Digital Storytelling for the Business Professional

Ryan Fleischmann

Grand Valley State University

Follow this and additional works at: http://scholarworks.gvsu.edu/honorsprojects

Recommended Citation

http://scholarworks.gvsu.edu/honorsprojects/131

This Open Access is brought to you for free and open access by the Undergraduate Research and Creative Practice at ScholarWorks@GVSU. It has been accepted for inclusion in Honors Projects by an authorized administrator of ScholarWorks@GVSU. For more information, please contact scholarworks@gvsu.edu.
Digital Storytelling for the Business Professional

By Ryan Fleischmann

Excerpt: A survey of best practices and innovations in business intelligence reporting and how they can apply in 21st century business with an emphasis on solutions integrated with SAP enterprise systems.
Storytelling as Business Practice

It is a substantial challenge to simply explain how business and technology interact. Each realm has its own jargon which even experienced professionals from both of the respective disciplines have difficulty understanding. This paper’s excerpt could be considered informative to particular readers:

A survey of best practices and innovations in business intelligence reporting and how they can apply in 21st century business with an emphasis on solutions integrated with SAP enterprise systems.

However, this paper is really about how people in business tell stories in the 21st century and what resources exist for them to become better storytellers. This is important because it is the one job every professional, at every level, will always have. It is simply not enough to do or say the right thing. For every business leader, there is a need to compel their audience of co-workers, managers, business partners, and shareholders to a shared vision and understanding of problem-solving and strategy.

Our personal experiences with stories, from the books and magazines we read to the plays, television shows, and movies we watch can actually tell us a lot about how to successfully implement new business intelligence technologies to achieve excellence in business management.
There are times in which critically understanding business data can be likened to the introspection and engagement had in reading your favorite book. Other situations call for an executive to carefully consider the collective efforts and insights had across the information. Aggregating such knowledge and synthesizing it can be an elaborate production, not unlike the co-ordination of creative and technical resources needed of a blockbuster movie. At other times, executing business applications with excellence and performance require resources that have the flexibility and effectiveness of a cast and stage crew on Broadway.

The metaphor may seem to be a stretch, but do not let the storytelling topic matter distract you from the purpose of this paper: to survey the technology and best practices of business intelligence and the innovations which enhance the management process in such a way that a clearer, more engaging narrative of business performance emerges.

**Business Intelligence Defined**

Before unpacking the finer points of these innovative technologies, the term “business intelligence” must be defined. Though the practice of business intelligence is still new, its concept has existing for a very long time. In 1958, Hans Peter Luhn, a researcher at IBM defined business intelligence as, “the ability to apprehend the interrelationships of presented facts in such a way as to guide action towards a desired goal” (314). Using technology as the means to “apprehension,” business intelligence can be defined as the collection of technologies that turn complex data into succinct facts and compelling trends for the purpose of improving business
processes and strategy. Business intelligence systems make relevant business information accessible to the user through an interface that delivers high quality user experience, facilitating further interaction and analysis of information.

The term business intelligence is often used interchangeably with the term business analytics. Business analytics more commonly refers to the practice of putting business intelligence systems to a functional use, with a lesser emphasis on the technological aspect. For example, Nucleus Research recently published a study titled, “Analytics Pays $10.66 for Each Dollar Spent,” documenting several case studies of businesses achieving greater profitability and sales as well as lower costs using strategies derived from insights generated from analytics programs using the business intelligence technology. A more precise understanding that will be explored in this paper is that it is rather the active practice of data science that delivers these increases in business performance, not necessarily the investment in analytics programs or business intelligence systems. But do not be mistaken, business intelligence systems and analytics help uncover a realm of lead-nurturing and business performance management possibilities not likely to be achieved without business intelligence and analytics programs.

The bottom-line business value these business analytics and business intelligence systems deliver is ultimately the most important consideration to make with business intelligence strategy and policy. The scope of this paper is broader. It also takes into consideration cutting-edge system architectures and other innovative technologies and how they are a resource in implementing truly engaging business analytics. This paper will relate
these technologies as advantages in practicing data science. To put it briefly, new business intelligence system architectures are facilitating greater access to more granular, relevant data in much faster, efficient, and predictable way, empowering businesspeople and data scientists to define and solve business problems that were previously unknown or too difficult to do anything about.

