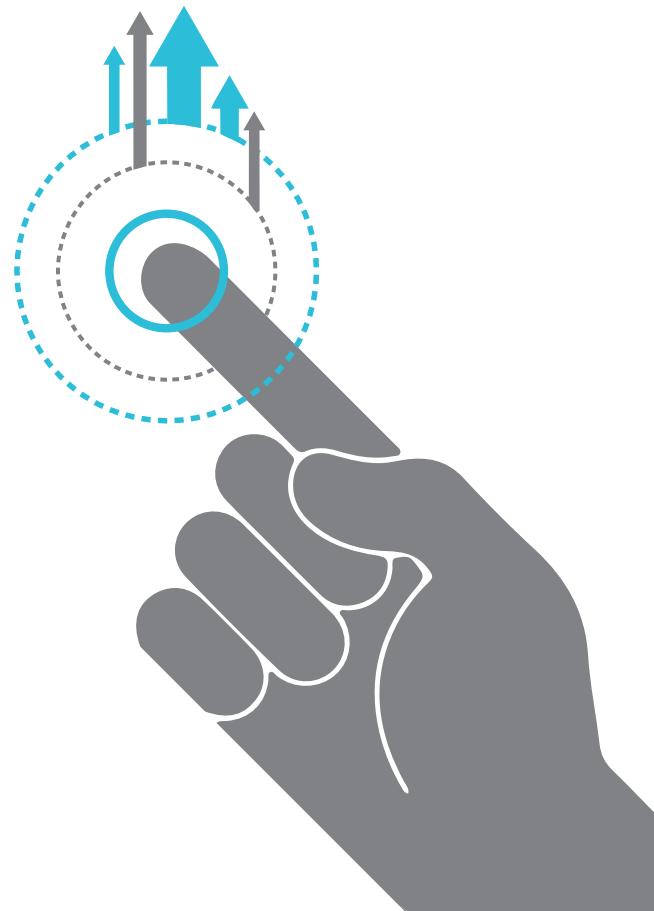The Government Summit
Thought Leadership Series

Achieving Excellence
via Data-Driven Decision
Making in Government

Serving the Future with Power of Analytics

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Executive Summary

This paper provides a comprehensive introduction to data-driven decision making in the public sector and how the use of smart applications can enable government entities in the Middle East to improve their operational efficiencies through faster, evidence-based decision making and rank them among global government leaders. We demonstrate the power of data usage by high-lighting the success in corporate world followed by a deep-dive into specific applications within law enforcement and healthcare sectors. Also we provide an overview of analytics muscle employed in the 2012 U.S. Presidential election. Finally we illustrate how service delivery can be improved across different citizen-facing ministries like utilities, education, transportation etc by using data driven decision making approach. We end our paper with key steps for consideration while embarking on the journey of governing with insight.

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Effects of Information Explosion

In the past two decades, the world has witnessed an unprece-dented information explosion thanks to digitization and broader access to the Internet and cell phones. These developments have changed our lives for the better. It's difficult to imagine that at one time not long ago we didn't use a laptop or cell phones as a search tool for answers to our questions or browsed our favorite websites. Today, we are all smarter, faster, and more connect-ed than ever. Former Google CEO Eric Schmidt once famously claimed that "Every two days we now create as much informa-tion as we did from the dawn of civilization up until 2003".

The increasing use of technology in society has led to a dramatic increase in the amount of electronic data being generated. Until a few years ago, corporate databases were measured in the range of tens to hundreds of gigabytes, but nowadays multi-terabyte or even petabyte databases are quite common. Large databases have left the traditional approach to decision making based on gut feeling redundant. Moreover, much of the data generated today from tweets and blogs is not in a structured format. Trans-forming such data into a usable format and linking it with other data for later analysis is a major challenge.

Data retrieval, storage, modeling, and analysis are additional challenges which require more sophisticated statistical tech-niques to generate useful insights and anticipate what will hap-pen based on the trends in the data. To succeed with analytical efforts, we need skilled individuals to perform the analysis, dis-cern which questions to ask related to data, gauge the limita-tions of the data, and present the results. This usually requires an understanding of statistics, knowledge of computing, and often a bit of social science, as well. In the end, the presentation of the output and the conclusion by non-technical domain experts is critical for deriving actionable insights.

Data Driven Decision Making involves integrating dispa-rate data sources to form a common pool of data, ap-plying combination of statistical and optimization tech-niques to uncover hidden insights, and use it to take informed decisions.

Data Driven Decision Making is referred by many dif-ferent terminologies ranging from Analytics, Predictive Modeling, Statistical Analysis, Optimization models, Data Mining, Business Intelligence, and in recent period Big Data. All these terms are closely related and complemen-tary to the goal of informed decision making.

Data-Driven Decision Making in the Private Sector

The explosion of electronic data volumes has led to several challenges. However, many businesses including Wal-Mart, Amazon, and Proctor & Gamble have aggressively worked to uncover meanings hidden in all this newly-created data and have managed to achieve success for their customers, employees, and shareholders alike. Researchers have calculated that data-driven decision making (DDD) is responsible for a 5%-to-6% increase in productivity and output as well as significantly higher profitability and market value.

Businesses organizations across multiple sectors are utilizing business analytics to gain a better understanding of customer behavior and make more informed decisions to manage performance. More specifically, business analytics is being used by the private sector to drive proactive demand forecasting, take the right course of action, manage risk, and increase profits as well as customer satisfaction.

Private-sector organizations have already demonstrated success using predictive analytics for the past several years. Enterprises have upgraded from legacy retrospective planning models to predictive models to achieve enhanced corporate performance and competitive advantage.

