

“Stop Annoying Your Customers: Apply MDM + Big Data to Build a Complete Customer View Now”

An Informational Guide to Next-Generation MDM Solutions for the Large Enterprise

An MDM Institute White Paper

Savvy IT architects are moving on to planning for next-generation Master Data Management (MDM) capabilities to address demands of an increasingly mobile society. These capabilities are required to address opportunities and challenges of an increasingly "networked economy".

For many Global 5000 enterprises, MDM is a relatively mainstream business strategy when it concerns CUSTOMER or PRODUCT master. Or so they thought. With the perfect storm of Mobile, Social, Cloud and Real-Time Information brewing, these once leading-edge MDM architectures are quickly becoming obsolescent and/or "IT money pits".

Because master data is required to provide competitive advantage, increase customer service levels, and drive new product/service combinatorial market offerings, MDM solutions must embrace the next-generation of IT capabilities (e.g., location awareness, noSQL technologies such as Hadoop and graph databases, Big Data analytics, etc.) to deliver such requirements.

The fact remains that MDM is fundamental to realizing value from information—whether it is Big Data or not, multi-tenant cloud or on-premise, mobile or static, etc.). Moreover, next-generation MDM solutions must transcend the limitations of contemporary MDM platforms regarding breadth and depth of "single view". These next-generation domains ("sphere of influence", etc.) must leverage all the internal/corporate and external/public deep web capabilities to enrich and confirm the information (data and relationships) that comprise the most important info assets of every enterprise—no matter the geography, industry or size.

“Mega trends such as Mobile, Social, Cloud and Real-Time Information are playing a key role in enhancing business value as enterprises transform themselves to meet the reality of MDM-enabled Big Data analytics. At the same time, these trends have considerably stressed the capabilities of contemporary MDM solutions.

You'd be hard pressed this year to locate a senior executive at a large, public company who hadn't stood in front of her employees, customers, or shareholders to pronounce that corporate master data is a critical asset that must be nurtured and protected ... and further pronounce that "Single Customer View" will be the corporate initiative to deliver mobile commerce, enhance quality of customer service, cross-sell to increase wallet share, drive regulatory compliance, and more.

This year, the trending topic de jure for boardrooms is Big Data and its brethren Big Data Analytics. Sound familiar? Clearly, MDM and Big Data are co-dependent. The fact is, without consistent master data, an enterprise can't discern and measure "who" is "tweeting/blogging/friending" about "what" product or service.

*And *both* MDM and Big Data business strategies mandate a healthy dose of Data Governance to be cost effective, measurable and sustainable.”*

Aaron Zornes, Chief Research Officer, The MDM Institute

TABLE OF CONTENTS

Executive Summary	1
Key Business Initiatives Driving Next-Generation MDM Solutions	2
Technology Challenges for Next-Generation MDM Solutions	4
Disruptive Technologies Impact on Next-Generation MDM	9
Case Study: Next-Generation MDM at Work	12
Conclusion	13

LIST OF FIGURES

Figure 1 – Key Business Initiatives Driving Next-Generation MDM Solutions	2
Figure 2 – Key Technology Challenges for Next-Generation MDM Solutions	4
Figure 3 – Five Disruptive Technologies Facing Next-Generation MDM Solutions	9

“Stop Annoying Your Customers Apply MDM + Big Data to Build a Complete Customer View Now”

A White Paper on Next-Generation MDM for the Large Enterprise

Page 1

Executive Summary

Until recently, a consumer's most sophisticated computing experience was at work, and computing was limited at home. In the networked economy, the opposite is true in most cases. Prior to the arrival of the networked economy in the past five years, businesses typically valued customers only in terms of their lifetime value. In the networked economy, businesses need to view how customers are connected to other people, places and things— i.e., the customer's "net worth of their network".

Master data management (MDM) solutions have been tangibly effective in creating enhanced views of customers by aggregating information from internal and external trusted sources. However, these contemporary MDM solutions suffer from "data blind spots" resulting in businesses annoying their customers with misdirected marketing and inappropriate customer service levels due to their myopic view of the consumer.

Clearly, most enterprises suffer from an incomplete understanding of the commercial clout of their customers in the networked economy, e.g., the “sphere of influence” of a customer that incorporates both extended and non-obvious relationships. To attain such multi-dimensional views of a customer, market-leading enterprises are looking to deploy next-generation MDM capabilities that leverage the Big Data generated by social and mobile commerce to better understand the "sphere of influence" or "graph" of their customers. The business objective? Enable the business to leap ahead of competition in operational business performance by providing a more complete or 360° view of entities such as customer or supplier. Enterprises can grow their share of wallet from the individual (ego-centric marketing) to that individual's network of influence (exo-ego).

