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Making Sense of the Master Data Management (MDM) Concept: Old Wine in New Bottles or New Wine in Old Bottles?

Abstract. This paper presents an insight into the emerging concept of Master Data Management (MDM) and highlights a set of issues that both academics and business managers should consider to better understand the meaning of this 'hot topic'. This paper is forward looking and is the first attempt by the academic community to make sense of the MDM concept and highlight the issues associated with implementation. We argue that both the Data Warehousing and ERP concepts are the forerunners to the emergence of MDM. We argue that MDM is effectively Data Warehousing branded with ERP market rhetoric and contains an added repository of 'master data'. We see MDM as another attempt at data integration due to the failure of previous Data Warehousing and ERP initiatives. Finally, we argue that more research should be conducted to fully appreciate the true meaning of the concept of MDM and MDM implementation.

Keywords. Master Data Management, Data Warehousing, Enterprise Resource Planning, Implementation.

Introduction

Whilst the area of adoption and diffusion of IT innovation is one of the main areas of attention in the IS field for over four decades, evidence suggests that organizations have often followed a hasty and incomplete approach to their adoption decisions, preferring to 'jump on the bandwagon' as managers try to conform to the latest fad or fashion (c.f. Swanson and Ramiller, 2004). Within IS the 'bandwagon effect' has resulted mainly from practitioner approaches to engineer self-replicating demand for a new fad of fashion. Practitioners have achieved this through the identification of performance benefits offered by a new IT artifact, and a corresponding performance gap suffered by those that have not adopted it (c.f. Abrahamson, 1991; 1996). A classic example of such *rhetoric* and the proliferation of the new dictum can be seen with Enterprise Resource Planning (ERP) packages (cf. Wood and Caldas, 2001; Sammon and Adam, 2002; Swanson and Ramiller, 2004).

Within IS fashion setters are constantly creating new artifacts, techniques, and methods, which are selected for introduction into the 'fashion cycle' (c.f. Abrahamson, 1991; 1996). If and when a bandwagon develops around an IT innovation, the *mindless* organizations may join in, get caught up in the momentum generated by prior adopters, and impressed by 'success stories' that appear to validate the innovation as a good, maybe even an irresistible, idea (Strang and Macy, 2001; Swanson and Ramiller, 2004). To justify adoption the organization may be content with the rationale that 'everyone is doing it' or the justification that 'it is time to catch up'. As a result, the *mindless*

organization places its faith in what the broader community appears to know – in common competences – rather than its own distinctive competence (Swanson and Ramiller, 2004). The very interesting side effect which this approach has is that *mindless* implementation of a new innovation will lead to negative experiences which gives a fresh opportunity to fashion setters to push a new release or implementation approach to those who did not manage to derive benefits the first time around. For example, while the Enterprise Resource Planning (ERP) area was an excellent example of legitimization of a technological improvement in that it was characterized by a strong vendor and consultant push, organizations appeared to have little choice with regard to the selection and implementation of an ERP package. We contend that Master Data Management (MDM) could be about to achieve the same legitimization. Therefore, the objective of this critical reflection paper is to arrive at an acceptable description of MDM and an understanding of the issues of concern in MDM implementation.

The remainder of this paper is organized as follows. A retrospective account of a master data categorization problem is presented. The emergence of the Master Data Management (MDM) concept is then discussed. Our efforts at making sense of the MDM concept are then presented where we take an historical perspective of data integration initiatives, namely: Data Warehousing and ERP. The issues of importance for MDM implementation are then presented followed by some concluding remarks.

1. An Organization's Story: Data Integration in a post-ERP Environment

In this section, we present a retrospective account of a Global Director (Supply Chain Management) in a large multi-national organization regarding the problems raised by their recent ERP implementation. This narrative illustrates vividly the problems inherent in data integration when it has been achieved without giving sufficient thought to how the data would be used, as follows:

"..there is a major limitation with the way data was represented on the ERP system, in that, it was a failure to consider developing an enterprise-wide data model at the outset of the project that was the root cause of the problem. Ultimately, we never setup a standard classification system for the products that we procure on behalf of our customers. Therefore, if I [the Global Director of SCM] want to find out relatively quickly how much we are paying for a 'two color CD on a spindle'1 around the world, it is not possible. Therefore, due to the fact that I cannot simply request global prices for a product classified as a 'two color CD on a spindle' I have no visibility as to global procurement costs and on how savings could in fact be made.."

