

Developing a data sharing framework: a case study

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Abstract

Purpose:

The purpose of the research project was to examine the process of developing a data sharing framework between different public sector organizations.

Design / methodology / approach:

A two year case study of a data sharing project between a UK fire and rescue service, local council, NHS primary care trust and a police force was undertaken.

Findings:

It is important to carefully determine the requirements for data sharing, to establish data sharing agreements, to have secure arrangements for data sharing, and to ensure compliance with data protection legislation.

Research limitations / implications:

Data sharing between public sector organizations can operate effectively if appropriate care is taken when creating data sharing agreements between partner organizations.

Practical implications:

Data sharing can assist in reducing duplication of effort between public sector organizations, and can reduce costs and enable more co-ordinated provision of public services.

Social implications:

Data sharing can assist in identifying citizens who might otherwise have been overlooked to relevant organizations. Data sharing can also assist in reducing risks associated with individuals and promote more independent living.

Originality / value:

The detailed analysis of a data sharing case study identified the need for a systematic data sharing framework. Such a framework is proposed and illustrated with practical examples of specification, implementation and evaluation.

Key words: Data sharing framework public sector management data protection legislation

1. Introduction

UK public sector organizations acquire, analyse and process large amounts of data (Riege and Lindsay, 2006). In this paper we examine the issues associated with the development of a data sharing framework for partnerships between different types of public sector organizations. The research reported in this paper was undertaken as part of a two year project funded by the UK Department of Communities and Local Government (CALG, 2012), which involved developing customer insight using shared data between a UK fire and rescue service, local council, NHS primary care trust, and a police force.

There have been moves towards inter-organizational data sharing in the public sector (Yang and Maxwell, 2011), in order to attempt to improve policy and practice (Florence et al, 2011; Quigg et al, 2010). However, there do not appear to be any commonly used frameworks for data sharing currently available for use by public sector organizations.

The project upon which the case study research was based aimed to deliver initiatives to help reduce the risk of fires and improve the quality of life targeted at relevant households, based on the use of shared customer insight data across the partnership organizations. The project aimed to proactively signpost relevant partners' services when contact was made with householders in the region concerned, for example when fire and rescue service officers were carrying out fire prevention activities, such as the home fire safety check (HFSC, 2013). The data sharing approach examined aimed to assist in creating an improved, co-ordinated approach to public sector provision for local citizens by highlighting relevant partner services. The aim of the project was that services would be better targeted based upon the needs and risks present in the community, identified from the data shared between the partners. The partner organizations had a keen interest in providing services to the community that reduced risk and improved the quality of life for citizens within the region studied.

The motivations for developing a data sharing framework within the customer insight project were:

- Reduction of the number of accidental dwelling fires and related injuries and fatalities within the region through more informed fire prevention activities via improved data sharing between the partner organizations.
- Increased numbers of citizens giving up smoking through smoking cessation services offered by the local UK NHS Primary Care Trust (NHS SC, 2012), via

improved data sharing and referral and advocacy services between the partner organizations. A reduction in the number of smokers would also be expected to lead to a reduction of the number of smoking related illnesses.

- Decreased numbers of citizens binge drinking through improved signposting to local UK NHS Primary Care Trust alcohol management services (NHS AS, 2013) via improved data sharing and referral and advocacy services between the partner organizations
- Improved signposting to early intervention services enabling people to live independently in their own homes. For example, working in partnership with the local “Healthy Homes” (HH, 2013) initiative, fire and rescue service community safety officers would be able to identify and refer citizens whose homes could potentially cause risk of illness and injury through trip hazards, damp and excessive cold.
- Providing informed and proactive instruction to the public in subjects that may be difficult to approach, such as alcohol misuse and smoking cessation, via improved data sharing.
- Providing analysis of community risks and needs through customer segmentation using shared local information and data about communities via formalised data sharing agreements.

Overall, the data sharing and customer insight project aimed to ensure that data gathered concerning ‘at risk’ individuals, and social groups within the region studied was more effectively processed and disseminated, and to reduce duplication of effort between the fire and rescue service, the local council, the NHS primary care trust, and the police force. This adopts a principle of collecting data once and using it numerous times for analysis in different partner projects and initiatives. Using the shared data, identification of at-risk groups by one organization would lead to onward referral to partner organizations. This would enable the provision of services earlier and reduce the need for the citizen to re-contact another public sector service.

