Data-Centric Business Transformation

by

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Submitted to the System Design and Management Program
in partial fulfillment of the requirements for the degree of

Masters of Science in Engineering and Management

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

August 2014. [September 2014]

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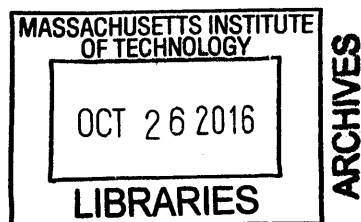MIT Sloan School of Management
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Abstract

Today's digital business environment is imposing a great transformation challenge on the enterprises to effectively use vast amount data in order to gain critical business insights to stay competitive. In their aim to take advantage of data many large organizations are launching data management programs. In these attempts organizations recognize that taking full advantage of data requires enterprise wide changes in organizational aspects, business processes, and technology. The lack of recognition of this enterprise-wide scope haunts most data management programs. Research shows that most of these programs fail and get abandoned after long efforts and investments. This study aims to highlight critical reasons why these programs fail and a different approach to address the fundamental problems associated with the majority of these failures. It is important to be successful in the data efforts due to the fact that data driven businesses are gaining significant competitive edge.

Data Centric Business Transformation Strategy (DCBT) is a holistic approach for the enterprise to transform into a data driven and agile entity. DCBT is also away to achieve better alignment in the enterprises. DCBT aims to achieve two goals to transform the organization; become a smarter organization by instilling continuous learning and improvement culture in all aspects of the business and achieve agility in enterprise-wide organizational learning and technology. To achieve these two goals, understanding the current state of the organization in the tree fundamental DCBT areas of organizational learning capacity, business processes and technology is essential to incrementally and continuously improve each one in concert. Required improvements should be introduced to smaller parts of the organization delivering the value of data. Strategically chosen pipeline of projects would allow the ramp up of the organization to a continuously learning and changing organization. In the age of digital economy, agile organizations can learn quicker from large amounts of data to have the competitive edge. This study will also look into how a data management program relates to DCBT and can be used in concert to enable DCBT.

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Acknowledgements

First and foremost, I want to thank my girlfriend Tatiana Lukyanenkova for moving across the country and supporting me every step of the way while I was at MIT.

I want to thank my parents, Ulker and Mehmet Yildirim, for never stopping to believe in me and my brothers Tunc, Cenk, and Enes for all their support.

I want to thank my friend and previous manager Kerem Koca for mentoring me throughout the years and supporting me in my efforts to apply and work towards my degree at MIT.

I want to thank Director of System Design and Management, Pat Hale, for all his encouragement and guidance. His kind heart and professionalism is an icon at MIT.

I want to thank SDM Staff Amal Alalam for always being on my side and helping me through the academic processes.

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Introduction

Effective technology management with organizational alignment is a personal passion for me due to my professional experience in large multinational organizations as a technologist and leader. I experienced first hand, in almost all projects that I was involved in, how enterprise cultural and organizational challenges made a significant difference in the success of delivering competitive technology solutions. In the age of automation and efficiency there is no room for inefficient systems, business processes or organizational structures. Corporations that carry traditional organizational structures, business processes and technologies are struggling to transform to rapid pace, continuously learning and improving organizations that are efficiently utilizing critical business insights from large amounts of data. This involves extreme attention to improvements in organizational elements, business processes, and technology.

According to an article in New York Times in 2011 by Steve Lohr, citing a study of 179 companies by Erik Brynjolfsson of MIT Sloan School of Management, companies who are able to establish the data-driven decision making culture in their organizations are able to gain 5-6% higher productivity compared to their competition, which are not utilizing data in their decision making as effectively. In the same article he mentions data related to business decisions is doubling every 1.2 years creating a data deluge. (Lohr 2011) Today's large enterprises are imposed a transformation from traditional rigid organizational structures, business processes, and technologies to continuously learning and rapidly improving ones by leveraging data.

I have worked in financial, automotive and electronics industries for large organizations such as JP Morgan Chase, Dell, and Cummins. I held positions as an engineer, software developer and IT manager. At Redwood Trust, as the senior manager responsible for all system development efforts including enterprise architecture, software development, project management, quality assurance, and application support, I experienced that organization's culture and turf wars, which prevent any kind of organizational alignment, "eat" strategy and technology even before breakfast. This prevented the organization from moving into new lucrative markets. When I arrived at Redwood Trust, auditors gave "Significant Deficiency" rating to the IT systems and Redwood Trust had one year to clear all related pervasive problems or risk getting a "Material Weakness", which is a significant problem for a public company. I was able to align the business strategy with the IT strategy with the support of the CEO and the President for a window of six months when development cycle times, defect rates, and high severity production problems were significantly reduced, allowing further development to be made for new business opportunities and reversal of the "Significant Deficiency" status. However, when the crisis was perceived to be averted, company's rooted culture surfaced and swiftly reverted the significant gains made.

At JP Morgan Chase, I witnessed first chasm between the application development, test and support teams and their business partners, which caused the technology they developed to have significantly high levels of downtime and defects in production. Inefficiencies in the development life cycle and management of these systems and teams resulted in more resource requirements to deliver technology solutions that are harder to manage, use, and improve. Even a minor business change request couldn't be delivered before 6 to 9 months, which is a very long time considering the pace of today's business cycles and regulatory changes. This was consistent with Fidelity, yet another financial organization, with which I lead an MIT project in 2014 to identify alignment opportunities between IT and business units.

Over the last 15 years enterprise business systems development has evolved from independent and siloed efforts by various business units to federated and governed IT organizations. IT organizations have been performing cost driven transformation efforts to consolidate common business and IT functions into single platforms and have had a federated approach for infrastructure and maintenance. "Cost of ownership" became the number one concern for many application owners and CIOs. However, between 2000 and 2014 I observed the following negative impacts to the organizations as a result of the transformation efforts from traditional silos to federated and governed IT

- Business units lost flexibility and agility on driving the development of business systems due to enterprise level prioritizations and governance IT efforts.
- IT solution developers were segregated from the business units.
- Organizational structures within IT became so complex that various IT functions become hyper-siloed in order to have more separation of duties and specialization. This resulted in many specializations but leaving no one being the expert of the whole, which made technology development more complex, costly, and lower in quality in many cases. Forbes recently reflected this problem mentioning in an article the need for more broad based expertise for system developers. (Loukides 2014)

There is an inherent struggle between the global optimization at the enterprise level and local optimizations at the individual business unit, or IT vs. business level. Moreover, all of the above reasons contributed to IT solution development projects to demand long horizons and very rigid requirements. Many of these projects would be long enough to make the initial requirements become obsolete during implementation. This highlights a significant problem in the face of faster business cycles and regulatory changes. In a recent Forrester report Brian Hopkins mentions that in their research many business people say, "We stopped asking IT because every request gets met with the same huge cost and long time frame. It's like they only know how to solve a problem one way." In the same report Brian Hopkins emphasizes the necessity for recognizing the need for incremental efforts and shorter project life cycles, which will allow a quicker delivery of an urgent business need and also be able to react to the changes that arise or mistakes that need to be

corrected during the implementations. (Hopkins 2013) Federation and consolidation transformations in their executions during the last fifteen years essentially reduced IT ownership costs but made the organizations even more rigid by creating a new brand of silos and legacy systems.

I began asking myself – "How can organizations become continuously learning and improving entities by leveraging critical insights gathered from data they already have?" In other words why organizations cannot be "data centric". I asked myself and others in the industry and academia, why manufacturing organizations in the US in the 1980's were able to become continuously learning and improving organizations, processes and technologies but it is not the case for most enterprises. I know from my own experience as a former manufacturing engineer that metric driven continuous improvement has become the core culture and way of life for most manufacturing organizations. I believe enterprise level paradigm shift to become very high pace continuously learning and improving organizations is now a matter of survival for many companies. Organizations that cannot address the silos and rigidities, which are preventing them from becoming agile in change management and technology adoption, will not be able to compete since other organizations are already doing this and disrupting entire industries by driving continuous improvement with insights from data. The Data Centric Business Strategy outlines the foundations of how to become data centric.