One needs only to examine the narrative presented above to appreciate the enormity of the problems presented by a lack of management and standard classification around their data. As investigators you can also imagine that this issue was teased out further by the researcher in order to make sense of this lack of visibility in their data and indeed encourage the Global Director of SCM to make further retrospective sense and provide context for the problem. What emerged was amazing, the problem was in fact simple, if not impossible to fix, especially because every product was redundantly codified in a customer part number. So products were represented as part number 1, 2, 3, 4, 5, etc. for customer 1 and part number 6, 7, 8, 9,

[1] *It is estimated that the company typically procures up to $15 to $20 billion worth of CDs per year.*

etc. for customer 2 and so on, where part number 2 and part number 8 could be a 'two color CD on a spindle'. Furthermore, there could have been a thousand products ('two color CD on a spindle') for Customer 1 throughout the various company sites, all identified by different part numbers due to the fact that the CDs contained different information2. Therefore, the company had no way of knowing the mix of business or the profile in terms of what was being procured at what price and if cost savings could be made, or indeed if the company's bottom line could be improved.

It is worth bearing in mind that there are hundreds of thousands of products stored on the company's ERP system and as suggested by the Global Director of SCM, an end-user had to know the part number upfront, for instance 1, 2, 3 or 4, etc., to identify the product. This problem of classification is further complicated by the fact that the company moved to a central sourcing operation, and where this type of product information is needed, it had to be solicited from the relevant sites. The obvious reaction of those at the site level, as recounted by the Global Director of SCM is "well we have centralized sourcing but yet you are coming to us for all the information, it just does not make sense".

While this example does highlight the lack of an enterprise-wide view from a data perspective at the outset of the ERP project, it also signifies a lack of awareness as to the costly repercussions of such a decision, the initial trade-off being to get the ERP package implemented quickly with an automation of 'as-is' business process and a basic replication of the existing site specific data structures. Therefore, a failure to standardize and codify data at the outset of the project caused problems with the system in use, and required considerable effort to retrofit the ERP system to meet the requirements of a standardized enterprise-wide data model. Whilst it would be all too easy to discount the problems encountered in this organization as trivial examples of bad management, we consider the scenario hereby presented as representative of many case studies we have conducted recently.

The account given by the Global Director of SCM highlights the fact that in hindsight there must have been a failure to have a 'good think' about data integration and the organization did not see the data analysis activity as one of the basic fundamental aspects of their enterprise-wide ERP project initiative. Indeed, this is the retrospective reality for a large number of organizations where the outcomes of their Data Warehousing and ERP projects have not been in line with initial expectations. As a result of these less than desirable project outcomes, the understanding of the organization regarding implementation must be questioned. We feel that it is important for the academic community to appreciate what problems practitioners are faced with and make an effort to improve managers' levels of understanding so as to ensure that their organization is focusing attention on the right issues with regard to Master Data Management (MDM). A failure to move in some way to achieve this increased understanding will leave organizations faced with the same regrets in the area of MDM. We argue that an increased understanding of MDM amongst managers will reduce the occurrence and the impact of problems with the outcomes of MDM projects.

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[2] *A part number would only be the same across all sites if the company was conducting business with the same customers, for instance, Customer 1 or Customer 2 across all sites.*

2. The Emerging Concept of Master Data Management

MDM is rapidly approaching 'buzzword status' (Lager, 2005). However, while MDM has come to the forefront as a critical data management practice, the varied MDM requirements have not yet converged into a coherent market and as a result, organizations are understandably confused about where to start (Wadehra, 2007). Therefore, while the concept of MDM has come of age in recent times with compound average growth rates (CAGR) of 14.7% predicted over the next five years for the worldwide market, it is also expected that the MDM market will be one of the fastest growing software markets (forecasted value of $10.4 billion in 2011). However, as has been the case with other technical concepts, there is also a lack of understanding as to what constitutes this concept of MDM, which could compromise the benefits sought by implementing organizations, as illustrated in Table 1.

