A BASIS, DATA ORIENTED AND FRAME FOR ACTIONABLE DECISION MAKING IN MANAGEMENT

Adewole O Mayowa, Ligs University, Honolulu, USA

ABSTRACT

This is an extensive, detailed and succinctly in – depth discussion and delineation on data for actionable management decision making processes stressing and emphasizing on the relevance and importance of accurate and precise data sources quantitatively and qualitatively for actionable decision making processes in management.

The big data thing was also highlighted and extensively captured with the inherent trends, features, events and paradigms seen so far extrapolating into design attitude and the limits of rationalized models emphasizing on the essence of design attitude and its bearing on communication and collaborative teaming.

A frame was presented for actionable decision making in management – leadership and organizational settings.

Keywords: Data, Actionable – effective decision making process, Big data, Rational bounds, Design attitude, Collaboration and Communication, Organizations, Leadership & Management.

INTRODUCTION

Decisions are frequently made in organizations on a number of instances or occasions. Top management teams and management – leadership do and drastically take decisions on a number of occasions and instances crucial to the organization in its strategies, goals and strategic - fit.

Management decisions can't always be left to intuition or intuitive making even though this seems to be often done in a number of instances and looking up to the data and information sources towards decision making in management and organizations is a crucial subject or topic for discussion.

It is essential and pertinent to recognize and understand the roles and place of data in decision making in management fields among others and organizational contexts as well as take cognizant of the big data era while emphasizing on data sources, information dissemination or data flows and where these data do come from.

Decision taking and the entire decision- making process or sequence is not a very simple task and some instances require a vivid data delineation and analysis with scrutinizing existing pieces of information and data.

Various decision making processes and efforts are frequently taken in management, leadership and organizational settings, businesses and firm levels. These include decisions towards fund disbursements, supply chain management and design, processes and plant – operations design; change management processes requiring rigorous and extensive delineation, while some instances have been previously considered and was extensively delineated and presented recently back in some few newly emerging concepts in decision making cases and extant literatures. '*

The right data source and base is crucial and essential towards building an appropriate frame or model utilizable and in making the right management and leadership decisions or identifying and resolving problems and emerging problems or issues in management - leadership settings and organizations.

Decisions are sometimes basically taken intuitively; management decisions on a number of instances do go beyond intuition and intuitive decision making calling for more elaborate and some bit of rigorous, insightful, detailed or explicit and more extensive analysis.

The right available data in quantity and quality would be of tremendous importance toward key management – leadership and organizational settings in diverse and broad ranges of applications and 'sub – fields among; "management, change management process, leadership, marketing and sales force, supply chains, information and social media network digitization, communication, organizational theory, planning and implementations", etc.

Data based driven oriented decision making choice is a potential trigger and layout or fundamental precept for actionable decision making as inferred and subsequently trying to delve into some literatures.

LITERATURE DESCRIPTION & CONCISE FACTS

Big Data – Model, Trajectory & Paradigm: The right data, information and available sources of precise and accurate data is highly crucial, essential and fundamental to decision making in organizations, management fields and leadership spheres.

For instance the 1990s saw a new shift or trajectory heralding the emergence of concepts such as knowledge discovery in data bases and data mining (Piateski & Frawley, 1991).

A link exists and can be established between decision making and big data, thus presenting a new event 'shift & paradigm.

Horita et al. (2017) investigated the efforts towards bridging the gap between big data and decision making towards disaster management in Brazil. Cervone (2005);

Cervone (2015) unveiled revealing that in order for any team to make an effective decision, it must have and establish a sound methodology and methodological approaches that the team can use to achieve and realize a decision; stressing an empirical research on intuitive decision-making vs. analytical.

Again borne – out of and driven by ICT, an acronym tag for information and communication technology new trends have resulted and emerged in the so called 'Online learning with data mining meshing and fusing into big data and new terms and concepts like "data analytics, big data and mining" becomes fused and reflective in more robust and sophisticated machine statistical data learning and visualization.

Out of these new trends, emergences and shifts the tasks hectic and tedious is how to extract or fish out data and information from this massive pool and nexus of big large pool described as tsunamis of information Davenport & Patil (2012).

For many firms it is generating asset value both through the storage of information whose potential grows by virtue or position and status of its volume and from the consequences of its examination Schmidt & Cohen, (2013); Brynjolfsson & McAfee, (2014).

