Advanced Practices Council

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Selecting Digital Data Stream Winners

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SIM Advanced Practices Council (APC)

The Society for Information Management's (SIM) Advanced Practices Council (APC) is an exclusive forum for senior IT executives who value directing and applying pragmatic research; exploring emerging IT issues in-depth; and hearing different, global perspectives from colleagues in other industries.

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Executive Summary

We generate digital data every time we tweet, search for a hotel on Travelocity, send an email, tap on a smartphone icon, walk into our badge-enabled offices, and drive through a tollbooth. Our smartphones are packed with sensors able to gather in real-time sound, images, light, gestures, proximity, rotation, movement, magnetic field, temperature, humidity, atmospheric pressure, and geolocation. Moreover, sensors are increasingly embedded in the physical world around us, where we would least expect to see a computer: the entrance to a bar, our stationary bicycle, and even our kitchen counters.

Companies create value and even strengthen their competitiveness by generating or birthing streams of real-time data, either deliberately or as a byproduct of other activities, and then streaming that data to partners who harvest them and create value-added services. Alternatively, companies create value by collecting, aggregating, and repurposing digital data streams (DDSs). The resulting value comes from creating new products and services or improving existing ones, optimizing internal operations, or producing analyses or improved visualization that lead to superior insight or knowledge.

Realizing the potential for DDSs depends upon the characteristics of the events as well as the capabilities of information technology. Streamability depends upon the event's ability to be birthed, intercepted, or channeled. The degree of completeness of the information surrounding the event must also be considered. Current information technology capabilities essential for leveraging DDSs include real-time sensing (e.g., location of a plane, speed of a car, the mood of an individual) and real-time mass visibility (e.g., detecting traffic congestion).

Given the myriad DDSs potentially available to a company, how can you evaluate which DDSs to harvest either for action or analysis? The first step involves identifying potential DDSs based on feasibility - how streamable and complete they are. The second step involves assessing the potential of the DDS to lead to business value. The report presents the Value Potential Matrix to address the first step and the DDS Prioritization Matrix to address the second. In some cases, companies that invest in unlocking a DDS, despite costly value extraction, can benefit or even build businesses around DDS generation. For others, wait and see strategies may be better suited. Moreover, a highly available DDS with apparently limited upside potential can represent a quick win whose main organizational value will not be to generate a strong ROI, but rather to enable the company to learn and experiment with DDSs.

Beyond an appreciation for the possibilities for value creation and an understanding of the characteristics of DDSs, a company must have the appropriate IS capabilities in place to leverage DDSs. The four key capabilities are: mindset (the company's culture, strategy, and willingness to pursue DDS initiatives), skillset (the company's ability to orchestrate the resources necessary to deliver value from DDSs), dataset (the company's ability to identify DDSs that can generate value), and toolset (the company's capacity to use appropriate technology to harvest DDSs). Our research indicates that a company must master all four to capitalize on the potential value of DDSs. Moreover, high readiness on these dimensions is positively correlated with perceived enhanced company performance, especially increased product and service quality and functionality as well as improved business processes.

Digital Data Comes in Many Little Streams

We generate digital data every time we tweet, search for a hotel on Travelocity, send an email, or tap on a smartphone icon, walk into our badge-enabled offices, and drive through a tollbooth. Our smartphones are packed with sensors able to gather in real-time sound, images, light, gestures, proximity, rotation, movement, magnetic field, temperature, humidity, atmospheric pressure, and geolocation. Moreover, sensors are increasingly embedded in the physical world around us, where we would least expect to see a computer: the entrance to a bar, our stationary bicycle, and even our kitchen counter where some of us have "computing helpers" such as Jibo or Amazon Echo.

We term the phenomenon of real-time birthing of digital representation of events as digital data genesis (DDG).[1] Unlike the traditional process of digitization, there is no lag between the event's occurrence and its availability in digital form. More importantly, DDG events rarely occur in isolation. For example, 27 million unique people made 85 million posts, comments, and likes related to the recent U.S. mid-term elections. There were 3,366,881 tweets on Twitter on election day, and over one million of those occurred between 9 p.m. and midnight ET as results for many of the most closely-watched races began to pour in.[2] Each post, like, or tweet – a DDG event – was a representation of an opinion, a point of view, a comment, or a critique on the evolution of the election day. Together these subjective views and comments produced a real time stream of opinions reflecting the aggregate sentiment of the tweeting electorate. We define the continuous flow of digital representations of events as a digital data stream (DDS). When referring to big data, executives typically imagine a mountain of semi-structured multi-typed data in which to dig for valuable patterns. Instead, DDSs represent the real-time streaming of events.

As with big data, companies are leveraging DDSs to significantly increase business value. What type of business value can companies expect to gain? Which events hold the greatest potential for streaming in order to gain significant business value? How can you prioritize among potential DDS initiatives? How can you prepare your organization to recognize and capitalize on the best opportunities? This report addresses all these questions.

[1] Piccoli, G. and Watson, R. "Profit From Customer Data by Identifying Strategic Opportunities and Adopting the 'Born Digital' Approach," *MIS Quarterly Executive*, (7:3), 2008, pp. 113-122.

[2] What social media says about Election Day, http://www.msnbc.com/msnbc/election-day-through-social-media

Creating Business Value with Digital Data Streams

Value creation occurs when a company leverages one of more DDSs to increase a customer's willingness to pay for its offers or reduce resources needed to maintain value propositions. Companies create value and even strengthen their competitiveness by generating or birthing the stream of real-time data, either deliberately or as a byproduct of other activities, and then streaming these data to partners who harvest them and create value-added services. Alternatively, companies create value by collecting, aggregating, and repurposing streams of data. The resulting value comes from creating new products and services or improving existing ones, optimizing internal operations, or producing analyses or improved visualizations that lead to superior insight or knowledge. Table 1 describes these value-proposition strategies.

Value Strategy	Description	Examples
Generation	A company creates value by originating the stream of data itself, either deliberately or as a byproduct of other activities. The company could then stream such data to other partners who can harvest them and create value-added services leveraging the DDS.	SceneTap Flightradar24.com
Aggregation	A company creates value by focusing on collecting, aggregating, and repurposing a stream of real-time data.	Socrata MyCityWay
Service	A company creates value by using one or more streams to provide services to consumers or to improve service quality.	PeeqPeeq TripIt Ford Coca-Cola Disney
Efficiency	A company creates value by using real-time data streams to optimize internal operations and/or to track business performance (e.g., waste reduction, response speed).	MyTaxi Ruter.no (and several smart cities initiatives i.e. smartsantader.eu) Coca-Cola Disney
Analytics	A company creates value by processing real-time data and information to produce analyses or improved visualizations with the objective of enabling better decision making and/or producing superior insight or knowledge (e.g., through dashboards and data mining).	Google Trends Mint Coca-Cola Ford

Table 1. DDS Value Creation Strategies

SceneTap (http://www.scenetap.com) generated and deployed a dedicated network of facial detection cameras capable of streaming real-time information on crowd size, male-to-female ratio, and average age of patrons of the affiliated bars and lounges. The app, already available in more than a dozen US markets including Chicago, Boston, and San Francisco has more than 350,000 users.

PeeqPeeq (http://www.peeqpeeq.com) provides a service that transforms annoying spam into a relevant and visually appealing catalog tapping into email to create a personalized DDS. With the consent of the owner, PeeqPeeq searches the person's inbox and spam folders for shopping related messages. It then uses image and text recognition to convert the stream of commercial messages into an organized shopping catalogue, flagging expiration dates for coupons and deals.

