

Exploring the SME Quandary: Data Governance in Practise in the Small to Medium-Sized Enterprise Sector

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Abstract: The purpose of this paper is to explore how small to medium-sized enterprises (SMEs) perceive data and data governance and investigates whether current data governance frameworks are applicable to SMEs. Enterprises of all sizes and complexity have had to learn how to operate in an increasingly digital business environment. Such an environment demands that an enterprise equips itself with the ability to use its data effectively both internally and when dealing with external partners such as suppliers and customers. Enterprises now recognise that both their survival and success requires taking control of all aspects of their data as a critical business resource. In recognition of the demands placed on enterprises in this digital age, a discipline has emerged called *data governance*. Although the definition of data governance is still evolving, current usage describes this discipline as being a facilitator for enterprises to take control over *all* aspects of their data resource from the setting of integrity constraints for data quality to the creation of enterprise-wide policies on data access and security. Large enterprises are often better placed to absorb the necessary demands that data governance places on resources. However, for the resource-poor SME, the investment in data governance is far more challenging but nevertheless critical in the digital business environment. This paper reviews examples of published data governance frameworks to establish whether these frameworks are applicable to SMEs. A data governance framework (Khatri & Brown, 2010) is assessed using ten SMEs that have differing data requirements. This research is further enhanced by reviewing the results of a project which audited technology use in SMEs. This paper finds that although many data governance frameworks claim to be adaptable and scalable, there is little published evidence by industry or academics on the application of data governance to SMEs. Furthermore, our research revealed that the optimal use of data governance frameworks requires that those with authority and responsibility over enterprise data must have knowledge and some understanding of the terminology that describes data, data-related issues, and data-based technology and this requirement may not be met for many SMEs. The initial reflections on the reality of data governance for SMEs reveal that they do not recognise the inherent value of their data nor view their data as having an independent existence from the systems that support their business processes. The paper concludes, amongst other things, that SMEs are poorly served by the data governance community and that further research is required to fully appreciate their data governance needs.

Keywords: data governance, SME, data management, data quality, framework

1. Introduction

There is a wealth of evidence that large enterprises are waking up to the inherent value of their data and this realisation brings the need to control and manage data as with all other enterprise assets. An increasingly popular approach is through data governance, which assigns authority, responsibility and tasks for all aspects of data management throughout the enterprise. However, as an industry, data governance solutions are largely directed at solving the needs of large enterprises with little evidence of an equivalent interest in small to medium-sized enterprises (SMEs). There appears a common assumption by industry that data governance solutions for large enterprises can be scaled down and applied to SMEs. This paper seeks to explore the validity of this assumption.

The great interest in data governance by industry is not matched by the academic community. The academics currently working in this area do appear to agree that there is no single approach to the implementation of data governance in all enterprises. However, although their research uses a wide range of organisations to test their theory, all were large enterprises (Weber et al. 2009), (Khatri & Brown 2010). This paper takes published data governance approaches and explores the particular requirements of introducing data governance to SMEs.

The authors believe that the lack of attention given to SMEs by the data governance community is unwise given the significant contribution that this sector makes to economies worldwide. Furthermore, the commonly used criteria that determine the size of an enterprise do not reveal the nature or volume of data used by the enterprise. The authors believe that the characterisation of enterprises used to demonstrate the effectiveness of data governance should include some measure of the complexity of

their data environment. In addition, current technological developments such as cloud computing are likely to encourage SMEs to store and process even greater amounts of data.

SMEs will continue to face significant and unrelenting pressure to work in an increasing digital business environment and this will place significant demands on them to take control and effectively manage their data. Therefore, SMEs will need to adopt data governance practises to help them both survive and find success. However, our initial investigations of how SMEs perceive data and its governance reveal that SMEs do not recognise the inherent value of their data nor view their data as having an independent existence from the systems that support their business processes. As a consequence, SMEs cannot easily envisage how data governance can be achieved without first achieving control over their IT systems.

This paper examines, in Section 2, the definition of a SME as described by the European Community and comments on this categorisation. Section 3 presents definitions of data governance and provides examples of published data governance frameworks that propose to be adaptable and scalable. Section 4 presents our research and findings concerning the application of a data governance framework (Khatri & Brown, 2010) in ten SMEs. Section 5 discusses the realities of data governance for SMEs and the quandaries that they face when considering data governance. This paper concludes, in Sections 6 and 7 by identifying the original contribution of our research to the body of knowledge and presents future avenues for investigation.