With the widespread adoption of smartphones, social media platforms, and wearable technologies, there has been not only an increase in the amount of available data but also a proliferation of new data sources. All of these "*big data*" have the potential to trans-form the

entire business process Gopalkrishnanet al. (2012), Wamba et al., (2015), as well as to provide greater support for decision-making in different contexts, such as business management and marketing Ko´scielniak & Puto, (2015), Vieweg et al., (2014).

However, a remaining challenge lies on how to align decision-making within the organization with the data sources, e.g., how to determine, which data sources could provide useful information for assessing market trends?

The reason for this challenge is that despite the fact that the available data could be of great value in supporting decision-making, they often fail to reach the decision-makers in a suitable way Vieweg et al., (2014).

As a result, decision-makers are supplied with useless information that still requires extended knowledge or experience for further data processing (Horita 2017).

This also makes it difficult to predict the impact that a change of data availability may have on specific tasks, since it is virtually impossible to find out if and where there is a lack of information.

In light of this challenge in their paper (Horita 2017) proposed the following research question: "*How can the decision-makers' tasks be connected to emerging big data sources*?"

In order to investigate this question in a practical scenario, we (Horita, 2017) perform a study based on the context of disaster management in the Brazilian National Center for Monitoring and Early Warning of Natural Disasters (Cemaden):

(http://www.cemaden.gov.br). Cemaden has the mandate of monitoring disasters across the entirety of Brazil's continental territory with 8.5 million km^2.

This is thus a notable scenario of decision making within a "big data" context, since Cemaden must cope with datasets characterized by volume, velocity, variety and veracity. It must process a considerable volume of data, since it monitors around 1000 municipalities with recurrent disaster problems using more than 4750 rainfall gauges, about of 550 humidity and rainfall sensors, 9 weather radars, and almost 300 hydrological stations.

The Path & Trajectory

Social media messages have also been employed to support organizational tasks like marketing trends (Kuniawati et al., 2013, Maisbender et al., 2013), or disaster management (Vieweg & Cstillo, 2014).

For instance, Mandviwalla & Watson (2014) described an organization as a mix of capitals (human, economic, social, symbolic, and organizational), which is generated through a social media strategy.

Moreover, Kleindienst et al. (2015) integrated social media analytics and the business goals of an organization by breaking down these goals into critical success factors that make it possible to find out the information requirements.

Horita et al., 2017 addressed an important issue left behind and failed to consider in previous cases which did not provide a method for establishing a connection with the information needed for the decision-making, as well as for providing a representative model that describes this connection.

Cervone's (2005) research also reached and stressed upon the fact that there is a delicate relationship between the external leader and the internal behaviors and actions of the team.

This has a bearing to the complexities seen and encountered in teams, groups and organizational settings and somewhat a correlation existing between the risks, complexities involved and decision makings in management – leadership, teams & organizations.

Learning about the casualty indicators, lagging and delayed effects relationship with performance is very difficult as recognized by Luft & Shields, (2001), becoming more difficult with 'multi – complex systems (Gibson, 2000).

Cervone's (2005) research also reached and stressed upon the fact that there is a delicate relationship between the external leader and the internal behaviors and actions of the team.

Flawed mental model has been identified as a barrier to learning in a dynamic environment while research has revealed that more accurate knowledge or description of casual relationships brings and results to enhanced decision making bringing positive impacts to decision performances (Gary & Wood, 2011).

Steman (2000) identified cause – effect relationship as a major deficiency of the mental model developed of complex systems been expressed as local and intermediate especially when individuals are distant in time and space.

Time delay in information can be described as one risk of decision making; Kaplan (2010) presented and emphasizing the potentials of a strategy road map of dynamic system model estimating magnitudes of time delays.

This is a basis and justification for management to be using enhanced dynamic casual models in their operations.

Model – Based Decision Making, Culture & Data – Based Driven Orientation

Beyond decision making based on methodology, models and intuition we can look beyond and delve into data – based oriented choice of decision making.

Data is even crucial or urgent and quite significant to analytical and critical decision making and more pertinent compared to intuitive decisions which might not actually follow some specific model, strict rules or precepts but rather intuitions, instincts or sometimes spontaneous or occasionally spurious.

Culture and models drive and impact significantly on decision-making,

'SDMPs are shaped within organization by the interplay between decision-specific characteristics, management, organizational and environmental factors Papadakis et al., (1998).

