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Supporting Decision Making: The BI Sweet Spot

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Abstract. In this paper, we propose the concept: the BI Sweet Spot. The BI Sweet Spot ecosystem includes mobile computing, cloud computing and Big Data. We provide an overview for each of the key components and explain how these three components support the BI Sweet Spot. We also discuss best practices for managing these essential components. This study is the first-of-its-kind work in the BI research that considers the inter-relationships and the combined effect of mobile, cloud and Big Data.

Keywords: Business intelligence, mobile, cloud, Big Data

Introduction[1]

In recent years, enterprises have seen a new array of technologies that afford organizations new ways to support decision making. These technologies include mobility, cloud computing, and Big Data. The combined impact of mobile, cloud and Big Data are significant for most companies that embark on the creation of business intelligence (BI). By definition, BI is "a broad category of applications, technologies, and processes for gathering, storing, accessing, and analyzing data to help business users make better decisions" [1]. The landscape of massive amounts of data, and new computing paradigms is growing exponentially as the inputs from the ever-increasing mobile world compound the pile of information available to create BI. Contemporary organizations will help empower their knowledge workers by employing the intersection of mobile, cloud and Big Data to create a new BI ecosystem, and consequently the 'BI Sweet Spot'. The BI Sweet Spot is where organizations can realize the best return on their BI investment. That return can come in the form of better decision-making, enhanced understanding of consumer sentiments, increased sales based on better marketing, more precise tracking of vehicle routes and road conditions, or in some other way. Specifically, we argue that the key components of the BI Sweet Spot are:

- Mobile computing. Mobile computing is "a technology that provides a service automatically based on perceived situational information in personal and ubiquitous environments" [2]. Mobile computing has brought a whole

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new level of data into play and is a major driver toward the attainment of the BI Sweet Spot. Mobility provides a new frontier of information creation, access, and processing. We are bombarded with the many uses of mobile computing - for example, locator apps that know geographic position, apps that allow travel reservations and rate tour travel experience, and even more mundane uses like package tracking.

- Cloud. To some, the cloud means anything connected to the Internet, and to others it means a very specific technology based on characteristics like elasticity, scalability, metered use, and pay-as-you-go consumption. The US National Institute of Standards and Technology (NIST) defines cloud computing as "a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction" [3]. Whatever a user's view of the cloud, it is critical in reaching the BI Sweet Spot. The cloud enables consumers to connect to services, interact with businesses, and generate data. The cloud is an enabler and understanding how it works is critical to harnessing technology's power.
- Big Data. There is no clear definition for Big Data. However, we propose that Big Data is a phenomenon created by the ubiquity of transactions and devices that generate digital information in contemporary society. It is about the volume, velocity, and variety [4] of information assets being created today and not just the databases or data views created from large data stores. It creates opportunities that did not exist in the past. Those opportunities include things like easier access to customer sentiments, access to data previously unavailable, and the ability to combine newly available cloud and in house data stores.

Each of these needs to be understood along with how they interact to create the BI Sweet Spot, as depicted in figure 1 below. In fact, we all hear about the sweet spot - whether it is the baseball player that hits a ball as effectively as possible, or tourists finding that place on the beach where they are comfortable; many have found the sweet spot. While we use this term metaphorically, it is simply a place that works for us, a place where we get the best return on our activity. The same is true within the BI ecosystem; there is a sweet spot where the enterprise can maximize its investment. Managers today are challenged with understanding how to gain advantage in the marketplace using increasingly complex and emerging technologies. They must understand the forces created by mobile computing, cloud technologies, and Big Data. This paper aims to illuminate a path towards a clearer understanding of the interaction of these three main components that constitute the contemporary BI ecosystem and together create the BI Sweet Spot. We reviewed the related literature and put forward the best practices for managing mobile, cloud, Big Data and the associated BI innovations. This research contributes to the literature of an emerging area of interest – the BI ecosystem that takes into account the compounded effect of mobile, cloud and big data. Organizations that capitalize on the BI Sweet Spot will gain greater advantage in the marketplace than organizations that only capitalize on one or two of these technologies.