2. SME defined

The term 'SME' refers to micro, small, or medium-sized enterprises that meet criteria defined by the European Commission Recommendation (2003/361/EC). An enterprise qualifies as an SME if the maximum number of staff is less than 250 with an annual turnover \leq 50 million or an annual balance sheet total \leq 43 million euros.

The significant contribution that SMEs make to the European Union's economy is acknowledged and well documented in both the Lisbon strategy (EC, 2000) and its successor Europe 2020 strategy (EC, 2010a). An annual performance review for 2009 revealed that 99.8% of all European businesses are SMEs and are responsible for providing two out of three jobs in the private sector and contribute more than half of the total gross value added by businesses in the European Union. Furthermore, nine out of ten SMEs are actually microenterprises with less than 10 employees. (EC, 2010b)

The characteristics that determine an SME such as number of staff and the turnover or balance sheet total does not have any strong correlation to the amount and nature of organisational data. In fact, it is entirely possible that many SMEs use far larger amounts of data to support their business than some larger enterprises. This will become increasingly true as enterprises (including virtual enterprises) of all sizes move to exploit the capacity and services offered by cloud computing to capture, process and store growing amounts of data without necessitating an equivalent increase in accommodation, computing resources and staff to manage these resources.

For the purpose of this paper, we do not distinguish between micro, small and medium-sized enterprises but use 'SME' as a collective term to represent all enterprises that do not exceed the criteria identified for a medium-sized enterprise.

3. Data governance

3.1 Data governance defined

Data governance formed from a convergence of several well-established areas concerned with data such as data quality management, data management systems, data security, and data administration. The major driver for this convergence was a need to co-ordinate the control and management of all aspects of data throughout an enterprise.

Since the initial emergence of data governance as a critical and fundamental enterprise-wide discipline, the data governance community has published several definitions of the discipline. While earlier definitions focused on procedures, policies, processes, technologies and responsibilities for the control and management of enterprise data, more recent definitions place more emphasis on identifying roles and/or business structures that have authority over data-related matters.

While most definitions present the ‘what’ aspects of data governance, others can also include the ‘who’, ‘how’ and sometimes ‘why’ aspects. The range of definitions is partly due to the fact that data governance is currently an industry-led discipline, which can mean that vendors tend to use definitions that focus on the ‘what’ and ‘why’ aspects that best match the product or services being promoted. Organisations such as the Data Governance Institute (DGI) and Data Warehouse Institute (TDWI) that aim to inform and share good practice, present definitions that place emphasis on ‘how’ data governance is to be achieved.

Our research suggests that the definition of data governance is still evolving and that the data governance community does not appear to be converging on a single agreed definition. For the purposes of this paper, we will not contribute to this evolutionary process but use a data governance definition by (Weber et al. 2009), which is based on an adaptation of an IT governance definition by (Weill 2004). This definition states in simple terms what data governance aims to achieve.

“Data governance specifies the framework for decision rights and accountabilities to encourage desirable behavior in the use of data. To promote desirable behavior, data governance develops and implements corporate-wide data policies, guidelines, and standards that are consistent with the organization’s mission, strategy, values, norms, and culture.”, (Weber et al. 2009).

Examples of published frameworks that propose to facilitate the establishment of data governance within an enterprise are presented in the following section.

3.2 Data governance frameworks

Some authors of data governance believe that enterprises are too diverse, for example in terms of organisational structure, culture, politics and policies, to use a common framework or approach, (Weber et al. 2009), while others believe that published frameworks offer a good platform on which to establish data governance for any enterprise. Taking these perceptions together there are several options available for enterprises to consider when planning a data governance programme (Dyché 2007). These options include creating your own unique framework, adopting an industry standard framework such as the ISO 9000 series, or using an adaptable and scalable framework such as the Data Governance Institute Framework (2011).

As this paper is focusing on the needs of SMEs with their limited resources and based on the fact that SMEs taken as a group form a highly diverse sector of industry, the most obvious option to explore is those frameworks that propose to be adaptable and scalable. In this section, we review some of the most prominent contenders of published data governance frameworks and also examples of frameworks published by the academic community. The purpose of this review is to present examples of the types of published support available for an SME seeking advice and expertise on data governance.