The novel theoretical contribution of the research reported in this paper is to provide an effective and efficient framework for data sharing between different public sector organizations.

2. Literature review

In the literature review we considered the management aspects of data sharing, and what would be required for the operational implementation of data sharing between public sector bodies. Currently there do not appear to be any commonly available frameworks for data sharing between public sector organizations. The need to develop a data sharing framework to support effective and efficient data sharing between public sector organizations was the basis of the research undertaken.

Public sector management

In the current economic climate, public sector organizations seek to improve the efficiency and effectiveness of their activities (Stuckler et al, 2010a). Collaboration between public sector organizations can potentially reduce duplication of effort, thereby reducing costs, and can lead to more efficient overall utilization of resources (Stuckler et al, 2010b; Sorrentino and Simonetta, 2011; Niehaves and Krause, 2010). Ryan and Walsh (2004) commented that there is increasing pressure being placed on government agencies to act in a more collaborative, integrated manner.

Public sector data sharing

Previous research has examined the issues associated with inter-organizational data sharing (Bigdeli et al, 2012a; Bigdeli et al, 2012b; Bigdeli et al, 2013), however, there has been little research into intra-organizational data sharing between different types of public sector agencies that may have very different operational frameworks. Yang and Maxwell (2011) stated that organizations have shifted from a model that emphasized information protection to one where cross-organizational information sharing is the new goal. Information sharing between public sector bodies can lead to significant benefits for the partner bodies (Florence et al, 2011), and can inform policy and practice (Quigg et al, 2012). However, as Bellamy et al (2005) and Combe (2009) comment, there can be tensions between more extensive data sharing and privacy protection.

Data sharing (Ryan and Walsh, 2004; Otjacques et al, 2007; Bellamy et al, 2005) between UK public sector organizations needs to comply with the provisions of the UK Data Protection Act 1998 (DPA, 1998). The UK Ministry of Justice oversees the overarching legislative and non-legislative framework for data sharing across the UK Government. The UK Ministry of Justice developed a data sharing protocol (DSP, 2013) that provides guidance for public sector bodies with regard to data sharing. The UK Office of the Information Commissioner has produced guidelines for data sharing that include guidance on whether data sharing is justified, and whether the organizations involved have the power to share data (ICO, 2013). Data sharing agreements describe the regulations for managing shared data among multiple participants in different domains and contexts (Swarup et al, 2006; Smith et al, 2008).

Managing public sector partnerships

Partnerships between public sector bodies in the UK and elsewhere are slowly developing. For example, within the UK NHS, the launch of the Connecting for Health project (CFH, 2013) dealing with sharing patient information electronically has led to specific toolkits for preparing and sharing information between NHS partner organizations. Greasley et al (2008) and Liddle (2009) commented that, while there can be clear benefits of public sector partnerships working, achieving successful collaboration is not straightforward. They note that as future public sector partnerships develop, further research should be undertaken to explore this phenomenon.

Managing data sharing between public sector partners

Overall the literature review indicated that although collaboration and in particular data sharing between public bodies is encouraged by governments (Le Dantec and Edwards, 2010), there are various potential barriers to such data sharing. These potential barriers include the initial setting up of contact mechanisms between the partner organizations, the legal aspects of data sharing agreements (Cairns et al, 2011), the management of data sharing activities, and the technological mechanisms for actual data sharing.

The issues derived from the literature review that could be taken forward for further investigation were that although there has been research into specific aspects of data sharing such as the legal aspects (Combe, 2009) and the potential benefits of such (Sorrentino and Simonetta, 2011) there appears to have been little if any research into the development of frameworks for the overall process of intra-organizational data sharing of personal data between different separate types of public sector organizations. This is the originality of the research reported in this paper, the detailed examination of the overall process of data sharing between different types of public sector organizations and the development of a data sharing framework for use by public sector organizations with different priorities and focii.