For the purpose of brevity, we will not take data quality into too great of consideration in this paper. The process of achieving data quality is very important. However, the technological landscape has changed dramatically and with it the processes in which we achieve data quality in this new context. The bulk of this paper is about surveying this new context, not exploring its details in-depth. Rather, data visualization will be emphasized as a tool for bringing clarity to quality, existing data sets.

So much strategic and technological change certainly stirs up ethical and change management considerations also vital to the successful implementation of business intelligence. An analysis of these softer factors of business intelligence strategy will follow an in-depth survey of innovative and proven business intelligence technologies and the best practices of data scientists responsible for leading successful business intelligence projects.

Additionally, there are some biographical details to document. SAP acquired Sybase in 2010. BusinessObjects is SAP’s own business analytics application.
Backend Systems

Big Data, Big Responsibilities, Bigger Opportunities

Evolution in system architectures serves as the bedrock of 21st century business intelligence. Advances in technologies such as cloud computing and columnar database tools such as MapReduce, Hadoop, and NoSQL have been integral to the growth of Google, Facebook, and Twitter to store and make profitable use of massive volumes of data (Adrian & Childs, Video: “What is Hadoop? Other big data terms like MapReduce? Cloudera's CEO talks us through big data”). These leading technology companies and others pioneered the development and use of these technologies because relational databases and traditional server offerings were not meeting their business needs. Their systems needed to provide an unprecedented amount of data to millions, daresay billions of users. Commercial enterprises outside Silicon Valley are now also facing similar business challenges. This is what is commonly referred to as “Big Data” which can be specifically defined as, “information of extreme size, diversity, complexity and need for rapid processing” (Friedman 1). There are many factors of Big Data which include:

- Reporting requirements of Sarbanes Oxley and other major new government regulations
- Businesses becoming larger, more globalized, and complex
- Many more possible points of interaction with customers, both internal and external, led by advances and widespread adoption of technology
- Increased pressures of market competition
- Environmental sustainability
Automated data creation technologies

These factors have vastly expanded the already-large network constituency of stakeholders which thereby fosters a need for superior analysis competencies that work in harmony with the massive amounts of data.

Large commercial enterprises using enterprise systems like SAP deal with Big Data, however, in a different way. Their system needs are more internal and operations focused and their Big Data challenges pertain more heavily towards supporting many transactions of data, rather than data’s organization. SAP has responded to this particular need of large enterprises with SAP HANA (short for “High Performance Analytic Appliance”). HANA differs greatly from SAP’s traditional enterprise software offerings because of its use of in-memory computing rather than traditional disk storage to handle transactions of data in the enterprise system (Curtis, “SAP HANA Makes Big Data Analytics More Accessible”).

System Architectures Explained

How does in-memory computing differ from other Big Data technologies? How does the fusion of these technologies create value to businesses? What is the role of these technologies in business intelligence? Most importantly, can the workings of this new system architecture explained in a succinct way and more easily understood?

In-Memory Processing

First, let’s better understand the benefits of in memory processing. Timo Elliott, Senior Director of Strategic Marketing at SAP BusinessObjects recently wrote about in-memory
computing in a blog post entitled “Why the Last Decade of BI Best Practice Architecture is Rapidly Becoming Obsolete”:

Over time, memory processing capabilities has expanded exponentially, in line with Moore’s Law, doubling every few years. But disk access speeds have been limited by real-world aerodynamics, and have increased only by 13x or so over the last fifty years. The result has been an ever-widening gulf between the speed of processing data and retrieving it from disk. Today, it can be up to a million times slower to get data from disk than from live memory.

This leads to tough architecture choices. One way of imagining the consequences is to compare it to a chef cooking a meal. If — like on the TV cooking shows — all the ingredients are already prepared and sitting on the counter-top, it’s very quick and easy to create the meal. This is the equivalent of “in-memory processing” once all the required data is available.

But imagine now that the chef doesn’t already have the ingredients ready. Given the slow relative speed of disk access, it’s as if the closest supermarket was on the planet Mars, and the ingredients had to travel months by rocket before each and every meal.