IBM and other enterprises formed the IBM Data Governance Council with the aim of establishing best practices for data governance. This collaboration resulted in the creation of a framework referred to as the Data Governance Maturity Model (IBM 2007), which proposes to assess and measure the data governance maturity of an enterprise. This model is available as a free on-line self-assessment tool (at www.infogovcommunity.com) and is organised as a series of questions and responses on a range of data-related areas. The tool also provides simple reporting of the responses gathered so far.

The Data Governance Institute (DGI) (at www.datagovernance.com) describes itself as being “a mission-based, vendor-neutral authority on essential practices for data strategy and governance.” A major aim of the DGI is to provide a *single* framework that is capable of dealing with data governance programmes that focus on one or more data-related areas. The framework proposes to work by establishing that, no matter what the focus area(s) are, any data governance programme shares the same ‘universal objectives’ from enabling better decision making to ensuring transparency of process. A partner company of the DGI provides an online workspace tool called Stakeholder Care (at www.datagovernance.com/software) to support an enterprise following the DGI framework. This tool is available through monthly subscription.

There are many vendors offering data governance solutions to enterprises able to pay for their services. For example, Kalido (at www.kalido.com) offers consultancy services and data management software referred to as the Kalido Information Engine. Kalido encourages clients to first undertake a

self-assessment of their data governance maturity using an online tool, which uses criteria that cover three potential aspects (organisation, process and technology) of data governance implementation. Based on the results of the assessment, an enterprise is then deemed to fall into one of four data governance maturity stages: Application-Centric, Enterprise Repository-Centric, Policy-Centric, and Fully Governed.

Weber et al. (2009) states that there is not one approach to data governance and hence proposes a flexible data governance model made up of roles (executive sponsor, chief steward, business data steward, and technical data steward), decision areas (or tasks) and assignment of responsibilities. The components of the model are drawn together into a responsibility assignment matrix. Their proposed data governance model documents data quality roles and their type of interaction with data quality management (DQM) activities. The paper also proposes that contingency factors taken from IT governance (such as organisation structure and decision-making style) influence the design of the data governance model in achieving successful data quality management. This influence is thought to facilitate the creation of company-specific data governance solutions. The paper presents initial results of a data governance action research project involving six large enterprises from various industries.

Khatri & Brown (2010) propose a data governance framework that is an adaptation of a previous published IT governance framework by Weill & Ross (2004). This approach promotes the idea that the control and management of data assets (data governance) should be closely aligned to the control and management of IT assets (IT governance). The data governance framework uses five interrelated data decision domains: data principles, data quality, metadata, data access and data lifecycle. The purpose of each domain in exploring data-related matters is established along with identifying '*the locus of accountability for decision-making*' in each domain; in other words the key decision makers in each domain. The investigation associated with each domain is presented as a series of possible questions. In addition, a matrix is available, to establish the locus of accountability, ranging from two extremes of centralised to decentralised against each decision domain. The paper concludes that all data-related decisions that establish the data governance for an organisation must be achieved in close association with IT-related decisions and IT governance. The proposed data governance framework was tested on a case study for a large insurance company.

3.3 Critique of data governance frameworks

The examples of data governance frameworks are presented in this paper to illustrate the range and types of support available for SMEs seeking to establish data governance. As the SME sector is considered to be a highly diverse sector, those frameworks that are adaptable and scalable are mostly likely to be useful. This section highlights some of the features of available frameworks.

Before data governance can be introduced to an enterprise, all published frameworks recommend that a data governance maturity assessment is undertaken to establish the current state of data management and control. Some frameworks have supporting (online) tools that can facilitate this process by directing an enterprise to assess all key aspects of data management.

Implementation of data governance involves defining the owners or custodians of the data assets in the enterprise. All data governance frameworks emphasize the importance of assigning responsibilities for data areas to individuals or groups that are also given appropriate authority to make decisions and take appropriate actions.

Optimal use of available frameworks and assessment tools appears to require that those with authority and responsibility over enterprise data have knowledge and some understanding of the terminology that describes data, data-related issues, and data-based technology. All proponents of data governance frameworks agree that responsibility for this data governance must be shared between business and IT departments and this suggests that alignment of data governance with IT governance is likely to be a productive approach for the management of both data and IT enterprise assets.

The frameworks examined display a wide range of complexity. For example, the Data Governance Institute (DGI) (at www.datagovernance.com) is formed from several interrelated items (including programmes, phases, decision domains, universal objects, and components) requiring significant

effort to learn and use. Whereas, the Khatri & Brown (2010) framework is relatively simple and includes few items (including tables and matrices) requiring less effort to learn and use.