Data-Driven Decision Making in the Public Sector

Although the principles of DDD are relevant in any organization irrespective of whether it is a for-profit, not-for-profit, or public sector entity, greater awareness of its effective applications within government and its various ministries is a more recent phenomenon. In fact, the public sector lags considerably behind the private sector in terms of using data to make strategic as well as tactical decisions.

Government organizations can utilize predictive analytics to become more efficient and effective in their delivery of services by creating a holistic view of individual citizens, thereby ensuring government programs and services address the overall needs of its citizens. DDD can also help improve accountability and transparency which are also being demanded by citizens of governments across the world. Through the effective use of DDD technologies and techniques, the public sector will be able to make decisions that are based on facts rather than assumptions, politics, and myths.

In the following sections, we examine examples of public sector organizations that have embraced DDD to optimize their performance and achieve their core missions and goals.

Smart Policing for Reducing Crime

Citizen expectations for solid public services continues to be on the rise. As part of this, citizens also expect safer living environments, lower crime rates, and the speedy resolution of safety threats. Law enforcement officials also have similar objectives for law and order, protecting and safeguarding the lives and properties of citizens. They need to defend themselves and others against any loss of men and material to the society.

In the traditional setup, to fulfill the responsibility of reducing crime, police departments have used complaint reports from citizens, internal intelligence, patrolling, undercover police work, and unofficial intelligence sources, past arrest records, prisoner release data, and other sources of information. Technological advances have led to an increase in the sources of information for the police that extends to security cameras, mobile network data, internet and virtual social networks etc. Technology has provided the means to improve officer safety, assist in investigations, and to help maintain information and communications.

But there have been unintended effects:

The increase in the variety, volume, and speed from different information sources ends up overwhelming the rank and file officers with so much data that separating the wheat from the chaff becomes even more difficult.

The data is scattered across multiple departments and systems which impedes front-line officers and decision makers from quickly and comprehensively assessing situations.

With so much data available, law enforcement agencies are challenged to aggregate, analyze, assess and determine the operational relevance of data to their day to day needs.

Meanwhile, budget allocations have not kept pace with the requisite manpower, thus stretching existing resources. There is no question that the key to resolving this lies in being able to mine the different pieces of information in an efficient way and convert them into actionable intelligence. Departments like the Real Time Analysis and Critical Response Division within the Los Angeles Police Department (LAPD) have successfully leveraged a state of the art crime data and analysis center. For example, their uses of statistical prediction techniques to churn out maps with specific highlighted areas where certain types of crimes are most likely to occur are relevant applications of DDD.

In several developed countries, including the US and UK, law enforcement bodies have been making active use of DDD to investigate crimes, apprehend criminals faster and increase public confidence in police forces by reducing the crime rate. In Boston, US the Smart Policing Initiative comprised of process and impact evaluation of Safe Street Teams' officers, works exceptionally well. It involved longitudinal analyses of stability of violent crime hot spots in the city. As such, 400 interventions were deployed by the Safe Street Team's officers which led to significant reductions in the total number of violent crimes and a significant reduction in the number of robberies.

Applying DDD to achieve law enforcement objectives

Let's examine some of the ways in which the mass of data available could be used for accurate threat assessment, crime identification and prevention.

Field reports from local police department are a source of data relating to day to day crime reporting by the citizens and for solving cases. By using scientific profiling techniques, it would be possible to uncover different types of crime patterns. For example, which group of burglary jobs are conducted by the same criminal gang based on time of the incident, type of place, type of product stolen, victims sharing similar characteristics, nature of force and weapons used etc and using this to catch criminals faster.

> Smarter deployment of patrol officers in requisite areas at right time-periods using advanced statistical and data mining methods is an effective approach to prevent crime.

Security camera footage is a rich source of information with regard to people and automobile movement in commercial/residential areas. Advanced data mining techniques have enabled the detection of unusual activity in video sequences, enabling on-duty officers to focus their attention on potential crime situations only and to catch criminals while they are at work.

Traffic data can be used to identify high traffic zones and divert traffic to low utilized traffic roads and thereby reduce traffic jams. Such information could be utilized to identify speed offenders and thereby monitor speed limits on highways and punish the offenders. Suppose we find a disproportionate number of fatalities occurring on a stretch of a roadway. To address the issue, the police can identify relevant data sources from engineering, education, and emergency services perspectives to strategically target the problem. The respective agencies can holistically examine the problem through a comprehensive view of all available information. For example, the data may drive operational change such as additional median barriers, improved signage, or repositioned emergency services or enforcement activities.

> Integrated data maximizes the value of each data source by providing insight into the scope of the problem and helps craft a more complete response.

Social media data can identify precursors to dangerous activity at events, such as riots at concerts or flash mobs, and connect the dots of how people associate around various crimes. By identifying trends, patterns and associations of suspicious activity, social media and network analytics can make significant contributions to criminal investigations.

> In the 2011 London riots, the swift spread of information on social media sites made the situation much worse as groups of mobs could assemble themselves quickly by sending messages. If police had been able to monitor these networks, then force allocation could have been done wisely and avoided millions in losses.

Mobile data can be utilized to track calls of anti-social elements using voice recognitions software and to track the geographical location of the criminals. This could also be utilized to identify links among different individuals taking part in crimes.

Creating a prevention-focused strategy

Obtaining the right information and relaying it to the right people is paramount for law enforcement; acquiring this information at the right time and place is even more critical. Law enforcement can use predictive analytics methods to shift from focusing on what happened to focusing on what may happen.