The four key trends shaping the next-generation of MDM capabilities can be summarized as: **Mobile** (pervasive mobility), **Social** (ubiquitous connectivity), **Cloud** (economically hyper-scalable computing services) and **Real-Time Information**. Collectively, these trends make information accessible, shareable and actionable by anyone, anywhere, and any time. Next-generation MDM leverages these trends.

In the networked economy, the combination of Mobile, Social, Cloud and Real-Time Information decreases the "air space" between information and action.

Near term, enterprises must stop annoying their customers now by applying MDM with Big Data to build a complete customer view. Longer term, as the "the Internet of Things" becomes a daily reality and everything is "Smart" -- smart phones/tablets, smart TVs, smart cars -- savvy IT architects are betting that graph database-based MDM solutions can provide the "master relationship management" necessary to act as a knowledge-based "Smart Hub "to enable actionable insights in this networked economy.

Key Business Initiatives Driving Next-Generation MDM Solutions

Clearly, global consumerization and the ubiquity of smart connected devices are mandating that enterprises transform the way they interact with both their customers and suppliers. To provide the agility necessary of information technology to support this sea change, enterprise architects are increasingly championing MDM to enable such business transformations.

That's the past and current "group think" regarding master data. However, society and commerce will continue to rapidly evolve. Does your enterprise architecture of two to three years ago sufficiently accommodate the economic juggernaut of Cloud computing or the complexities of multi-channel commerce?

How then does an enterprise architect its master data solutions to account for such sea changes in society, commerce and information technology? **For many (if not most) enterprises, their existing IT architectures are becoming obsolete and their master data capabilities suffer from a lack of support for Mobile, Social, Cloud and Real-Time Information IT trends.**

The new "networked economy" is based on a technology-immersed world with increasingly mobile and interconnected parties driving business at an increasingly accelerated pace. Using multiple devices and applications of their choice, consumers will connect with one another and interact with an abundance of information. Clearly, through 2013-15, traditional enterprises will struggle to adapt to the "networked economy"– both from a business model and IT architecture perspective.

As a result, there are five key business initiatives driving the next-generation of IT architecture which in turn mandate a "next-generation MDM solution". The following five business initiatives are but a handful of the evolving set of business strategies arising from Mobile, Social, Cloud and Real-Time Information IT trends. Pick any industry, and there will of course be numerous industry-specific initiatives as well, i.e., enterprise master patient identification in healthcare, etc.

- 1. Mobile Commerce (m-commerce)** – Leading analyst firms predict a shift from e-commerce to mobile commerce will reach a tipping point by 2015 when mobile applications and social media will account for more than 50% of online sales. It is widely assumed that merchants will provide context-aware and location-aware, mobile-based application capabilities to be accessed via a browser or as a smart phone/tablet application.

Figure 1-

Key Business Initiatives Driving Next-Generation MDM Solutions

- 1. Mobile commerce*
- 2. Social commerce*
- 3. Customer experience management*
- 4. Customer communication management*
- 5. Governance, risk management & compliance*

Source: The MDM Institute

“Stop Annoying Your Customers Apply MDM + Big Data to Build a Complete Customer View Now”

A White Paper on Next-Generation MDM for the Large Enterprise

Page 3

- 2. Social Commerce (s-commerce)** – Coming on strong are online retailing models and marketing strategies which incorporate social media networks (e.g., Facebook, Pinterest, Twitter) and peer-to-peer sales platforms (e.g., Amazon Marketplace, eBay) to drive sales via analysis of intent, sentiment and product feedback. Both the major social networks and e-tailers are deploying new marketing models and methods to leverage peer-to-peer (P2P) and group-based interactions to increase sales and customer satisfaction.
- 3. Customer Experience Management (CXM)** – When consumers have deep digital access to information about products, competitors and pricing, the customer experience becomes a necessary competitive strategy to align business processes around individual customer needs. A consistent customer experience across multiple touchpoints mandates company-wide processes, policies, and technologies to enable employees and partners to focus on the customer-centric quality of service across blended channels- e.g., retail stores, web/mobile sites, and call centers. Merchants must provide consistent platform capabilities to manage products, orders and customer data across all customer touchpoints.
- 4. Customer Communication Management (CCM)** – This convergent set of IT solutions together provides organizations with the capability to advance the way they communicate with customers in the networked economy (email, mobile and SMS marketing, for example). Relevance of communication is key in increasingly competitive markets where customer experience differentiation can be difficult. Through the use of intelligent, microsegmented marketing documents/messages, new ways can be leveraged to develop customer relationships via cross sell and up sell, as well as better managed customer acquisition and retention.
- 5. Governance, Risk Management & Compliance (GRC)** – These initiatives typically encompass corporate governance, enterprise risk management and corporate compliance with applicable regulations. In the networked economy, compliance with privacy and financial laws is challenged by the feverishly fast evolution of m-commerce, s-commerce, CXM and CCM. For example, the payment card industry is faced with complex, ever-evolving issues affecting consumers, merchants, service providers, and credit processing entities. The fragmentation of the payment process across these multiple entities creates diverse entry points for criminal access and other misuse of customer information.