Many published frameworks propose to be scalable with some providing case studies. However, the particulars of each case study, including the size of the organisation, are not provided in detail and the authors could find no examples of data governance applied to SMEs.

In the following section, we justify using the Khatri and Brown framework and present the initial findings from our action research involving ten SMEs.

4. Research

4.1 Overview

While most data governance frameworks claim to be adaptable and scalable, there are few, if any, notable cases of frameworks being applied to SMEs. Given the important contribution that SMEs make to economies world-wide, and their ever increasing reliance on data as an enabler of more effective performance, there is a need to explore SME awareness and understanding of data governance.

Caira et al. (2009) highlight the data-related issues that are typically faced by SMEs in their operational environment and comment that, in ICT audits undertaken in over 100 SMEs, every enterprise had data management issues. Given that data-related issues appear to be endemic in SMEs and that such issues should, in theory, be addressable by data governance, the authors chose to assess whether the Khatri & Brown (2010) data governance framework can be applied, in practice, to SMEs.

4.2 Selecting the data governance framework

In this section, we discuss why the Khatri & Brown framework was selected to support our action research on how data and data governance is perceived by SMEs. Our selection process used the 'typical' characteristics of SMEs and their approach to data management, which was well-known by the authors through decades of practical experience working with SMEs and was evidenced in ICT audits of over 100 SMEs (Caira et al. 2009). These 'typical' characteristics dictated that candidate data governance frameworks must be simple and use non-technical language. A simple, non-technical data governance framework is required to reflect the simpler organisational structure of 'typical' SMEs with no IT department and with very few, if any, dedicated IT staff.

Furthermore, SMEs tend to have very few employees with comprehensive knowledge of core data and business processes and these employees 'typically' play a critical role in the day-to-day running of the enterprise and as such are in constant, high demand. Unfortunately, our review of published data governance frameworks revealed that only *one* framework, namely the Khatri & Brown framework, appeared to be both simple and non-technical. In addition, this framework claimed to be both adaptable and scalable; however there was no published evidence to support these claims as the framework was only tested on a single large organisation.

In the following section, we describe our experiences of using the Khatri & Brown framework in practise to assess how ten SMEs perceive their data and data governance.

4.3 Methodology

The methodology used takes the form of action research with both authors acting as change agents in collaborative projects with ten SMEs whose organisations form the basis of the research. The findings of this action research were supported by further research of technology audit reports on SMEs located in the West of Scotland.

The enterprises involved in the research were all small or micro enterprises with less than 30 employees. They ranged across manufacturing, distribution, retail and service-based industries, as well as both the private and voluntary sector. The enterprises had varying reach from entirely local to Europe-wide. None of the enterprises were from the IT sector. In every case, enterprise business processes were supported by both paper-based and computer-based systems. Office automation and

accounting services were provided by standard application packages. Some of the enterprises used additional specialist software packages but none of the enterprises involved in the research were sharing data between any of the software packages that they utilised. Communication with external partners was through telephone, fax and e-mail with data transferred by paper or e-mail attachments. All enterprises had a web presence but only three of the ten utilised e-business functionality. Most of the enterprises had a mainly internal company focus in relation to their access to and use of data, but the three who had implemented e-business functionality all recognised the need to also maintain a significant focus on external data access and use.

There was no evidence that any of the enterprises overtly utilise any form of data governance. The aim of this research is to explore the awareness of and attitude to data governance within each enterprise and, given the differing data focus between the enterprises, to explore the potential benefits that could be provided by the implementation of data governance and to highlight any barriers that might restrict these enterprises from capitalising on such. We use the data governance framework proposed by Khatri & Brown (2010) due to its uncomplicated format, as this is likely to engender a better level of understanding of data governance concepts within the enterprises and hence provide for better elicitation of valuable research data.

4.4 Research

A board-level representative of each enterprise was asked to comment on what they considered to be their key organisational assets and the response was compared against the “key organisational assets to be governed” as defined by Khatri & Brown (2010), namely: Human assets; Financial assets; Physical assets; IP assets; Information and IT assets; Relationship assets. A summary of the responses is presented in Table 1.