Although startups such as Scene Tap and PeeqPeeq capture most of the attention, large mature companies are also leveraging DDSs for business value.

Finance

MasterCard, in collaboration with Mu Sigma, developed an advanced analytics system based on the DDS generated by card transactions. Since a DDS contains only raw transaction data (i.e., merchant name, time, date and credit card number), MasterCard required the support of Mu Sigma, an analytics company, to provide retailers with customer insights such as segment, spending pattern, and purchase behaviors. MasterCard opened an Advanced Analytics Centre of Excellence in India to make sense of this continuous stream of global spending trends.

Beverages

In 2009, Coca-Cola (https://www.coca-colafreestyle.com/) introduced its sensor-enabled Freestyle fountain drink dispenser capable of gathering and reporting consumption data. The initiative not only increased sales and guest traffic, but also created a platform for experimenting with new flavors. More recently, the company developed a proprietary algorithm called Black Book to standardize the taste of its Minute Maid orange juices. The algorithm matches consumer preferences with the attributes of each batch of raw juice.

Heineken analyzes shoppers' behavior in front of the shelf, generating metrics and real-time events to drive more conversions. The company is testing a solution to gather deeper knowledge on where each bottle, six-pack, or can of Heineken beer is purchased in the store. This completes the vast amount of data already used to forecast sales in different regions around the world.

Entertainment

Disney is testing a new wireless-tracking wristband called "MagicBand" (https://disneyworld.disney.go.com/plan/my-disney-experience/bands-cards/) to be deployed in its parks and resorts. The system allows Disney to collect massive amounts of valuable visitor data such as real-time location, purchase history, profile information, and riding patterns for popular attractions.

Automotive

Ford Motor Company gathers real-time data on over four million vehicles through onboard sensors

to provide its R&D group with valuable telemetry data about vehicle use, issues, and failures. Ford recently installed an array of over 74 sensors in its hybrid Energi line of cars for gathering data concerning both car and driver behavior. These vehicles generate about 25 gigabytes of sensor readings per hour that can be returned to the factory for analysis and to the driver as added value service. These data are useful for improvements in fuel economy and vehicle emission reductions.

We discovered that profiting from DDSs, especially in established companies, requires a new set of capabilities. Some companies opted to develop the skills and the knowledge necessary for value extraction internally, sometimes creating dedicated structures. Others partner with specialized companies capable of filling gaps. In either case, companies identify opportunities for deploying DDSs by learning from those they currently exploit. For example, MasterCard first created a service based on transactions in order to provide insights – an added value service – to their customers. MasterCard then established a research center in India to analyze and forecast worldwide spending trends.

Characteristics of Leveragable Digital Data Streams

Although most events are not streamed, those that are amenable to channeling as DDSs hold potential for value creation and extraction. Realizing such potential depends upon the characteristics of the events as well as the capabilities of information technology. Streamability depends upon an event's ability to be birthed, intercepted, or channeled. The degree of completeness of the information surrounding the event must also be considered. Current information technology capabilities essential for leveraging DDSs include real-time sensing (e.g., location of a plane, speed of a car, the mood of an individual) and real-time mass visibility (e.g., detecting traffic congestion).

Streamability

Streamability enables firms to assess the feasibility of harnessing a given class of events or creating DDSs if they don't currently exist. Those events most amenable to DDG or birthing meet the criteria of detectability and measurability. An event is detectable if it exceeds a minimum threshold magnitude to sense it. A sensor coupled to a telescope can only detect a star if it receives enough emitted photons. A thief's actions might go unnoticed if the stolen amounts are negligible. An event is measurable if it can be accurately quantified. A firm's quarterly profits have high measurability. The subjectivity of an individual's pain level limits its measurability.

Technological innovation can enhance detection and measurability through sensors, such as domotic technologies. Google's NEST technology has enabled such home events as temperature and motion to be detectable and measureable. SceneTap has created a dedicated network of facial detection sensors capable of providing real-time information on the number, gender, and age of patrons in affiliated bars and lounges. Thus, the number and type of patrons in a venue become detectable events measured with precision.

Those events most amenable to intercepting or channeling must meet volume, sensitivity, and latency criteria. The volume of data necessary to digitally represent the event must meet a minimum threshold. Events detected from video DDSs will be of higher volume than lean DDSs from the temperature readings of sensors. Sensitivity criteria ensure that data won't be misused or subjected to unauthorized access. European governments regulate DDS access and exploitation, thereby limiting the ability to intercept them without the direct consent of the owner. Latency, which is the interval between the detection and measurement of an event and its actual streaming, should be minimal. Examples include the time necessary for rendering a video for sharing on the Facebook event stream or the time required to make a weather station's readings and radar images available on NOAA's website. Financials of publicly traded companies represent another example. Although financial transactions are processed in real-time, profit and losses are computed only quarterly. So despite the real-time availability of granular financial information, the latency of financial data is measured in weeks rather than seconds.

As information technology improves over time, more events become streamable due to the moderating role of three classes of IT capabilities: representation, reach, and monitoring.
Representation is the IT capability of capturing an event digitally, even when detectability and measurability might not otherwise reach sufficient thresholds. Until the advent of geolocation

technology in smartphones, the current geographical position of a device was not streamable. Reach is the IT capability that allows transmission of digital representations of events. Reach mitigates volume and latency requirements allowing for more complex events to stream. Today smartphone owners can stream audio and video events as they occur. Monitoring is the IT capability to authenticate and track parties in a transaction. Advances in cryptography and cyber security increase control over data access. Monitoring capability mitigates data sensitivity, allowing access and sharing of information only to intended parties. For example, machine learning allows for more sophisticated automated fraud detection using DDSs.

Completeness

In addition to evaluating the streamability of potentially valuable data sources, a company should consider whether data sources contain the information needed to describe an event. As indicated in Table 2, such information can be categorized as when, where, who, what, how and why.

Element	Description	Example
When	The time when the data segment was created	A timestamp with date, time, and time zone
Where	The location of the entity when the segment was created	Latitude, longitude, elevation
Who	The unique identifier of the entity that caused the data segment to be created	Person's customer number, RFID of a pallet, URL of a web site
What	The activity that caused the segment to be created	The identifier of an item in a sales transaction, the arrival of a ship in a port
How	The means by which the event was initiated, authorized, or completed	Credit card number for payment, status of arriving flight (e.g., safe landing)
Why	Motivation for the action related to data segment creation	Birthday gift, planned destination

Table 2: Elements of a Digital Data Stream Segment

Although completeness is an important determinant of the value creation potential of a DDS, it is not a prerequisite of value extraction. As we discuss in the following section, different value extraction opportunities stem from DDSs with different degrees of completeness, and multiple streams are often combined in the process of extracting value.

Profiting from Digital Data Streams

Established companies that successfully leverage DDSs follow the process depicted in Figure 1.