Predictive analytics uses historical and current data from multiple sources to identify trends, discover interrelationships, and to create models that can be used to help anticipate crime and disorder. This allows law enforcement to look ahead toward the future by examining data in innovative ways in order to more proactively address the public safety needs of a community. Through these types of analysis, strategies can be created that tactically target short-term issues and strategically address the long-term causes of crime and victimization.

New York City Police's Compstat (computer statistics) program is one such highly successful program which is focused on crime prevention through its innovative use of DDD. The program is based on compilation, distribution and utilization of real-time data to allow police officers to make better informed decisions. The data is used for identifying potential crime zones and for personnel efficiency to combat crime. In the past, data at the disposal of individual district level commanders were never utilized to analyze the patterns of crimes across districts and this was the one of the main objectives of the Compstat program.

> Previously predominant measures of success for police commanders were predicated on the number of arrests made after a crime; Compstat helped in changing the measure to crime reduction and the most effective ways for achieving that objective. The results were spectacular. In just 5 years the burglary and murder rates had dropped by excess of 50%. This far outpaced the change in rest of the country.

The weekly crime control strategy meetings held as part of the Compstat efforts helped increase information flow between the agency's executives and the commanders of operational units, with particular emphasis on crime and quality of life enforcement. By being made aware of the situation the departmental and operational heads were able to efficiently allocate resources to reduce crime and improve departmental performance. Compstat led to individual departments becoming more empowered for better decision making that can "analyze, reflect, learn, and change based on experience".

Timely and relevant information is the most powerful weapon to fight crime

With the diverse nature of the Middle East population and their fast paced nature in terms of technology adoption, vibrant tourism, and the expansion of expat workforces, it has become more imperative for governments to implement DDD into its crime control strategies. Integration of data with the use of modern software is the clarion call of present day society. The level of data available at the disposal of the government is huge and can be effectively utilized for smart policing across cities and would radically change the face of law enforcement as we know it. We need to integrate these massive volumes of data into a centralized pool, analyze them to arrive at definite and real time insights and develop strategies to reduce crime.

> Opportunities for law enforcement will be driven from the result-oriented ideal of delivering the right information to the right people at the right time and place.

In summary, delivering better quality, actionable intelligence faster gives those responsible for public security the ammunition they need to deter threats and combat crime to protect citizens – whether it's on the street or in cyberspace. Advanced analytics combined with superb data sharing and management techniques can help surface early warnings of potential security threats as they emerge.

We believe that law enforcement agencies that are making this transition now can position themselves to develop a safer society. Many developed nations' police forces have taken effective steps to utilize data for evidence-based analysis and decision making. The opportunity is there for the Middle-East countries to follow suit by applying DDD techniques.

Improving the Government Healthcare System Using DDD

Middle-East countries with rising socio-economic status and growing populations have seen considerable improvement in its medical facilities with a growing number of hospitals, primary health clinics and specialty centers throughout different parts of the country. The region has embarked on a rapid healthcare modernization with both public and private operators providing excellent quality care. Life expectancy at birth for both males and females rivals most of the developed countries. There is a growing trend in publishing detailed healthcare statistics in the public domain which can lead to higher levels of transparency about healthcare quality.

Yet the high rate of chronic diseases related to a population's lifestyle such as diabetes, obesity and cardiovascular diseases highlight that enduring excellence in healthcare will come about by incorporating a proactive approach to health care management. The ideal of right treatment in the right format to the right individual at the right time and right cost requires active participation and collaboration of the key players: from care providers, patients and health insurers to health system planners, regulators and health ministry. This is where health analytics – and more specifically predictive analysis - can play a leading role.

Paradoxical state of modern healthcare system

Traditional forms of healthcare were provided on a needs basis depending on the patients visiting the doctor's clinics and corresponding medical facilities provided to the patients. Technology has helped to improve the quality of healthcare delivery by leaps and bounds. Let's look at some modern day examples.

- Microscopic laser pulses reshape the human cornea to restore perfect vision.

- Magnetic resonance imagery & computerized axial tomography show us intimate details of living tissue, even the human brain.

- Robotic systems with tiny cameras and instruments perform delicate microsurgeries.

There is no question that modern-day health care is truly a technological marvel. Yet, the practice of medicine still operates on a somewhat traditional model. In addition to being highly manual with record-keeping, the practice tends to be reactive; focusing on the treatment of an existing condition.

> We have technological marvels to diagnose and treat conditions, yet many business processes and systems are still on paper. We pour money into sophisticated treatments for acute conditions, while paying relatively little attention to the preventive and educational efforts that could reduce or eliminate some of those acute conditions.

The level of investment made in core technology related to the acquisition of the latest medical equipment and the newest forms of treatment have not kept pace with using scientific approaches of data-driven decision making for proactively improving care quality and outcomes.