Table 1: Summary of responses to key organisational assets

Asset	Enterprise Comment
Human	All ten enterprises identified this as a key organisational asset
Financial	All ten enterprises identified this as a key organisational asset
Physical	All ten enterprises identified this as a key organisational asset
IP	Eight of the ten enterprises identified this as a key organisational asset.
Information and IT	All ten enterprises identified this as a key organisational asset. However, all organisations identified IT assets as being the physical IT hardware employed within the organisation and four of the ten did not differentiate this from other physical assets. Only three enterprises referred to information as an organisational asset and in each case considered this information to be part of their IP assets
Relationship	Five of the organisations identified this as a key organisational asset, with the other five including it in their description of either their human or financial assets.

None of the enterprises identified any key organisational assets that had not been defined by Khatri & Brown. Significantly, however, only one of the enterprises commented on ‘data’ being a key organisational asset and even then was somewhat reticent to classify it as such.

Each enterprise was also asked to provide an explanation of their understanding of the term ‘data governance’ and of the decision domain terminology used in the Khatri & Brown framework as a means of establishing awareness and understanding of the concepts. The authors then provided an explanation of the terminology and used the questions contained in the framework to effect a discussion that revealed organisational attitudes to data governance and engendered consideration of potential benefits and barriers.

When asked to provide an explanation of ‘data governance’, all enterprises referred to governance by external entities such as government and regulatory bodies (e.g. UK Data Protection Act) and then, almost as an afterthought, to the internal governance of business data, the management of client data and the provision of effective data backup and security.

The enterprises were then asked to provide an explanation of their understanding of the five ‘decision domains’ that are contained in the Khatri & Brown framework and these responses are summarised in Table 2.

Table 2: Summary of responses to organisational awareness and understanding of decision domain terminology

Decision Domain	Awareness and Understanding
Data Principles	All of the enterprises struggled to explain this term with most believing it to relate to external regulatory or compliance frameworks and only three of the enterprises providing responses that provided any focus on internal use and management of corporate data.
Data Quality	All of the enterprises identified this term as relating to the accuracy and integrity of their electronic data.
Metadata	None of the enterprises could offer any form of explanation for this term.
Data Access	Enterprises offered differing explanations for this term with some enterprises relating it to security and others explaining it in relation to the variety of ways in which a dataset can be accessed.
Data Lifecycle	Only one of the enterprises provided an explanation of this term that matched the definition provided in the framework

An explanation of data governance and of the decision domain terminology was then provided to the research subjects, who were then asked to further comment on how they felt that such should or did impact on the management and governance of their business data. A summary of responses is presented in Table 3.

Table 3: Summary of attitude and perception of benefits and barriers associated with data governance

Decision Domain	Attitude and Perception of Benefits and Barriers
Data Principles	In all but one of the enterprises, data was not perceived in any way as an asset. The general perception in the other nine enterprises was that data is not currently viewed as an asset by other organisations within their locus of operation and hence has no perceived value to the enterprise, as opposed to intangibles like goodwill. All of the enterprises recognised the value of data as an essential element of operational management but most considered this data to be little more than a transient component of corporate business processes that enabled the enterprise to function effectively. Whilst many of the enterprises had enshrined their business processes in corporate policy and procedure, they did not consider such to be required for their data.
Data Quality	All of the enterprises commented that their data was not 100% correct and that inconsistencies, duplications and missing data were identified and corrected in a reactive matter. All enterprises felt that this was sufficient to provide effective company services with data quality perceived as a reactive process driven by practical needs. In all of the enterprises, a great deal of trust was placed in employees to maintain data accuracy. All of the enterprises commented that the software application packages that they utilised both aided and hindered data quality: aiding by imposing quality constraints at data entry time but also hindering by forcing adherence to the built-in data structures defined by the packages. Many of the enterprises commented that they do, on occasion, have to handle data that does not fit within their normal business processes or within the data structures defined by the software application packages used and that management of this data can often, therefore, be problematic. All of the enterprises commented that the need to conform to the built-in data structures defined within the software application packages that they utilised was overly restrictive at times and that they often perceived themselves working in a form of data "straitjacket". In general, data quality issues were considered to be easier for SMEs, and particularly microenterprises, to address because of the small size of the workforce which facilitated regular personal contact between all staff.
Metadata	All of the enterprises struggled to understand this term even when further explanation was provided. None of the enterprises have documented their corporate data. In general, the meaning of data tends to be passed on to new employees through training and personal contact, thus establishing a 'community' view of metadata. All of the internally focused enterprises consider this to be adequate given the small size of their workforce. The enterprises that have implemented e-business functionality commented that they recognise the need to formalise their metadata and communicate such to all parties and especially to those involved in accessing and manipulating data through their e-business facilities. They were, however, unsure of how to best accomplish this.
Data Access	All of the enterprises recognised that their data-handling systems are too open to internal abuse. Enterprises are aware that this makes their organisation vulnerable to malicious attack by disgruntled employees and all of the enterprises acknowledge that they place a great deal of trust in their employees in this respect. Whilst all of the enterprises have backup procedures in place that can reactively resolve any potential data loss, the enterprises, in general, felt that this was not an ideal protection mechanism and that they would far rather establish appropriate data security in a proactive manner. Most of the enterprises echoed the comments that they gave in relation to data quality in that reliance is placed on application packages providing inbuilt data security functionality and that if such is not available or not fully understood then the enterprise does not have the necessary knowledge and skills in-house to be able to establish appropriate data security. The enterprises that have implemented e-business functionality commented that they very much relied on external organisations to provide for appropriate data access and data security and that