Elliott further notes that the price of memory has also gone down considerably

Just ten years ago (when we first defined the current BI best practices) the price of one megabyte of live memory was around one dollar. Now it’s over a hundred times less:
below one cent, and still falling fast. This is equivalent to something shrinking from the size of the Statue of Liberty down to a Chihuahua.

**Columnar Databases**

Elliott also provides a simple, humorous explanation of the difference between traditional relational database technology and the columnar database technology earlier mentioned in this paper.

Let’s use an analogy to illustrate the difference between the systems: I employ a “row-based” filing system at home. I open each day’s mail, take a quick look, and then put it on top of a big pile in the corner of my bedroom. At one level, it’s an extremely efficient system: it’s very fast to “write” to the database, and if I want to find all the papers I received on a particular date (a “transaction”), I can find it pretty quickly.

But if I want to do some “analysis”, such as finding my last five bank statements, it’s slow and painful: I have to systematically go through the whole pile (a “full table scan”). I could make things faster by, say, adding yellow post-it notes to the corners of bank statements, so I can go straight to that type of document (a “database index”), but that would create extra work and complicate the system.

My (far more organized) wife uses a “column-based” filing system. When she receives her mail, she takes the time to sort out the documents and allocate them to separate folders. It’s initially slower to store information, but it’s much, much faster when she wants to find all her bank statements.
Column databases store data more efficiently, and allow greater compression, because you store similar types of information together.

The picture provided with Elliott’s example almost speaks entirely for itself:

Most business intelligence system architectures in use today are centered around a data warehouse. This data warehouse is meant to have minimal interaction with enterprise systems so as to preserve the efficiency and performance of both. The consequence of this is that business intelligence systems have not always had timely, relevant data from which to use. The Extract, Transform, and Load process that sent data from the enterprise system to the business intelligence was very difficult and took a long time to process (Webinar: “What You Need to Know About Netweaver BW Powered by SAP HANA”). Further, business intelligence systems had many “data marts”, stores of data relevant to specific organizational levels that tended to be redundant at best, incorrect at their worse. It also has not been uncommon to export Excel spreadsheets from business intelligence systems for use in business analytics programs, creating “spread marts” of data. If a forecast or planning run were to be left un-updated, it
could render tremendous pain and foster nasty politics and misunderstanding throughout the company, reintroducing the “silo effect” in the enterprise. In contrast, the synthesis of these in-memory computing and columnar database technologies presents an intriguing possibility: making massive amounts of internal and external data readily available literally and the click of a mouse. Does this make data warehouses obsolete? No, but it does very much change their nature and capabilities.

The Role of Data Science

Who is a Data Scientist?

However, the success in using such powerful new systems rests on a company’s team of “data scientists”, employees who are both passionate and skilled in gathering and using data and have the critical thinking skills to look at things differently. Elliott was recently quoted in Forbes,

"The barriers to successful business intelligence projects are so rarely on the technology side. They are usually on the human side—the culture, the processes, and the lack of imagination. A data scientist is someone who has technical knowledge but does all the human stuff right as well: the communication, the culture, and the imagination. (Woods 1)."

Elliott’s characterization of a data scientist closely matches what was earlier described in this paper as a business storyteller. Yet, the profile of the data scientist seems so very optimistic. The term “data scientist” is rather new, lending the suspicion that it is just a passing buzzword. Regardless, data science is alive and well, even in its formative state. But even so, on
must ask: what really is data science and how is it best practiced? How can we illustrate data science's value to business?

**Data Science at Target**

Consider a case study of Target Corporation, a major retailer that uses SAP enterprise systems extensively to support their business operations. In a recent New York Times story titled, “How Companies Learn Your Secrets”, it was revealed that Target had a breathtaking ability to predict which shoppers are pregnant, quite possibly totally unbeknownst to the shopper’s or their family’s observations.