Health analytics in action

There are multiple areas wherein data driven approach could enable the ideal of ideal of right treatment in the right format to the right individual at the right time and right cost. Let's look at a few of them:

Predicting at-risk individuals and engaging with patients optimally

Using analytics to predict and qualify individual patient risk as early and as regularly as possible to provide the care team with ample opportunity to intervene, prevent avoidable errors and complications is one area of opportunity for applying data. This could extend to developing models that proactively identify patients at risk of developing a treatment associated infection or other hospital-acquired condition. Or by developing models that routinely score patient-specific readmission risk to proactively inform the physician and care team members.
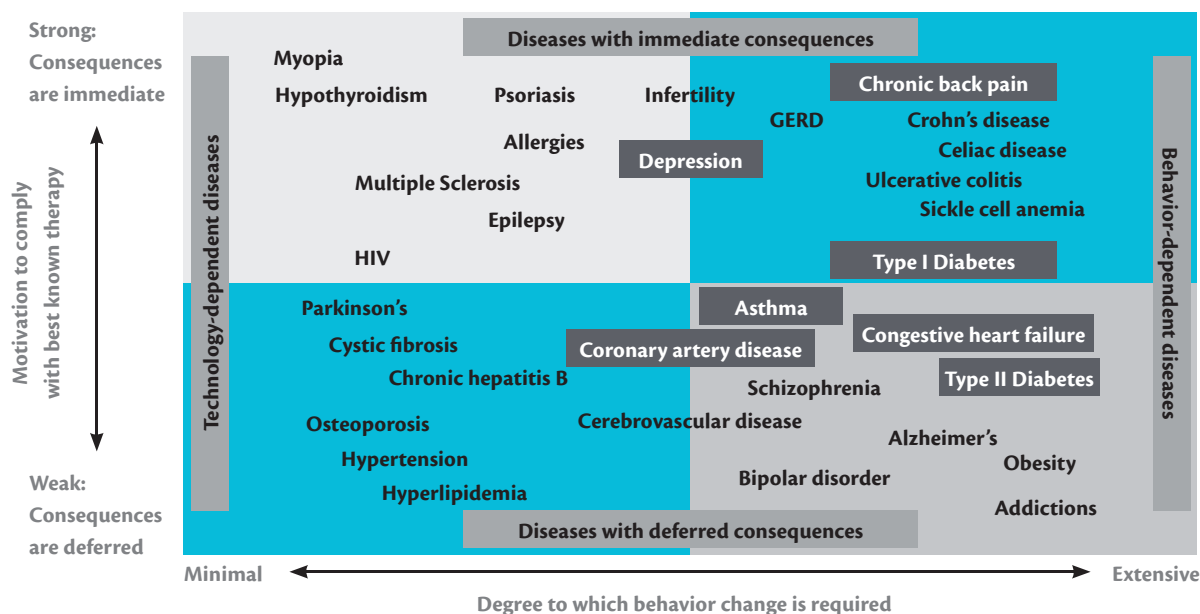
The focus doesn't stop at prediction. If we could model our health system around a patient-centric model and proactively engage with not only those who are at maximum risk but who carry diseases that require maximum behavioral/lifestyle changes, this would lead to lasting benefits for both practitioners and patients.

Let's look at Clayton Christensen's famous "chronic quadrangle" from his book The Innovator's Prescription. Conditions in the chronic quadrangle include industry heavy hitters as it relates to patient morbidity and health care costs: diabetes, obesity and hypertension.

Advanced analytic techniques that focus attention on such high risk patient groups and devise differentiated outreach based on personal characteristics – including estimates of readiness to change - would be highly relevant. By using data collected on patient preferences – email, SMS, MMS, IVR or in person visit - the best channel for patient outreach can be determined. The end result is that patients who stick to treatment recommendations and medications prescribed by their physicians will rise dramatically.

> If care is limited to hospital visits, the industry is missing a real opportunity to change behavior and change lives. To truly influence the patient's health, the industry must adopt and apply customer outreach and engagement lessons from best-in-class examples.

Consider Amir, a diabetic, who sometimes forgets to take his insulin – a habit that has sent him to the emergency room several times over the past 10 years. If we could send text messages reminding him to take his insulin or if he doesn't respond, an IVR call is made then complying with prescriptions becomes much easier.

Diagram axes and labels:

- Vertical axis (left): **Motivation to comply with best known therapy** — from **Strong: Consequences are immediate** (top) to **Weak: Consequences are deferred** (bottom)
- Horizontal axis (bottom): **Degree to which behavior change is required** — from **Minimal** (left) to **Extensive** (right)
- Left band label: **Technology-dependent diseases**
- Right band label: **Behavior-dependent diseases**
- Top band: **Diseases with immediate consequences**
- Bottom band: **Diseases with deferred consequences**

Disease placements:

Myopia, Hypothyroidism, Psoriasis, Allergies, Infertility, GERD, Chronic back pain, Crohn's disease, Celiac disease, Ulcerative colitis, Sickle cell anemia, Depression, Multiple Sclerosis, Epilepsy, HIV, Type I Diabetes, Parkinson's, Cystic fibrosis, Chronic hepatitis B, Asthma, Coronary artery disease, Congestive heart failure, Schizophrenia, Type II Diabetes, Osteoporosis, Cerebrovascular disease, Hypertension, Alzheimer's, Obesity, Bipolar disorder, Hyperlipidemia, Addictions

Source: Christensen, Clayton M., Jerome H. Grossman M.D. and Jason Hwang MD The Innovator's Prescription: A Disruptive Solution for Health Care

Optimizing demand and supply in organ transplants

Organ transplantation is one of the great medical success stories of our generation. However, improved healthcare, road safety, and lower numbers of donations, have contributed to a reduction in the number of organs available. Factors affecting the outcome of transplants are one of the critical information in ensuring the optimum use of a very limited resource. Operational issues such as the time between organ removal and subsequent transplantation complicate these matters further. DDD helps in identifying the factors that help improve the survival rates of the patients and also the factors that influence the wait time for a transplant.

In the case of organ transplants, a high success rate and fair allocation requires the study of probability and risk weights across many variables such as blood group match, size, waiting time, tissue types etc.

Right medication at right time

By statistically profiling drugs to be used for specific conditions, we can check for deviations in current prescriptions. This would help in preventing unintended mistakes by health professionals as well as reduce abuses in healthcare system.