Data Centric Business Transformation

In this study I propose Data Centric Business Transformation (DCBT) approach as paradigm shift for organizations to become fast pace in continuously learning and agile. DCBT emphasizes importance of recognizing the enterprise-wide scope of change in three major and fundamentally important areas. Addressing these three areas establishes a culture of organizational learning from data insights and be able to act on these inssights by continuously improving the enterprise and realizing business value from data. Three fundamental areas are organizational aspects, business processes, and technology. DCBT suggests incremental ramp up is essential to improve organizational learning by introducing strategically chosen, relatively smaller scope and high impact projects that address the three fundamental areas to illustrate to the organization the business value of leveraging data. This iterative approach ramps up organizational learning while executing the transformation in the three fundamental areas. This approach inherently aligns the organization in every iteration due to the required enterprise-wide involvement. Many organizations fail in their efforts to become data centric businesses because they do not factor in one of the three areas or they have a "big bang" approach. It is important to recognize that DCBT is a continuous journey to become and remain as a data centric business and not a transformation project with an end date. This is essential due the reality of constantly changing markets and regulations. In this thesis I will propose how DCBT can be successful through research of various approaches related to this area and organizations that executed these approaches.

We have the largest amounts of data available to organizations than ever before. It is also growing at an even more accelerated rate. It is very important for organizations to have a strategy to manage data now with a vision for the future in order to effectively turn data into business value. Most organizations do not recognize actual enterprise level scope of a data management program, which requires to become hyper aligned across the board with traditional silos broken down, to make way to fluid organizational interactions. This is the only way data can be managed effectively and leveraged as an enterprise asset. Unfortunately, many organizations are still struggling with challenges related to rigidities and siloes in organizational structures, business processes and technologies. Many organizations still aren't effective in working in cross-functional and hybrid settings.

There is a significant amount of overlap with DCBT and MDM. In fact, my research in data management programs in general lead me to form the DCBT idea. MDM is a subset of EIM and in fact an enabler of EIM. MDM also an enabler of MDM and DCBT complements MDM's approach with DCBT's emphasis on the continuous organizational learning and its data being a business value and not a technical endavour.

Research Background

Introduction

According to the research, the utmost important prerequisite to become a data-centric organization is to form technology and business teams to have an intimate working relationship, which can be facilitated by a data-centric business transformation. The idea of using data driven decision-making is popular and could be seen as an obvious choice. Yet, many organizations fail or they are largely ineffective in their efforts to become data centric. Why? As the organizations and technology which their business processes depend on become more complex, data management across the enterprise becomes a dauntingly complex task of coordination between many business units and the IT organizations. This requires a very complex and strong change management and governance effort supported by the highest level of leadership. Often organizations do not fully understand the scope of implementing a data management program such as Master Data Management (MDM) or Enterprise Information Management (EIM) (O'Kane, Top Four Reasons Your MDM Program Will Fail, and How to Avoid Them 2011). They see these programs as technical efforts that IT should work on. Many organizations do not engage the key stakeholders from IT or business from the start. It is not uncommon to see IT organizations to drive the data efforts without much business involvement. This eventually results in prolonged efforts and negative outcomes. A Gartner report outlines some of the main reasons why MDM will fail. The main emphasis is as follows:

> *Organizations that fail to proactively address potential pitfalls associated with a lack of business alignment, master data governance, master data quality, and the definition and scope of master data are likely to experience negative effects, ranging from repeated requests for business justification, to withholding of planned project resources, to outright cancellation of the MDM program.* (O'Kane, Top Four Reasons Your MDM Program Will Fail, and How to Avoid Them 2011)

Faster business cycles and regulatory changes demand from organizations more frequent changes and quicker turnaround for organizational structures, business processes, and technology. This requires enterprises to build agile organizations, which means agile organizational structures, agile business processes, agile business systems that are ready for continuous change. The competitive edge for businesses is to be agile while keeping stability and quality.

Legacy systems pose a significant challenge to become a data centric business. Over the decades, large organizations have built systems that many still survive and business units still depend on. These systems were built in longer project horizons and in vastly different business environments. Much needed transformation to these systems and data they contain usually has a very large scope and impact to that business. Apart from their scope and impact, legacy system transformations are very costly. These transformation projects slow down the agility efforts because of

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their large time and resource requirements, but organizations should make calculated risk taking decisions in their prioritization of investments to undertake such efforts when it is most opportune for the organization to make the necessary legacy transformation. The dilemma of choosing between burning "keep the lights" projects, competitive business projects and strategic transformation projects is a complex problem. Chip Gliedman in a Forrester report elaborates on how translating business strategies into technology roadmaps is a complex process that needs due attention. (Gliedman, et al. 2012)

Current State

Once high level of management support attained and appropriate level of engagement form key stakeholders, the organization can start forming a data strategy. There are approaches, such as MDM and EIM, that aim to establish enterprise wide management of the data and information for the purposes of driving the business value from data. Many organizations are working with consulting companies and researchers to employ data management approaches to harness the power of data-driven decision-making and become data centric organizations. The landscape is rich with several approaches that were used over the years with varying results. Gartner and Forrester also dedicated resources for data management research due to its importance for the businesses. There are varying results of these approaches depending on the organization and the execution. In this research I focus on EIM and MDM because of the holistic nature of their approach, which overlaps with the DCBT foundations.
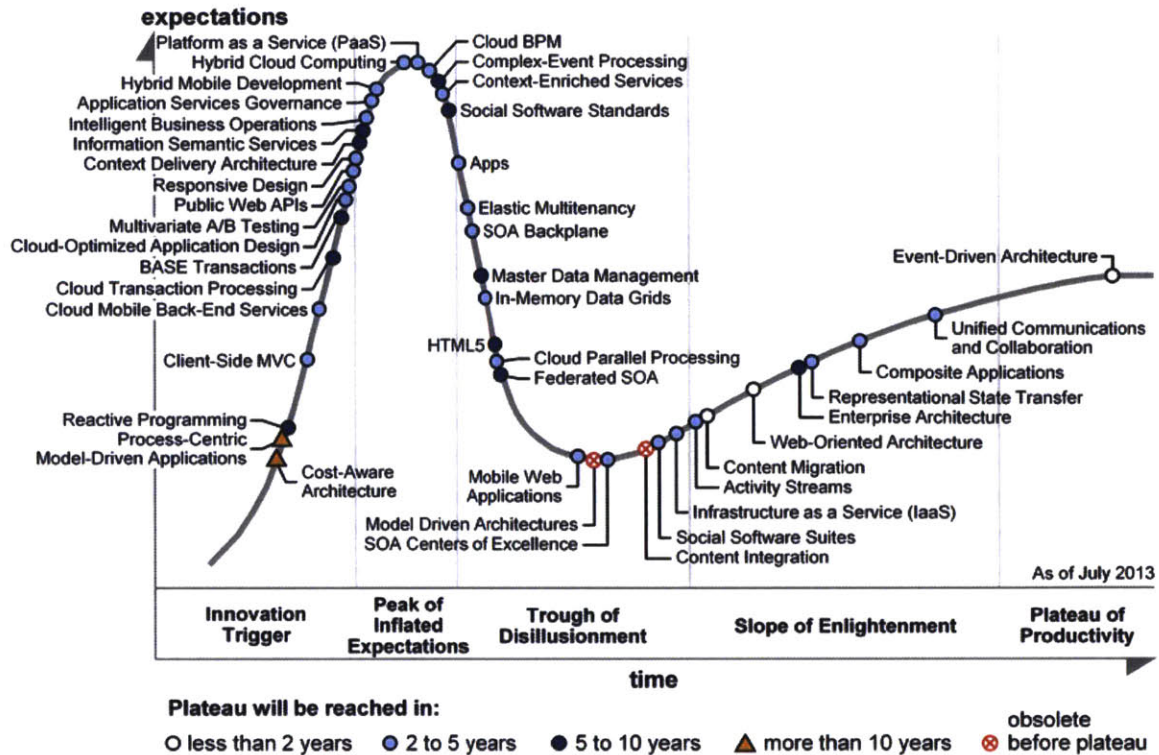
Figure 1 Gartner Hype Cycle for Application Architecture 2013 (Huizen 2013)

Gartner Hype Cycle indicates that approaches for enterprise technology agility, such as SOA and Master Data Management, are becoming more mainstream and the business value they bring is being more recognized. Moreover, Enterprise Architecture is accepted as a necessary cross-functional entity in many large companies striving to bridge the organizational silos and drive enterprise technology and business vision in various technology implementations.