The "networked economy" and its five key business initiatives is being driven by Mobile, Social, Cloud and Real-Time Information technology trends which are increasingly obsolescing existing IT architectures and their supporting software underpinnings.

Technology Challenges for Next-Generation MDM Solutions

IT organizations have been perennially critiqued for slow response to market dynamics – in part because of IT's disciplined approach to technology architecture and standards which historically have served many enterprises well. The advent of ecommerce placed considerable strain upon this status quo IT:business partnership model with the result that many sales and marketing organizations built up a separate ecommerce capability. With the accelerating dominance of m-commerce and s-commerce, the prototypical "IT architects as technology gatekeepers" model is under further considerable duress to address the juggernaut of Mobile, Social, Cloud and Real-Time Information technologies. Data-related processes need to align with intricacies of the real world – especially complex relationships and hierarchies of increasingly mobile customers and extended social networks. Based on interviews with and surveys of the MDM Institute's customer advisory council, Figure 2 summarizes the "top 10" challenges faced by incumbent MDM architectures and software platforms.

Complex Relationships

The relational DBMS underpinnings of contemporary MDM solutions lacks agility and performance in modeling and managing the complexities of multi-level relationships and hierarchies that represent the real world of corporate business and personal/household relationships. Moreover, the "single views" offered by most contemporary MDM solutions provide minimal additional insight beyond harvested corporate data. In fact, most "customer master" MDM programs appear to the critical professional reviewer as modest improvement to the classic enterprise CRM efforts. What the CRM-style MDM solution does not leverage are the location-aware m-commerce relationships and non-obvious (key-driven) relationships of the individual's extended s-commerce relationships (i.e., the graph or "sphere of influence" of that individual party a.k.a. the "value of the network of key opinion leader or individual").

Simply stated, conventional MDM architectures cannot accommodate the increasingly connected nature of data which is fundamental to easily and effectively capturing useful and relevant insights. During 2013-14, the classical 360° view of "X" will take on new meaning due to the acknowledgment of "data blind spots" found in traditional MDM; enterprises will realize the need to reconcile social identity with corporate/household identity to provide authoritative master data to drive e-marketing and commerce within social networks.

Figure 2 -

Key Technology Challenges for Next-Generation MDM

1. ***Complex relationships***
2. ***Mobile***
3. ***Social***
4. ***Big data***
5. ***Time-travel***
6. ***Cloud***
7. ***Action-enablement vs. data management***
8. ***Real-time***
9. ***Extreme scalability***
10. ***Proactive, integrated governance***

Source: The MDM Institute

“Stop Annoying Your Customers Apply MDM + Big Data to Build a Complete Customer View Now”

A White Paper on Next-Generation MDM for the Large Enterprise

Page 5

Mobile

The "mobile" aspect of MDM is much more complex than simply providing tablets with highly personal demographic/lifestyle info to support concierge-level sales staff in retail settings. Within the changing context of location-aware m- and s-commerce, the networked economy demands that the customer retain a highly interactive experience both online and offline. Certain of the main requirements and dependencies act together. For example, m-commerce requires acknowledgement of the mobile nature of society, i.e. consumers require devices and applications in their hands as opposed to (only) desk-, media-center or automobile-tethered devices. Location-awareness data (e.g., from a device) adds geographic and location context to information which enables enterprises to perform location analytics to understand more about their customers. This in turn shapes the enormous amount of potential data (a.k.a., "Big Data") into information that is both relevant and actionable, e.g., an m-commerce recommendation engine proposing offers based on both location and social media network "mastered" data. By 2014-15, mobile location-based services enhanced with location-specific customer info will raise the ante for e-commerce within and outside major social networks.

Social

MDM of customer/citizen must increase its innate support for the social customer master (i.e. Amazon, Facebook, Google+, et al). Clearly, these "public MDM hubs" are increasingly becoming repositories of high-value demographic information that is directly and indirectly managed and shared by consumers. This need to link traditional customer master data with social media network data creates both new challenges and opportunities. New approaches are required which will provide improved customer segmentation, lead generation, retention, and targeted marketing to leverage the "sphere of influence". Moreover, mass consumer acceptance and use of such social networks will ultimately serve as marketing and sales delivery channels. As a business strategy, MDM will both enhance and benefit from such personally relevant transactions that are initiated from and integrated into social networking platforms such as Facebook.