With the help of DDD it is also possible to actively monitor the health of admitted patients and to identify deviations in safe levels to raise flag for personal intervention by health professionals. Such flags may be based on combination of blood pressure, cholesterol levels and other key indicators that are continuously measured and statistically compared against historical data and outcomes.

Long term health services planning

Using DDD, a forward-looking strategic approach to health services planning based on constituent's needs and demographic profiles could be done. This could extend to where and how many new hospitals and primary research centers to be opened, which specialties will experience a shortage in health professionals and in how many years and so on.

Studying sources and patterns for the spread of communicable diseases

One of the most innovative examples of health services planning involves a study led by researchers from the Harvard School of Public Health wherein they quantified the impact of population movement to the spread of malaria in Africa.

Between June 2008 and June 2009 every call made by Kenyan mobile phone subscribers to one of 11,920 cell towers in 692 different settlements were mapped. This helped in identifying the time and location of the trips made by the mobile phone users. This data was then used along with the malaria prevalence map to identify the traveling pattern of the infected disease

It is well known that human movement is a major cause of the spreading of malaria as compared to mosquito dispersal. Identifying the sources and location of imported infections because of human movement and identifying high risk zones will be a great help in the malaria control programs.

Since the disease infects humans through mosquitoes that carry the malaria parasite, the movement of infected humans into areas where the disease is less prevalent is an important factor. Using mobile calls and SMS data over a year and matching it with infection rates by specific regions the researchers were able to arrive at clear indications of how the disease spread from one region to another. Researchers used mobile data to track the movement of about 15 million people.

The study found that a high percentage of infectious disease was carried by people while returning from trips to locations such as lake or coastal areas. This also helped in raising warning signals for travelers about the prevailing of disease in specific areas. The analyses also helped in identifying that the maximum effort to prevent the disease at the source would be the best effort to the control of the disease. This brought forward a pivotal method to use DDD in preventing the outbreak of such events of national concern and ways to take preventive action against them.

There are many more applications of data-driven decision making; from benchmarking hospitals, primary research clinics on key outcomes and also by cost of service; through analytics-based drug discovery processes identify better and safer therapies, optimal clinical trial designs and populations, and potential synergies or problems. And at a more strategic level, by devising the right kind of policies based on emerging health trends. Beyond improving the efficiency, cost, accuracy and outcomes of medical treatments, predictive analysis can revolutionize the essential model of healthcare delivery.

Creating a foundation for data-driven decision making in health sector

A key enabler to making data-driven decisions is to have sound, consolidated data from different sources and categories in the right format. This includes access to mental health data and physical health data; inpatient, outpatient and ER; care given over time and in different locations – it all must be brought together to create a 360-degree view.

Next, data from all three traditionally siloed markets – care providers, health plans, and researchers/manufacturers – must be joined in order to produce a more complete picture of quality, efficacy and safety both at the individual patient level as well as within the larger ecosystem.

"It is astonishing that, in a time when computers enable businesses to manage and locate everything from dry cleaning to used trucks, few healthcare providers are able to access and track the medical records of patients across the continuum of care. Most large acute care providers are aggressively tackling the electronic medical record deficiency, but providers in thousands of solo and small office practices, where the majority of care is delivered, show little progress toward that goal." - Charlene Marietti, Editor of Healthcare Informatics.

In short, the analytically derived insights needed to drive health industry transformations require industry-wide collaboration on shared information and common analytical needs to formalize the link between clinical and business concerns.

Of course, creating a collaborative, cost-aware, outcomes-oriented health care system requires embracing an ability to prioritize information-based decisions. And those decisions will have to be powered by analytics.

Analytics Takes Center Stage in the U.S. Presidential Campaign

In 2012, the United States of America held its 57th presidential election. Democratic incumbent Barack Obama stood for re-election against Republican nominee Mitt Romney and won by a convincing margin. While most media outlets and political pundits insisted that the race was too close to predict a winner, statistical-based analysis listed Obama as a clear favorite. The President himself continued to build upon the fact-based analytical approach used in his 2008 election throughout all aspect of the 2012 campaign - only this time, the analytics team was five times bigger.

Obama's campaign election team made extensive use of DDD to understand voter behavior and formulate election strategy. Their goal was to measure every metric associated with the campaign and act accordingly. The massive DDD effort helped the Obama campaign team to raise $1 billion and provided a smart and targeted approach to fund raising and spending for maximum impact. The effective use of analytics proved to be Obama's competitive advantage over Mitt Romney.

secret the data sources and detailed analytical methodology that were used. The insights shared by these business leaders with Messina would have been the most valuable political donation received by Obama.

In parallel, Messina hired Rayid Ghani as Chief Scientist to head the entire analytical department of Obama's campaign team. In his prior role as a senior research scientist with a leading consulting firm, Ghani had used innovative data and text analytics techniques to detect customer behavior patterns for client strategy development, to minimize marketing cost and to maximize customer response and revenue. Those same techniques were also applied to each aspect of the Obama campaign, ranging from fundraising, recruiting and mobilizing volunteers to messaging, polling, social media, TV ads, online ads, persuasion efforts, getting out the vote etc. The analytics machine was leveraged not only to gain insights but also to optimize day to day operations.

