frequency of interactions with clients.

Enhanced data collection tools included characteristics such as height and weight (in order to calculate BMI) and contacts with other services such as mental health. The increased number of data fields within the MIS was in response, partially, to changes in NHS policies (changes to the NHS Tariff) over the period, but also the needs of external parties in particular the Social Investors where pressures intensified to improve the breadth and volume of the data to improve quality of decision making surrounding outcomes for payment.

It was now clear that throughout all three phases that the ongoing and fragmentary demands made on and by the SPV and SDH programme have had implications as to how the activity of the Link Worker is organised with the consequent effects of the ways in which outcomes of the client were being recorded. The emphasis on the expansion of data capture requirements within the MIS can be interpreted primarily as mechanism for recording encounters rather than supporting link worker interventions aimed at enhancing wellbeing (for instance the provision of a local directory for ‘social prescriptions’).

From the perspective of the system the maturity of the MIS and the wider system becomes the basis on which to produce the data for an accounting ledger, where transactions provide evidence and activity for performance-related payment rather than recording used primarily for care. The following figure (Figure 4) reveals the complex network of actors involved with the mature SIB system and the production and use of data which go far beyond the original understanding of the stakeholders engaged in the original specification of the MIS. Given the coupling between the systems required to produce the data for the SIB accounting even minor changes in the surrounding health systems, as we have seen throughout the phases of the MIS lifecycle, potentially have significant implications for the SDH MIS.



**Figure 4: Mature Operational SIB relationships and Data Flows**

As can be seen, the evolution of these Figures highlights the increasing involvement of actors and organisations. This only becomes apparent once the MIS is operationalised and the purpose of the information produced is realised.

## Discussion

Turning back to the dimensions to provide the sociotechnical lens through which to analyse the MIS of the SDH, we summarise the dimension in the following tables (Tables 3-5), highlighting the key events from the development of the SIB including observations made. We then discuss in further depth, the narrative drawing on the phases outlined above.

Within the context of the SIB, the MIS - and therefore the starting functionality and outputs - was inscribed by the system designers from the technical and social perspectives primarily in phase one of the case. This is because the understanding of the SIB was ‘completed at distance’ from the work of Link Workers and their recording practices and done so in the context of imposed constraints of the central tool for recording (the Outcome Star) and existing data sources needed to provide evidence for the payments (the NHS payment tariffs). Furthermore, this perspective shows how the primary concern of the stakeholders (separately from the technical and the social perspectives within the view) in the design and intended use of the MIS (and its associated outputs of data for payment) shaped the first part of the activity where the initial design took place. How these played out from the technical and social 1D perspective are summarised below in Table 3.

**Table 3: One Dimensional (1D) view of Digital Government applied to the SDH Case**

Dimensional View	Key events from the SDH case
<b>Technical One-Dimensional View:</b> <b>“technological determinism” or “techno-centric”</b>	Assumption that Outcome Star would provide necessary information to support delivery and production of data to ensure payment.
	SDH needed to provide data for accounting purposes and ensure similar-based datasets and data objects used by Service Commissioners were in place. Accounting data ensured validity of funding, leading to financial payments.
	Technology implemented to reflect interpretation of requirement outcomes to validate underlying process, and the origins and provenance of the data provided. Fluidity in how (more) data would later come to be produced.

<b>Social One-Dimensional View: “socially-shaped” (Bellamy and Taylor, 1998)</b>	Social, economic and political aspects of bespoke MIS defined in response to several pre-conceptions and interpretations by external Information System consultant. Assumption that NHS datasets were needed, and to frame a client’s episode of care without prior consideration.
	Underlying assumptions implemented by system developer led to certain restrictions to SDH and the Service Providers being unable to respond to requirement to produce more data relating to outcomes. Role of Information System consultant, in the design stages, impacted production of data at a later stage when more and different data was needed to respond to low recruitment.

The realities of how the MIS would and could be used in practice for service delivery and care were not able to be explored in any meaningful sense leading to many of the issues which emerged in the second phase. This supports the notion that the system designers and SDH programme stakeholders - invested and aware of the intention of the MIS but not the extensions that might be required in the delivery of the care to the clients - were operating almost exclusively within the first dimension.