"Develop your digital customer experience strategy"

	Company strategy	Customer expectation of the brand	Customer experience strategy	Digital customer experience strategy
Enterprise	Cost leadership	Lowest prices	Self-service optimization	Simplify or replace
	Differentiation	Innovation	Proactive guidance	Engage users with solutions that satisfy latent needs
	Segmentation	Fit	Tailored intimacy	Offer customized experiences
Performance measures				
	Market share 5%+ $500M	Sales volume 12%+ $100M	Customer loyalty 95% retention $350M	Engagement 15% action rate $1.75B pipeline
Data	Enterprise data management	Analysis and data governance	Segmentation and data quality	Real-time CRM and data quality
	Information fabric $25M	Data virtualization and big data	MDM $5M	Data services $10M

91221   Source: Forrester Research, Inc.

Figure 2. Data Management Strategy Aligns With Customer Expectations (Michele Goetz with Leslie Owens 2014)

Business and IT organizations should form a solid data strategy that addresses the vital business needs and opportunities. This strategy would straddle in the business realm with solid understanding of the business processes linked to the customers and mapping these processes back to a sound enterprise data strategy. Ownership from both the business and IT in the data value chain from customer to data management policies keeps IT projects at a pace with the business needs. In Figure 2, Michele Goetz in a Forrester report suggests an approach that links company strategy to customers and data management strategy with financial metrics attached to them. Such an approach can only be successful with executive leadership and support and intimate alignment and performance measures for both IT and business.

To address these needs, organizations are looking for sound approaches. I will further elaborate on two approaches in the context of their effectiveness in leveraging data value to the business and making the organizations more data driven decision makers. These two approaches have strong overlap with DCBT. However, they have very high failure rate due to their execution. These approaches are organizational as well as technological in nature. I will explore them in the context of their effectiveness in enabling organizations to become data centric businesses. Also, why these frameworks might not have worked for other organizations. These approaches are:

- Enterprise Information Management (EIM)
- Master Data Management (MDM)

EIM and MDM both aim to make the organizations more data centric. EIM was first formed. Its enterprise-wide approach is correct. However, in its implementation securing a long-term "bing-bang" program was not feasible. MDM was essentially created to address a subset of EIM. However, MDM is still a large undertaking with big scope of impact to the business. It does emphasize smaller runs to ramp up. However, it doesn't emphasize organizational learning's impact on becoming data centric. MDM is strong enabler of DCBT just like other areas such as Enterprise Architecture and Service Oriented Architechture.

Enterprise Information Management
Enterprise Information Management (EIM) is a data management approach outlined by Gartner to help organizations establish information as an asset for the enterprise. When EIM was first introduced many organizations have been in the initial stages of their transformation efforts in 2003 transformations from legacy systems to consolidated and federated system. Enterprises with siloed systems often have variations of the same data with different formats and different qualities. For example, product A could be defined with a unique product number in sales who might update this data once a day, whereas same Product A might be identified with a unique product name in the manufacturing systems and have a real-time update. It is very hard to connect these sources of data for analytical purposes at the enterprise level or integrate them with other systems without significant normalization efforts. This type of data causes confusion and inefficiencies when trying to use the data to make enterprise level business decisions. If data were needed from a system for analytics, it would be necessary to build a normalization layer database or data warehouse with appropriate replication from the sources. When this has to occur for various analytics or integration projects, it results in a proliferation of disparate databases and data warehouses and a significant complexity and overhead to keep them updated and maintained. Soon, managing these databases also becomes a problem. It is yet another way to address data problem in isolation, rather than an enterprise approach to information management. EIM aims to establish an enterprise wide data management to ensure various parts of the organizations can benefit from the information that can be gathered from this data more effectively by establishing one definition of the enterprise data objects.
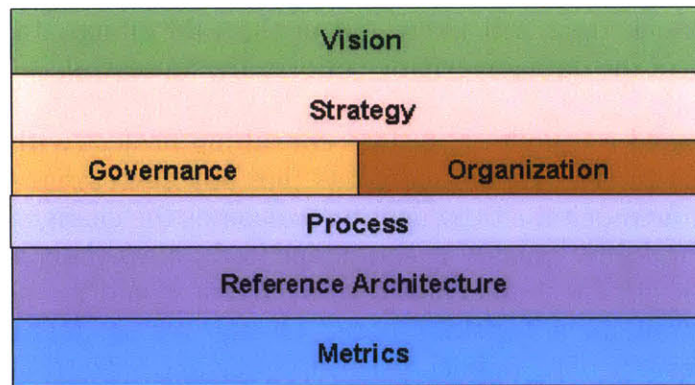
Figure 3 The Building Blocks for EIM (Newman and Logan 2005)

Gartner emphasizes a holistic approach with EIM to manage data to ensure full enterprise impact. Figure 3 depicts the building blocks and progression of a successful EIM implementation. Vision aims to solidify the business value and gain high-level commitment for implementation from the start. Strategy outlines high-level planning, stakeholder commitment executive sponsorship to the implementation. Governance ensures successful enforcement of new culture in the Software Development Life Cycle (SLDC) and other relevant business processes. Organization block addresses the need for changes in the organizational structure to ensure continuity of the EIM effort with ownership is shared between business and IT units. Process block addresses the need for new processes and roles with business and IT units to ensure integrity of the data and information assets. Reference Architecture block ensures effective integration between different components and infrastructure to reduce redundancy, cost and complexity. The matrix block is to ensure agreed upon metrics on EIM success by the organization is tracked.

Challenges with EIM implementations
EIM's strength is also its biggest challenge and cause for failure in many implementations. Having a full commitment at the highest level executive sponsorship with a holistic enterprise approach is often too ambitious and not realistic. Typically these initiatives are born out of an IT organizations' recognition of the significant challenges with managing data, and brought in as an investment decision at a high level prioritization meeting. In this context, it is already doomed to be perceived as an IT initiative. Hence, real business value is not recognized by the business leaders. This start causes subsequent issues with the vision and strategy building blocks. Many implementations fail due to this initial stage. Practitioners should understand the current capabilities and state of the organization to direct their efforts. Gartner identifies 6 stages in their report, as illustrated in Figure 3, to ensure the success. (Newman and Logan 2005) The reality is that ensuring a solid strategic vision for a data/enterprise effort that spans an entire enterprise is very hard for organizations with the current business priorities, where as EIM would be seen as a strategic investment. With this reality, even though executives believe in the competitive edge of information management, securing a sustained strategic commitment is not very likely. If organizations cannot secure

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this initial building block they will likely fail in the EIM efforts. In fact, Gartner reports that only 10% of the data governance efforts are successful.

In 2006 Deloitte released a report on an EIM consulting project with a health and medical insurance carrier. The report mentions that any such large scale project's success depends on how much the organization welcomes the change, finds benefits in the new changes, and how quickly it can adapt to the new tools and processes. They mention that it is critical to measure the effectiveness and the performance of the change management on a constant basis. Change management needs to be handled as an effort worthy of its impact. (Griffin, Cohen and Salzetti 2006)

Master Data Management

Master Data Management (MDM) is a relatively new approach to data management. It limits the scope of the data management to master data, which covers the core data objects for a business such as customer, product, asset, supplier, employee, etc. MDM helps an organization to start with a narrower but easier portion of a larger enterprise information management program. It is essentially a subsection of EIM.

Master data is the official, consistent set of identifiers, extended attributes and hierarchies of the enterprise. Examples of core entities are parties (customers, prospects, people, citizens, employees, vendors, suppliers and trading partners), places (locations, offices, regional alignments and geographies) and things (accounts, assets, policies, products and services). Groupings of master data include organizational hierarchies, sales territories, product roll-ups, pricing lists, customer segmentations and preferred suppliers. An MDM program should describe the business use cases of each data object, the scope of the data objects, governance style (central vs. distributed), and the industry context. The process of developing and maintaining master data involves modeling, mapping, metadata management and semantic reconciliation exercises. MDM merges and resolves conflicting data sources and establishes a trusted, authoritative reference source for commonly used information assets. (White and O'Kane, Mastering Master Data Management 2008)

When organizations maintain the meaning of the data as a single version of the truth with different views, it supports organizational cohesion, hence organizational and technological agility. One of the fundamental challenges to SOA, which is the design paradigm in enterprise application development enabling development and change agility, is the data disparity across the enterprise. When different business units have different underlying definitions representing the same business data object, SOA becomes cumbersome during integration. MDM allows single version of the same business data object to be shared by different business units and IT systems, leveraging the power of SOA.