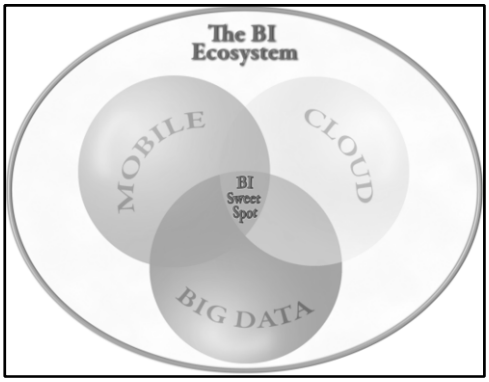

Figure 1. The BI Sweet Spot

The remainder of this paper is structured as follows. The next section outlines and discusses how mobile computing, cloud computing and Big Data inter-relate to each other and how they collectively contribute to create the BI Sweet Spot. Following on that, we present the best practices for managing the BI ecosystem and associated components. Finally, the paper proposes further research initiatives.

1. A synthesis of literature

In this section, we bring together relevant literature from both academic and trade/practitioner sources. Because the development of BI is primarily driven by IT industry, the trade/practitioner publications provide current industry thought on these topics. . This is done to provide a strong real life basis for discussing best practices that drive organizations to achieving maximal benefit from the BI Sweet Spot - the intersection of mobile, cloud, and Big Data. Mobile.

Mobile computing is defined by a number of technologies that converge to create untethered access to data assets, including assets owned by the enterprise and the individual. Enterprise assets include on-premises and cloud-based data stores. Individual information assets include files stored at cloud providers like Dropbox and Google drive as well as data stored at one's bank, on social media sites, and by a myriad of other online providers.

The interaction of mobile and cloud computing is somewhat of a "chicken or egg" problem. Without the cloud to enable mobile devices and without mobile devices to create the need for data storage and processing, neither cloud nor mobile could have become the force that it is. This symbiotic relationship has allowed both to flourish and will continue to do so.

Mobile computing is defined as the devices and technologies that have or can do the following:

- **Communicate over mobile networks**: This includes devices that can communicate over WiFi or mobile networks.
- **A unique user interface:** Mobile devices typically have an interface that is driven by voice, finger movements, or gestures.
- **Apps:** Lightweight, small footprint applications that can run on mobile devices. These include personal mobile apps (e.g., Facebook, LinkedIn, and

consumer banking) as well as commercial and business applications that allow access to corporate information assets.

- **Recognition of geographic and physical context:** The mobile device knows where it is geographically because of integrated location based services and can provide that information to a locator app. The mobile device also knows how it is moving in space because of its accelerometer.
- **Computing power:** Mobile devices have computing power that allows local processing and mobile connectivity.

1.1.1. Mobile in the Enterprise

The pervasiveness of mobile computing poses new challenges. One of these is whether to allow personal mobile devices to access corporate information assets. Another is that mobile allows access both more quickly and from anywhere, with "anywhere access" being the biggest game changer. The enterprise must also consider that the forefront of maximizing the investment in mobile access is self-service BI. If mobile access is being considered, then the enterprise has to deal with employees bringing their own devices to the workplace (BYOD).

The mobile device allows managers and staff to access the digital assets of the enterprise, possibly replacing the need for tethered access to the desktop. It is common for managers and staff to access multiple devices, including a desktop PC, laptop, tablet, and/or mobile phone. This untethered access signals a change in the way employees interact with customers, the enterprise's digital assets, and other stakeholders in the supply chain—in fact, mobile computing has the potential to change practically every interaction and the associated cost of those interactions. Two examples provide insight into those changes:

- In the health-care setting, patient interactions have changed because of mobile devices. Doctors and nurses initially entered patient information on paper charts and then later into desktop computers. In both cases, the entries were made after seeing the patients. Today it is common for medical providers to enter information into a mobile device in the exam room or at the patient's bedside. That allows the providers to interact with patients differently than they did even five years ago, capturing information in real time while seeing the patient.
- In the manufacturing, retail, and warehouse setting, similar changes are observed. Mobile devices are used to monitor and collect data from process control devices in manufacturing; in warehouses and in retail stores. It is common to see mobile devices (e.g., RFID tags and scanners) used for inventory control.