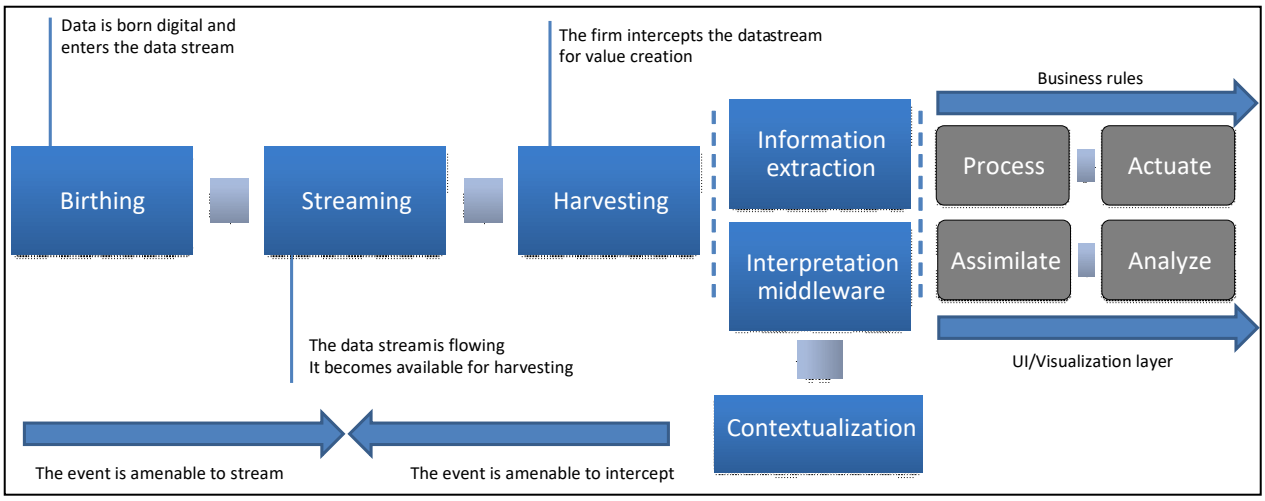

Figure 1: Digital Data Stream from Inception to Value Creation

Birthing

Digital information is created as the event occurs – a tweet, a Google search, the GPS position of an object. Detectability and measurability are the streamability dimensions that come into play at this stage.

Streaming

When events are available, they have to be channeled and transmitted. Event volume, sensitivity, and latency are the streamability dimensions that come into play at this stage.

Harvesting

At this stage, an organization taps into the DDS to extract some or all of the streaming data. Data harvesting employs such technologies as APIs, XML messaging, web crawlers, and scrapers.

Contextualization

Although the majority of DDSs are fairly lean, containing a limited amount of data, companies typically complement them with data from multiple external sources. TripIt, for example, collects airport codes (e.g., LAX) from the DDS of travel confirmation emails. Once recognized as such, airport codes become linkable to a wealth of static information as well as other DDSs. Contextualization provides the necessary meaning for an event's interpretation. Once harvested and contextualized, a DDS is used for value extraction.

Extracting Value

Our analysis of existing DDS initiatives indicates that companies extract value from events in one of two ways: process to actuate and assimilate to analyze.

Process to actuate occurs when value is created by initiating an action or a response

based on real-time DDS processing. The focus is on the immediate action ensuing from event detection. Budget Direct monitors the local weather forecast data stream, for instance, and sends a text message to its customers in an area where hail is expected in the next 30 minutes[3]. Coca-Cola's standardization of Minute Maid orange juices and Ford's continuing product improvements in vehicles provide additional examples.

Assimilate to analyze occurs when value is extracted by merging multiple DDSs and static databases and then exploring the composite data set. The focus is on extracting valuable insights rather than taking action. Inrix and TomTom integrate and analyze multiple DDS sources (e.g., GSM, GPS, TMC, etc.) in order to offer new insights that emerges from these DDSs. Integrating location information from their proprietary network of sensors with data from millions of mobile phones from their subscribers, they analyze the data in real time with advanced analytics to provide traffic predictions and information as value added services to their customers.

Selecting DDS Winners

Given the myriad DDSs potentially available to a company, how can you evaluate which DDSs to harvest either for action (process to actuate) or analysis (assimilate to analyze)? The first step is to identify potential DDSs based on feasibility - how streamable and complete they are. The second step is to assess the potential of the DDS to lead to business value.

Figure 2, which addresses the first step, presents the Value Potential Matrix. It identifies four classes of opportunities, each with its strengths and weaknesses.

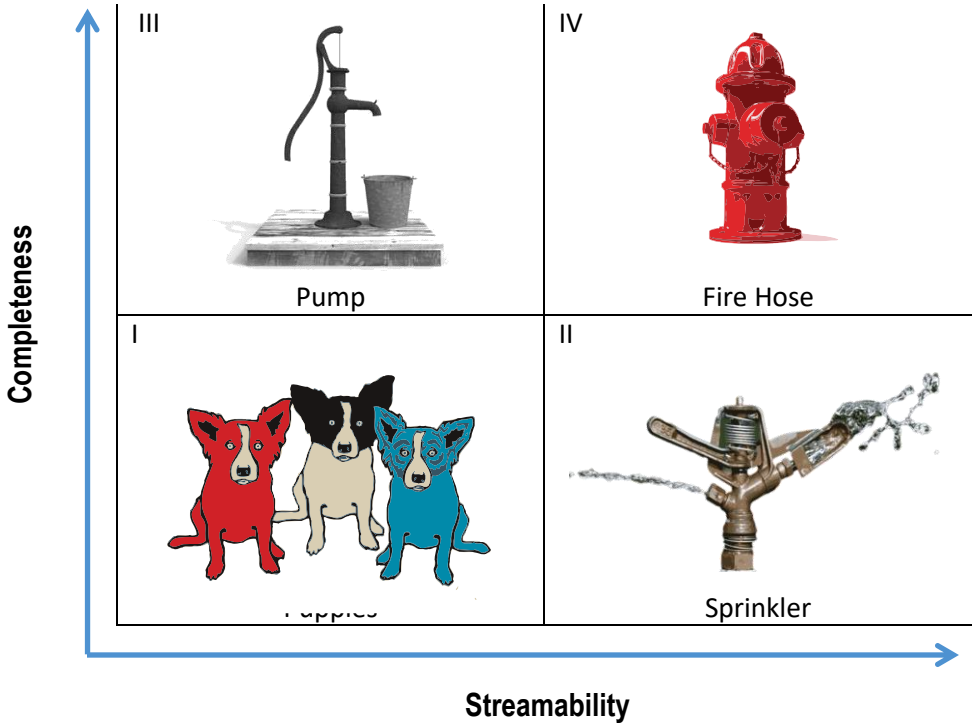

Figure 2: Value Potential Matrix

[3] http://www.smh.com.au/environment/weather/hail-on-way-insurers-offer-a-headsup-from-the-heavens-20120219-1tha0.html

Puppies. A DDS of limited streamability and completeness is generally not ready for exploitation, but it may have future potential. The many sensors integrated into modern smartphones could lead to future exploitable possibilities, including the use of emotional state, air quality, UV intensity, or even earthquakes.[4]

Investments in puppies should be cautious as value potential has yet to be proven. Closely monitor the evolution of relevant IT capabilities in order to predict when puppies may evolve into more exploitable DDSs. In addition, increase your company's DDS readiness, which is described in the next section of this report.

Sprinkler. DDSs with high streamability and low completeness are lean and deliver the essential elements of the events they represent. Their high streamability makes these lean representations of events available with no latency and great measurement accuracy.

MyTaxi is an example of a sprinkler that takes action (process to actuate) to connect taxi drivers and passengers without a centralized headquarter dispatching requests. With more than 10 million users and 45,000 affiliates, MyTaxi serves over 40 cities. Mytaxi's value extraction strategy is based on two very lean streams: the taxi streams containing data on where, when, and whom should be serviced; and the customer streams with information on where and when (and eventually whom) has to be served. These DDS are then very streamable because the events are:

- highly detectable as they are generated by the smartphone sensors and dedicated app;
- precisely measurable as determined through GPS location, clock, or direct customer input;
- low volume as the data representing the events can be encoded in a few bytes;
- low latency as the data are streamed as soon as the relevant events for the service occur; and
- sensitivity is opt-in, being agreed in the terms and condition for service use.