3. Research method

The purpose of the research reported in this paper was the development of a framework for effective and efficient inter-organizational data sharing. The case study research method (Yin, 2009) was used. The case study research method was an appropriate research method, as it allowed an in-depth qualitative examination of the mechanisms of data sharing between public sector organizations, and the development of a data sharing framework in actual practice.

A two year case study of the process of data sharing and the development of a data sharing framework was undertaken involving a UK fire and rescue service, a UK NHS primary care trust, and the following departments in a UK local council: adult social care, early intervention, community health and well being, housing and benefits, and a UK police force between 2010 and 2012. The qualitative research techniques utilized included: meetings and discussions with management staff and relevant operational staff such as councilors, information analysts, managers, and community fire prevention officers in the partner organizations. Quantitative data analysis for customer insight purposes based upon the shared data was performed by the Strategic Planning department within the fire and rescue service using the k-means cluster analysis facility with the SPSS statistical package (SPSS, 2013).

The research reported in this paper addressed the following research questions;

- What is involved in data sharing between public sector organizations?

- How can data sharing be carried out in practice between public sector organizations?
- What can data sharing provide for public sector organizations?

These research questions were developed from the literature review, which indicated that data sharing is increasingly encouraged between public sector organizations, however, there appears to have been limited research into how this is actually carried out, and in particular, there did not appear to be any commonly available frameworks for such data sharing.

These research questions are important since current UK public sector budgets reductions imply that organizations need to operate more efficiently and more effectively. Data sharing agreements can potentially reduce duplication of effort between organizations and promote more co-ordinated provision of public services economically.

In order to develop an appropriate and practical data sharing framework, the project was piloted in a local authority area that contained a diverse mix of communities ranging from pockets of nationally recognised affluent rural areas to areas of nationally recognised deprived urban areas. This meant that the pilot results would indicate how well, or otherwise, the framework could be applied to other regions.

Based upon the previous research discussed in the literature review (Yang and Maxwell, 2011; Quigg et al, 2012; Florence et al, 2011) we posited the following hypotheses regarding data sharing frameworks between public sector organizations:

H1: A data sharing framework is necessary for public sector organizations to share data.

H2: Data sharing has the potential to reduce duplication of effort for participant organizations.

H3: Data sharing has the potential to identify at risk citizens who might otherwise be overlooked.

3.1 Data collection

Data sharing between organizations was discussed in meetings with those staff involved in data sharing between the organizations studied. These included two IT managers, two project managers, two data protection officers and two community fire safety officers within the fire and rescue service; two information analysts and three councilors from the local council, two information analysts from the NHS primary care trust, and one community liaison officer from the local police force. The meetings typically lasted for around one hour. The meeting notes were recorded on paper and then analysed. These meetings facilitated discussions around information sharing between organizations, allowing colleagues from each organisation involved to meet and form professional relationships with their counterparts from other organizations. Some topics for discussion

in these meetings included the reasons for data sharing, the mechanisms for initiating data sharing, the legal aspects of data sharing, the management of data sharing activities and the technologies employed for data sharing. These communication channels allowed colleagues to raise and discuss any concerns they may have about data sharing, meaning any issues could be quickly resolved. The relationships formed through these meetings resulted in delegates feeling comfortable sharing data because they fully understood the purposes for sharing, how it will be stored and used, and they anticipated benefits and results of sharing data.

An outcome from this meeting was a series of data sharing agreements, which were agreed and signed by each organization concerned. This provided a gateway to accessing data to support a more joined up delivery of services within public sector services.

3.2 Data analysis

The data collected was then content analysed by identifying themes within the meeting texts. For example, what would be involved with regard to data sharing for each of the partner organizations, and what potential benefits were envisaged from data sharing. This allowed an understanding of the issues associated with data sharing, and the process of formulation of a data sharing framework by the partner organizations, the nature of the data sharing framework, and the application of the data sharing framework in practice.

An overview of the research methodology is shown in Figure 1.