Table 1. Descriptions of MDM

Description	Source
MDM supports the global identification, linking, and synchronization of all data elements that help to fully explain products, customers, and other key categories of data. An MDM serves as a central system of record and improves the quality of the information lifecycle across data creation, augmentation, and use	ARC Advisory Group (2006)
MDM is a system of business processes and technology components that ensures information about business objects, such as materials, products, employees, customers, suppliers, and assets, is current, consistent, and accurate wherever they are used inside or exchanged outside the enterprise	Murphy et al. (2005)
MDM supports such goals as a 'single version of the truth', operational efficiency and management information as a strategic resource - that is, Enterprise Information Management (EIM)	Radcliffe et al. (2006)
While businesses are not investing in new ERP and CRM systems as much, they are trying to rationalize their existing purchases. MDM reaches across a number of areas, where functional units within an organization need to share data on products, customers, locations, etc., across multiple systems	Lager (2005)

While a variety of descriptions for the concept exist, the lack of a core set of principles as to the true nature of MDM and how it should be approached by an organization is a significant concern. This concern was also expressed by the Ventana Research Group in a report published in 2006 which stated that *"the constant pressure on organizations today to increase transparency and accountability and improve compliance with fiscal regulations is having a strong effect on data management efforts. To meet these challenges, many organizations are turning to Master Data Management (MDM) – and finding a dearth of accurate information about it. Although much has been said and written on this topic, useful details about interest in and implementations of MDM remain scarce. As a result, uncertainty is rampant among end users and vendors alike"*. From our perspective, this scenario is not a dramatization and we feel that, not too long ago, organizations faced the same uncertainty with regard to deciding on what ERP package to purchase and implement or indeed what Data Warehouse to build. While these issues may still be puzzling for some organizations today, a large number of these Data Warehousing and ERP solutions are already in place, but with varying degrees of success, as many case studies published in scientific and practitioner publications indicate. Based on years of research on Data Warehousing and ERP projects, we feel that the lack of success with ERP and Data Warehousing initiatives

relates to the absence of a conclusive understanding of what they entailed and the impact they would have on an implementing organization. The existence of much confusion with regards to MDM is therefore very likely to lead to similarly mixed fortunes with implementing organizations.

We are not alone in our thinking as Lager (2005) suggested that *"ERP were being put in place, but they didn't solve the problem they were implemented to solve"*. Swanson and Ramiller (2004, p.554) reported that *"by the mid-1990s, ERP was a topic that was being banded about in boardrooms. It wasn't just an information technology (IT) project, but a strategic business imperative… the ERP genie was out of the bottle – every company needed to have an ERP implementation"*. Furthermore, they suggested that *"adopting organizations entertain scant reasoning for their moves. Especially where the innovation achieves a high public profile, as with ERP, deliberative behavior can be swamped by an acute urgency to join the stampeding herd, notwithstanding the high cost and apparent risk involved"* (Swanson and Ramiller, 2004, p.554). Indeed, this *mindless* behavior - a concept borrowed from Weick and Roberts 1993 - in pursuit of 'best practice' is the rule, and *mindful* organizations engaging in IT innovations appear to be the exception. Paradoxically, the argument can also be made that the investments in these ERP packages were amongst the most significant an organization has ever engaged in (Olsen and Saetre, 2007); however, the nature of these ERP packages and the impacts of implementation on the organization was not well understood by managers (Parr and Shanks, 2000; Besson and Rowe, 2001; Swanson and Ramiller, 2004; Kim *et al*., 2005; Finney and Corbett, 2007). Therefore, the question being asked is as follows: are the mistakes of the past going to be repeated, with organizations following the same *mindless* approach with regard to their adoption of MDM?