A new realm of entities will arise to be governed such as public data-derived entities. Through 2013-14, next-generation MDM will address the s-commerce "sphere of influence" to incorporate both extended and non-obvious (hidden/extended relationships) relationships to grow share of wallet from individual to exo-ego network as a disruptive sales strategy (vs. ego-centric marketing).

Big Data

Challenges include the need to extract and manage the entities (profiles) from social media sites whose legal and programmatic restrictions are in continual flux. Yet MDM must discern and identify the key influencers and brand ambassadors by winnowing identities out of the noise that is Big Data. Clearly, the ability to act on sentiments of key opinion leaders (KOLs) active on such social networks is increasingly vital for marketing

“Stop Annoying Your Customers Apply MDM + Big Data to Build a Complete Customer View Now”

A White Paper on Next-Generation MDM for the Large Enterprise

Page 6

and sales organizations– not only to target millennials and, Gen-X segments but increasingly Baby Boomer and other generations as well. Acquisition of such data and the relationships (often non-obvious) presents challenges such as the sheer data volume and complexity of determining identity resolution and associated relationships..

For Big Data analytics to be effective, it will be critical to shred and tag unstructured tweets, posts, comments, emails, etc. while discerning the slang, the innuendo and the coded jargon associated with various target populations. This is necessary in order accurately taxonomize and tag sentiments/nuances to produce aggregate trends. This is further complicated by the use of multiple online identities/avatars by a growing population which make it essential to employ identity resolution capabilities of traditional MDM software to accurately identify such "netizens" and then match that online identity with the enterprise's B2C customer data. Clearly, an MDM-managed customer profile becomes the nexus or integration point for both the virtual and physical world behaviors and relationships. The future MDM systems will be not just "social networking aware" but also serve as the platform for reconciling both worlds-- with Big Data serving as a major capability to do so. In other words, Big Data will feed MDM by augmenting existing "best of breed" customer master data with additional relationship network data and derived insights. Big Data will also feed product master information as businesses augment product master data via real-time product and supply chain metrics based on m-commerce, s-commerce and social media feedback.

Through 2013-14, Big Data will repatriate itself into the MDM fabric via registry/hierarchy overlays as yet another trusted source. Concurrently, mining of Big Data to populate Social MDM and to perform entity matching on Big Data stores will help provision the "new" 360° view of entity from public, subscription and enterprise data. Clearly, Big Data innately requires both MDM and Data Governance to be effective and sustainable.

Time Travel (a.k.a. "Temporal MDM")

Because data and relationships among data change over time, it is found necessary to be able to recreate past (or project future) master data relationships. Such "time travel" or "time machine" history functions are required in not just Customer master data but also Product master data. For example, Product Life Cycle management (PLM) requires capabilities to initiate, manage, control and track changes throughout the lifecycle of products or assets-- from conception through disposition.

Through 2013-14, compliance and other corporate functions will increasingly mandate "temporal MDM" to view and manage entities and hierarchical relationships at a specific point in time (past, present or future "effective date"). By 2015, temporal MDM will be standard feature of the majority of MDM platform– both relational- and object/semantic/graph database-based. The latter MDM will dominate in time-travel while the former will dominate in real-time MDM updating.

Cloud

Few organizations are immune from the economic advantages and availability/scalability of on-demand storage and computing power offered by Cloud computing. MDM both benefits from and is challenged by such economics and the resultant hybrid application landscapes. Other benefits of Cloud deployment include the fast time-to-deployment for certain applications ... without the need for acquiring new hardware and software, installing these, and then maintaining them as well. Cloud applications such as NetSuite, Salesforce and WorkDay in addition to mobile applications are robustly challenging corporate IT (IT standards, architectural guidelines/standards and multi-year deployment lifecycles) via opex-funded and rapidly installed applications such as human resources and sales force automation.

Challenges include how to determine/design which source (off-premise or on-premise) is where the master data resides, or if both, how to synchronize the two masters and "which" is the "master" and which the "slave". As such Cloud-hosted applications become broadly deployed, demand increases for application and data integration services such as MDM to provide trusted access to that off-premise information.