It is extremely important to have a close engagement between business and IT organizations. Even though MDM sounds like a technology solution, it really is trying to solve a business problem first and allowing the technology to follow. Hence, significant business involvement is crucial to MDM programs' success. Business units typically perform the data stewardship roles.

Figure 4 The Seven Building Blocks of MDM

Gartner has defined a similar approach to EIM for MDM with slight modifications as illustrated in Figure 4. (White and O'Kane, The Seven Building Blocks of MDM: A Framework for Success 2012) These modifications highlight the critical importance of business engagement and business driven performance metrics for successful implementation of an MDM program. Without full business and executive support Vision and Strategy blocks cannot be successful. Without these initial blocks all subsequent blocks are doomed. Once there is required support, appropriate metrics need to be established to gauge performance of MDM program that translates the gains to business value. Without these metrics MDM purpose would go unrecognized over long periods. Remaining blocks are very similar to EIM in that they emphasize the disproportionate amount of work that needs to go to non-technical efforts rather than technology choices that are discussed in the Enabling Infrastructure block.

MDM has a variety of implementation styles. These styles are important due to the nature of the organization that they each might fit better. Starting with a wrong implementation style could cause negative outcomes. These styles are:

- Consolidation — Used primarily to support business intelligence (BI) or data warehousing initiatives; generally referred to as downstream MDM, in that MDM is applied downstream of the operational systems, where master data is originally created.
- Registry — Used primarily as a central index to master data that is authored in a distributed fashion and remains fragmented across those systems.
- Centralized (formerly transactional) — Where master data is authored, stored and accessed from a central system, either in a workflow or a transaction use case.
- Coexistence — Used primarily where master data authoring is distributed, but a golden copy is maintained centrally. The central system publishes the golden copy master data to subscribing systems.

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	Consolidation	Registry	Centralized	Coexistence
Authorship vs. Hub	Author is separate from hub	Author is separate from hub	Authorship or harmonization takes place in Hub	Author anywhere
Persistence vs. Hub	Hub stores copy separate from author/source	Hub stores index for master data; master exists at edge	Master persists in hub, though copies may exist at edge	Persist anywhere
Validation	Hub is system of reference	Hub is system of reference	Hub is system of record	Mixed system of record/ reference
Primary Consumer	Downstream analytics and reporting	Both operational and analytical	Upstream operations	Upstream operations
Data Latency	Batch to real time	Batch to event-driven	Real time	Event-driven, pub/sub
Search Complexity	Relatively light	Very complex	Relatively light	Reasonably complex

Explicitly Cleans Up Source Data/Processes

Figure 5 Attributes that characterize MDM implementation styles (White and O'Kane, The Important Characteristics of the MDM Implementation Style 2011)

Attributes that define the implementation style are outlined in Figure 4 in the Gartner report, which elaborates further on each of these characteristics.

Challenges in the MDM

Most, if not all, MDM implementations are transforming an existing enterprise. I had an interview with an EA from a very well known electronics manufacturer regarding their initial MDM conversations and I saw a first hand glimpse of enormous challenges that the enterprise leaders face. They are in the midst of an MDM program initiation because they are feeling negative impacts of siloed systems and data, causing reporting as well as agility problems. There are exiting business operations that depend on numerous critical enterprise systems that are in the scope of MDM. This makes it extremely hard to do a "big bang" project to implement the MDM program to make the necessary changes to all enterprise systems that consume the data in MDM's scope.

Another approach is to implement in an incremental fashion. In this case, the horizon of the project would be longer while new systems go online with the MDM driven changes. In this intermediate state, there would be a complex dependency problem with consumers of the data that might not have been converted yet and the source of data that might have been converted or vice versa. For example, if a CRM system hasn't been upgraded with the new MDM requirements, it cannot consume

any data from a manufacturing system until manufacturing system has been upgraded to the MDM requirements. The only way to accommodate this is to create throwaway conversion components to interface these systems that are in different stages of the conversion. These components would become obsolete at the end of the full enterprise conversion MDM. These type of "throw away" components are very complex and expensive to build and maintain. Stability of this intermediate state of the enterprise systems would be considerably lower with increased customer impact and there would be customer impact would increase as a result.

Implementations for MDM conversions are very complex and high impact to the business and customers. This is a significant deterrent for organizations since they almost always have other high business critical projects with high positive impact to the business and lower time scope and risk in their prioritization pipeline. This challenges the executives to make hard and complex decision while prioritizing MDM programs and their commitment.

What needs to be done?

Becoming a data-driven business is an organizational challenge as well as a technology challenge. In the core of data and information management approaches, such as MDM and EIM, lies the organizational alignment and organizational learning capacity because this is the only way an organization can start the data centric business journey and take advantage of the power of data to become a data centric business. These programs address the technology aspects after the organizational aspects and emphasize the importance of starting with the organizational aspects. Organizations should evaluate its current organizational learning capacity and ability to transform itself to become a continuous "Learning Organization" since the business pressures and markets are changing at a higher speed. (Senge 2006) Data management programs require a significant portion of the initial efforts to "organizational learning" in order to prepare the organization to transform into a more aligned and agile organization. Understanding the state of the organization's learning capacity is essential to the success of any transformation program, such as the data management programs we have discussed. They can implement necessary improvement to the organization and the technology tailored to their specific state.

Organizational learning is a prerequisite to alignment, agility, and being able to take advantage of the business value of data. Organizations have to become agile in order to compete. Alignment is essential for an agile and competitive business because as Peter Senge puts it "The fundamental characteristic of the relatively unaligned team is wasted energy." In this era of agility and effectiveness there is no room for wasted energy. He continues to mention "alignment is the necessary condition before empowering the individual will empower the whole team." He also mentions without proper alignment, empowered individuals or sub teams in an organization can do more harm than good to the general direction of the organization as depicted in Figure 6. (Senge 2006)
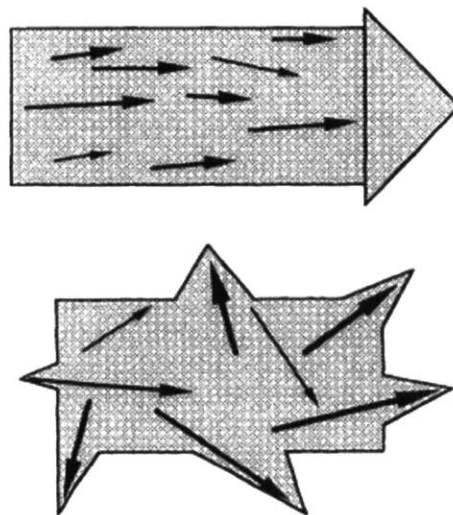
Figure 6 Empowered individuals/Teams vs. Empowered Organizations (Senge 2006)

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Intelligent and learning organizations are becoming the most competitive businesses by leveraging data. At the core of this is being able to learn organizationally from data insights to make better decision and continuously improve the business processes and technology. Technology essentially becomes an enabler of the culture of continuous improvement. This means both the organizations and the technology should be agile and be able to adopt changes quickly. Organizations that can do this will be able to learn from the data and make necessary organizational, business process, and technology changes continuously. This is the state, which I define as the data-centric businesses.

Data Management Program Execution

Many organizations considering a data management program in order to take advantage of the business value of data are inherently taking the first step towards becoming data-centric in their business processes and decision. In the absence of a methodical approach, which takes into account the organizational, business process, and technology challenges, these programs lose their credibility and fail. Forrester outlines a "Data Management Playbook", which summarizes a sound approach to for a data management program leading to a data centric business. (Forrester 2013). This approach starts with the stage of the vision and goes through necessary steps of organizational commitment, organizational structures and roles, identifying processes and ownerships as well as selecting technology and implementation strategies. It is important to note that most large-scale changes have failed due to "big bang" approaches. This playbook emphasizes that, just like individuals, organizations learn in smaller experiments. Just like the individuals having different absorption rates to changes from their behavior, organizations also have different adoption rates to change form their culture and existing way of doing business. Hence, with smaller experiments and strategic wins, most organizations would recognize the need and the business value of a data centric business transformation, DCBT. Programs, such as MDM, would support the organizations ability to learn from their data.