3. Making Sense of Master Data Management Initiatives

To date the somewhat confused MDM rhetoric also reminds us of the problems inherent in the discourse of vendors in the area of management support systems. For instance, 40% of respondents to a recent study by the electronic forum *The Register* characterized the language used by vendors as often ambiguous or confused; with a further 44% referring to vendors as creating an unhelpful mire of marketing speak around Business Intelligence (BI) (Vile, 2007). Indeed, whilst the concept of BI is comparatively simple (a business management term that refers to applications and technologies used to gather, provide access to, and analyze data and information about company operations) vendors have ensured that a substantial overhead of jargon has been built into the BI debate. SAP and Oracle are now pushing the concept of embedded analytics and Vile (2007) describes how other vendors have rearranged older concepts such as cockpit, dashboards, data marts, and scorecards as part of the marketing efforts to promote their new portal technologies. According to Lock (2007), the problem is heavily compounded by the fact that vendors are pounding potential users (i.e. business managers) with their marketing efforts and make disproportionately small efforts to keep IT professionals adequately informed about their products creating a tension in many organizations, due to the fact that they cannot easily invest much time into experimentation with new BI technologies. We fear that the discourse of vendors when it comes to MDM will follow the same trends, with potentially negative consequences on the returns obtained by organizations from their investments in IT. To

us, this is a strong incentive to study the MDM concept and bring definitive and independent clarity into it, for the benefit of managers and practitioners.

It has been argued that MDM is different from other data quality/integration initiatives due to the fact that 'master data' elements are identified from an analysis of all organizational systems across the organization's information architecture as opposed to concentrating on just one system (Griffin, 2005). Such a cross-system analysis will help an organization to ensure that their data is accurate, uniform and complete and there will be 'one single version of the truth' across the organization's information systems (Griffin, 2005). Crucially, this was already the promise of the Data Warehousing initiatives of the early-to-mid 1990s.

Analysis conducted by Ventana Research (2006) indicated that *"organizational maturity with respect to MDM currently stands at a point that indicates there is substantial room for greater maturation in organizational MDM deployment and utilization"*. Bearing this observation in mind, the objective of this critical reflection paper is to arrive at an acceptable description of MDM and an understanding of the issues of concern in an MDM project implementation. We set about achieving this objective through a review of the trade press literature available on MDM and the results of our own sense-making approach to position MDM against the concepts of ERP and Data Warehousing. In particular we highlight the similarities and more importantly the differences between what has been understood about ERP and Data Warehousing, and the now emerging concept of MDM. Indeed, we argue that MDM appears to be positioned as a new term for an old problem, and again in the IS area we have a tradition of this re-branding of technologies and solutions, but a failure to realize that if we *'ignore history [we are] condemned to repeat it'* (Judge, 1997; Webster, 2000). To further illustrate our argument we set out to use the discourse of the MDM vendor Kalido. Kalido (www.kalido.com) is often positioned in the trade press as the leading provider of Master Data Management solutions in the market.

This seems to be an adequate statement when it comes to describing the mixed fortunes of organizations deploying Information Systems (IS) and researcher's approaches to studying these IS evolutions. Indeed, Lucas (1991) suggested that, as a field, we need to think about interesting problems and look for underlying issues rather than focus on today's 'hot topic' to keep up with the latest IS fashion. Therefore, this paper builds upon existing research carried out in the areas of Data Warehousing and ERP, while emphasizing a 'continuity of ideas' and construction of a 'cumulative' body of research with regard to data integration. Embracing the concept of Mason et al. (1997, p.307) who stated that *"a study of history offers a valuable perspective with which to view our present circumstances. It provides a backdrop from which to determine what is novel in the current situation and which factors serve to distinguish the present situation from any others in the past…It also identifies the solutions that worked in the past and those that did not"*. In the next section we present a brief historical account of organizations' approaches to data integration.