How is Target capable of doing this? That is very much both a practical and ethical question. As it happens, the Times profiled the very person largely credited with the development of this fascinating and controversial program: Andrew Pole, a young, computer-savvy statistician who used historical data on consumer purchasing habits to create the scoring algorithm to identify customers who are characteristically pregnant. The article describes this to be a particularly ripe customer segment because long-standing buying habits tend to settle in during and after pregnancy. Pole, a self-described “analytics evangelist,” can be credited as a valuable resource in Target’s strong growth between 2002 when Pole was hired — and 2010, Target’s revenues grew from $44 billion to $67 billion. In 2005, the company’s president, Gregg Steinhafel, boasted to a room of investors about the company’s ‘heightened focus on items and categories that appeal to specific guest segments such as mom and baby.’ (Duhigg 2).
It would reason that data science would be synonymous with statistics. Indeed, quantitative competency is always a need of any business. But when has that not been so? Rather what made Andrew Pole a true data scientist rather than just a statistician was his success in using technology to legitimize his theories on pregnant shoppers. Had he been more academic and less so technologically inclined, arguably, neither Pole nor Target would be able to accomplish this tremendous success. Ultimately, Pole’s ideas were realized not solely by the credibility of his analysis but also the capability to implement it in analytics and automated systems as a means to market to potential customers.

**Frontend User Interfaces**

**Crafting Data Science into a Narrative**

Earlier in this paper, data scientists were likened to storytellers in the business. If we return to the storytelling analogy used earlier, we would understand that the mode used to convey stories in business is very important just as it is with our favorite books, movies, and other entertainment. In business intelligence, there are online dashboards, tablet and mobile devices, as well as other modes of innovative presentation that are still in their early stages of development. But more important than presentation is the structure of the story. Your favorite book or movie would not at all be the same if the plot points were not carefully developed and sequenced by the writer. Similarly, how data is developed into information and organized into business analytics applications matters greatly to how well important business stories are told. Raw, unstructured data seldom makes narratives clearly known, however business people can use data visualization to help tell important business stories.
First, we will tackle what makes great data visualization and summarize why it is so valuable in business analytics. Following that, we will explore the finer points of deploying a mobile business analytics strategy with an emphasis on data visualization in mind. Lastly, we will consider some innovative technologies and applications that could revolutionize how we interact with data.

**Data Visualization**

The practice of data visualization far predates enterprise systems, mobile computing, daresay computing itself. Statisticians, scientists, economists and others throughout history have used data visualization to develop and share some of the most innovative thinking at their own time. Though many business analytics and business intelligence books cover data visualization well, few cover the topic with such rigor, clarity, and prose as Edward Tufte’s *The Visual Display of Quantitative Information*, a publication that actually predates any widespread use of business intelligence technology.

Tufte describes two general characteristics of sound data visualization: graphical excellence and graphical integrity. At the end of the first chapter, Tufte summarized graphical excellence as follows:

Graphical excellence is the well-designed presentation of interesting data—a matter of substance, of statistics, and of design.

Graphical excellence consists of complex ideas communicated with clarity, precision, and efficiency. (51)
These points basically strengthen the notion that data scientists are basically the storytellers of data. Their creativity is expressed not only how well visually they can convey an idea, but also how well they understand it quantitatively.

Perhaps the most important point Tufte makes on graphical excellence is:

Graphical excellence is nearly always multivariate. (51)

But equally, if not more important, “Graphical excellence requires telling the truth about the data,” meaning graphical excellence must have graphical integrity. Data graphics may lack integrity for either deliberate or unintentional reasons. For example, Tufte illustrates that a change in context may amount to a deliberate effort to deceive the viewer:
At other times, data visualization designers have a polemical idea in mind and will use data graphics to distort the truth.

(Tufte 74)
In this example, this data graphic deliberately misuses scale. The dimensions are correctly factored. However, this squares the factor of difference between the areas, rather than by the factor itself.

This gives way to an important fact about data visualization: the visual distortion of data very often amounts to distortion of data itself. In attempting to achieve graphical excellence, some may attempt to use 3D distortions to make the graphic more interesting. In such cases,
there is more than just a distortion, there is an assumption that the viewer is not truly
interested in the data but also lacks the sophistication to understand it.

Central to understanding Tufte's approach to data visualization is his “Theory of Data
Graphics,” which can be put quite simply,

Data graphics should draw the viewer’s attention to the sense and substance of the
data, not to something else. (Tufte 91).