DISCOVER	PLAN	ACT	OPTIMIZE
Vision	Assessment	Organization	Performance Management
Landscape	Strategic Plan	Processes	Benchmarks
Business Case	Road Map _Coming September_	Tools And Technology	Continuous Improvement

Figure 7 Forrester Data Management Playbook (Forrester 2013)

Figure 6 outlines progressive stages of a successful data management program. These stages are important in terms of progression in order to have successful outcomes.

Phase 1: Discover

In this phase organizations spend time to understand the impact and vision for why they need data for competitive edge. It is also important at this stage to understand the state of the organization in terms of its organizational learning capacity and agility to change. It is important at this stage for the organization to have executive

level understanding of how business strategy and data have to be interwoven in order to become a data-centric organization and gain a competitive edge.

Vision: Design Tomorrow's Data Management For Agility In Context

IT has been performing cost based consolidation efforts without the consideration to preserve the original context of data, which is needed by business to gain accurate insights from data. Context, from which the data is extracted, is what provides the meaning for data. As data gets pushed through the classical enterprise data stores, it generally loses its context. Subsequent extractions of this data without its context would have reduced the value of this data significantly. Traditional cost driven enterprise transformations are resulting in rigid technology that cannot quickly respond to business needs of becoming more and more data oriented. IT transformations should have an end result that is in-line with what the business needs from data. This requires more engagement between technology teams and business teams.
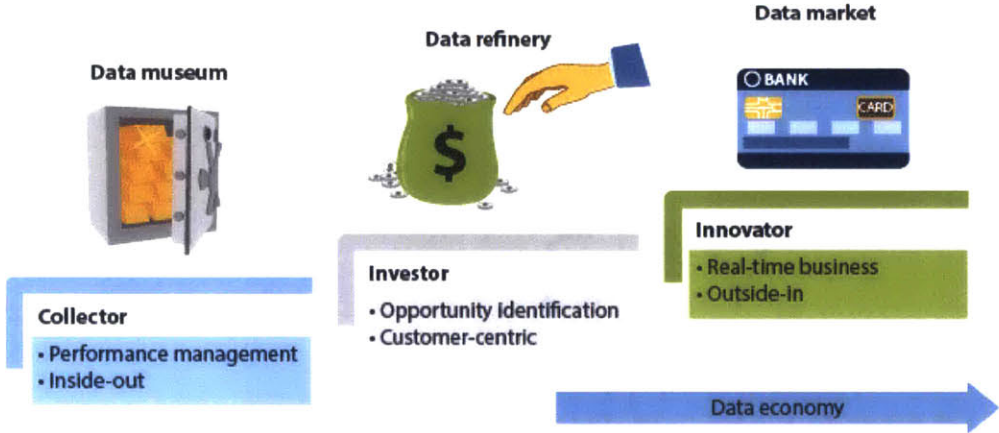
Figure 8 Data profile of an organization (Forrester 2013)

Landscape: Data Technology Pathfinder

Business and data strategies must be intimately involved. Firms should have a data strategy that covers both IT and business. Understanding the current state of the organization in terms of how it treats data is the key to having a data driven business strategy forward. There are three stage of how organizations treat data. These stages are Collector, investor, and Innovator. Collector organizations have a governance around keeping the data safe, mostly due to security and regulations such as SOX. However, they cannot effectively manage data to produce business value because of the extreme lock down of data even within the organization. Investor organizations recognize the business value of data and how it relates to the customer and the business. Innovator organizations create effective ways to make data available near real time to the organization and are ready to make necessary changes to the business and organization to react to the insights the data brings. Purposely built RDBMS and warehouses are too rigid for today's business challenges. Development cycle for creating and maintaining these databases has too

much overhead. They require special attention to avoid creating new problems while making the data available to the organization, such as extreme processing for insight from data, elastic integration, and contextual services.

Business Case: How To Make A Business Case For Data Investment

IT's efforts on trying to justify data or technology initiatives fail or they are not quite understood by the business. Data investment proposals should be tied to business cases. Enterprise Architects should intimately understand the business unit level goals and tie data efforts to these goals, not superficially but organically. Forrester makes it a must to use design thinking, which is to identify with the customer with creative experiments. Figure 7 shows an example of how customer expectations can be linked to the data strategies.

"Develop your digital customer experience strategy"

	Company strategy	Customer expectation of the brand	Customer experience strategy	Digital customer experience strategy
Enterprise	Cost leadership	Lowest prices	Self-service optimization	Simplify or replace
	Differentiation	Innovation	Proactive guidance	Engage users with solutions that satisfy latent needs
	Segmentation	Fit	Tailored intimacy	Offer customized experiences
	Performance measures			
	Market share 5%+ $500M	Sales volume 12%+ $100M	Customer loyalty 95% retention $350M	Engagement 15% action rate $1.75B pipeline
Data	Enterprise data management	Analysis and data governance	Segmentation and data quality	Real-time CRM and data quality
	Information fabric $25M	Data virtualization and big data	MDM $5M	Data services $10M

91221   Source: Forrester Research, Inc.

Figure 9 Data Management Strategy Aligns with Customer Expectations (Forrester 2013)

Phase 2: Plan

It is important to recognize the analytical and operational use of the data. This will dictate how the data is used and hence the kinds of technologies that are associated to efficiently maintain the data. However, the traditional lines for analytical and operational data sets are getting blurred. Hence, this recognition has implications to

the data management and necessary organizational and technology solutions that are required.

Assessment: Pivot Your Data Strategy And Architecture To Unleash Business Transformation

This section considers key metrics that are fundamental to track performance of the transformation efforts related to the current data strategy and architecture. 1) the business capability required (from operational to analytic); 2) the time and value of the data (from persistent to disposable); and 3) the data source (from internal to external). Stage of the organization's data archetype (collector, investor, innovator) Leverage governance to ensure business centric data strategy is performing. Tie business cases back to the data strategy in IT project prioritization. Agility is key. Data should be the center of excellence.

Strategic Plan: Deliver On Big Data Potential With A Hub-And-Spoke Architecture

Organizations are still attempting to put a framework around how they should handle the Big Data. Some organizations believe this is a fad and others are just not sure how to tie this new "phenomenon" into their organizational structure and technology. This stage aims to explain the hub-and-spoke architecture approach and how big data can leverage this architecture. This architecture addresses agility, rigidity, and governance dilemmas.
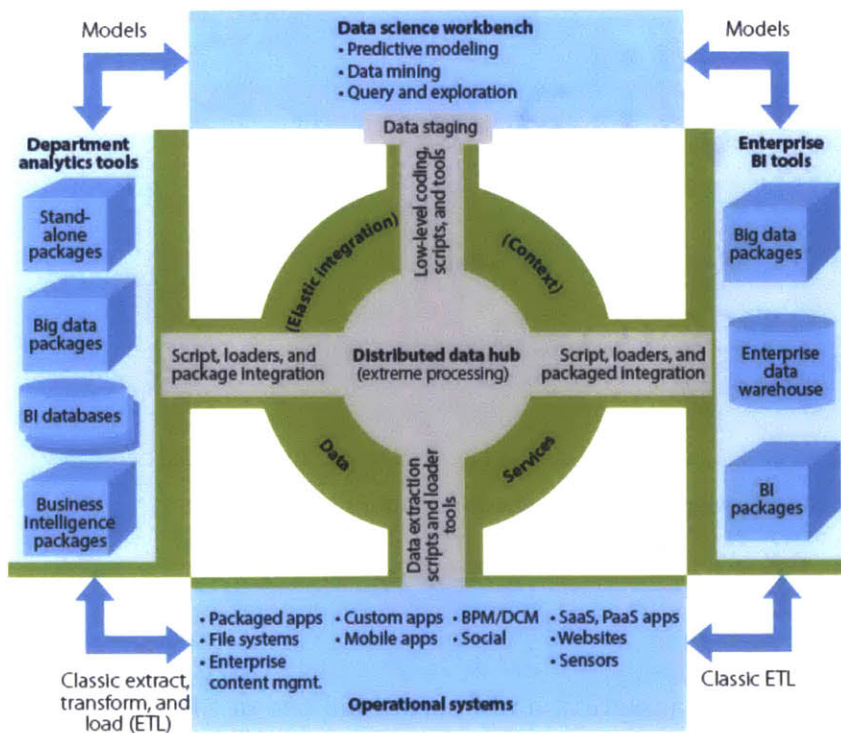
Figure 10 Hub-and-Spoke Provides Performance and Cos Options for Extremes of Scale (Forrester 2013)

Phase 3: Act

This phase outlines organizational alignment and the necessary organizational changes that are essential for a data management program. This also leads to a appropriate selection of a data management tool selection.