Real-time traffic services like Google Traffic, TomTom, and Inrix are examples of sprinklers that analyze (assimilate to analyze). These companies collect hundreds of millions of lean, real-time geolocation data from smartphones and then link and process them to provide traffic information to customers. The collected data are then stored for historical analysis and integrated with other sources (e.g., weather conditions, construction schedules, holidays, sporting events) to provide real-time traffic predictions.

Pump. DDSs with low streamability and high completeness contain the majority of the elements characterizing an event. However, the low streamability of these DDSs introduces a relevant lag between event occurrences and DDS availability. The magnitude of the events is then implied or inferred through processing and analysis of the available elements, making pump DDSs difficult to process and actuate, thereby limiting the extent

[4] Lane, N. D., Miluzzo, E., Lu, H., Peebles, D., Choudhury, T., & Campbell, A. T. (2010). A survey of mobile phone sensing. Communications Magazine, IEEE, 48(9), 140–150.

or the value opportunity of real-time action. Advanced IT capabilities can mitigate the low streamability of certain events, for example, by increasing their detectability and measurability.

The Conference Board Consumer Confidence Index, an example of a pump that analyzes (assimilate to analyze) to provide a barometer of consumer perception of the U.S. economy's health. The index is calculated by assessing business and employment conditions as well as consumers' expectations six months into the future. This DDS has low streamability because an event is a complex measure inferred from monthly questions and data. Its volume and sensitivity are low because sampling techniques require the participation of just 12,000 opt-in respondents per year. But it is quite complete, since it contains all elements of consumer perception of the U.S. economy.

Fire Hose. DDSs with both high streamability and completeness are rich in content and readily available with minimal latency. These characteristics make fire hoses easy to grow in volume. However, measurability may vary depending on the capacity of the company to infer and assess the events within the stream.

Social bots are examples of fire hoses capable of complex event processing and actuating (process to actuate). They can react in real-time to many contacts and feel human. In fact, some of these bots have gathered followers in social media mimicking human behaviors.

Brand and reputation intelligence systems are examples of fire hoses that analyze (assimilate to analyze) opportunities. NewBrand Analytics assimilates multiple streams from social media and provides insights to support decision-making. Similarly, Tesco and other retailers merge and analyze multiple DDSs with the specific purpose of improving demand forecasts.

The Value Potential Matrix helps assess usability of DDSs in terms of streamability and completeness. In summary:

1. Puppies demand a wait and see approach;
2. Sprinklers hold potential for direct action, but their low level of completeness often require integration with other DDSs;
3. Pumps' high completeness force a focus on event extraction, still a very specialized activity that could require serious effort and investments; and
4. Fire hoses demand focus on both event extraction (as for pumps) and data management. Fire hoses could challenge current architectures by virtue of their high volume, low latency, and rich DDSs.

Since companies have limited resources, they must prioritize their investments. The DDS Prioritization Matrix in Figure 3 aids in selecting investments based on their potential to reap business value. The matrix focuses attention on two dimensions: upside potential and feasibility. Upside potential represents how much value the firm can extract from the initiative, and feasibility depends upon the streamability and completeness of the DDS being evaluated.

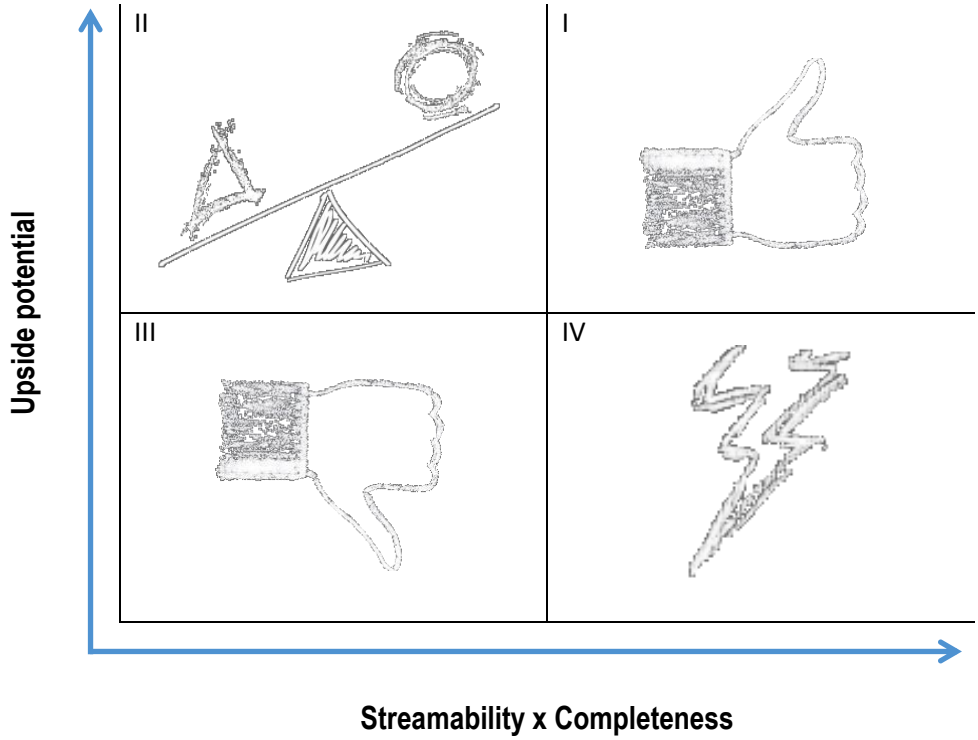

Figure 3. DDS Prioritization Matrix

Possible DDS initiatives that fall into Quadrants I and III lead to obvious decisions. Unavailable DDSs with no perceived potential (quadrant III) make investment currently infeasible. Conversely, high streamability and completeness DDSs provide strong upside potential (quadrant I) and call for immediate investment. The only risks involved relate to the cost of event extraction, processing, and integration that could require new sets of skills not currently in the company.

Considerations of trade-offs are appropriate in Quadrants II and IV. DDSs with strong upside potential, but limited streamability and completeness (quadrant II), should be carefully considered. In some cases, firms that invest in unlocking a DDS despite costly value extraction can benefit or even build businesses around DDS generation. For others, wait and see strategies may be better suited. Finally, a highly available DDS with apparent limited upside potential (quadrant IV) can represent a quick win whose main organizational value will not be to generate a strong ROI, but rather to enable the firm to learn and experiment with DDSs.

Digital Data Stream Readiness

Beyond an appreciation for the possibilities for value creation and an understanding of the characteristics of DDSs, a company must have the appropriate IS capabilities in place to leverage DDSs. In order to help CIOs measure their companies' current level of capacity, we created and validated the DDS Readiness Framework (Figure 4). Our framework has four dimensions: mindset, skillset, dataset and toolset.