In order to comprehend why groups and organizations behave in the way that they do, including how they make decisions, it is necessary to understand their culture (Schein, 2010).

Another perspective quite crucial and pertinent recently is design thinking infusing culture and corporate strategy:

Kolko (2015) summarizes it thus, and quoting;

"*Design thinking comes of age, the approach, once used primarily in product design, is now infusing corporate culture.*"

According to Schein culture is: "[…] the set of shared taken-for granted implicit assumptions that a group holds and that determines how it perceives, thinks about, and reacts to its various environments" (Schein, 1996, p. 236). Schein suggests that management is affected by three different cultures, those of the operators, the engineers and the executives.

In particular, the CEO and the top management team surrounding the CEO have significant impact or influence and roles on the SDMP. Elbanna (2006) in reviewing the SDMP literature found mentioning two widely reported negative factors in decision-making and cited in Frisk et al., 2017.

First, those who manage the SDMP are in a strong position to over-influence or severely control and dictate the outcome of the process. Second detrimental or damaging effects from political

maneuvering are often found and encountered in such processes. A well-designed SDMP should seek to minimize the impact of both of these factors. As a way of tackling this problem;

Schein argues contesting that there is a need to reflect or draw upon both how executives learn and on how to get them to understand the importance of collaboration and of integrating subcultures.

Horita et al., 2017 mentioned that O&M provides an abstract view of observations that originate and come from various data sources, also enabling the prospect of being able to integrate the data sources to the requirements of the information (O & M, 2013).

As presented in previous works and extant literatures, the use of BPMN, DMN and O&M has been mentioned and pointed – out as a relevant alternative for connecting the business process of an organization to data sources (Horita et al., 2016).

But one thing left out as highlighted, recognized and identified (Horita, 2013), they do not describe a process or mechanism for acquiring and obtaining information about conceptual elements or building framework and unit compositional blocks from decision-makers of the application context or basis.

Business processes can be defined as "*a chain of functionally connected activities using information and communication technologies, which lead to a closed outcome providing a measurable benefit for a customer*" [OMG, 2013: 22]. The Business Process Model and Notation (BPMN) are a standard model and notation that defines a set of conceptual elements for modeling these processes. BPMN has been applied in different areas, such as customer services and business management Elveseter et al., (2010).

Sackmann et al. proposed an extension to BPMN for including elements to represent place-related information, such as water hydrants or ambulances.

Although process modeling notations are valuable to represent organizational activities that involve decision-making, they do not include an explicit consideration of the decisions involved.

Decision Model and Notation (DMN) overcomes this gap by providing conceptual features (e.g., business rules and required information) for modeling decisions, and thus establishing a relationship between business processes and decision-making [OMG, 2014: 23].

This presents a frontier for future research investigation and prospects!

N.B: 'Notations or abbreviations;
BPMN: 'Business Process Model and Notation
DMN: Decision Making Notation
O & M: 'Observation Measurements

'**Big – Data, Pathway & Strategic Consequences**

Bhimani (2015) had stated and stressed the strategic consequences of big data.

All of the big data and massive pool of information blocks and nexus have the potential to transform businesses as recognized and mentioned Gopalkrishnan et al. (2012); Wamba et al. (2015).

This trend, shifts and trajectories regarding and with respect to big data has the tendency and bearing to influence, shape and transform management and business processes to marketing.

As evidently seen and unveiled in literatures this has tendency to provide support, reinforcement and a tenacious or firm basis for decision making in various contexts or situations and cases

emerging in management, businesses and marketing processes Koscieslniak et al, (2015) You et al, (2015).

Feehan (2016) highlighted and stressing the significance of big data in synthesizing or creating and providing users with the exact or precise data needed towards reaching and making informed intelligent decisions.

Some first examples of studies that have employed DMN can be found in the literature Bazhenova et al., (2015); Janssens et al. (2016). DMN and related studies are certainly an important step for providing a further understanding of decision-making in organizations. However, it does not take into account the kind of data sources that could provide the modeled information requirements to support decision-making.

This problem can be partially solved by resorting to the Observations and Measurements (O&M) standard.

In short, O&M provides an abstract view of observations that originate from various data sources, as well as being able to integrate the data sources to the requirements of the information O&M, (2013).