	this was something which was perceived, in reality, to be outwith their own locus of control, although they also accepted that this should not be the case.
Decision Domain	Attitude and Perception of Benefits and Barriers
Data Lifecycle	All but one of the enterprises acknowledged that they did not actively monitor lifecycle aspects of data. Electronic data was rarely audited and was commonly stored for longer than necessary with any maintenance being reactive and performed in an ad hoc manner. Reasons cited for this revolved around a lack of understanding of how to perform data lifecycle maintenance and a lack of awareness as to how to properly and appropriately 'retire' or 'archive' electronic data. Many of the enterprises used the term "good housekeeping" in their response but further discussion revealed this to be more dictated by regulation than from any internal desire to effect appropriate data governance. Lifecycle maintenance of paper-based data was actively and appropriately managed by all enterprises with the general view being that this was something that was enshrined in company policy and procedure and which had been a traditional element of day-to-day management within the organisation. When challenged as to why the same policy and procedure was not being applied to electronic corporate data, the enterprises all commented, in general, that the lack of "tangibility" of this electronic data coupled with a lack of awareness and understanding as to the structure, format and even physical location of the data left them relying totally on functionality within their software application packages to manage the data lifecycle. If such functionality was not provided or if the enterprise did not know how to use it then data lifecycle issues were not addressed.

4.5 Research findings

Our primary research finds that, whilst the enterprises involved in our research have a variety of data needs and differing data focus, they all seem to have similar views on developing a data governance strategy and are experiencing similar issues in relation to their ability to successfully address the management and control of data as an organisational asset.

Awareness seems to be a key factor in the SME view of, and approach to, data governance. Even the most uncomplicated published approach to data governance uses language that is not easily understood by SMEs. In addition, awareness, or lack thereof, of the technology that is used to manage and maintain electronic data has a major influence on an SME's ability to develop a data governance strategy. All of the enterprises lacked full awareness and understanding of how to address data lifecycle issues (in particular data retirement) and were reticent to take action on this for fear of disrupting live data or the processes that operate thereon.

Another key factor for SMEs is their perception of the value of data both within and outwith their enterprise. Only one of the enterprises had some recognition of data as an organisational asset. Data is viewed internally as a somewhat transient 'means to an end' in that it provides the 'fuel' to drive business processes but is not viewed in itself as having any intrinsic value. All of the enterprises recognise the value of intangibles such as goodwill and customer loyalty but do not regard data governance as providing intangible value in this respect. All of the enterprises commented that if data governance received such recognition within the business community then they would see value in implementing a data governance strategy but, as this recognition is not currently perceived to exist, the practical needs which tend to drive SMEs force them to operate in a 'reactive' manner. As such, they would struggle to implement and maintain the required 'regimented practices' and would likely therefore not extend to embracing the concept of data governance at this time.

SMEs do not tend to explicitly acknowledge or define data principles. Standards, policies and guidelines for management and use of data tend to evolve over time and become established as a norm which is communicated to, and developed between, existing and new employees within the organisation on an ongoing basis. This is particularly true in microenterprises where data quality issues are perceived as being easier to address because of the small locus of control. All of the enterprises identified the locus of accountability for decision making to be decentralised for data quality and centralised for all other decisions domains. Non-conformance of data in non-regulatory situations is not generally viewed by SMEs as an issue.