3.1. A History of Data Integration: Data Warehousing and Enterprise Resource Planning (ERP)

For more than a decade, organizations have adopted a number of different approaches to data integration; from Data Warehousing in the early-to-mid 1990s, striving to achieve informational integration, through to ERP in the mid-to-late 1990s, focusing on operational (process and data) integration. Organizations have expected enterprise

technologies to provide real tangible business benefits, with buzzwords like 'integration', 'collaboration' and 'optimization' proposed to ensure definite success (Fornadel, 2003). As a result, organizations around the world invested billions in Data Warehousing and ERP initiatives specifically; unfortunately, this confidence in technology was misplaced, where only a very small number of implementations were successful (Fornadel, 2003). We argue that the most important factor for the emergence of MDM has been the unrealized benefits in previous ERP implementations and unresolved Informational IS requirements. Indeed, these previous approaches to integration have facilitated the emergence of MDM which is set to define the organizational landscape for the next five years or so (a fashion cycle) as the solution to the data and information integration problem.

3.1.1. Data Warehousing (1990-1995)

During the early-to-mid 1990s the concept of Data Warehousing was constantly redefined and the emergence of an inclusive definition of Data Warehousing was slow to emerge. However, proposed definitions of that time identified the goal of Data Warehousing as enabling the provision of better enterprise-wide information to support an organization. Traditional Data Warehousing comprises of three phases, namely: data acquisition, enterprise data management, and data delivery; therefore, the main objective of Data Warehousing is to turn data into information, and by design it is informational, analysis and decision support oriented, rather than oriented towards transaction processing (Sammon and Finnegan, 2000).

Reflecting on the early-to-mid 1990s Data Warehousing can be described as an informational solution to an operational problem in terms of data integration. The limitations of the traditional Management Information Systems (MIS), perceived as being unable to maintain a consistent view of an organization's reconciled data, was identified as the potential benefit of a Data Warehousing system (Wu and Buchmann, 1997). To overcome the problems with traditional approaches of accessing large amounts of data in heterogeneous, autonomous distributed systems, the emergence of Data Warehousing introduced the concept of a 'logically centralized data repository'. Therefore, the concept of Data Warehousing emerged due to the evolution of IS objectives within organizations to the growing demand within organizations to analyze (internal and external) business information.

3.1.2. ERP (1995-2000)

Similar to the experiences with Data Warehousing, there was no agreed definition for ERP systems, although their characteristics position these systems as integrated, all-encompassing, complex mega-packages designed to support the key functional areas of an organization (Gable et al., 1997). Therefore, by design, an ERP is an operational-level system. By the mid-to-late 1990s ERP systems vendors provided an alternate operational solution to the data integration problem, retiring the previously existing fragmented legacy systems that operated throughout the organization. Furthermore, ERP systems also promised to deliver on the informational requirements of an organization, such is its scope, therefore, the perceived need and along with it, the rate of Data Warehousing project implementations, was reduced. Due to the fact that an ERP systems implementation replaced many of the legacy systems throughout the organization, it can be perceived as the 'base line application', containing integrated application data, generated as a 'by-product of transaction processing', or as an 'ODS'

(Operational Data Store), a 'hybrid structure' that contains some aspects of a data warehouse and other aspects of a transaction processing environment (Inmon, 1999).

Many research studies of ERP implementations have reported how the failure to properly analyze requirements and understand the impact of the changes brought about by ERP implementations has created problems for implementing organizations and has curtailed the extent to which they have been able to derive benefits from their investments. As organizations moved toward the post-implementation phase of their ERP projects, post Y2K for the vast majority of organizations, the real issue of benefit realization emerged (Sammon et al., 2003). Pallatto (2002) added that concessions and compromises in the design of the rushed Y2K ERP projects had negative impacts on systems performance and benefits which were not promptly and fully communicated to the implementing organization.