Organization: Eliminate Confusion In Data Management Roles And Responsibilities

Enterprise Architects should search across the organization to identify the data management resources. Understanding these resources' capabilities and their formal and informal location in the organization are key to the delivering solution for a quicker access to the data by business. Understanding your organizations current DM capabilities is the key. This report outlines how you can map DM capabilities to your organization. Figure 10 shows how to map organizational roles to data management capabilities.

Goal	Task	Step	Capability	Roles
Customer 360	Understand customer data	Identify all sources of customer data	Data architecture development	• Data architect • Business SME
		Define data needed for analysis	• Stakeholder engagement • Data architecture development	Business SME
		Establish customer data quality	Data architecture development	Data architect
		Define needed data transformations	Data architecture development	Business SME
	Obtain effective analysis and reporting tools	Understand existing available tools	Data management technology research and planning	• Technology architect • Data management technical SME
		Select adequate tool if available	Data management technology research and planning	• Technology architect • Data management technical SME
		If not available, research alternatives	Data management technology research and planning	• Technology architect • Data management technical SME
		Implement tool	Data management technology implementation, operation, and maintenance	Data management technical SME
	Prepare data for analysis	Configure analysis platform	• Data management technology implementation and maintenance • Business data services delivery	• Technology architect • Data management technical SME • Data analyst • Data scientist
		Extract data from sources	Business data services delivery	• Data analyst • Data scientist
		Perform cleansing and transformation operations	Business data services delivery	• Data analyst • Data scientist
		Load analysis platform	Business data services delivery	• Data analyst • Data scientist
	Perform analysis	Determine analytical approach	Business data services delivery	• Data analyst • Data scientist
		Execute analytical operations	Business data services delivery	• Data analyst • Data scientist
		Analyze data	Business data services delivery	• Data analyst • Data scientist
		Report results	Business data services delivery	• Data analyst • Data scientist
		Operationalize analysis process	Data management technology implementation and maintenance	Data management technical SME
			Data management technology operation	
			Data security	Data security SME
			Data governance	Business SME
				Data architect

Figure 11 Map Tasks to Organizational Capabilities to Roles (Forrester 2013)

Process: Data Governance Equals Business Opportunity.

There are challenges in establishing and creating data related business value from data governance efforts. Research shows that data governance when done right produces operational efficiencies and business value. Top performers use data as a competitive business advantage by harnessing internal and external data to business decision-making. Alignment of data and business process makes the difference. Business processes must be engrained with the processing data. This report looks at how top performer organization leverage data governance to drive business goals.

**Tools and Technology: Purchasing The Building Blocks For Data Management**

There is an array of rapidly evolving complex solution that does not align with the data capabilities many organizations need. Approach for selection should be not on the solutions functions but it should be on the proof of capability (POC) of a solution on the data system design of the organization. There should be a POC checklist to drive vendor conversations.

Phase 4: Optimize

It is critical to set the performance metrics on the organization to gauge impact to the business. Enterprise architects hold a critical role to enable cross-organizational implementation of the data management program. They would monitor the impact to the business units and convey the program progress to individual units.

Performance Management: Build Trusted Data With Data Quality

Data quality is the key to the business value delivery. Enterprise Architect should be always in tune with the business point of view of the data quality. This requires EAs to be always intimately engaged with the line of business units. This is also important from the organizational perspective. Right metrics and ownership on the business side is essential to ensure EAs and IT to have a feedback loop on their technology solutions from the business line of managers. A large investment bank recently mentioned that one of their central databases had significant errors which business users based their business decisions for almost 8 years. This organization has significant business-IT alignment gaps, which explains why it took them so long to figure out the data quality problem. Figure 11 shows how data quality could mean different things to business and IT.
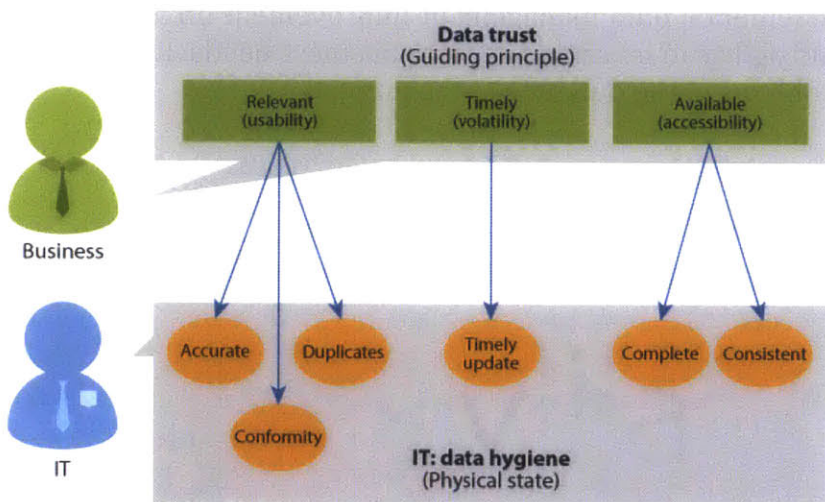
Figure 12 Data Quality Definitions are Different between business and IT

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Benchmark: Can You Give The Business The Data That It Needs?
Benchmarks help drive prioritization efforts when short-term and long-term goals are on the trade-off table. This stage discusses a 6-dimesion data management Center of Excellence to benchmark themselves. These dimensions are (Forrester 2013):

- Business capabilities. An agile data strategy aligns with business strategy and objectives.
- Data governance. The business and IT establish and manage data policies and process to provide trusted data to the organization.
- Organization. IT has the resources, skills, and a responsible framework to develop and manage data solutions and platforms.
- Processes. Effective practices are in place to facilitate communication and the performance of teams that manage data, and efficient methods source, profile, use, and protect data.
- Data and technology. Data management technologies and sources of information meet the data needs of the business today and in the future.
- Measurement. Organizations have transparency in data management and its ability to support business outcomes and achieve return on investment (ROI).

Continuous Improvement: Optimize Data Management For Hyperflexibility
The days of long horizon project cycles are over. Business needs data and technology to deliver the data at a faster pace every day. Quality and security requirements increase but IT should understand the requirement of data quality and security from the business' perspective in order to make cost effective decisions for speed and agility in technology delivery. Large projects with rigid end results are no longer acceptable. Incremental data management improvement on a continuous basis will allow speed and agility to learn and react to business needs. It will also be easier to rollback any problems in the outcome of the projects.

Business Cases of Data Transformation

In this section I will tie the three important aspects of a data centric business strategy and execution, which are organizational, business processes and technology, to cases of corporations that have undertaken data related transformations.

The Evolution of Information Governance at Intel

(Tallon, Short and Harkins 2013)

The article "The Evolution of Information Governance at Intel" in MISQ December 13, 2013 by Paul P. Tallon -Loyola University (U.S.), James E. Short -University of California, San Diego (U.S.), Malcolm W. Harkins - Intel Corporation (U.S.), is a great article that illustrates Intel's data journey from loose restrictions with silos to federation, to extreme governance, to what they now call "Protect-to-Enable". (Tallon, Short and Harkins 2013)

Intel is a semiconductor manufacturer, which has presence in 9 countries. It is extremely important to control and protect data related to product design and manufacturing in semiconductor industry while it is extremely important for this data to be available to various parts of the organization to allow fluid learning and continuous innovation and improvement as an organization to stay alive and competitive. Intel has been an industry leader as a result of its agility to innovate new products and in cutting edge lean semiconductor manufacturing technology. It has been proven in the semiconductor industry that a new product design is relatively easy to replicate by competition. However, taking that design to a full-scale manufacturing is a significant competency that Intel has proven to be successful time and time again (Froot 1992). These competencies require data to be available to various parts of the organization. For example, design data should be available to manufacturing and vice versa. These are traditionally different organizations with different breed of staff and data needs. It is essential for these organizations to have intimate sharing of each other's data.