During 2013, single- and multi-tenant Cloud MDM will continue to attract small-to-medium sized business (SMBs) to achieve MDM benefits without long-term project timelines and major expense; while offering an enticing entry point for large enterprises (opex vs. capex, federated architecture for geographically-distributed organizations, proof-of-concepts (POCs), etc.). Through 2013-14, integration of on-premise MDM with SaaS apps will arrive via Salesforce, SAP Business By Design, et al, however, enterprises will continue to wrestle with data integration issues between on-premise and Cloud with the majority of enterprises unwilling to house master data about customers/products/suppliers in a public cloud. By 2014-15, Cloud-innate services for Data Quality and Data Governance will be more prevalent; however, enterprise MDM will remain “on premise” with increasing integration to Cloud applications become the norm. MDM-enabled applications will migrate to the public Cloud, especially for decentralized and geographically distributed organizations.

Action-Enablement/Decision-Making

As stated previously, in the networked economy, the combination of Mobile, Social, Cloud and Real-Time Information decreases the "air space" between information and action. The trend in marketing (due to s- and m-commerce, in particular) is towards pro-active engagement rather than re-active rapprochement. Clearly, the combination of Bid Data analytics and location awareness further reduce the air space/gap between marketing and sales (information and action). The combination of traditional analytics (business intelligence) with social and location-aware (spatial) analytics will enable new modes of marketing and sales as action-enablement and decision making speeds up due to increased delivery of trusted master data. Businesses and governments will increasingly

be able to discern in real-time *which* person is both influential in their community and a high spender (or risk).

Real-Time Performance

During 2013, MDM requirements will increasingly evolve from myriad of batch match/merge processes for evergreening master data into near real-time best-of-breed data consolidation architectures. Mega vendor MDM platforms with RDBMS underpinnings (IBM, Informatica, Oracle, SAP, SAS) will compete to outperform each other while next-generation MDM solutions will lag due to the overhead of their semantic model underpinnings. An additional challenge facing both the contemporary MDM and next-generation MDM solutions is the overall impedance mismatch of graph database vs. relational database in executing "connected query performance" (complex joins and recursion required in both hierarchy and non-obvious relationship traversal). Data architects also bemoan the experience that real-world systems continually defy rigid schemas of relational databases. Also in-memory and database machine computing will have ongoing long term, disruptive impact. The increased frictionless nature of transactions and use of personal/business networking relationships will radically alter user expectations, user experience and application design principles, product architectures and vendor strategies -- all to adjust to the near real-time nature of society and business in the networked economy.

Extreme Scalability

The increasing price:performance of Hadoop and related data management technologies for Big Data and related analytics is also crossing over into transactional architectures. By 2014-15, very large enterprises (e.g., financial services, large government agencies) will additionally look to scaling of MDM solutions via the economic elasticity of Cloud-based solutions, in-memory databases, and next-generation extract-transform-load (ETL) capabilities increasingly embedded as "always on" MDM services.

Proactive, Integrated Governance

Data Governance for master data is moving beyond simple stewardship to the convergence of task management, workflow, policy management and enforcement. Through 2013, most enterprises will struggle with enterprise Data Governance while they initially focus on customer, vendor, or product. However, given the nascent entry of integrated/proactive Data Governance capabilities in the mega vendor MDM offerings (IBM Master Data Policy Manager, SAP Master Data Governance, et al) large enterprises are increasingly mandating the delivery/inclusion of such integrated and proactive Data Governance in vendor-provided MDM offerings. While most currently marketed Data Governance solutions of the MDM vendors are in fact re-active, upstream data steward consoles, by 2014-15, vendor MDM solutions will finally move from such "passive-aggressive" mode to the market-dictated "proactive" Data Governance mode. Not addressed by any of the mega vendor contemporary MDM offerings is support for the governance of Big Data. This failure of current MDM:Data Governance offerings to "tame

Big Data" is another by-product of increasingly outdated architectures and underpinnings. To dismiss Big Data Governance of s-commerce and m-commerce data as "out-of-realm-of-control due to the external nature of such data" is not realistic. There are already Big Data Governance capabilities found in the next-generation of MDM solutions coming to market.

Disruptive Technologies Impact on Next-Generation MDM

According to a mid-2013 report from the McKinsey Global Institute¹, a dozen potentially disruptive technologies could deliver up to \$33 trillion in economic value around the globe in the next 10 years. Neither MDM nor Big Data are called out specifically in the report, however one of the co-authors stated at the May 2013 MIT CIO Symposium that "big data underlies all of them in some way or another." In this white paper, we have made the connection between MDM and Big Data such that "MDM underlies all of the disruptive technologies in some way or another" as well. Figure 3 summarizes five additional disruptive software technologies that will have undeniable and forceful impact on the next generation of master data-driven solutions.