> "What made us successful was that we embedded analytics in processes across the campaign and in tools that people were using to get their jobs done. By completing the 'loop' and increasing automation, we were able to deploy fairly sophisticated analytics that improved over time and were used by the campaign" said Rayid Ghani, Chief Scientist, Obama's campaign team

Overcoming silos of voter profiles using smart data integration

One of the biggest lessons learned from the 2008 Obama presidential campaign was that the campaign built and managed too many databases. Voter data from different sources normally don't have a key to link each other together; hence this limited what the analyst could do. The same person may use slightly different names between consumer data and voter registration data, different aliases on Facebook and Twitter and so on. Different communication channels data were not linked (i.e. voter was annoyed that he/she receives a phone call right after someone knocked on their door). To keep Messina's promise for applying metrics to each strategy, the analytical team embarked on an 18-month journey called Project Narwhal. This led to the creation of a massive system that merged the information collected from pollsters, fundraisers, field workers and consumer databases as well as social-media and mobile contacts with the main Democratic voter files in the swing states.

The people behind the analytics revolution

In Jan 2011, Obama's campaign manager Jim Messina boarded a plane for a month-long journey to meet a number of the USA's most influential leaders from Apple, Google, Zynga, Facebook, Microsoft, Salesforce, and DreamWorks to name a few. "I went around the country for literally a month of my life interviewing these companies and just talking about organizational growth, emerging technologies, marketing," he said from Obama's campaign headquarters in Chicago.

Those business leaders shared with Messina what they thought Obama could do to catch voters' attention. Face to face interactions with Steve Jobs (Apple co-founder), Eric Schmidt (former Google Executive Chairman), Steven Spielberg (movie director of Jurassic Park fame) guided Messina and his team on how to use analytical approach to raise money, register voters, and persuade them to vote for Obama.

> "We are going to measure every single thing in this campaign," said Jim Messina, Obama's campaign manager.

It is no coincidence that most of those companies Messina visited were in the business of generating huge volumes of user behavioral data or hosting the platform/channel for customer communication. Marketers endeavor to gain access to those types of data. For obvious reasons, the Obama team have kept

> Project Narwhal's goal was quite simple: build a unified political profile of each individual voter using data from tweets through donations and everything in between

In parallel, the team built a communication platform called Dashboard that allowed voters to express their view in free text and engage in online discussions. This generated information that could not have been gathered from polls. The Dashboard became the social networking site for Obama's supporters. A number of applications were developed to facilitate interaction between voter and Obama's campaign team and this was believed to have generated increased donations to Obama and better data quality for the analytics team.

The project also helped logistically; in 2008, volunteers canvassed neighborhoods by simply going from one door to next. But in 2012, armed with detailed maps about neighborhood residents, canvassers skipped the hardcore supporters on each side and got right to those illusive, undecided voters.

Turning data in to insights and action

Having harvested the data, Project Dreamcatcher was the analytical phase used to drive insights from data, so that team could deploy effective strategies based on different groups of voters. The text analytics engine sifted through mountains of voter comments posted on Dashboard, recorded in phone banks and surveys to extract key messages and sentiments from voters. As a result, the analytics team could tell what topic a particular demographic group was concerned with and how it changed over time; the information that was likely to change voters' views; and how a voter was likely to react to a political issue, etc.

> Obama's campaign team boasted of their ability to "micro-listen". Before going out for a speech, Obama had already gained a good idea of what to talk about and how to lure voter to his side. The analysis also revealed that voter preference was mostly determined by age, sex, race, neighborhood and voting record.

A well-known strategy developed through data mining were the Dinner with Barack contests, a presidential fund raising event. Obama leveraged George Clooney's star power to have raised a whopping $15 million over a dinner setting - a new record for presidential fundraising event. The dinner was hosted at Clooney's residence and attended by 150 wealthy Democrats and other members of the public. Although the Hollywood VIPs

paid $40,000 for a seat, two thirds of the donations for these events actually came from the general public. Few would have known that George Clooney was picked to host the event based on results of data mining: on the West Coast, he is particularly appealing to women aged 40 to 49, who are willing to donate to for a dinner with Clooney and Obama.

Thanks to Obama's visionary tactics and commitment to analytics, his campaign team raised $1 billion and secured the majority of votes to seal his second term of presidency.

Analytics together with grass-root connections was Obama's huge advantage over Mitt Romney

In contrast to Obama, his contestant Mitt Romney was largely an intuitive political thinker whose campaign decision making was made based on political instinct. Given Romney's background in Bain Capital, he was well connected with deep-pocket corporate investors who donated generously. However, Obama's strategy for winning grass root voters diminished Romney's fundraising efforts. It was only after the election that Romney discovered that Obama had a campaign force of 3,000 people, most of whom were volunteers and many of whom were recruited through his Dashboard and Call Tool. By comparison, Romney had a campaign team of just 500. By interacting with voters by using a personal touch through the right channels, Obama effectively created a one-to-one contact with voters. This could not have been achieved without the aid of analytics and the relevant communication platforms.

> "We had leadership that made sure analytics was embedded in every part of the campaign and that the decisions that were made in the campaign were informed by analytics", says Rayid Ghani, Chief Scientist, Obama Campaign team

Organizing and interpreting polls in a scientific manner

Opinions were divided between political pundits and statistical analysts on who would win the campaign. Those who relied on gut feeling, poll results, and political instinct believed the race was close. Those that used statistical analysis deemed Obama as a clear winner.

The analytical approach used by Nate Silver, a New York Times blogger, has been much talked about. Silver didn't think that a simple reading of poll results would provide an accurate indication of voters' opinion as errors may occur in the process

(e.g. An Obama supporter might have been overly sampled in a phone poll; If most Romney's voters customarily did not answer their phones to respond to polls, the voter sample would not be an accurate representation of the whole population). When pollsters try to adjust this variance, each might have done this differently, thus creating inconsistencies. By incorporating the different variances, Silver was able to quantify the likelihood of Obama support in different percentage ranges.