Turning to the insights provided by the 2D view, we focus on the imperative at the beginning of Phase Two for the SDH SPV and Service Providers and the management of the recruitment to the SDH programme. This was allied to the tensions between ongoing management and development of the MIS over the data recording for payments. The specification during the first phase of the SDH programme had failed to account for the agility and functionality needed to record and progress the care of a client – from the initial starting point of recording transactions between the client and those involved in the SDH programme intervention. As a result, the SDH programme ended up being increasingly integrated into the performance logics of the wider health care system and the MIS being one of the sources of data needed to provide the accounts for the payment of outcomes. Table 4 provides key observations and events from the SDH underpinned by the theoretical framing within which a summary of observations from the 2D perspective have been made.

**Table 4: Two-Dimensional (2D) view of Digital Government applied to the SDH Case**

Dimensional View	Key events from the SDH case
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<p><b>Two-Dimensional View: “Enactment” perspective” (Fountain 2001)); “Digital Era Governance” (Dunleavy et al., 2006)</b></p>	<p>Additional data points along with prompts for notification regarding payment-related activity implemented. Care delivery predicated by requirement to introduce incentivisation to produce and provide more data to ensure payment. Further evidenced with introduction of explicit incentivisation.</p>
	<p>Use of activity-based data supported identification of lack of referrals. MIS re-developed to include incentive-specific features and refactored to respond. No stable state for SDH: managerial requirements emerged and requested, to ensure proof and timely payment. Changes have been made to MIS to provide this data.</p>

Finally, we seek to view the case through the 3D lens to build on the insights from the 1D and 2D views with the additional insight that the difference between ‘technology’ and ‘organisation’ are in themselves an emergent, malleable and contingent sociotechnical entity (McLoughlin and Wilson 2013). Applying a 3D view requires the adoption of a new discourse that is a critique of current methodologies and their perceived benefits. This view, which includes the considerations and importance of one-dimensional and two-dimensional views, should and can be used as a means to reflect and predict the outcomes of care-based information systems (the key points being summarised in Table 5 below).

**Table 5: Towards the Three-Dimensional (3D) view of Digital Government applied to the SDH Case**

Dimensional View	Key events from the SDH case
<p><b>Three-Dimensional Sociotechnical View (McLoughlin and Wilson 2013)</b></p>	<p>MIS remains constantly under development due in part to reconfiguration of NHS data requirements and need for further performance-related data which increased interrogations of KPIs. Organisational changes are represented within the MIS and data it produces. Little evidence to support real improvements to healthcare delivery. Evidence of performance of an indoctrinated way of working whereby data is produced to support payments.</p>
	<p>Increasingly wide array of interested parties and ways they have come to be involved reflected in ongoing reconfigurations of MIS. Constant re-development coincided with new linkages and interpretations of data and how recording this information is primarily geared to recording encounters to scaffold payments. New customisations seen to reduce risks to payment with greater emphasis on those re- which allow for communication of actions required to manage the risks associated with these payments.</p>

By applying the ‘integrated multi-dimensional view’ to the SIB system, we conclude that, in our case, information being recorded by Link Workers for care is at best agonistic with the overall requirement to collect data for the purposes of payment. By using and applying the 3D view, we improve our understanding of the challenges of management information systems overall – including the case being analysed here – and the ways in which the modes of interaction between the organisation and information system create a ‘locked-in’ perspective of data and information.

## Conclusions

This paper has highlighted an aspect of SIBs which has not been explored before. It provides a unique contribution in that no one has viewed SIBs using a socio-technical perspective. In doing so it has allowed for analysis of the technical and the social aspects of a SIB. This has led to the discovery of the rapacious nature of the SIB – and its constant need for data – which means that SDH’s mission becomes limited, and its original objectives have become progressively denatured. Furthermore, only by use a 3D perspective can we analyse the need for an informational infrastructural approach to SIBs which would allow them to become “unstuck” from 2D.

Given we have applied both a 1D and 2D view to reflect upon the outcomes of the SIB, we offer the interpretation that the SDH SIB programme and the MIS, and the wider system we are considering, is currently “stuck” within a 2D frame – unable to move to a reflective account of itself provided within the 3D view. This ‘lock-in’ is based on the assumption that information for care and data for payment can be one and the same, that they can be re-purposed to achieve the upstream requirements of each and that this can be achieved with the current approach to designing and implementation of an MIS in digital government contexts. Looking at the SIB case through a 1D perspective foregrounds the focus of the SDH programme on the specification through the initial phase of system design where the MIS was primarily designed as a vehicle to fulfil the requirements in relation to data collection specification linked to payment (driven by the mechanism of SIB funding). However, as shown in the second phase of its implementation, these requirements did not necessarily provide a usable MIS beyond production of the data and more development was required. From this phase, the actors in the system demanded new changes to the MIS (including the existing need to provide evidence of outcomes for payment) and these significant implications for the future shaping of data and the information system, and their use. However, such insight is not determinable until additional dimensional views were applied. Applying a 2D approach reveals the MIS used to produce data is a constantly evolving, bespoke construction that itself exists within a constantly evolving and re-configuring environment. Our analysis recognises that the MIS uses a proxy to determine wellness – in the form of the Outcome Star - but additionally that this is necessarily reflective of the changing requirements of the SIB in order to respond to the complex data gathering requirements of those clients with whom they are engaged. Furthermore, the constant changing external state requires data outputs which are needed by the SIB in order to