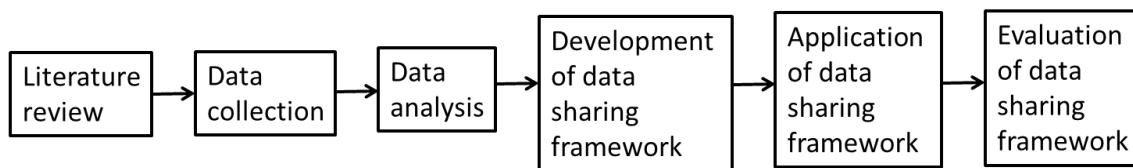


Figure 1. Research methodology overview

4. Results

4.1 Data sharing activities

The data sharing project upon which the two year case study was based involved:

- An examination of the current customer insight data availability, data acquisition, data analysis and data sharing activities between the partner organizations.
- The design of protocols for shared data acquisition, data analysis and data sharing activities between the partner organizations.
- The implementation of the protocols established for data sharing in a pilot area.

- An evaluation of the protocols and their effectiveness by the partner organizations.

4.2 Development of the data sharing framework

The data sharing framework was developed with the focus of better targeting improvements for individuals and social groups considered at risk within the region studied through improved data acquisition, data analysis and information dissemination and utilization by the partner organizations. The data sharing framework developed by the partner organizations included the activities below.

Data sharing framework stages

1. Identification of the organizational activities for which external (shared) data would be beneficial, for example to support joined up service delivery or enhancing engagement with local citizens. From the case study, such identification was achieved through meetings between representatives from the partner organizations to discuss the types of external (shared) data that would be useful.
2. Definition of the shared data available for defined organizational activities. It was identified by those participating in the project as important to define the metadata of the shared data in terms of its source, owner, and frequency of updates, as well as the actual nature of the data (that is what the data actually described).
3. Determination of the availability of shared data. This concerned how data could be shared between the partner organizations, and whether a new or updated data sharing agreement (with reference to the UK Data Protection Act 1998) would be required.
4. Data acquisition changes for identified organizational activities within the partner organizations. This concerned whether the manner in which data was gathered might need to change. For example, if data relevant to a number of partners might be acquired by just one partner in future.
5. Secure data transfer methods and the frequency of data transfer between the partner organizations. Under the UK Data Protection Act 1998, a secure method for data transfer would be required. It was also deemed important to establish an agreed frequency for data updates.
6. Data integration mechanisms. New data from external partner organizations needed to be appropriately integrated into existing databases within a given partner organization. This included protocols regulating information exchange, for

example relating to the frequency of data updates (typically quarterly) and interoperability between the diverse information systems deployed by the partner agencies (for example data file formats).

7. Analysis of shared data to inform decision making. New data from external partner organizations would need to be appropriately analyzed in order to assist decision making.
8. Changes to organizational activities within the partner organizations resulting from data sharing. Improved analysis made possible by the use of external data from partners might lead to changes in organizational activities.

The data sharing framework was discussed and agreed by the various knowledge managers, information analysts, information officers and IT staff concerned within the partner organizations. Specific data sharing agreements (in compliance with the UK Data Protection Act 1998 (DPA, 1998)) were created and signed off by the appropriate representatives within the partner organizations.

All those involved in the data sharing project in the partner organizations agreed upon the importance of formalized data sharing agreements, particularly with regard to compliance with the relevant UK legislation.

4.3 Application of the data sharing framework

The data sharing framework developed was utilized by the partner organizations. The following organizational activities for which external (shared) data would be beneficial were identified by those involved in the project as being:

Fire and Rescue Service: Fire prevention activities via the home fire safety check.

NHS Primary Care Trust: Smoking cessation, and alcohol management activities.

Local council: Independent living support for elderly and disabled residents.

Police force: Crime prevention activities relating to alcohol related crime.

Using shared data would result in improved targeting of these initiatives towards those who require them most. In particular, it would also allow the opportunity to signpost or refer those more vulnerable individuals onto other agencies.

It was necessary to understand the importance and purposes of collating personal data, and the requirements for compliance with the UK Data Protection Act 1998 (DPA, 1998) with regard to the data sharing agreements developed. The shared data available for the organizational activities identified included data on smoking, binge drinking, mental health, disability, those living alone, elderly residents and information on housing conditions. The exact data items needed to be identified in order to comply with the requirements of the UK Data Protection Act 1998 (DPA, 1998) with regard to the

specification of the data to be held. Since the shared data included health and social care information that could be classified (under the UK Data Protection Act 1998) as sensitive personal data, the staff involved in the project required Criminal Records Bureau checks (CRB, 2013).