The changes motivated by mobile computing have increased the accuracy of data assets but have also caused new concerns for the enterprise. Some of these concerns are resource-based, whereas others can be addressed by a mobile device management solution.

1.1.2. Mobile and Big Data

With the right tools, employees are creative. Staff members generally want the organization they work for to succeed. There may be a few who just want a job, but most want to enjoy their work, be creative, and move the company forward. That is a

good thing. It means that management, with a mobile computing deployment, must provide the tools necessary for the employees to reach these goals. Big Data and BI are just such tools.

Mobile allows for the creation of new data stores that result in Big Data that can be combined to create innovative BI solutions. The intersection of mobile computing, Big Data, and BI create opportunities for innovation. Being able to assemble data stores and cloud services through mobile apps creates a convergence that can greatly benefit the organization and the consumer, and thus the organization's market share. Harnessing this intersection can positively affect the bottom line.

1.2. Cloud

In the past decade the amount of data available to support decision making has exploded. Organizations often do not have the ability to analyze it efficiently in-house. That is where cloud-based analytic solutions providers and cloud data providers appear. Just like any innovation that is first implemented in the cloud to minimize up-front organizational risk, BI can also be implemented using cloud providers.

1.2.1. The Cloud and the Analytics Cycle

The analytics cycle describes how we collect, analyze, and disseminate BI. A well-implemented analytics cycle creates BI that acts as a feedback loop, thus improving the cycle (see Figure 2).

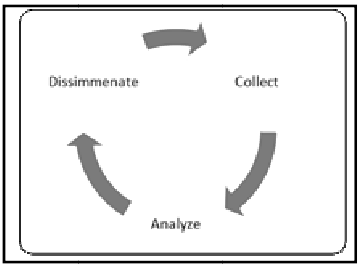

Figure 2. Analytics Cycle

1.2.1.1. Data Collection

Organizations are faced with an enormous amount of data from internal and external sources. It is important that firms understand why they are collecting data and how those data support the objectives of your organization and its BI plan. As part of a BI plan, the first step in data collection is to develop a set of objectives (e.g., what you want to accomplish or the BI you want to create) so enterprises can decide which data will support those objectives. Once that is done, internal and external data sources can be reviewed, and their fit into organizational objectives can be understood.

1.2.1.2. Data Analysis

With BI objectives in place and data sources selected, firms can decide how they are going to analyze the data. They can store all the data in-house and run the analysis there, or they can send the selected data to a cloud provider and run the analysis in-

house or at a cloud provider; it is a matter of meeting the organization's needs and objectives. The choice of where applications and data will reside requires both technical and business decisions.

1.2.1.3. Data Dissemination

As part of a BI plan, companies must decide on the distribution of the intelligence. This decision must be driven by the goals and objectives of the BI project, but that is just the beginning. Not only should firms disseminate the information, they must also provide a way for the users of the information to provide feedback about the quality, content, and format. In that way, BI can improve over time.

1.2.2. Self-Service BI

Many BI tools are not very user-friendly, which can create problems when disseminating tools to end users. Self-service BI is a way to solve that problem—it gives users the tools to ask questions and do analysis on their own terms. "Self-service BI is technology that provides non-technical individuals who need data with the ability to gather and display meaningful information about the desired subject matter." [5] Before self-service BI is implemented, strategic decisions must be made and a BI plan must be created. The technical and business intricacies of cloud providers or on-premises software, identification of data sources, and such must be addressed before a self-service BI application is made available. These significant undertakings before deploying a self-service BI make it possible for the users to access complicated queries on their own terms.