Figure 13 illustrates significant events that show the information governance evolution at Intel. It is important to note Intel has been agile to respond to all the external and internal needs or requirements to change its approach to data and information technology. The last reflection of this is the emergence of data analytics and data driven business decision-making in the 2010 era. By 2010 Intel had already gone through several learning cycles as an organization and a rigorous data centric business transformation to set itself up to take full advantage of the data.

Year	Description of Significant Event
1992	Introduction of centralized IS organization (mainframe environment/WAN)
1995	PCs brought under central control
1998	Centralized applications consolidated in separate e-business group
2002	Compliance with Sarbanes-Oxley through information governance policies
2003	SQL Slammer virus impacts Intel
2004	E-business and infrastructure groups consolidated into one centralized IS organization
2005	Information protection and risk management efforts scaled up
2006	Manufacturing and factory systems brought under central control
2009	Governance inflection point reached—triggers the Protect-to-Enable approach
2010	Data analytics efforts launched

Figure 13 Intel's Information Governance Timeline (Tallon, Short and Harkins 2013)

Intel's data journey starts with information systems centralization efforts in 1992 and continues the federation efforts to centralize anything from PC's to manufacturing systems under one group. This is consistent with many organizations in this era. In 2002, after the Enron scandals and Sarbanes-Oxley(SOX) legislation, information governance took a turn to stricter control and protection of data. Intel responded to these requirements swiftly by putting in the necessary controls to comply with SOX. Intel was still hit with a major security incident with the "SQL Slammer" due to proliferation of remote computers and off-site working schedules. As a response, Intel formed a cross-company security task force to protect Intel's business from all security and safety related risks, such as cyber attacks and natural disasters, to ensure business continuity. This resulted in extreme protection of data, in many cases preventing various groups not being able to access data necessary to perform their jobs effectively. In 2004, Intel launched an MDM effort lead by the IT Security and Safety group, but it included business leads, who were assigned the ultimate ownership of the data. This group also included the data architects, who understand how large amounts of data can be safely stored and made available to various parts of the company.

In 2009 Intel realized that protection of data in the "Scorched Earth" manner they implemented their policies resulted in a very high cost and further security vulnerabilities. One example is the case of data storage, for which requirements are growing geometrically, by some estimates 40% a year, due to lack of proper purge policies. By a strict data lock down and storage policies without a robust understanding of real requirements from users of the data, regulation (SOX), and Intel Business Safety and Security group, Intel had to store data in very expensive storage technologies that are aimed to prevent any data loss. This also caused an uncontrolled behavior of storing everything to be on the safe side. Another problem was due to the highly strict data controls, employees started finding ways to get to data they need within the Intel guidelines but not in the spirit of the security and protection of Intel's business. This was causing further technical, organizational, financial, and reputational risks. Moreover, this extreme lock down on data assets

was impacting Intel's innovation cycles, which was their competitive edge in the cutthroat semiconductor industry.

Intel recognized this problem and reacted with the new Protect-to-Enable information governance. In its essence, this approach took data safety and usability in a very granular and risk-calculated fashion by understanding actual risks and needs behind various data assets and allow these data assets to be available to more parts of the organization to be consumed. This resulted in Intel's ability to cut 25% off from its chip design life cycle, which is a significant business value considering speed to market has been the competitive edge for this industry and Intel.

Intel paid special attention to organizational learning capacity. They exhibit their agility through the many changes, which they responded with swiftly, as shown in Figure 13. They also display that they can react to internal as well as external feedbacks to the changes they implement and keep evolving just like in the case of going from an extreme lock down to a smarter and granular approach to information governance.

Organizationally, Intel recognized the need for involving all necessary stakeholders to the data governance. They formed the cross-functional information security and safety group for enterprise-wide engagement. They understood that business, as the ultimate owners of the data, should be in close alignment with IT, who ensures the robust delivery of the technical aspects of the transformation. Intel also saw employees as a stakeholder and involved them with the transformation through necessary training on risk and cost of data use and governance. This is the necessary holistic approach to the organizational aspects that is required to become a data centric business. This approach allows various teams to be aligned and individual employees are enabled to use data more.

Intel's IT organization provided necessary agility to respond to swift changes in the company policy as a result of regulation, market changes, or innovation to be competitive. IT governance boards focused on technical aspects of MDM related to issues such as ensuring integration and consistent data standards across all critical systems. Policy setting was tasked to Ethics and Compliance Oversight Committee within the Risk and Compliance function of Intel. Intel IT performs all operational aspects of information governance from governance rules to disaster recovery planning. All these efforts were in concert with Corporate Risk and Security Group, which has executive level engagement from business as well as IT stakeholders.

Intel also had IT and business to classify data in order to put a financial value to these classifications. Data stewards emerged as a result and monitored the changes in the data value and keeping the organization informed about it.

Norfolk Southern's BI Journey
(Wixom, Watson and Werner, Developing an Enterprise Business Intelligence Capability: The Norfolk Southern Journey 2011)
Norfolk Southern (NS) is one of four largest railroad companies in the US during the time when the case was written. NS is also an intermodal service operation (rail, ship, truck). After deregulation in this industry in the mid 1990s, NS decided to have a competitive edge to grow in their operations by mainly acquisitions. They also decided that utilizing data will add to their competitive edge and started investing in their technology infrastructure to make data more available and useful to its internal and external users.

It is important to note that even though this is a case for a Business Intelligence (BI) implementation, since NS started its transformation from an infancy stage with minimal data assets, they established many data management practices as part of this BI implementation, which essentially became a data centric business transformation. This made it simpler in the sense that technology complexity compared to an organization with further data and systems proliferation was minimal. It is also important to note that in the absence of support from data management fundamentals such as data quality, master data, and governance, BI efforts couldn't be effective. (Wixom, Watson and Werner, Developing an Enterprise Business Intelligence Capability: The Norfolk Southern Journey 2011) Because this case had all fundamentals of the data centric business transformation, it was an appropriate example of how NS went through various stages to become a data centric business.

Initial approach by the marketing and cost departments to justify the effort was through a business need for the reporting that the existing operational systems weren't allowed to provide due to performance concerns. Hence, they were able to justify a reporting system, which was their way into the cycle of learning from the data and improving. This is a more viable approach in many cases rather than trying to justify a long and expensive data management program, which business managers might not be able to attach the business value directly to the effort causing a significant lack of commitment issues.

This case emphasizes that NS viewed the enterprise data as an asset to make it available to the enterprise and protect it as such. The case describes the evolution of the NS organizationally, technically, and managerially to become more data centric business in order to have the competitive edge after the deregulation in 1990s. Recognizing their initial organizational learning and data maturity, NS went through the prenatal, infant, child, teenager, adult, and sage stages as described by Wayne Eckerson (Eckerson n.d.). NS launched their BI efforts with replicating their operational data to a data warehouse and making data available to the users, which allowed more learning and ideas for improvement in the organizational, business processes and technology. As they progressed through their evolution, they made sure the business is engaged and driving data efforts with roles such as governance structure that included 24 business unit managers versus 3 IT managers. They also

made sure silos are broken down with rotation of technical and business staff rotations, which made collaborations and alignment more fluid.

In their data warehouse platform they took an enterprise wide approach as well. This is a result of their enterprise wide approach to the organizational aspect of the BI efforts. Technology was able to replicate this approach. IT staff responsible for the BI infrastructure regularly met to review and improve the availability and performance of the system at a high level. While data was being made available to be used by all parts of the organization, IT was making sure from a technology perspective there were no hindrance to this effort.

(Wixom and Ross, The US Securities and Exchange Commission: Working Smarter to Protect Investors and Ensure Efficient Markets | Resources on iT 2012)

The Securities and Exchange Commission (SEC) is the federal regulatory body, which was established under the US Securities Exchange Act of 1934 to protect investors; maintain fair, orderly, and efficient markets; and facilitate capital formation. SEC was not able to keep up with the technological advances since the 1990's where as the financial markets as well as the businesses advanced tremendously. This was mostly due to the US Government's overall tendency towards having less regulation to help business growth and subsequent lack of funding for SEC. As a result, SEC was not able to catch up with the requirements of a growing economy and the changing business landscape and rendered mostly an ineffective agency. Thomas Bayer, the current CIO, cites that SEC was ranked 37th out 37 government agencies. In the 2000's financial markets were impacted by major scandals such as Enron in 2001 and Bernard Madoff in 2008, which underlined the need to improve SEC's capabilities to gain its credibility. Mary Shapiro was appointed as the chairman to drive an agency wide transformation. What Mary Shapiro was faced with was increasing amounts data that needed to be processed and much of it was not captured or captured in a standard process driven way. Much of what was captured was in paper form and organizational silos made it impossible for any sound process to be established.