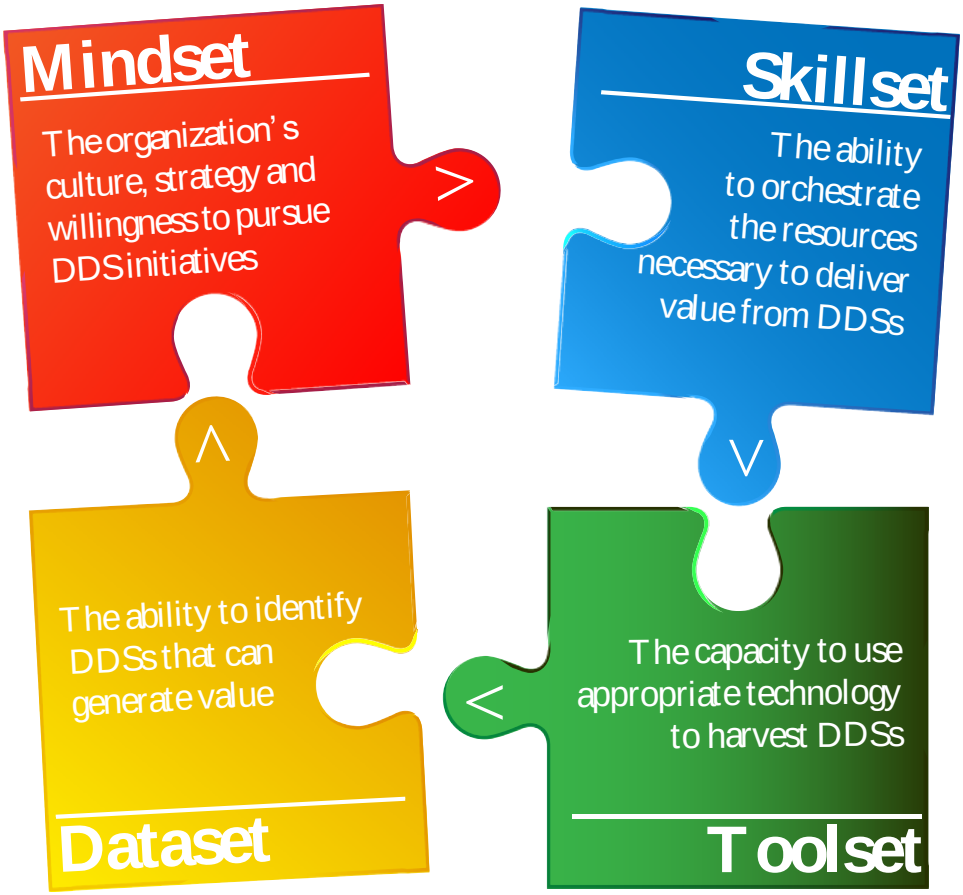

Figure 4. DDS Readiness Framework Components

Mindset

Mindset refers to a company's willingness to invest in new data-driven initiatives and assume the associated risks. The requisite cultural mindset could jeopardize established cognitive and decision processes. It requires companies to trust and understand these data and take decisions accordingly, thereby prompting changes in established decision-making habits.

Consider Amazon, a full-scale data driven company where decisions and actions are grounded in substantial data analysis. At Amazon "the numbers alone are a proxy for what is working and what

is broken, how customers are behaving, and, ultimately, how well the company overall is performing." [5]

Skillset
Skillset refers to the ability of a company to manage DDS initiatives by acquiring and orchestrating all the resources necessary to deliver value with a DDS. Since DDS initiatives are by their very nature typically cross-functional and challenge conventional practices, they can be highly disruptive of established organizational structures and project management practices. Consequently, DDS initiatives require strong coordination mechanisms among business functions as well as new practices.

Dataset
Dataset refers to the ability to identify, intercept, and access the real-time DDSs needed for value creation. MyCityWay is an example of a company that has mastered dataset readiness. Its app provides contextualized real-time information concerning weather, transit traffic cameras, deals, events, movies, gas prices, and more on the basis of a person's location, social graph, profile, intent, and time of day. The app integrates over 100 external DDSs and creates a valuable context for citizens to experience their city. This requires accurate matching between a person's perceived value of information and the characteristics of the DDS containing it.

Toolset
Toolset refers to the ability to use appropriate software and hardware to intercept a DDS and harvest its content. The most technical of the four DDS capabilities, it encompasses both technical competencies and resources necessary to tap into streaming data. The following four elements are required at the technical and architectural level for operating real-time DDSs:

1. Message-orientated middleware (MOM) with an Enterprise Service Bus implementation, allowing for standardized and abstracted communication among heterogeneous systems
2. Advanced analytics engine, advanced analytics, or predictive analytics to be applied on DDS as per requirements of the application
3. Business process modeling (BPM) engine, enabling flexible and deep integration into the human workflow, which significantly assists in consumption
4. Rules engine, capable of executing business rules in runtime and a related rules repository (separating the business and the software/application component)

Although some researchers consider these four dimensions of the readiness framework to be evolutionary in nature, representing a progressive maturity,[6] our research indicates that a company must master all four to capitalize on the potential value of DDSs.

[5] Brad Stone, *The Everything Store: Jeff Bezos and the Age of Amazon*, Little, Brown and Company, 2013

[6] For reference see: Mike Barlow, *The Culture of Big Data*, O'Reilly, October 2013, available on line at http://chimera.labs.oreilly.com/books/1234000001713/ch01.html#fitting_in

Results for U.S. Companies in the DDS Readiness Survey

We conducted a survey of U.S. companies using a validated tool for assessing the four dimensions of the DDS Readiness Framework. The survey items are listed in Figure 5.

Four Dimensions of the DDS Readiness Framework

Mindset

- Our organization has a data-oriented culture.
- We believe in experimenting and testing innovative IT initiatives.
- We believe we can beat our competitors using real-time DDSs.
- We use real-time DDSs to envision and pursue new competitive strategies.

Skillset

- We are good at designing new initiatives that exploit real-time DDSs.
- Once we envision an application of real-time DDSs, we know how to select the key resources to deploy it.
- Once we envision an application of real-time DDSs, we know how to assemble the needed organizational, financial, and technological resources.
- Once we envision an application of real-time DDSs, we know how to form cross-functional teams with the appropriate business functions to successfully deploy it.
- Once we envision an application of real-time DDSs, we know how to exploit the data to deliver the benefits of the initiative.

Dataset

- We are good at identifying valuable internal real-time DDSs.
- We are good at identifying valuable external real-time DDSs.
- We have a clear data governance policy.
- We evaluate the quality of our internal DDSs (e.g., timeliness, completeness, accuracy).
- We maintain an accurate catalog of valuable real-time DDSs.

Toolset

- We have the appropriate tools to integrate real-time DDSs with current workflows.
- We have the appropriate tools to integrate real-time DDSs in current business rules.
- Our systems architecture allows for real-time DDSs to be dispatched to existing systems.
- We have the tools and the technical talent to create our own real-time DDSs.

Figure 5: DDS Readiness Survey

The results of the survey reflect respondents' views on how well they currently exploit the potential of DDSs, their current DDS strategies, their assessment of their DDS readiness, and - most important - the performance improvements they are realizing from their DDS investments.

DDS Potential and Exploitation

Among those companies running DDS initiatives, only 33% think they are already exploiting the full potential.