> Nate Silver rated the probability of Obama's victory at 90.9% and successfully predicted the electoral outcome in each of the 50 states.
>
> Nate Silver's analytical interpretation of poll results is of particular importance to government policy making. Simple interpretation of polled opinions runs the risk of misrepresenting segments of general public and could potentially erode public confidence. A policy making approach that is complemented with sound ways of using DDD is the right way forward.

Ubiquity of DDD in Modern Public Service

Research shows there is a strong link between government service delivery and citizen trust and confidence. Over the years, governments around the world have been looking to improve service delivery, and increase productivity and efficiency by using integrated government service and advanced analytics. Some governments that have invested in innovation have started to see the benefit of DDD in their service delivery and improved quality of life.

> It is of strategic importance for government to improve citizen satisfaction and trust in government. DDD can be used to:
> - Improve public service delivery
> - Optimize resource planning and allocation
> - Improve process efficiency within and across departments
> - Encourage citizen participation
> - Reduce transaction cost
> - Drive productivity

For instance, Singapore has taken the lead in this with the establishment of multiple innovation centers in partnership with leading consulting firms and through the active support from the Singapore Economic Development Board. The goal is to leverage DDD in service delivery across education, health, procurement, public safety, resource utilization, smart grid, transportation, taxation etc.

Fiscal lockdown on public spending

Since the credit crunch started in 2008, financial markets have contracted, economic growth has stagnated, and many governments are under huge pressure to cut costs and balance budgets. Over the past 2 years, UK civil servants have had their salaries frozen; austerity measures have driven 270,000 public sector job cuts, mostly in healthcare and education. Similarly, the US government cut 11,000 federal jobs across all departments. The struggling economy and its looming outlook have taken a toll on many governments. Although impacted by the global economy slowdown to a lesser extent, IMF urged oil exporting Gulf counties to reduce growth in government spending to make their budget more sustainable, as their combined surplus could turn into deficits by 2017.

While government budgets are closely scrutinized by the public, governments are looking for ways to innovate on service delivery at the same or lesser cost.

eGovernment initiatives have produced huge amount of data

In the past two decades, many countries have been developing integrated communication channels including email, call center and websites to deliver coordinated services. All of them have had their data saved one way or another. Many of them have established eGovernment initiatives to integrate and streamline services to offer a one-stop-shop web portal that allows for access to all governmental services (e.g. paying bills and making complaints). Most public services are being delivered online so that citizens can save the trip to the bureau. Services are more accessible, processes are standardized, and data is shared across different departments and channels. Some of the eGovernment portals even have forums and blogs to allow citizens to share their opinions online. Each of these capabilities enable governments to serve citizens well and drive higher rates of citizen satisfaction and trust by promoting awareness and access to the services.

The Middle East counties are well aware of the strategic importance of improving public service delivery and have made significant achievements in modernizing public service delivery. For example, according to a United Nations (2010) survey of global readiness for eGov service, the UAE ranked first among Arab countries and placed 45th in term of maturity and development. These are impressive gains.

Following this rapid development of public service modernization through computerization, vast amounts of data have been collected throughout service delivery processes.

From service-centric to citizen-centric service delivery

Governments realize that they cannot meet societal needs merely by computerizing service procedure to continue a "government to citizen" model. A large proportion of the population is well informed and has vast experiences in enjoying ever-improving service from commercial sectors. As such, they demand the same smart service from government. In response to these heightened expectations, governments need to treat their citizens like customers. For instance, the UAE government has made this one of the highlights of their strategy to improve the quality of life for its citizens.

Developed countries have embraced and pioneered a "government with citizen" or "citizen centric" service delivery model to design services around the needs of different segments of citizen. In an effort to reduce confusion and simplify service, some governments started to deliver service at the citizen segment level - rudimentary segmentations have been manually created based on the experience of field workers.

This approach to segmentation provides citizens with an easy way of identifying relevant services according to their personal circumstances. However, with diverse groups of population in terms of age, education, ethnic origin, area of residence, etc. and the rapidly growing volume of data, structured, semi-structured and unstructured that governments collect from their people from all channels, it is not possible for humans to digest such huge and complicated data sets necessary to generate insights.

This presents a huge opportunity. DDD can be used to accurately identify relevant citizen segments to optimize resource allocation, achieve better engagement with citizens through listening and conversing, and, moreover, to proactively deliver the right service to right people. In other word, to transform a service model from "What service do you need?" to "What is your situation? Did you know those services may be relevant to you?"

DDD could play a formidable role across multiple departments

Governments around the world have adopted DDD in many aspects of life not only to react to citizen demands and concerns, but also to proactively anticipate an issue before it develops into a crisis. DDD helps to make public service more efficient and productive and truly citizen-centric.

Citizen complaints

The Hong Kong government's Efficiency Unit acts as single point of contact for many government departments to handle citizen complaints and suggestions. Each year, the unit receives 2.65 million calls and 98,000 emails. "Having received so many calls and e-mails, we gather substantial volumes of data. The next step is to make sense of the data," says the Efficiency Unit's Assistant Director, W. F. Yuk.

The Efficiency Unit partnered with a text mining vendor to build a complaint intelligence system to uncover the root cause of complaints. Report generation is shortened from a week to a click of button and the responsible department is immediately informed of issues.

Transportation

Transportation is an area where a broad range of challenges can be tackled by DDD, such as traffic flow models to reduce congestion, setting the price of congestion charge, and finding optimal routes to destinations.