Figure 3-
**Five Disruptive Technologies Facing
Next-Generation MDM Solutions**

1. *Graph database*
2. *Big data analytics*
3. *Cloud enablement & integration*
4. *Real-time information*
5. *Location-awareness (mobile commerce)*

Source: The MDM Institute

Graph Database. Experienced MDM program managers often state that data modeling is the most time-consuming part of their deployment efforts. MDM systems based on Relational database technology force a waterfall approach to data modeling – from conceptual to logical to physical -- and increasingly create a conceptual chasm between business and IT. In contrast, the newer approach of "Graph database" modeling is much more intuitive and agile because such systems support the way people think. If a concept can be described on a white-board, it can be captured "as is" within a Graph database. Thus the business community can finally own the model development and work with their IT counterparts to source the right data. In essence, Graph databases enable better collaboration and trust between business and IT, that has been long missing in the data management world. Additionally, the next generation of MDM applications also require increased location awareness and attention to the "relationships/hierarchies" among master data entities -- both of the same domain and cross-walking of domains. Relational database-architected MDM solutions have difficulty in defining, managing and traversing such nuances. In fact, many enterprise architects

¹ "Disruptive Technologies: Advances that will Transform Life, Business, and the Global Economy" May 2013. The McKinsey Global Institute.

“Stop Annoying Your Customers Apply MDM + Big Data to Build a Complete Customer View Now”

A White Paper on Next-Generation MDM for the Large Enterprise

Page 10

would state that relational database architectures have had their run, and that we are in a new era of semantic-based architectures which in turn have nontrivial application architecture implications that impact how MDM functionality will be composed and delivered (location-aware, offline/online, web-services, Cloud services). Wikipedia provides an excellent summary of the pros and cons of relational vs. graph database.

"A graph database is a database that uses graph structures with nodes, edges, and properties to represent and store data. By definition, a graph database is any storage system that provides index-free adjacency. This means that every element contains a direct pointer to its adjacent element and no index lookups are necessary. ... Compared with relational databases, graph databases are often faster for associative data sets, and map more directly to the structure of object-oriented applications. They can scale more naturally to large data sets as they do not typically require expensive join operations. As they depend less on a rigid schema, they are more suitable to manage ad-hoc and changing data with evolving schemas. Conversely, relational databases are typically faster at performing the same operation on large numbers of data elements."

In other words, graph-based data modeling enables MDM solutions to be deployed faster and more cost-effectively. Such graph database solutions provide a relationship-centric view across entities/domains, which in turn eliminates domain-specific silos to deliver better-provisioned views of entities such as customers, supplier and vendors in context. In summary, Relational databases are great for storing information, but not so good at finding and storing knowledge. Data structured within a Graph Database lends itself nicely to running a new generation of analytics, specifically the use of centrality based statistical algorithms (Closeness, Betweenness, Degree, Eigenvector, Community Detection) that measure the strength and position of the entities and their relationships relative to other entities in the network. This can help organizations identify brand ambassadors, predict churn, identify non-obvious relationships and even provide a basis of a recommendation engine. It is telling to note that Amazon, Facebook, Google, LinkedIn and Netflix have adopted graph databases as a key component of delivering such transactional insight.

Big Data Analytics. Enabled by the power of MDM identity resolution, "strategic" Big Data analytics will increasingly replace "tactical" Big Data analytics. This trend will be accelerated by an emphasis away from individual Big Data analytical projects and enterprise data warehouse to focus on a more strategic view. Such federated MDM-enabled and -enhanced views will comprise data from a multitude of sources (rather than singular sources) -- e.g., unstructured information of enterprise content management, the less-structured information within data warehouses and data marts, multiple Big Data analytical systems, and MDM hubs themselves. Furthermore, such Big Data analytics will ultimately span domains— customers, prospects, accounts, products, suppliers and locations and others. The term "single view" or "best of breed" golden record will take on more strategic value.

“Stop Annoying Your Customers Apply MDM + Big Data to Build a Complete Customer View Now”

A White Paper on Next-Generation MDM for the Large Enterprise

Page 11

Cloud Enablement & Integration. Cloud computing will provide both cost and logistical advantages in deploying MDM solutions-- driven by the scale and speed with which such data services can be implemented. Cloud MDM will further be a democratizing force as it provides master data capabilities to both a global customer base and mobile, decentralized workforce. The scalability, elasticity and provisioning of Cloud MDM will enable enterprises of all sizes (and in all locations) to take advantage of advanced analytics enabled by the quality master data maintained by MDM hubs. And MDM implementation costs can shift from technology implementation and maintenance to human capital-- from standing up infrastructure to delivering and acting on trusted master data.