3.1.3. Post-ERP (2000-2005)

One benefit in particular which did not materialize was the provision of an integrated informational platform to facilitate reporting on every aspect of an organization's activities. This led organizations to reconsider undertaking Data Warehousing projects post-ERP implementation. Therefore post-Y2K, many organizations discovered that the solution to leveraging investment decisions in, and retrieving useful data from, an ERP system was to undertake additional initiatives, for example Data Warehousing; ERP II initiatives embracing the concept of PIM (Product Information Management) and CDI (Customer Data Integration); and Business Intelligence, in conjunction with their already implemented ERP system (Sims 2001; Raden 1999; Inmon 2000; Radding 2000; Hewlett-Packard 2002; Hayler, 2003; Sammon et al., 2003). Indeed, Ventana Research (2006) highlight the fact that over half of the organizations considering MDM have already implemented a PIM or CDI master data deployment. The harsh reality of ERP systems implementation, to the expense of those organizations that invested resources in the initiative, is that ERP only facilitated getting data into the system; it did not prepare data for use and analysis (Inmon 2000). This is due to the fact that ERP systems lack certain functionality and reporting capabilities (Adam and Doyle, 2001). Many organizations experienced frustration when they attempted to use their ERP system to access information and knowledge (Radding 2000). It was quickly realized that ERP systems are good for storing, accessing and executing data used in daily transactions, but it is not good at providing the information needed for long term planning and decision making (Radding 2000; Adam and Doyle, 2001) as ERP systems are not designed to know how the data is to be used once it is gathered (Inmon 1999). As we have argued earlier, this has led to the emergence of the Master Data Management (MDM) concept.

3.2. The Reality of MDM Initiatives

Our key question in this paper concerns identifying the key issues that both academics and business managers should understand about the concept of MDM and the implementation of an MDM solution. It is our contention that the issues that will face organizations in their pursuit of MDM initiatives will mirror those that they faced in their Data Warehousing and ERP implementations for almost twenty years. As we know the degree of success of these Data Warehousing and ERP implementations was considered to be low by many organizations. The full scale of these initiatives was

rarely tackled by organizations, highlighted in no small part by inadequate organizational analysis at the outset of the project and below expectation project outcomes.

As highlight previously, to illustrate our argument we use the discourse of the market leading MDM vendor Kalido. As a result it is important to appreciate that managers will be exposed to the Kalido rhetoric in their efforts to gain a priori understanding of what MDM actually is, the benefits of MDM, approaches to MDM implementation, etc. Figure 1 is one such representation of MDM published on the Kalido website in 2006. At first glance this diagrammatic representation looks comprehensive while also being self-explanatory. Having a 'golden copy of master data' stored in a 'master data warehouse', accessible to users over a web-based interface, and feeding into the organization's enterprise data warehouses is being illustrated as one of the main capabilities of the Kalido® 8M solution.

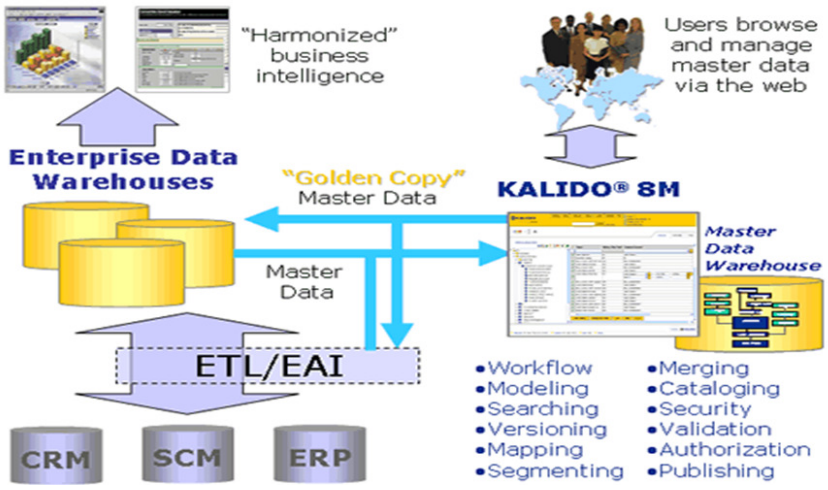


Figure 1. Representation of Master Data Management (source: www.kalido.com)

If we look a little deeper at the diagram and rotate it 90 degrees (clockwise) we can appreciate the real sense of what MDM is about (in this instance as per the explanation offered by Kalido). This is captured in Figure 2 and highlights the harsh reality that MDM is effectively Data Warehousing branded with ERP Market rhetoric and contains a repository of master data.