The Primary and Preventative Care GIS is a New York State public sector self-service BI solution [6]. It allows public health agencies to query health indicators from a statewide database by various geographic areas, to overlay the areas and indicators, and to incorporate local data on a thematic map. For example, if the number of patients with cancer was mapped along with the location of toxic waste sites, a relationship might become evident. If a user also overlaid the number of oncologists, he could determine whether there are sufficient numbers of them in the right locations. This mapping might cause a policy shift within the state.

Self-service BI is a way to reduce the effect of BI requests on an organization's IT department. Nike was faced with this problem. According to Jimmy Lee, an architect at the company, Nike is creating self-service BI in response to the constantly changing needs of business users. With each new report "our users say, 'We have more questions that we need answered.'. . . Meanwhile, the complexity of the analysis that the business needs is growing, too. We're having to do more complicated work—more data types, deeper questions—in a shorter amount of time" [7].

There are casual users and power users of BI. Casual users need only minimal features of a product and are unwilling to negotiate a learning curve. Power users need advanced features and are willing to invest the time required to learn advanced features. For example, a regional sales manager might only spend ½ hour a day running standard reports whereas a product analyst might spend most of the day dicing, slicing, drilling down and drilling through data. Selecting one BI product to service different groups of user is a challenge. The product must hide the advanced product features from the casual user that are required by the power user. The casual user needs to be able to perform simple tasks without learning about the advanced features. Self-service BI must be designed to help accommodate these different groups of users.

1.2.3. The Cloud's Impact on BI Strategy

Organizations use the term *business intelligence* quite often; in fact, organizations are often abuzz with it. However, have they carefully thought about what BI really is or why it is important? A basic decision: BI is something a firm creates by asking the right questions of the right data using the right analytical tools. This requires knowing where the organization is today, having a solid mission-driven BI plan, and using the BI that is created to improve organizational performance.

Before undertaking a BI project, an organization must ask how well it is currently using analytics to create BI and how well those efforts are aligned with the organization's strategy. If its data are stored in spreadsheets or on hard copy, it may find creating BI difficult. If it is using a database-driven application (e.g., ERP or CRM), it may be a matter of determining what questions the users want to ask and what they are going to do with the answers. Successful BI depends on the alignment of the organization's mission, strategy, and objectives with its people, processes, and technology.

1.3. Big Data

Big Data is a phenomenon that is created by the ubiquity of transactions and devices that generate digital information in our society today. It is not just databases or data views created from large data stores. Globally, individuals generate a multitude of tweets, LinkedIn postings, Foursquare location data, Instagram images, and many other social factoids every second of the day. Organizations also create large volumes of data. Walmart's data store is estimated to be more than 2.5 petabytes—the result of keeping the details of more than a million transactions per hour. Many web sites contain forums that allow purchasers to rate hotel rooms, airline flights, or other products and services; Organizations have customer service, sales, human resource, and other data in their data stores. An estimated 90 trillion e-mails per year and a wealth of other memos and phone records are available for analysis. These existing sources amount to an almost overwhelming amount of information that can be stored, processed, and understood - that is the Big Data phenomenon.

The cloud enables the coupling of data stores to create BI that can help organizations competitively. Big Data also affects the individual; for example, the individual can use existing data stores to research companies where they want to be employed or to find out about an organization's customer service record, just as the enterprise can use these sources to uncover customers' perceptions of their products. The uses of these data are limited only by the innovativeness of the data scientist analyzing them and the resources available to do so.

Organizations are faced with complexities and costs to extract the maximum BI from Big Data; they also reap benefits by doing so. As the volume, velocity, and variety [4] of data increase, the cost of managing the data also increases. But so does the ability to create more complex and accurate BI. The complexity of suitable analytics goes from basic descriptive statistics (e.g., mean, ratio, and sums) to more predictive ones (e.g., data mining and regression) as there are larger amounts and more varied types of data to analyze (see Figure 3).