Tufte proceeds to describe the process of making multivariate, clear, well-designed data
graphics. First there is the elimination of “chartjunk,” (107-121) or rather, unnecessary visual
distortions of any kind. The most frequent “chartjunk” offense often ridiculed by Tufte and
surprisingly seen in many business analytic applications is the unnecessary 3D transform. Tufte
called the this example, “quite possibly the worst graphic ever to make its way into print,”
Following that is the optimization of “data ink” (123 – 137). This consideration is particularly relevant to the topic of mobile analytics. It is best defined as one of Tufte’s attributes of graphical excellence:

Graphical excellence is that which gives to the viewer the greatest number of ideas in the shortest time with the least ink in the smallest space. (51).

**Business Analytics: Mobile and Beyond**

From this, it can be inferred that not only can robust data visualization be used on mobile devices, it should. Following Tufte’s principles, it should not be unreasonable to expect a tablet display to convey just as much information than what could be gathered from several pages of raw data as printed output. Mobile devices, for what they lack in screen space, excel in terms in providing dynamic user experience. The touch and gesture interaction may seem to be novelty, a passing fad.

This rich user experience paired with other advances in technology allows for the taming of multifunctional elements that are difficult to show with a static, printed output. Laid completely bare on a single printed output, some data visualizations are simply too complex to make sense of without the ability to filter away certain information. Tufte describes these as “visual puzzles”

The complexity of multifunctioning elements can sometimes turn data graphics into visual puzzles, crypto-graphical mysteries for the viewer to decode. A sure sign of a
puzzle is that the graphic must be interpreted through a verbal rather than visual process. (153)

Yet, if a level of interaction could be introduced with these elements, the user could “verbalize” their thoughts using interactive controls. This would make the puzzle instead into a full-fledged data visualization application, and the appropriate narrative could become clearer. Intriguingly, some scenarios of multi-functioning elements involve three dimensional data visualizations. In this example, the perspective is correct for this 3D data visualization. However, the print medium does not accommodate 3D very well.

(Tufte 147)
Intriguingly, 3D display technologies are on the rise. This will be discussed in greater detail later when the topic of future innovations is revisited. But before looking so far ahead, let’s explore how a mobile business analytics solution can be deployed, particularly in the context of a large enterprise using SAP.

Perhaps the most obvious consideration when extending enterprise and business analytics applications to mobile devices is which platforms to support. Android and iPhone devices have a broad consumerist appeal, whereas Blackberry and Windows do more to ingratiate themselves to enterprise market. Choosing one is a difficult task; there are considerable pros, cons, and uncertainties. Why not choose them all?

It has long been easier said than done. Each platform largely has relied on its own standards and frameworks. There are proprietary software development packages in play, like Objective-C, Java, Adobe Flash and Microsoft Silverlight that may or may not work on this device or the other. There are differences in user experience design between the major platforms. However, more aggravating to the enterprise mobile developer has been the hodgepodge of way to access enterprise data using these proprietary sources. The painful, but obvious, truth is that these rich internet application development technologies were not developed with any particular business enterprise package in mind.

The politics at every level of the mobile market between manufacturers, developers, within companies, and among the rest of the mobile user base is certainly an interesting and relevant topic, but is not the chief consideration of enterprise mobile strategy. The broader
vision ought to be to have robust mobile enterprise development tools that take advantage of the latest technology while providing the necessary security, continuity, and modularity expected of any enterprise solution.

SAP has actively pursued mobile solutions for its customers. They have tackled the issue of security of mobile applications with the well-received Afaria application (“Frontline Management Tools - Mobile Device Management Solutions & Tools – Afaria”), which is able to manage security settings down to a single user across a range of devices using SAP mobile applications.

Enterprises using SAP’s business intelligence offering, BusinessObjects, have taken comfort in the fact that SAP has largely remained true to their promise to support all major mobile platforms (“Enterprise Mobility Applications & Development Platform - Sybase Unwired Platform (SUP) - Sybase Inc.”).