In terms of the availability of shared data between the partner organizations, data already acquired was already present in a variety of databases in the partner organizations. The data transfer method for shared data between partner organizations was the AVCO secure data sharing system (AVCO, 2013). An appropriately secure data transfer method was required in order to comply with the principle of the UK Data Protection Act 1998 (DPA, 1998) concerning appropriate organizational and technical security measures for personal data held.

The data integration mechanisms adopted included data records being created for people being referred to other services, for example, data records for individuals being referred to smoking cessation (NHS CS, 2013), and alcohol management services (NHS AS, 2013) within the NHS. This in turn led to changes in organizational activities such as extending advocacy services and referral services (such as smoking cessation, and alcohol management services) provided by the fire and rescue service studied.

The following metrics against which the outcomes of the data sharing and customer insight project were measured were identified by those involved in the project:

- Increased access to services, such as smoking cessation and alcohol management initiatives from the NHS Primary Care Trust within the area covered.
- Increased access to social care services, such as occupational health and older persons services offered by the council, to be measured by the reduction in the levels of housing related illness in the region. The project aimed to assist earlier identification of risks (such as damp, trip hazards, excessive cold) that may be causal factors in injury and illness.
- Increased access to initiatives, such as the 'Healthy (HH, 2013) initiative offered by the council housing department, which aimed to remove hazards from the home
- Reducing the number of smokers to be measured by the reduction in the number of admissions to hospital related to lung cancer and other respiratory problems. The cost of one person undergoing treatment for smoking related cancer is approximately £15,000. Smoking cessation services (including on going support and nicotine replacement therapy) costs £160 and has a 55 per cent success rate. This indicates a saving of over £8,000 ($£15,000 - £160 - £50 * 55$ per cent) per person visited.
- A reduction in the elderly fall rate in the area. With earlier identification of needs, the council adult social services and the NHS primary care trust would be able to intervene earlier, therefore potentially preventing some of these injuries. An elderly person falling at home will cost the NHS approximately £2,500. Remedial work (such as fitting hand rails, removing trip hazards, etc) carried out at the home of an elderly person, as a result of a £50 visit by an advocate, will cost

approximately £400. This results in a potential avoided cost of £2,050 per person. There are approximately 5000 elderly falls in Merseyside each year. Data sharing can be used to identify these individuals in advance so that this preventative activity can be undertaken to enable significant potential savings.

- Increased access to early intervention services enabling individuals to remain in their own homes, providing them with choice and control. For example, simple alterations to a home, such as fitting grab rails at minimal cost, would allow an elderly resident to live independently for longer.
- Improved identification of vulnerable individuals who may not be traditionally identified would allow the implementation of proactive outreach programmes best suited to the needs of individual communities.
- Increased reuse of demographic data and the delivery of collaborative services between the partner organizations.

In this manner, the potential of data sharing to reduce duplication of effort between the partner organizations, to identify at risk citizens who might otherwise be overlooked, and to enable financial benefits for the partner organizations could be assessed.

4.4 Analysis of shared data

Customer segmentation and analysis of customer data held by the partner organizations was used to identify individuals in the region likely to be more at risk of fire and in need of health/social care services. Customer insight data included information on home fire safety checks, incident data collected by the fire and rescue service, the adult social services data, the primary care trust smoking cessation data, and alcohol management data, and police force crime data, and national data from the UK Office for National Statistics and the UK Department for Work and Pensions available at a local level. The customer segmentation involved a detailed analysis of the shared data to find which social groups were most at risk and therefore would benefit from interventions. This in-depth analysis also helped the organizations involved in the project to understand the risks that are present in each area, resulting in the redesign of services.

The customer segmentation analysis included the following at risk groups:

At risk of fire

At risk of smoking related illness

At risk of alcohol related illness

At risk of health problems related to poor standards of accommodation (damp and excessive cold)

The data for customer segmentation analysis that was available within the region studied included 90 datasets consisting of 130 data variables. The types of customer data available included:

- Benefit Claimants
- Communication Preferences

- Community Safety
- Deprivation
- Disability
- Health
- Housing
- Population Demographics
- Sporting Participation and Preferences

All of the data variables identified could be used to help identify the types of risks of concern to the project partners. However, after analysis of all the datasets identified, the following were selected to be ‘fit for purpose’ for use within a k-means cluster analysis.