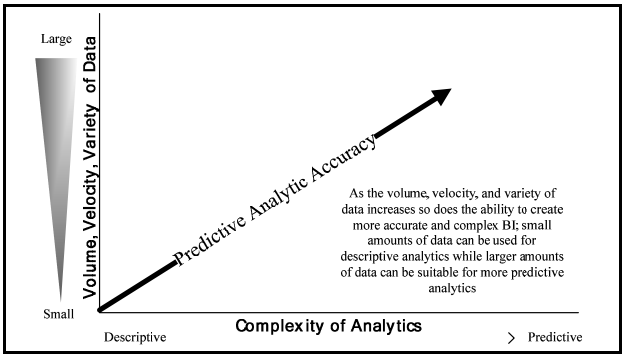

Figure 3. Data Characteristics and Type of Analytics

1.3.1. Big Data, BI, and the Cloud

As firms progress through the bevy of in-house data stores, cloud data, and service providers and contemplate combining them to create BI, they must determine whether the technical and analytical capabilities of their staff are up to the challenge. Cloud service providers may require specific programming or other technical skills, data providers may require specialized knowledge of creating BI from the various data sources, and internal data stores may require a skill set unique to managing those technologies. Internal and external BI solutions all have specialized needs that effect resource allocations, budgets, and time lines. The organizational consequences of these factors and others must be understood as Big Data, BI, mobile, and cloud deployments are considered.

1.3.2. Managing Big Data

According to Forrester's [8] pragmatic definition of Big Data, an organization needs to be able to manage its data stores. It must be able to create actionable and pragmatic BI. This is accomplished by the following:

- **Storing:** The organization having the technical ability to collect and store Big Data.
- **Processing:** Having the staff and other resources to properly clean, enrich, and analyze appropriate data stores to create BI.
- **Accessing:** Knowing how to retrieve, search, and integrate data stores to create meaningful visual representations that are useful and accessible to decision makers.

The organization's ability to store, process, and access Big Data must be as well understood as the variety, velocity, and volume of Big Data so that investments in Big Data and BI can be maximized.

2. Best Practices for Managing Mobile, Cloud, Big Data and BI Innovations

Organizations must understand how to expend their scarce IT resources on the creation of BI. The three technological forces of mobile, cloud, and Big Data intersect

to create the BI Sweet Spot that offers new opportunities for innovation and must be harnessed in the following ways.

2.1. Mobile

Mobile computing has brought a whole new level of data into play and is a major driver of Big Data and BI. Big Data comes from applications that companies create to interact with their customers, social media, cloud data providers, and a host of other sources. BI comes from using the data that are stored, processed, and distributed to create intelligence that can be used to innovate the business. All of this is enabled by cloud and mobile computing.

Mobile, cloud, Big Data, and BI all intersect to provide a new frontier of information processing. Mobile computing is composed of many innovative applications and technologies. For example, mobile devices provide location based services that understand geographic positioning which enables the user to find the closest service (e.g., a store or an ATM), and logistics companies to provide package tracking details.

Organizations must determine how personal, commercial, and business applications of mobile computing can increase employee, customer, and supplier satisfaction and productivity throughout the supply chain. Doing so makes it possible to increase market share and enhance the bottom line.

2.1.1. BYOD Policy

Mobile devices are part of our everyday lives, and organizations must recognize that mobile devices are now part of the fabric of business and society. No longer is anyone surprised to encounter someone using multiple mobile devices simultaneously (e.g., a mobile phone and a tablet). Considering that sales of mobile devices outpace desktop sales and that virtually everyone in the business world deals with mobile devices on a daily basis, it is practical for an organization to have a policy that dictates how these devices can be used in the workplace. It is better to manage mobile devices than to let them proliferate and be uncontrolled, creating another form of shadow IT. Organizations must reckon with personally owned mobile devices and need to create a BYOD policy that accomplishes their goals. Security is a major concern when implementing BYOD policies, especially when giving access to users on devices not owned or under the direct control of the enterprise.