Utility

The production of utility products are balanced according to demand. Some products like electricity need to be consumed as it is produced; otherwise surplus product effectively goes up in smoke. Meanwhile, other products such as gas can be stored, but the cost of storage can be high. On the other hand, a disruption in supply can cause huge economic damage on business and citizen life.

Eastern Denmark used to have 16 partners to balance electricity supply on daily basis in order to anticipate the right amount of power consumption and production needed by businesses and citizens. After partnering with Copenhagen Energy, which emphasized the use of DDD, consumption can be predicted on hourly basis to minimize production waste.

Another critical application for DDD in utilities involves encouraging citizens to manage their own consumption and be proactively notified when they cross their normal consumption patterns. This can happen when an electrical appliance is left running while people go on holiday. Through the analysis of citizen utility consumption patterns (taking seasonality into consideration), DDD can proactively identify early signs of over-consumption. Notifications can then be sent to citizens through SMS and mediation action can be taken to avoid bill-shock.

Education

A country's continued development and international competitiveness relies on the availability and quality of education across primary, high school and university levels. Students have different developmental needs and interests across different grades or even in the same grade. Delivering education through a blanket approach does not help every student to reach their full potential.

DDD can be used to determine the optimal location for new schools and universities, to evaluate whether curriculums are meeting the desired goals, and planning teaching staff recruitment based on evolving needs.

Customs

The border agency has the responsibility to secure national revenues by controlling imports and exports for the economic development and protection of domestic industry through contraband control. It is also responsible for the customs clearance of imported goods as well as tax collection at the customs border.

The volume of South Korea's imported goods had doubled over last decade but the size of its customs force remained the same. Samples were inspected for illegal import based on past illegal importer names, items and foreign providers. If any of the data points changed, an inspector would likely miss this during inspection. The agency adopted DDD approach to detect illegal import intelligently. Now, more than 400 inspectors are using DDD, which apply more than 60 search conditions for risk ranking. Since then, South Korea's detection rate for illegal cargo increased by more than 20%.

Oil & Gas

The oil and gas industry is constantly seeking opportunities to improve processes and use technologies to remain competitive. DDD provides a wide range of capabilities from predictive maintenance, forecasting and analysis, and energy trading to risk management systems. The resulting analyses have made significant impacts on businesses.

In Petrobras, multimillion-dollar investments are made to construct oil wells at sea by analyzing rocks with geological ages between 5 million and 150 million years old. Using DDD analytic models, Petrobras makes it possible to identify rock breaks that produce oil or gas. This has resulted in the doubled output of oil and improved profitability.

Relevance of DDD for Middle East Government Entities

What do these examples mean for a Middle East with a large proportion of a young, well-informed populace representing cultures from around the world? One positive impact is that citizens now come to expect far greater transparency and accountability in the public sphere as compared to before.

Citizens and non-citizen residents comment on social media whether it is Twitter or Facebook or write blogs when they get (or don't receive) excellent customer service from government departments. Frequent comparisons are made with other governments and public authorities. This has resulted in proactive steps being taken by many departments to become more efficient and productive in meeting citizens' varied needs.

Considerable improvement has been made across health, national safety, and service delivery through multiple initiatives. Still, Middle East governments trail other developed economies in wide spread usage of DDD. Fact-based decision making approaches could drive superior outcomes, lead to higher efficiency and proactive responsiveness, thereby realizing the strategic mission of individual government entities. Fortunately, the investments required from the government and the individual departments are predominantly incremental. Based on research done by Peppers and Rogers Group & SAS, the following are the key elements for fostering and sustaining a culture of DDD.

- Active DDD sponsorship by senior leadership - This has to come from the top, such as the head of the ministry or a corresponding public authority. The best example of this in recent times is the analytics initiative used in the 2012 US Presidential Election as propounded by Jim Messina with an active blessing from President Obama. Such passionate leadership is required for game-changing programs to work.

- Headed by an evangelist and an experienced practitioner of analytics – These efforts must be led by an individual who inspires users to embrace the language of data and facts both within and outside the organization. This involves opening the minds of government officials to visualize capabilities beyond basic reporting and query functions to include statistical analysis (what's happening?), forecasting (what happens next if this condition prevails?), predictive modeling (what happens to our plan if one or more variables change?) and optimization (what's the best possible solution we can expect?). Knows how to use insights and use them for operational decision making.

- Overcoming Data Silos and building consolidated data marts – The importance of this step cannot be emphasized enough. As evidenced across different case studies, this is requisite in order to efficiently uncover relationships between disparate data sources. Data stored in different formats and locations should be brought together in one consistent format. Data quality should be evaluated on an ongoing basis. Knowledge of domain, data understanding and technical smartness are the core skillsets needed to make this successful.

- Motivated staff with practical analytical training - The expertise to leverage clean data and turn it into insights using a combination of statistical and optimization techniques.

The essential elements outlined here don't have to be a big bang, multi-year approach with huge technological and manpower investments. Yes, this is a journey but there are creative ways to start small, prove the value of the initiative and then build it into a larger program.

In summary, we believe that each government entity that takes small but firm steps in this direction will result in sustainable success for all. The ability to develop and utilize an effective DDD approach will ultimately separate world-class government and also-rans.

"Start somewhere, even if it isn't perfect. It doesn't require rocket science to start doing analytics. The industry today has so much low-hanging fruit that even if you don't have the perfect data warehouse yet, you can still start on that measure, analyze, improve, control loop." Jan De Witte, President and CEO of Healthcare IT and Performance solutions at GE Healthcare

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