Trust in employees is perceived as a major contributory factor in ensuring data quality and conformance to any implicit data principles within SMEs. Again the small locus of control and accountability has a positive influence on a SME's ability to maintain its data at an acceptable operational level.

The use of standard application software packages within SMEs has both a positive and negative influence on data governance. On the positive side, these packages demand data quality to maintain operational effectiveness, assist with data access and data lifecycle provision, and offer a tacit framework for data principles. However, on the negative side, SME data needs are constrained by the application software packages they utilise and by their limited technical expertise in gaining access to the full range of facilities that such packages provide. SMEs have to adapt their business operations and any implicit data principles to suit the restrictions imposed by the implementation of application packages as this software imposes its own data principles which may not necessarily completely match those currently in place.

It is also interesting to note, in this respect, that all of the enterprises commented that they have no issues with data governance of paper-based data as they have long-established, tailor-made data principles and business processes for effectively managing such.

5. Discussion

In this section, we present a discussion on the quandaries that SMEs now face working in an increasingly digital business environment. Following this discussion, we highlight what we consider to be our main contribution to the data governance body of knowledge and conclude this paper with some ideas for future work.

The first and perhaps most obvious quandary is while SMEs may recognise the benefits that data governance could deliver, in that poor data is clearly bad for business, the effort required to achieve data governance often seems far higher than the perceived benefits. Much of the dilemma is due to the relationship that SMEs have with their IT systems. SMEs find the idea of data governance difficult to accept without first gaining control over their IT systems (IT governance). Furthermore, SMEs can find that they are treated as 'sinks' for data as it flows into their organisation from external sources such as suppliers and customers. For SMEs with many external partners this can mean that the SME must adapt internal systems to deal with data of various forms, controlled by the data governance of others and not by the SME. SMEs are often followers in terms of data format and use and this often leads to inefficient and ineffective data management as they try to govern this resource.

The second quandary is that SMEs may not seek data governance because they do not recognise the inherent value of their data nor view their data as having an independent existence from the systems that support their business. Many SMEs view their data as being 'owned' or worse still being 'trapped' by application packages that have been purchased to meet a particular business requirement. The use of standard application packages can often help SMEs achieve some control over their data such as improved data quality, data access and data management. However, on the negative side, SMEs can also be constrained by the same packages as the business changes to meet new requirements and cannot easily align their IT systems to support new or changing business practises due to a lack of in-house technical expertise. This is evidence of IT systems dictating data governance.

The third quandary for SMEs that do recognise the value of data governance is that there are no published data governance frameworks that are appropriate for use by SMEs. While most data governance frameworks claim to be adaptable and scalable, this was not supported with evidence. The authors could find no published examples of academic or industry-based research showing data governance adoption in SMEs. In addition, the language and terminology used by published data governance frameworks is not appropriate for SMEs, especially those with minimal technical expertise. Khatri & Brown (2010) claim to have provided a data governance framework that can be used by practitioners to develop a data governance strategy and approach for managing data as an organizational asset. Although such practitioner expertise can be brought in and paid for, resource-poor SMEs are commonly unable to fund such an approach.

The fourth quandary for SMEs is how they are viewed by the data governance community in that SMEs may be perceived as requiring 'simpler' data governance. However, this may not be true. The commonly used criteria (staff count, turnover, balance sheet) to identify an enterprise as being an SME is not necessarily indicative of their data environment. In fact, it is entirely possible that an SME could have a far more complex data environment than a large enterprise, in terms of the volume and nature of their data. Furthermore, it is thought likely that SMEs will use far greater amounts of electronic data due to technological advances such as cloud computing, enabling the provision of utility-type data capture, storage and processing services. Although cloud computing is promoted as

being a mechanism to deliver affordable computing to resource-poor SMEs, these SMEs may find themselves dictated to by the data governance practises used by third-party cloud computing providers.

The authors believe that the lack of attention given to SMEs by the data governance community is unwise given the significant contribution that this sector makes to economies worldwide. In addition, SMEs need to recognise the value of their data and the importance of data governance for their own survival in an increasingly digital business environment. It is likely that SMEs will continue to increase their use of IT, and e-business systems in particular, and this will bring growing amounts of data that requires their governance. It is also thought possible that data governance for SMEs will move from being a highly desirable achievement to a regulatory requirement, (Trope & Power 2005), (Khatri & Brown 2010). For SMEs, it would no longer be acceptable to ignore data-related issues or to have company data inaccessible to the auditors. Such regulation is likely to affect the banking and financial services industries first, and will emerge as a growing trend worldwide. However, once established, this regulatory requirement is likely to ultimately encompass all enterprises of any size, in all sectors.