participate in other networks – data networks that it itself has no direct relationship with or influence on – for the purposes of data linking and data analysis. Addressing the complexities of the SIB implies moving away from a MIS that aims to participate within the wider health system context - which itself exhibits various levels of disjointedness and fragmentation - with the primary issue here appearing to be providing data rather than care.

To this end, we would argue the constraints of the MIS has been to produce informational assets on behalf of the SPV which are then traded - as evidence - for payment. Additionally, as there is little concrete causal connection between the interventions and related outcomes, manifested as transactional accounts, we would argue that, at a fundamental level, the SPV and Service Providers are being paid for the data that is being produced and processed rather than improvements to client outcomes. This aligns and contributes further to SIB literature by suggesting that the informational elements of outcomes-based payment systems supplant their original developmental purpose (e.g. Lowe and Wilson, 2017). It cautions that the information system of SIBs takes on an essential instrumental function which can undermine their claims to innovation and instead restricts them to operating within traditional NPM accounting. We argue the MIS was designed, built, operates, and is constrained within, the environment where the uses and applications of data and information have been framed by decades of systems designed in the context of an NPM approach (McLoughlin and Wilson 2013). The implementation of a MIS has been driven by principles of measurement and the shortcomings of this are revealed where the logics of two versions of this approach - one the policy innovation of a SIB funded SDH programme and the second the wider performance management system of the NHS - collided.

The seemingly never-ending requirements for unplanned changes to the MIS, from internal and external drivers, has in the end led to a mature and stable boundary being set in the short term (notwithstanding wider system changes inevitable in the health and social system in England). The constraints here are imposed both by the information environment and data ecology we have described and the specific requirements of a SIB funded intervention and associated accounting mechanisms.

The 3D helps us to identify the existence – unseen through other dimensional views - of a clear distinction between the SIB as a process and the data that is being generated and used in, and by, that process. However, from the 3D perspective the SIB along with the purpose of the organisation and technology, reveals that the MIS as conceived here was impossible to adjust beyond the initial requirement of producing outputs for payment to deliver on the

wider intent of the SDH programme of transformations in the wellbeing of the clients. This “stuck” state of unplanned maturity is reflective of the characteristics of the SIB implementation process, the irony here is despite SIBs being heralded as an innovation in funding and therefore able to increase investment in risky interventions such as the SDH programme become merely redolent of the systems in which it operates. The consequences of this are the data being offered as evidence of the success or failure of the intervention is at best a mere shadow of the effectiveness (or not) of the SDH programme.

This shift is critical and extends beyond the usual rhetoric of wellbeing. Such ambitions fall foul of the ability for the parties to access information. In this case parties are isolated and excluded and are unable to access the data required to evaluate themselves against appropriate benchmarks and client-specific wellbeing improvements with judgements of success being predetermined in the contracts for payment. The parallel challenge here to the apparent disjointedness, contingent and fragmentation of the MIS outlined in this paper is to shape the information systems into ones that joins things up around wellbeing of clients (and Link Workers). The answer potentially lies in taking an infrastructural approach to the complexities of health and social care, both in terms of the organisational and technical aspects and the inter-relations between them. Here, stakeholders would be better served through the support provided to sociotechnical environments in which resources are shared between organisations. This would enable the exchanges and distributions of the information needed to support the ‘constellations’ doing the work of caring, managing and governing of the system (Ellingsen and Monteiro, 2003, Wilson et al., 2017). Without adopting a radically different approach to the sociotechnical system at this infrastructural level the improvements in the wellbeing of the clients that services are designed for, will remain in fact, largely, invisible and co-produced in the conversations between them, their carers, and the Link Workers in spite of - rather than by - the current structural approaches to improving the system.

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