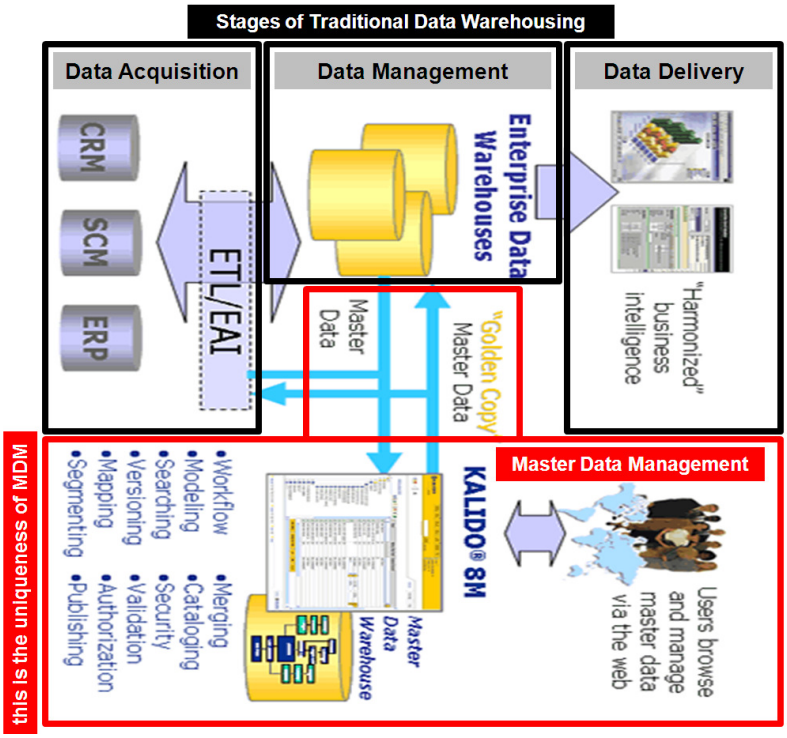


Figure 2. The Realities of Master Data Management

Therefore, the issues of importance for MDM should be focused on what is needed to create this repository of master data in support of the requirements of the business. This repository of master data ultimately redefines the existing data elements modeled in the existing ERP and Data Warehouse system(s) suggesting that the organizations existing Data Warehouses were fragmented in the way they represented organizational data from transactional systems (ERP), therefore, limiting organizational reporting capabilities.

4. Concluding Remarks

'Scant reasoning' and 'mindlessness' have been suggested as common characteristics defining organizations' approaches to implementing ERP packages (Chen, 2001; Wood and Caldas, 2001; Swanson and Ramiller, 2004) which indicates that the realities of ERP implementation are not fully understood by managers. Analyzing the discourse of participants within the ERP market, notably vendors and consultants (using their marketing brochures and website content), but also managers (using case studies published in academic journals) who look towards ERP as the solution to all their problems, all too often reveals unrealistic and unrealizable expectations on ERP packages (Sammon and Adam, 2002; Law and Ngai, 2007). We fear that these unrealistic and unrealizable expectations will now ultimately be placed on the MDM solutions on offer. As was observed in the ERP market, organizations seem to display an acceptance of the ERP vendors' and consultants' discourse that is not in keeping

with the most basic principles of prudence (Westrup and Knight, 2000). Indeed, *"the rhetoric of the packaged software vendors is particularly pervasive and has widespread appeal"* (Howcroft and Light, 2006, p.217). Therefore, believing that the introduction of an MDM solution will be the solution to all organizational problems regarding data integration (for the provision of better management information) will produce a less than desirable outcome for the organization. Again, this insight proves extremely worrying for organizations investing in MDM and calls into question the expectations of organizational decision-makers as to the 'desired' outcomes from investing in an MDM solution versus the 'actual' outcomes and value-for-money from such an investment.

In light of the argument that we have presented, we are left in a situation where our understanding of MDM implementation requires an appreciation of the factors critical to success in Data Warehousing and ERP and, the actions needed to successfully produce a repository of master data. As a result, examining the issues of concern for MDM implementation may provide us with some insight into the factors that should receive attention in the academic and business manager community going forward.

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