While BusinessObjects already supports many business analytics and data visualization needs, there are of course circumstances that call for a customized solution. The lynchpin that makes customized, multiple device support possible is the Sybase Unwired Platform (“Enterprise Mobility Applications & Development Platform - Sybase Unwired Platform”) and HTML5, the newly anointed language for web and mobile development (Clark & Finley 1). The Sybase Unwired Platform allows developers to easily access the data warehouse, view and send internal, SAP data via BAPIs, and consume external data through web services. All the more
exciting are the possibilities HTML5 brings to the table for user experience and data visualization. Because of HTML5’s open nature, there is a fast-evolving set of available data visualization tools such as Protovis. A gallery of data visualizations found in Protovis can be found at http://mbostock.github.com/protovis/ex/. SAP and Sybase Unwired Platform also have their packaged offering, MAKit, short for “Mobile Analytics Kit” (Smith 1).

Additionally, what makes HTML5 such a great programming tool for interactive, data visualization is its integration with scalable vector graphics, often simply referred to as SVG. Under the hood, SVGs have an XML-like schema that can easily be customized to be dynamically linked to an HTML5 control, allowing shapes and colors to change or “scale” with ease. Previously, such animation and interactivity capabilities were really only available in proprietary formats like Flash. However, with HTML5 and SVG both being “open” standards, the Sybase Unwired Platform can very easily draw upon compelling user interaction elements and animations without compromising on its core functionality: accessing data.

There is something left to be said about data visualization that should however temper any excitement. Tufte explains a new technology does not necessarily mean better data graphics will be produced.

Occasionally designers seem to seek credit merely for possessing a new technology, rather than using it to make better designs. ... But at least a few computer graphics only evoke the response, ‘Isn’t it remarkable that the computer can be programmed to draw like that?’ instead of, ‘My, what interesting data.’ (Tufte 120)
It is an important insight to keep as it reemphasizes the importance in applying ingenuity and understanding towards the data, not necessarily a new technology. Again, the data and information presented should be what compels the user, not the technology itself. Otherwise, the true practice of graphical excellence is cheapened and efforts towards data visualization fail to deliver real business value.

**Futurist modes of “Knowledge Navigation”**

From 1987 through the early 90s, Apple published a series of videos titled “Knowledge Navigator” which envisioned technologies remarkably similar to the mobile devices we have today. Similar such videos are produced today by the likes of Microsoft, Samsung Nokia, and others demonstrating the use of futurist technologies like transparent, flexible mobile devices, augmented reality, gesture-based navigation, and 3D displays.

One could speculate on these technologies are impacting business intelligence systems. However, the truth is, they already are! Take for example, augmented reality, a technology that reveals information based on location and/or what is being viewed through a mobile device’s camera. SAP has developed several working prototypes of augmented reality applications, including one for BusinessObjects Explorer (Elliott, "SAP Augmented Corporate Reality Proof of Concept.").
One of the most interesting intersections of technology has been that between Kinect, a commercially-available motion sensor camera, and SAP HANA. At the 2011 Sapphire conference, SAP demoed a HANA application that used Kinect navigation (Kruger). But perhaps the most unbelievable seen so far is an application name CEO Vision recently released by a United Kingdom-based SAP consultancy known as Keytree ("CEO Vision - SAP HANA + Augmented Reality + Microsoft Kinect."). CEO vision employs augmented reality, Kinect, 3D animation, and HANA technologies to provide business intelligence application that seems nothing short of unbelievable. However, Keytree is known as an established, legitimate general-practice SAP consultancy, which makes writing off CEO Vision as purely a hoax a little more difficult.

Beguiling as all this innovation may be, it is important not to lose sight of fulfilling and exceeding the value proposition of business intelligence. Considering where the future might bring us is indeed a vital consideration in business intelligence. However, it is more important to define tangible goals of the business intelligence system if only for the reason that largely such futurist applications need to be built upon proven business intelligence systems in order to have any future at all.

Creating Value from Business Intelligence

At this time, we have now thoroughly explored the “back-end” and “front-end” of Business Intelligence systems. What is left is the process of adopting a road map to make
effective, functional use these technologies. The challenge of adopting so much new technology is change management and engaging business people to become genuine storytellers of data. Sadly, business intelligence is too often considered the realm of expertise of the IT department.

Business intelligence is all about improving decision-making – as is the role of the management account. Yet, most people who attend BI conferences are IT specialists. (Simons 1).

Simons specifically cites an example of how the job function of the management accountant could be enhanced with Business Intelligence.