SEC's approach to transformation to become "smarter" conforms to three main aspects of data centric business transformation strategy: organizational, business process and technology. SEC also approached the transformation with key delivery parts rather than "big bang" approach, this allowed the organization to organically recognize and take part in the effort. They chose a high-impact portion of their operation, which was Tips, Complaints and Referrals (TCR). They realized that due to high localization of efforts there was no enterprise wide view of TCR. This was preventing SEC from connecting data, which was collected in distributed regions, and providing the necessary insight or intelligence they need to act on. SEC redesigned the TCR business process that takes an enterprise-view. They created a new organizational entity called Office of Risk, Strategy and Financial Innovation (RiskFin) to own the process and system related to the TCR. Subsequently, in concert with the organizational and process changes the requirements for a new TCR system was being implemented. This enterprise-wide implementation and engagement in building the new organizational roles and responsibilities, business process improvements, and technology implementations, allowed SEC to accept the changes more organically and realize the value it brought the SEC operations. Using this significant win, Mary Shapiro and Thomas Bayer extended engagement to the rest of the SEC to other areas such as Conducting Examinations. Soon "winds of change" institutionalized for a culture of continuous improvement of organization,

processes, and technology as they learned more from data and the value it brought to SEC.

Summary of Business Cases

Each of the implementation efforts we discussed in the business cases addresses the three fundamental areas of DCBT, which are changes in organizational, business process, and technology aspects, to learn from data insights and perform further changes. Intel case mentions all large-scale enterprise changes because Intel has relatively higher organizational learning capacity already. NS and SEC show that starting smaller and strategic implementations help the organizations to ramp up their organizational learning capacity. In each of the cases organizations recognized the power of data and aimed the organization to learn from data in order to improve and be competitive.

Intel almost always has been ahead of some of the necessary changes in the industry as described in the case. Intel addressed the organizational aspect of DCBT by making consolidations and forming cross-functional teams. They made swift changes necessary to improve the business processes each time. They also made swift changes necessary for technology. They performed significant consolidation and integration efforts ahead of many organizations before 2003. They quickly implemented changes as a response to regulatory and security related events. Intel also launched an MDM program in 2004 ahead of most in the industry. Intel displays a leadership that has an innovative vision and style that is always committed to driving organizational goals and changes very effectively. They also display that they learn from their mistakes and iterate new changes to address problems arising from the previous changes. When they recognized that the "scorched earth" approach to lock down of data security was not allowing the organization to learn from data in order to improve and innovate, they implemented a new security policy to address the problem. Considering these are enterprise wide cultural, organizational and technology changes that impact the entire business, they were able to repeatedly implement them fairly quickly. This was again ahead of the analytics hype in the industry in 2010. A significant differentiator for Intel among the three cases was that they implemented an operational metric as well as a financial metric to track the value of the transformation and data to the business.

NS addressed the three major aspects of DCBT strategy, which are organizational, business processes, and technology, in their efforts to leverage data to have a competitive edge after the deregulation. NS started with a small direct value-add reporting capability for marketing and took years to evolve into a full-fledged BI and data analytics capability with various incremental projects across the organization. This organic growth allowed them to ramp up the organizational learning capacity. It works more effectively with large transformation efforts, as opposed to a "big bang" approach. (Hopkins 2013) NS drove staff rotations across different organizations, such as technical staff in business roles and business staff in technical roles. This is significant from the organizational alignment perspective to break down the traditional silos. NS also made business the owners of the data with significantly heavy business involvement in data governance. NS made data available to the business through technology. NS improved its businesses processes with Thoroughbred Operating Plan (TOP), which was meant to help become

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operationally lean and optimized. This also required systems changes and support to provide data. This is where the technology and systems changes and improvements were introduced. This combination of organizational, business process and technology improvements to become data centric overlaps with DCBT approach. Unlike the Intel case, NS case does not mention any financial or operational value gained that was associated with the improvements. This is a significant part of DCBT approach, because it reinforces the value of the organizational learning and improvement.

SEC recognized the "burning platform" as an external mandate from the President of the USA and the US financial markets to transform and become once again a reassuring entity for the US financial markets and the economy. Under Mary Shapiro's leadership the vision of becoming a "smarter" organization was implemented in a way that overlaps with the DCBT strategy. From organizational aspect, they identified organizational change requirements in order to break down the silos and increase the collaboration among various SEC entities. From the business processes aspect, they built cross-functional teams and new transformational governing entities with enterprise-wide recognized responsibilities for business process improvements, such as the RiskFin and TCR. These strategically chosen smaller implementations and ramp up of organizational learning helped the enterprise level recognition of the value of becoming "smarter" to SEC. Even though the case does not specify a financial value, it cites significant operational improvement metrics in core business processes, such as TCR and Conducting Exams. They also mentioned the data related to these processes was made available to the enterprise to consume more freely, which spurred further organizational learning and continuous improvement.

Summary

DCBTS aims to drive the alignment and learning capacity of the organization organically with small implementations of successful transformations. Programs such as MDM would blend into these smaller runs of quicker gains just like in the Intel example. In the background, leaders of the organizations must have the vision of the enterprise-wide transformation in the organizational structures, business processes, and technology. Initial smaller scope and large impact implementations need to be strategic to the company's business goals and allow cross-functional collaboration to help interactions among business and IT teams to become more fluid. As smaller wins are achieved, larger organizational, business process, and technology changes can be undertaken. The vision should be shared with all parts of the organization because everyone in the organization is part of the change. DCBT aims to emphasize the enabling or disabling interactions between the organizational, business processes, and technology aspects of an enterprise.

Data management program approaches, such as MDM, stress the importance of starting with the organizational aspects of these approaches. Gartner reports that despite the strong emphasis on the business and IT alignment being the key for successful implementations, many implementing organizations struggle with the required level of such collaboration due to their traditional corporate culture. (O'Kane, Top Four Reasons Your MDM Program Will Fail, and How to Avoid Them 2011) Business units largely view data management programs as a technical effort that IT would naturally own. This assumption haunts the data management programs and becoming data-centric businesses due to subsequent lack of business engagement or commitment.

Two significant enablers of DCBT implementations worth mentioning here are extremely important to the transformation and agility of organizations due to their hybrid technology and business aspects. They are Enterprise Architecture (EA) and Service Oriented Architecture (SOA). EA role is critical to any enterprise business process or systems related improvement because EAs can see enterprise-wide optimizations better and can drive them in various projects. SOA is a technical approach to enable the agility of complex business systems. Hence SOA allows continuous improvement cycles for organizational and business process changes to become shorter.

It is also important to mention data governance, since it spans the three fundamental areas of DCBT. In the context of data management, data governance plays a pivotal role. Unfortunately, most of the organizations (85% in a Forrester study) currently utilize data governance bodies as IT only organizations with little or no engagement from the business. Ideally data governance would have significant engagement from both business and IT organizations with executive level sponsorship to ensure data is treated as an enterprise-wide asset rather than an artifact to be kept safe and secure. (Michele Goetz 2013)

In conclusion, Data Centric Business Transformation Strategy is a holistic approach for the enterprise to transform into a data driven and agile entity. DCBT aims to achieve two goals to transform the organization; become a smarter organization by instilling continuous learning and improvement culture in all aspects of the business and achieve agility in enterprise-wide organizational learning and technology. To achieve these two goals, understanding the current state of the organization in the tree fundamental DCBT areas of organizational learning capacity, business processes and technology is essential to incrementally and continuously improve each one in concert. Required improvements should be introduced to smaller parts of the organization delivering the value of data. Strategically chosen pipeline of projects would allow the ramp up of the organization to a continuously learning and changing organization. In the age of digital economy, agile organizations can learn quicker from large amounts of data to have the competitive edge.

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