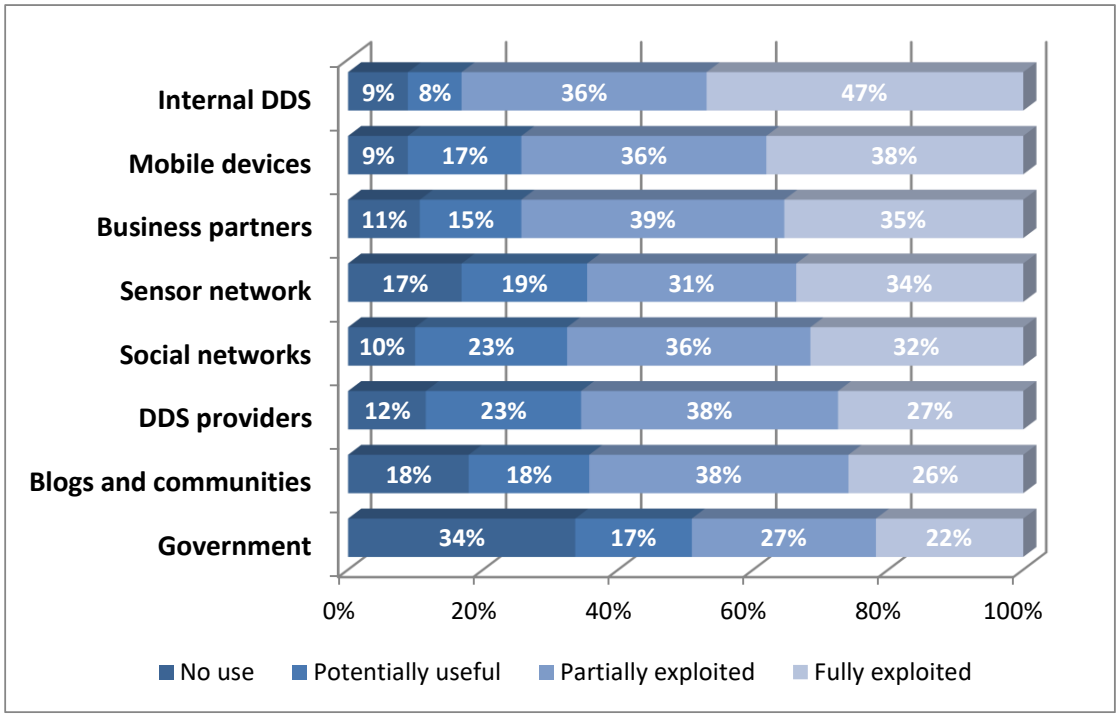

Figure 6: Exploited DDS

Respondents indicate that they are most comfortable in dealing with internal DDSs (47%) as well as those from mobile devices (38%) and their close business partners (35%). The majority of companies leverage social networks and online community DDSs (respectively 68% and 64%). This result reflects the increasing popularity of solutions for sentiment detection and analysis.

The CIO's take:

1. External DDSs are generally considered for value creation after an initial exploitation of internal DDSs. This implies the existence of a learning mechanism that facilitates the harvesting of external DDSs for companies already involved in internal DDSs projects.
2. Open data, typical of governmental initiatives, are being explored as sources of value, but they have to find their place in the decision process. McKinsey estimates this untapped potential to be $3 trillion or more in annual value.
3. Since off-the-shelf solutions offer only standardized results, companies in search of a competitive advantage should develop their DDS readiness.

Prevalent Uses of DDSs

Companies' DDS initiatives span all five value strategies depicted in Table 1, with a predictable preponderance for the analytical, efficiency, and service approaches (Figure 7). These trends undoubtedly reflect the current emphasis on big data, which is the natural extension of past activities related to business intelligence. So we are not surprised that companies place their first bet on analytics for DDS value exploitation.

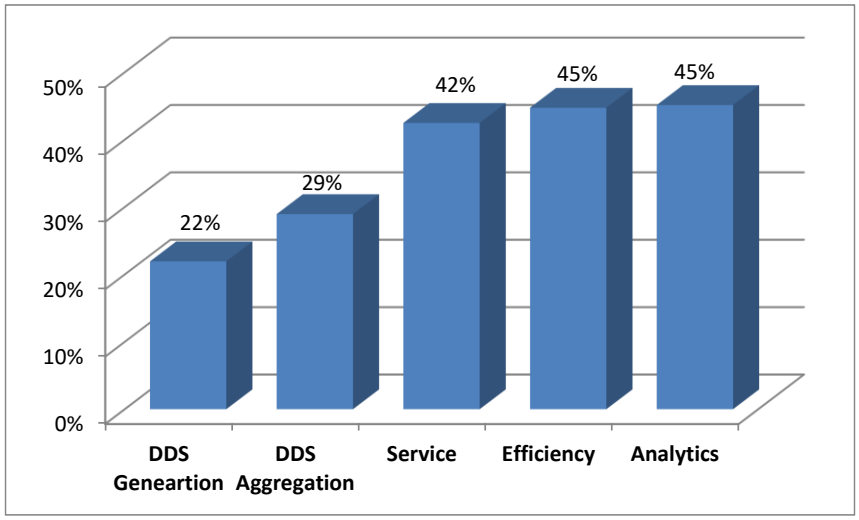

Figure 7. Value Strategies

MyCityWay provides an example of a shift from inward to outward focus. The company's initial app was designed to improve city life for city dwellers. By leveraging its competences in aggregating and contextualizing DDSs, the company then delivered mobile solutions for other companies, thereby creating even more opportunities to access new DDSs and improve its original service. Similarly, MasterCard first developed an analytic service based on recorded credit card transactions and then moved to a global exploration of spending patterns. And Coca-Cola first mastered the use of internal DDSs before integrating external data into advanced predictive models.

The CIO's take:

1. Service, efficiency and analytics strategies are prevalent today. Generating DDSs or aggregating and repurposing them require a greater level of maturity.
2. DDS generation can be a useful approach for developing platforms. Apple's integration of sensors in its devices, with a clear healthcare focus, is a good example of this trend.
3. DDS aggregation is gaining momentum. Open data could provide immense value for companies.

Readiness Framework Dimensions

The portfolio of organizational resources needed to identify and exploit value-creation opportunities from DDSs determines the ability to profit from value drivers. We evaluated the DDS readiness dimensions of mindset, skillset, dataset, and toolset in the survey (Figure 8).

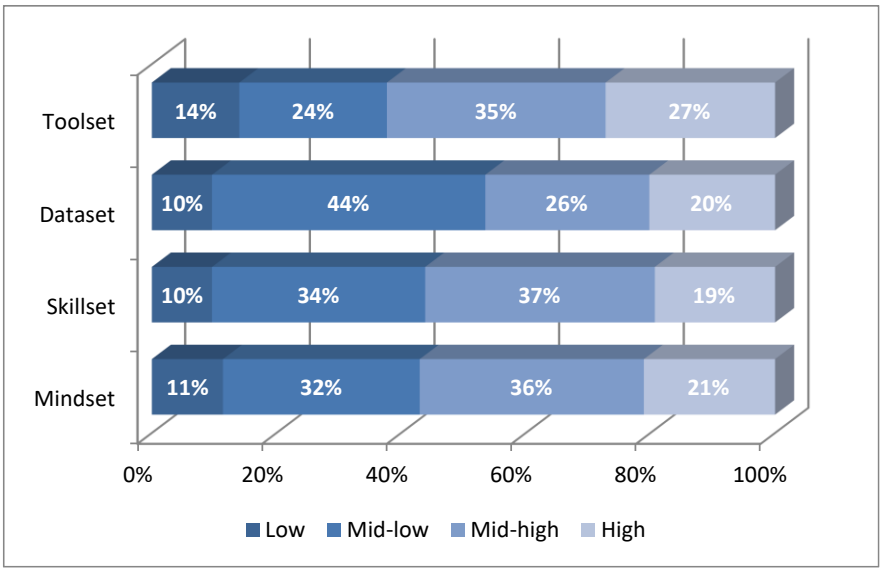

Figure 8: Readiness Components

Mindset

Companies already exploiting real-time DDS have a data-driven culture that incorporates experimenting with innovative IS ideas (84%). Seventy five percent think that real-time initiatives can enable the company to beat its competition. As these results refer only to companies exploiting DDSs, they reinforce our early assumption that mindset is built as the last step once skillset and toolset are established. Indeed, less ready companies (data gathered from a previous study on European firms) or companies not exploiting DDSs have lower scores on the mindset dimension. Moreover, the general uncertainty of competitive advantage emerging from DDS initiatives corroborates with the notion that companies are in the early stages of DDS exploitation due to the lack of strong business cases.