BI could release many management accountants from the budgeting and reporting cycle and allow them to support decision-making more effectively. They have important roles to play in helping realize BI’s potential. (Simons 1).

Considering the various sub-cultures in an enterprise that can emerge by department function, business area, and/or geography, it is very important that business intelligence projects have a distinct vision articulated. Rather than try to play at semantics with a vision or mission statement about business intelligence, perhaps a flow chart like this, called a “dependency network” (Simons 2) can help a business define the value to a business intelligence project:
With customized business analytics applications, the developer should adopt a user-centered development approach that ensures that the use of the analytics tool is intuitive. This requires not only extensive interviews and systems analysis, but a prototyping strategy that quickly and effectively mocks up what a proposed business intelligence solution will look and feel like. Paper prototyping is one of the best ways to do this because it requires only a pen and pad of paper. If a change needs to be made or if an idea literally needs to be thrown out, it can be done so easily. Paper prototyping is also beneficial as it divorces the user from any preconceived expectations or trepidations about the proposed technology on which to ultimately deploy the solution (Loehfelm).
In the bigger picture, people also want to know where they fit in the process. New technology can be intimidating, so it is also good practice to define the data mining process in a way absent of any technological jargon, save the job titles and key tasks of IT workers in business intelligence.

(Vercellis 91)
The process can be even better understood when expressed as a storyboard. Essentially, when data is first accessed it might look something like this. It looks very banal, devoid of any obvious insight.
Very careful calculation and analysis may result in something like this

The resulting optimization problem is formulated as

\[\begin{align*}
\min & \quad \sum_{i \in I} \sum_{t \in T} (c_{it} P_{it} + h_{it} I_{it}) + \\
& \quad \sum_{i \in I} \sum_{t \in T} \left( \sum_{k \in K_{i,t-1}} g_{ik1} \beta_{ik1} + \sum_{k \in K_{i,t-2}} g_{ik2} \beta_{ik2} \right) \\
\text{s.t.} & \quad P_{it} + I_{i,t-1} - I_{it} = \sum_{k \in K_{it}} w_{ik} \beta_{ik0} \\
& \quad + \sum_{k \in K_{i,t-1}} w_{ik} \beta_{ik1} + \sum_{k \in K_{i,t-2}} w_{ik} \beta_{ik2}, \quad i \in I, \; t \in T, \\
& \quad \sum_{i \in I} e_i P_{it} \leq b_t, \quad t \in T, \\
& \quad \beta_{ik0} + \beta_{ik1} + \beta_{ik2} = 1, \quad i \in I, \; k \in K, \\
& \quad P_{it}, I_{it} \geq 0, \; \beta_{ik0}, \beta_{ik1}, \beta_{ik2} \in \{0, 1\}, \quad i \in I, \; t \in T.
\end{align*}\]

(Vercellis 348)

As lucid as this calculus might be, even with careful explanation, it is likely not to likely to be as convincing or compelling to the common business person. It is not that the common business person cannot understand the depth and meaning of this analysis, it is just that the language of mathematics can come across as arcane. Further, we have refined our business vision to aspire to data science, not just statistics and mathematics alone. We must apply the same understanding to represent the scenario visually and emphasize key performance indicators and if possible, coordinate automated processes to respond to and optimize the process.
However, in many cases, a dashboard with features like these highlighted makes an excellent solution to a complex business problem.

(Chandoo.org, Google Images)

It is tools like this dashboard that empower people to inductively understand business problems and their solution. The ability to build, interact, share, and enjoy high fidelity business intelligence applications allows professionals to discover and tell stories that are otherwise left mired in the deep dark corners of a database or in the recesses the mind of an academic. New technology and the practice of data science allow businesses to overcome these obstacles and embrace the challenge of implementing a new breed of business intelligence.
In summary, business leaders ought to consider implementing SAP HANA, Big Data, business intelligence, mobile, Sybase Unwired Platform, and other innovative technologies mentioned in this paper. All together, these technologies more greatly fulfill the vision of having enterprise systems in the first place: to provide greater visibility into enterprise. However, they should not lose sight of the value of data visualization and should also strive for superior usability of these technologies. Doing so will empower professionals to share the stories that will ultimately help companies achieve superior profitability and sustained competitive advantage.