2.2. Cloud

The cloud is a game changer for BI—companies no longer depend on just their own organization's data stores. Data analysis takes on a completely new meaning when firms can leave data in the cloud (or use their local data store) and combine it with data from cloud providers. The cloud brings together storage, compute, and network services in ways that change the creation of BI. With IT vendors offering software like IBM's Business Analytics in the Cloud and Pentaho's Data Integration and Business Analytics for Cloud Applications, organizations no longer need to deploy a large expensive infrastructure in-house but can use cloud providers on a metered use basis. That allows organizations to manage the risk of BI projects. Cloud providers offer a

myriad of data from social media and CRM applications to business demographics and geographic data. Cloud data and business analytics providers allow a whole new generation of BI to be developed that provides an organization with new and better ways to manage its core business and interact with its supply chain.

2.3. Big Data

Big Data may seem passé, and cloud providers may seem like little more than web hosts that offer services. However, the trend is for an increasing number of organizations to put their Big Data in a cloud provider's stores and process it there. This is because the ability to store, process, and access data in the cloud is less financially risky, requires less up-front capital, and is more supportive of innovation than building local infrastructure.

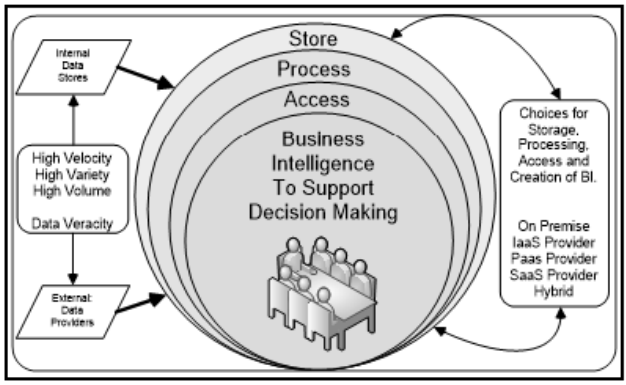

Figure 4. The Big Data Ecosystem

Before the term Big Data came into vogue, many organizations already had it—think of the early use of Twitter, Facebook, and LinkedIn by marketing firms. These firms would combine and visualize postings to these social media sites before we realized the effect of mining these sites, combining them with our own data, and creating actionable BI. Companies were utilizing these social media outlets long before we had the term Big Data and realized the significance of data volume, velocity, and variety. Today, the Big Data ecosystem (see Figure 4) is defined by that variety, volume, and velocity of data that stream into organizations along with how those organizations store, process, and provide access.

Organizations also need to be concerned with data veracity, since Big Data often forces analysis of data that might be imprecise [9]. At the core is the ability to create BI that supports decision-making. By combining internal data stores with external data providers and mining for new correlations and interactions, organizations can capitalize on Big Data momentum.

2.4. Business Intelligence and Self-Service BI

The ability to receive e-mail and webcasts and to perform video conferencing on a mobile device is important, but aligning those communication services with mobile BI is a game changer. This innovative approach allows staff to be able to make decisions

untethered from their desktops, and the aligned communication services allow those decisions to be carried out. The BI generated as visual analytics and reports delivered through self-service BI allow users to quickly access the information they need to drive enterprise success.

Self-service mobile BI provides essential capabilities so that decisions can be made and acted on more quickly. SAS Institute's mobile BI is an example of analytics that allows the staff to make decisions while untethered. When selecting a mobile BI solution, it is important to examine these key attributes:

- **Approachable user interface:** The interface for mobile BI solutions must not require technical skills. Data visualization and reports must be easy to generate, understand, and manipulate.
- **Required data stores:** The mobile solution must make access to data stores straightforward. The data stores necessary to support decision-making must be easily integrated and used.
- **Predefined views and reports:** The ability to create predefined views of the required data along with predefined reports is essential. These reports and views must incorporate dashboards and other visual representations of an organization's key performance indicators (KPIs). The user must be able to innovate and create custom views and reports, even combining existing ones.
- **Manipulation and examination:** BI solutions must allow the user to easily manipulate existing data views and reports as well as fully examine them. For example, a district sales manager must be able to examine a dashboard of KPIs for his or her region, and then be able to drill down to the sub-regional and/or store level. The user must be able to easily manipulate the views, reports, dashboards and other visualizations in order to understand where the higher-level aggregated KPIs came from.
- **Improved (not reduced) productivity:** A BI solution must be easy enough to use so it enhances productivity rather than decreasing it. It is important that mobile BI solutions are designed and implemented with user input so that the solution does not become too complex.
- **Untethered and tethered access:** The user must be able to access the same views and reports on their mobile device and desktop. This continuity is an important aspect of increased productivity and accuracy.
- **Deployment and maintenance:** The BI solution must integrate with existing digital resources and be an extension of them. The mobile solution must also be easy to maintain and not require substantial additional staff and resources to work effectively.

All these attributes must be considered under the spotlight of how the mobile BI solution aligns with existing business and IT strategies. The technological underpinning of these key attributes must recognize, according to SAS Institute, "that there are two opposing forces at work—the need for IT to control the creation and distribution of BI assets and the demand from information workers to have freedom and flexibility without requiring IT help" [10]. A balance between these two forces must be reached. Knowledge workers, managers, and other staff must have free access to all BI components while IT has oversight of the self-service BI environment to observe its utilization and manage technology resources.

3. Conclusion and Future Research

This paper has put forward the concept of a BI Sweet Spot along with its ecosystem that consists of mobile, cloud and Big Data. We provided an overview of the literature pertaining to these three main components and justified how they lead to the BI Sweet Spot. We also highlighted the best practices for managing the BI ecosystem and its associated components. Albeit the work represents an exploratory study, it is a pioneer work initiating discussions on the combined impact of mobile, cloud, and Big Data on BI innovation.

Further research using a case study method will shed light on where and how the identified key components can influence the success of a BI endeavor. Four organizations have been identified which have implemented mobile, cloud and Big Data technologies. Those organizations will help us further elucidate best practices for organizations that want to reach the BI Sweet Spot. An article detailing best practices based on these interviews is planned.

References

[1] H. J. Watson, "Business intelligence–past, present, and future," *Communications of the Association for Information Systems,* vol. 25, no. 1, p. 39, 2009.

[2] K. Y. Chung, J. Yoo and K. J. Kim, "Recent trends on mobile computing and future networks," *Personal and Ubiquitous Computing,* pp. 1-3, 2013.

[3] P. Mell and T. Grance, "The NIST definition of cloud computing: Recommendations of the National Institute of Standards and Technology," 2011. [Online]. Available: http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf. [Accessed 17 December 2013].

[4] Gartner, "Big Data," 2013. [Online]. Available: http://www.gartner.com/it-glossary/big-data/. [Accessed 16 December 2013].

[5] Ziff Davis, "Self Service Business Intelligence," 2012. [Online]. Available: http://hosteddocs.ittoolbox.com/zdwp_self_service_bi_v2.pdf. [Accessed 14 December 2013].

[6] M. Gendron, "The PPCGIS: A Technical Overview of the Pilot Implementation," in *Conference of the American Public Health Association*, New York, 1996.

[7] P. Swabey, "Self-Service Business Intelligence," 17 June 2013. [Online]. Available: www.information-age.com/technology/information-management/123457131/self-service-business-intelligence. [Accessed 14 December 2013].

[8] Forrester, "Big Data," 2013. [Online]. Available: http://www.forrester.com/Big-Data. [Accessed 16 December 2013].

[9] M. Walker, "Data Veracity," 28 November 2002. [Online]. Available: www.datasciencecentral.com/profiles/blogs/data-veracity. [Accessed 14 December 2013].

[10] C. Imhoff and C. White, "Self-Service Business Intelligence: Empowering Users to Generate Insights," 2001. [Online]. Available: www.sas.com/resources/asset/TDWI_BestPractices.pdf. [Accessed 14 December 2013].