Skillset

At least 72% of the respondents are confident in their ability to correctly manage the development of real-time data initiatives. In less ready organizations, confidence is on average lower and the proportion of companies that lack the necessary skill is higher. These data effectively validate our belief that the skillset dimension is higher in companies that are more able to profit from DDSs.

Dataset

Only 68% of respondents claim to have a clear data governance policy. Companies are already deploying solutions based on real-time data streams, but are still challenged by the integration process with existing systems. A majority of respondents monitor the sources of their data (86%) and assess the quality of the integrated data streams (81%), both fundamental aspects of data governance. DDS monitoring and data quality are the two aspects of dataset that most strongly discriminate between ready and less readying organizations.

Toolset

Respondents seem confident (84%) in their ability to integrate DDSs into current workflows or across heterogeneous systems. They are also convinced of their ability to engage in DDS generation (71%).

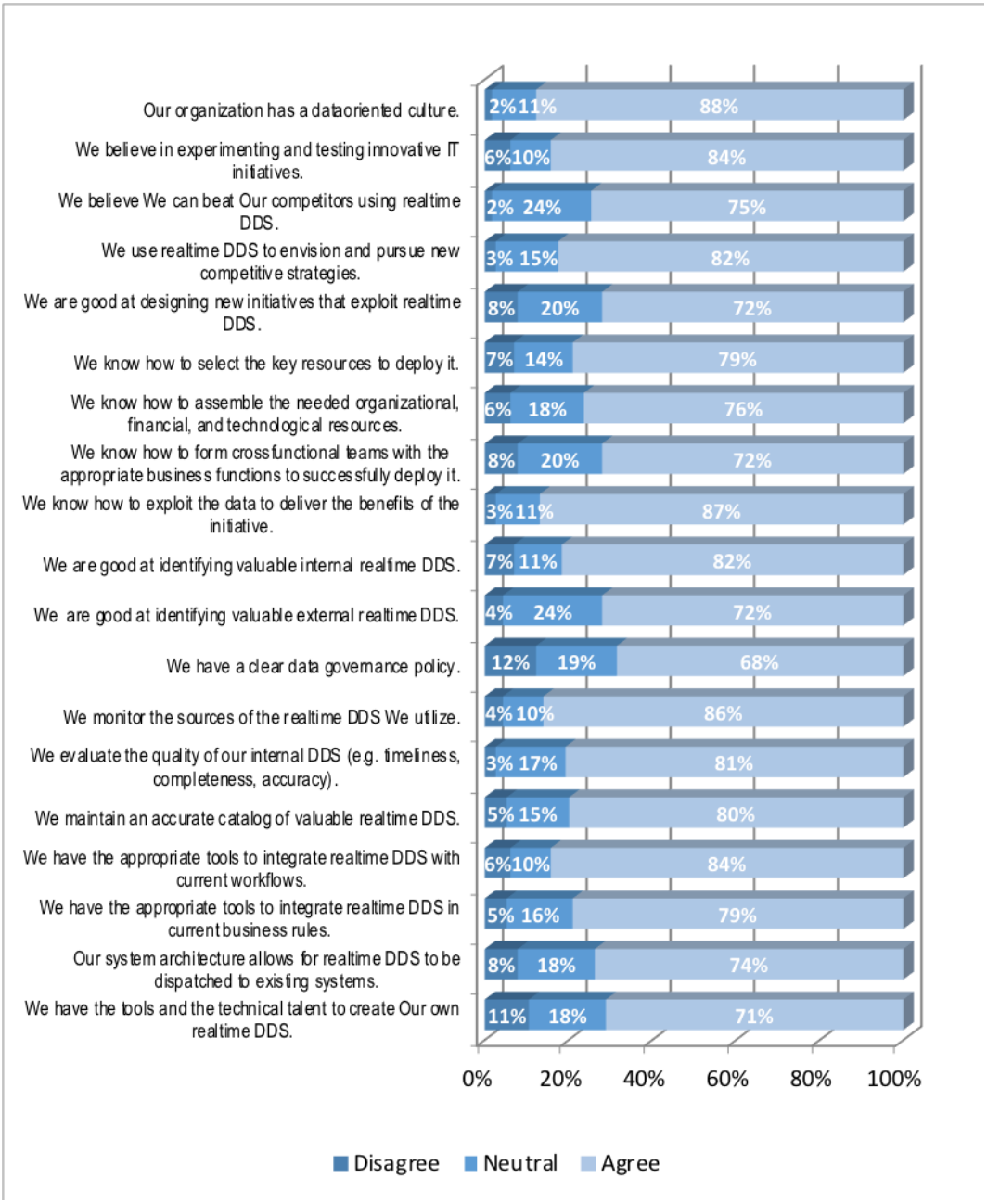

Figure 9: Measured Readiness Items

Does DDS Readiness Equal Performance?

The survey results indicate that DDS readiness and the resulting initiatives are significantly and positively correlated with perceived enhanced company performance, especially increased product and service quality and functionality as well as improved business processes. (Figures 10 and 11).

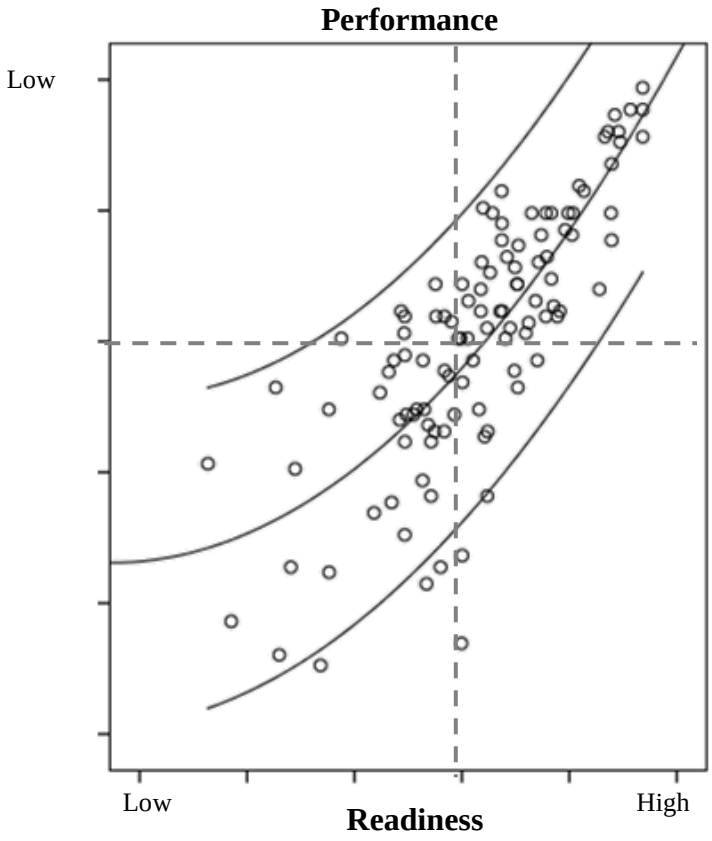

Figure 10. Standardized Readiness and DDS Performance Relation (R^2=0.634)