6. Contribution to body of knowledge

The main research contribution of this paper is in identifying that SMEs are poorly served by the data governance community. Our research shows that while most data governance frameworks claim to be adaptable and scalable, the most straightforward and simplest of data governance frameworks (Khatri & Brown 2010) was not suitable for use with SMEs. However, the time spent working in collaboration with the ten SMEs did provide the authors with greater insights into how SMEs perceive their data and its governance. The authors believe that these insights are critical pre-requisites for those interested in developing data governance frameworks, methodologies and/or tools suitable for SMEs seeking to reap the benefits that can accompany data governance.

7. Implications for future work

The research described in this paper raises several questions and avenues for further work with regard to SMEs and data governance; some of which are discussed below.

In this paper, we revealed that even the simplest published data governance framework is not suitable for use with SMEs. However, given the diversity of the SME sector, we ask the question - Can a single data governance framework meet the needs of all categories of SME? For example, is it reasonable to expect that a framework suitable for an enterprise with 250 employees will also be suitable for use with an enterprise with only a few employees? Furthermore, the true diversity of enterprises that make up the SME sector may be partly obscured by the abbreviation 'SME', which is commonly described in full as 'small-to-medium-sized enterprise' but does, in fact, also refer to a 'hidden' third category, namely the microenterprise. The European Commission (EC) provides criteria to identify this category as an enterprise with less than 10 staff and an annual turnover or balance sheet total that does not exceed 2 million euros (EC Recommendation 2003/361/EC). Microenterprises account for 90% of all enterprises (EC, 2010b) and it is therefore perhaps no surprise that nine out of the ten enterprises researched in this paper are in fact microenterprises. We therefore have the basis to continue this research to answer questions such as - What are the particular requirements of microenterprises in terms of facilitating their appreciation of their data and of data governance? In addition, are there any significant differences, in this respect, between microenterprises and the other categories of SME?

In this paper, we considered whether the commonly used criteria that determine the category of enterprise such as number of staff, annual turnover or balance sheet total are 'good' indicators of the complexity of an enterprise's data environment. We suggest that while these criteria are appropriate for the categorisation of enterprises according to their size and wealth, they do not necessarily serve as a good indicator of the data management requirements for an enterprise. While it is likely to be true that larger, more resource-rich enterprises will normally require more complex data management, it is increasingly possible that smaller enterprises will face similar data environments. Additional factors are likely to impact on the nature and quantity of data that an enterprise must manage such as whether the enterprise conducts much or all of its business online, the frequency of transactions and other interactions with customers and suppliers, and the use of third party companies offering data services. These factors can impact both small and large enterprises. This raises the question - Is it useful to categorise enterprises according to size and wealth when considering the development of

data governance frameworks? In addition, what factors determine the complexity of the data environment for an enterprise?

In this paper, we proposed that data governance will become an increasingly critical issue for SMEs as more enterprises conduct more of their business online. In addition, third party cloud computing will offer an affordable solution to SMEs seeking to increase their data storage and processing requirements. This raises the question – Will SMEs view cloud computing services as a means of acquiring data governance? Poor data management practices will prevail on the cloud unless SMEs regard the ‘move’ to the cloud as an opportunity to improve data governance in areas such as data security, data integrity and data accessibility. Currently, the impact of cloud computing on enterprises seeking to achieve data governance is not fully understood. In fact, data security and data privacy continues to be the major concerns for enterprises seeking to use the services of third party cloud computing providers. These concerns are so significant and persistent that many larger enterprises are delaying their ‘move’ to the cloud, storing only less important, less sensitive data, (Chow et al 2009), (Popovic & Hocenski, 2010). However, resource-poor SMEs may find the cost-effectiveness so attractive that they ‘move’ to the cloud before these concerns are fully addressed. This raises the question - How aware are SMEs of the concerns surrounding data management in the cloud? In addition, can we develop an approach to raising awareness and minimizing the risks for SMEs proposing to use third-party cloud providers?

The authors believe that it is important that the data governance community focuses more attention on the plight of SMEs. Failure to support this critical business sector will mean less wealth creation for economies dependent on SMEs. Instead of generating wealth, SMEs may waste significant resources trying to achieve data governance by applying frameworks that are not best suited to their business environment and culture.

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