Disability Living Allowance Claimants
 Child Benefit Claimants
 Residents living in converted flats
 Middle rate care (Disability Living Allowance)
 Age group
 Social Grade
 Pension Claimants aged 80+
 Life Expectancy
 Worried about crime
 Residents living in a terraced property
 High rate care (Disability Living Allowance)
 Mobility nil rate (Disability Living Allowance)
 Crime level
 Revenue & Benefits Claimants
 DASS Claimants

These variables were unique variables that resulted in a number of unique categories. The remaining data variables were matched against the groups to build detailed community profiles.

The customer segmentation was performed using k-means cluster analysis. The analysis was performed using the SPSS statistical software package (SPSS, 2013). The customer insight data was used to create a rich understanding of customer needs within the region. The fire and rescue service also established working relationships with residents and tenants associations and groups, via links with the local council housing department, to gain further insight into the areas concerned.

The project allowed the partner organizations to signpost individuals to services offered by other agencies. The fire and rescue service were already working with the local NHS Primary Care Trust to refer individuals who may benefit from smoking cessation services, or perhaps require more help with access to benefits.

5. Evaluation

Those involved in the project stated that ensuring the community had access to information in a suitable format can improve access to services offered by partner organizations. This can then enable improved up take of services by the most vulnerable individuals and social groups within the community. People may often lack awareness of public services that are available to them and support to which they are entitled.

Community fire safety advocates, who conducted home visits, worked closely with front line staff from the partner organizations to share knowledge and learning about what to look for when visiting homes in the community. For example, adult social care services recommended community fire safety advocates look for elderly people with mobility issues, and using identified communication methods, pass on information to the citizen about help that they could access. Data sharing agreements in place with adult social care services ensured that they also received information about relevant individuals and importantly, the fire and rescue service received relevant information back about that individual regarding services they have been provided. The community fire safety team and key partners continued monitoring such vulnerable individual's risk until a suitable intervention was in place to reduce the risk.

Those involved in the project agreed that increased information sharing improved the level of communication between the partner organizations. A review was undertaken and amendments made to the existing data sharing agreements to ensure compliance of the terms of agreement for data sharing with relevant stakeholders of the project partnership.

An evaluation by the UK Department of Communities and Local Government that funded the project discussed in this paper concluded that the project resulted in improved service delivery and generated real savings for the public sector (CALG, 2012).

Conclusions

Data sharing between public sector organizations needs to be approached in an organised and well-managed manner. The conceptual systematic data sharing framework examined in this paper aimed to provide guidance to organizations considering data sharing initiatives. The empirical findings of this research indicated that it is important to carefully scope data sharing activities in terms of the organizational activities that can be supported by data sharing, the actual data that can be shared (both existing data and new data), the actual mechanisms for sharing the data, and the manner in which organizational activities may be altered as a result of data sharing.

It is important that appropriate formalised data sharing agreements are created between the parties concerned, and that appropriate legal advice is sought regarding the legal implications of data sharing (with regard to the UK Data Protection Act 1998). Guidelines pertaining to data sharing agreements published by the UK Ministry of Justice and the UK Office of the Information Commissioner were a useful source of guidance with regard to creating and enhancing data sharing agreements. In addition it is also

important that appropriate security in the form of technological and procedural security mechanisms is applied to shared data.

The lessons learned from the research were that it is necessary to approach data sharing between public sector organizations in a systematic manner in order to fully appreciate the potential benefits of data sharing, and also in order to establish a workable approach to data sharing that is fully legally compliant.

It is hoped that the data sharing framework presented in this paper may be of benefit to other public sector organizations considering data sharing. The limitations of the research undertaken were the limited number of partner organizations involved, and the limited time frame for study. Further research involving partners in other public sector organizations over a longer time period could be beneficial in order to further evaluate and refine the data sharing framework described in this paper.

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