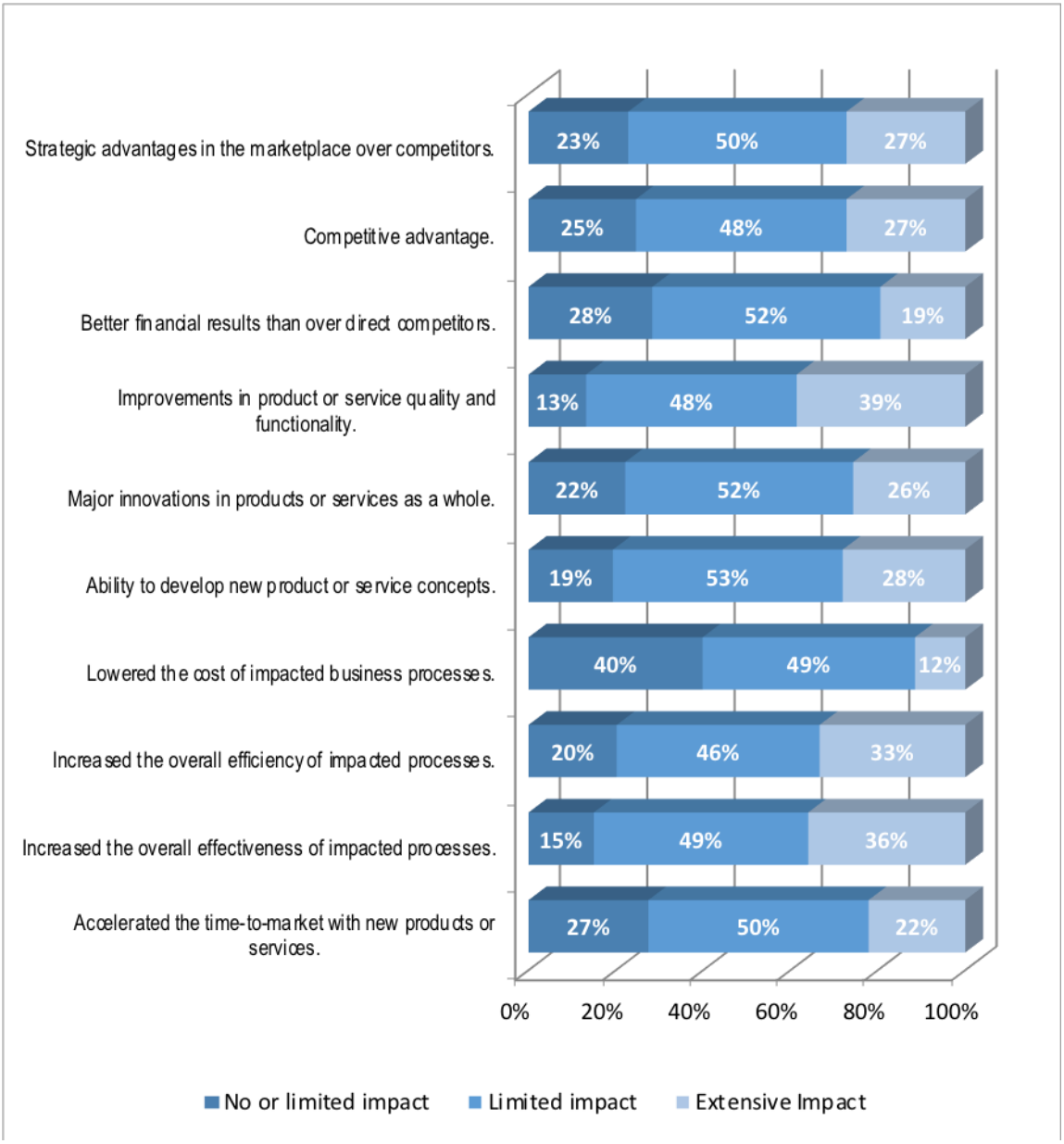

Figure 11. DDS Performance Items

The CIO's take:

1. DDS readiness is a portfolio of organizational capabilities to be developed for DDS value creation. A proper assessment could provide directions for improvement.
2. DDS readiness and the value created through these initiatives are related. Companies with high mindset, skillset, dataset, and toolset benefit most from DDS strategic initiatives.
3. Mindset is at least as important as the other three elements because it determines a firm's ability to perceive opportunities.
4. New sets of skills are often required. Your company will probably require more staff with strong data oriented skills. Hire such staff or collaborate with companies capable of filling the gap.

Conclusions

Companies in multiple industries are creating new products and services, improving their value to existing customers, and optimizing internal operations through innovative DDS initiatives. Many have enhanced their market positions, even gaining advantage over competitors. Realizing the potential of DDSs depends upon not only envisioning possibilities, but also assessing potential DDSs that may already exist or could be generated or aggregated. How can the firm evaluate which DDSs to harvest? The first step is to identify potential DDSs based on feasibility - how streamable and complete they are. The second step is to assess the potential of the DDS to lead to business value. The frameworks introduced in this report can help with both steps.

Frameworks for assessing opportunities can help companies identify and prioritize opportunities. However, a company must have the appropriate IS capabilities in place to leverage available DDSs. Through extensive research, we identified those necessary capabilities and discovered that firms high in mindset, skillset, dataset, and toolset capabilities report higher product and service quality as well as process effectiveness - all key ingredients of high performance. The tool for measuring company readiness of these critical IS capabilities can help companies assess their capabilities. Companies need to master all readiness dimensions to make the most out of their DDS initiatives.

Profiting from DDSs is not merely a problem of having all the necessary tools or competences — the right stuff — but instead demands proper management of their systematic interaction in the organizational setting. We believe that equipped with the tools we present in this report, managers will be better positioned to take the right decisions and make the right moves in the new world of pervasive digital data streams.

Recommendations

Be Prepared
Those companies high in DDS readiness reported greater business performance in the form of enhanced products and services. The challenge ahead is to properly balance the mix of capabilities necessary to appropriate the value generated through DDS initiatives. We believe that the patterns identified are significant and provide guidance to IT departments on where to look. Timing will be important because more companies, including your competitors, will develop the necessary capabilities to recognize and exploit DDS opportunities.

Watch Your Mindset
Not all readiness dimensions are created equal. Our results indicate that companies are better prepared on the technical and data management fronts than the cultural and managerial ones. Some studies suggest that we are on the verge of a radical change in the way we make decisions and develop our products and services. The Chief Technology Officer of IBM France described this change as moving from "gut management" to "risk management." DDSs will continue to infuse more fact-based decision making into companies. Embrace this change in mindset and help your company develop a more balanced guts and facts approach.

Assess Your Readiness
Use the DDS readiness framework to assess your company's readiness and then to check progress. Since DDS value creation has a strong learning component, check your progress and experiment with more advanced ways to create value.

Exploit Opportunities
Opportunities are increasingly becoming evident for DDS exploitation. Use the Value Potential Matrix to identify potential DDSs based on feasibility - how streamable and complete they are - and the DDS Prioritization Matrix to assess the potential of DDSs to lead to business value. Experiment widely and capture learning.

About the Authors

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