Real-Time Information. The "Internet of Things" will be enabled by (and further enable) real-time or near real-time services. As society's transactions become increasingly "frictionless" due to the expanded Internet, MDM itself must respond to near field communication (NFC) payments, embedded sensors, image recognition and more. The processing of such volumes of master data-enabled transactions will be facilitated by in memory computing. Millions of transactions can be analyzed and authorized in milliseconds-- opening the door to concurrent analytical and transaction processing of the same master data. Identity resolution and bulk loading of MDM hubs will no longer be the "hot spots" that restrict MDM's wider applicability to solving business challenges which will be in turn increasingly be challenged by the sheer volume of transactions.

Location-Awareness. Worldwide, mobile phones are overtaking PCs as the most common Web access device with the majority of handsets sold in mature markets being smartphones. This huge population of mobile clients will require transactions authorized (and in turn be marketed to and serviced by) MDM-enabled secure and trusted master data hubs. With the increasing volume of location-specific data, society will demand that every business process be validated and empowered by trusted master data.

CASE STUDY: Next-Generation MDM at Work

The University of Wollongong (UOW) is and always will be about academic excellence, but knows its impact extends beyond teaching and research. It's about making use of knowledge, being open to new thinking, making a tangible difference and about connecting like never before.

To that end, UOW is committed to connecting with its regions and strategically expanding its sphere of influence while investing in partnerships which add value. Historically, key researcher and research project relationship data was captured in disparate systems with limited interoperability. A more integrated holistic view of these relationships was required and subsequently UOW embarked on an initiative to understand, highlight and identify key interactions and influencers. The goal is to provide critical insights into the breadth and depth of these relationships and ultimately to propel UOW into the top 1% of world universities.

In late 2012, IT management at UOW determined that " Relationship Analysis" could be a crucial enabler to facilitate greater understanding of and improving the transparency of UOW's strategic relationships, partnerships and key collaborations. With executive-level sponsorship and support across the university, the UOW project team delivered a proof-of-concept project that yielded quantitative evidence, impact and insights into the nature of UOW's key relationships that were previously unanswerable, including:

1. Establishing UOW's institutional risk in relation to its key relationships either with institutions or individuals
2. Understanding the impacts to UOW's 'Sphere of Influence' if a key researcher is lost
3. Determining what happens to UOW's networks and relationships if a key researcher is recruited; and on that basis provide insight into which research candidates should be targeted, especially considering regions where collaboration is weak.
4. Understanding where UOW collaborates and the strategic extent of those collaborations
5. Determining how UOW alumni continue to influence key relationships and networks

In UOW's search for robust commercial software, the Pitney Bowes Spectrum Technology Platform was utilized during the proof-of-concept. This next-generation MDM capability enables "master relationship management" by linking entities with actions. At UOW, this is used to identify connections between people, places and things which in turn enables real-time analysis of key relationships and events ... making it far easier to track

“Stop Annoying Your Customers Apply MDM + Big Data to Build a Complete Customer View Now”

A White Paper on Next-Generation MDM for the Large Enterprise

Page 13

persons-of-interest and chains of activity. The Pitney Bowes software is based on Graph database technology which provides extreme flexibility in managing data models and analyzing relationships. This has enabled UOW to extend and visualize its collaborative research networks.

UOW is planning to leverage its new "network relationship analysis" to provide quantitative evidence supporting its partnership strategy and transparently communicate the extent of these relationships through customizable visualizations that enable further analysis and insight. The success to date has created an enhanced understanding of MDM and Data Governance while simultaneously creating demand across the institution for an improved understanding of key relationships. As an evolving competitive advantage, UOW will continue to integrate its various relationship data to a centralized repository that can be used for a more comprehensive view of strategic partners in support of its international and research strategies.

Conclusion

It is time for enterprises to stop annoying their customers. This can be achieved by applying MDM and Big Data technologies to build a more complete ("full spectrum") complete view of customer, product and reference data. Next-generation MDM is becoming a major exploratory effort at certain market-leading Global 5000 enterprises as these enterprises embark on near-term gap analysis for their IT requirements to address Mobile, Social, Cloud and Real-Time Information.

Large enterprises have moved beyond CDI and PIM to focus on relationships and hierarchies between different entities, i.e. to focus on "master relationship management". Many of these same enterprises believe "legacy MDM" platforms are too inflexible to support this modeling capability. Despite reticence to host CUSTOMER and other master data in the Cloud, economics and politics are mandating this and over-riding IT architectural and standards objections. Most such enterprises are open minded about suitability of next-generation technologies to address these requirements. However, mega MDM platform vendors are not perceived as investing sufficiently in next-generation capabilities – especially. regarding modeling flexibility and "master relationship management".

Next-Generation MDM 1H2013 Survey Finding

Over 90% of large enterprises surveyed report that the "top 3" evaluation criteria for selecting their next-generation MDM provider/platform included: "Complex Relationships," "Extreme scalability," and "Proactive, integrated governance".

Source: The MDM Institute

Coming to market during 2013-14 are next-generation MDM solutions which increasingly address the requirements for Mobile, Social, Cloud and Real-Time Information.

“Stop Annoying Your Customers Apply MDM + Big Data to Build a Complete Customer View Now”

A White Paper on Next-Generation MDM for the Large Enterprise

Page 14

SUMMARY

Clearly, enterprise information management, and particularly MDM, is a key enabler of the networked economy in supporting key business trends such as mobile computing and social networking. Without next-generation MDM's "full spectrum" view of entities and their relationships, the contemporary enterprise cannot be fully effective or efficient ... nor manage risk in the networked economy.

IT and business leaders charged with leading and updating MDM programs need to keep up to date with the convergence of Mobile, Social, Cloud and Real-Time Information. With the converging juggernauts of these technologies, once leading-edge MDM architectures are quickly becoming obsolescent and/or "IT money pits".

Near term, enterprises must stop annoying their customers now by applying MDM with Big Data to build a complete customer view. Longer term, as the "the Internet of Things" becomes a daily reality and everything is "Smart" -- smart phones, smart TVs, smart tablets -- savvy IT architects are betting that graph database-based MDM solutions can provide the "master relationship management" necessary to act as a knowledge-based "Smart Hub "to enable actionable insights in the networked economy.

Business and IT leaders in market-leading enterprises must prepare now for the next generation of MDM platforms so that they might overcome the challenges — and seize the opportunities — that lay in store for them in the networked economy.

About the MDM Institute

The MDM Institute is the world's leading research and advisory consultancy exclusively focused on master data management (MDM). As chief research officer, Aaron Zornes delivers the technology-related insight necessary for its clients to make the right decisions in their use of MDM, customer data integration (CDI), reference data management (RDM) and data governance solutions to achieve their customer-centric business goals. The MDM Institute provides authoritative, independent and relevant consulting advice to senior IT leaders in corporations and government agencies, to business leaders in high-tech enterprises and professional services firms, and to technology investors. The MDM Institute delivers its research and advice to more than 60,000 clients in 10,500 distinct enterprises via Twitter, Linked In, Xing, Google+ and email newsletters. Additionally, each year more than 2,000 paid delegates attend its MDM & Data Governance Summit conference series held in London, New York City, San Francisco, Singapore, Sydney, Tokyo and Toronto (now in its eighth year). Founded in 2004, the MDM Institute is headquartered in San Francisco and has clients primarily in North America, Europe and Asia-Pacific. For more information, visit www.the-mdm-institute.com.

Aaron Zornes is chief research officer of the MDM Institute. For additional info on this topic or other MDM Institute offerings, please contact info@tcdii.com.

To provide feedback on our client's MDM initiatives we have two levels of sponsorship for IT organizations: (1) free membership (by invitation) in our MDM Institute Advisory Council providing unlimited MDM consultation by phone, and (2) free membership in our MDM Institute Business Council (survey base) which provides bi-weekly updates on key MDM trends and issues via social media networks and email.

- **MDM Institute Advisory Council™** of 150 organizations who receive unlimited MDM and data governance advice to key individuals, e.g. CTOs, CIOs, and MDM project leads
- **MDM Institute Business Council™** of 25,000+ Global 5000 IT executives who receive a limited distribution, bi-weekly newsletter with MDM industry updates
- **MDM Alert™** newsletter provides IT organizations, MDM vendors, and investors hard-hitting insights into best practices as well as market observations derived from interactions with the MDM Institute Advisory Council™ and the MDM Institute Business Council™. The intended audience includes: enterprise architects, data architects, solution architects, MDM project managers, directors of data governance, CIOs, CISOs, CTOs, chief customer officers, chief data officers, chief privacy officers, data quality managers, data stewards, and project teams responsible for MDM solutions and infrastructure.
- **MDM MarketPulse™** monthly survey results, e.g. budgets, success/failure rates, mindshare based on ongoing surveys of the MDM Advisory Council and the MDM Business Council
- **MDM Fast Track™** quarterly 1-day workshop – fee-based and rotating through the major North American, European and Asia-Pacific metropolitan areas
- **MDM & Data Governance Summit™** annual 3-day conference and exposition – London, New York City, San Francisco, Shanghai, Singapore, Sydney, Tokyo, and Toronto.