The use of BPMN, DMN and O&M presents a relevant alternative for connecting the business process of an organization to data sources, as showed in our previous work (Horita et al., 2016). However, they do not describe a process for obtaining information about conceptual elements from decision-makers of the application context.

Interestingly; we're in a regime shift and new domain, era and dwell in a present boom and massive flux of big data, ample and wide information sources and data bases.

The big data realm and regime has tremendously and significantly contributed to a big stream and massive data source fields reflecting a new shift and paradigm which have become challenging or hectically crucial task to dissect and completely unravel, comprehend or fully understood.

Despite this significances, potentials and prospective contributions to diverse fields, businesses, firms, management – leadership and organizations there are pitfalls or tasks and rigors.

Furthermore; reflecting and falling back on Feehan (2016); there is a tremendous pool and amount of data streams outside there and makes it overwhelming dissecting the information.

This looks like a deluge and massive pool of data and information which requires some painstakingness, expertise and right tools to extract the best possible and useful data requisite to specific utilization, guided and well managed usage and applications.

Effective extraction and mining is crucial and expedient from the massive big – data pool available recently and in the new paradigm & 'shift seen so far.

METHODOLOGY

The present study and investigation expatiated on the concept of big data and following explicit literature review it was possible to extensively delineate the present state and emphasize the significance of big data and the need for developing a decision – making data driven and actionable frame work emphasizing and drawing upon the bound rational context as well.

In his book, titled Organizational Culture and Leadership, Schein (2010) observes that cultures that serve organizations well at certain stages in their development or in dealing with certain classes of problem or situations can themselves become an obstacle when circumstances change. They can also be an obstacle or impediment when a problem is different from those the organization has met and previously faced in the past.

Organizations most instances or occasions and circumstances often fall back relying on what has worked before or worked elsewhere previously in the organization, failing to recognize that the new situation needs a different approach Harvey-Jones & Tibballs, (1999). Schein (1996) also argues that organizational culture plays a critical and significant role when organizations attempt to improve and drive their operations or modes and working modules, templates or styles in response to new data, extant or present realities and facts.

Interestingly some relevant propositions and models were presented inundating the actionable domain and concepts of decision making.

DISCUSSION

Decision-Making Process, Fields & Data Domains

Decision-making and processes attached or connected to a field and its sub domains do require some ample and adequate amount of data and volumes. Where do this data and information pieces originate or come from? This is a pertinent and crucial question to answer, comprehend and fully unravel.

Data do emanate, originate and come from primary and secondary sources among other available and potential data and source fields.

The primary sources come from field survey, questionnaires administration, polls and interview or one on one correspondences captured by the researcher or individual.

Secondary sources include the data and information acquired from the websites and internet sources, articles, publications and bulletins.

Another paradigm and shift recently seen and encountered or experienced is the present realm of big data, growing lists apparently exponential, massive, huge and piles of voluminous data in a number of fields, for instance in marketing, management and information sciences.

It is crucial and essential to recognize and emphasize the big data era and exploration as access for decision making in recent times and prospects while mentioning here and noting Bhimani (2015) do emphasizes and stressed its strategic consequences or implications.

The big data source can be very beneficial in terms of ample, surplus and adequate data stream and field to explore; 'mine and extract, however there my seems to be some challenges as well.

There might be some data clutter in the midst of growing and ample streams of similar and available data on the same subject field, scope and related issues or topics. This could be one challenge to manage and resolve in practically real or pragmatic and realistic senses.

Illustrations & Elaboration

Data Sources: Primary and secondary data sources can be of significant importance and show immense roles to play towards making and influencing or shaping management decisions.

Each of this sources do come with some pros and cons and each shows some advantages and potentials if well utilized, carved or adapted and effectively shaped and managed towards making the best decision for the context applicable.

Feehan (2016) mentioned and stressed the big data can help users exactly or precisely synthesize the information and data they need to form intelligent decisions.

Traditionally based and usually seen or observed, the business process analyst adopted an interview based approach for extracting or obtaining data from decision-makers and modeling or

structuring their business processes or modules and schemes Antunes et al., (2013); Bazhenova et al. (2015) & Becker et al. (2000).

Some other investigators in their works proposed the use and adoption of a tool-based re-engineering Santoro et al. (2000).

In a contrastingly different manner and perspective Front et al., (2014) adopted a design – based approach, which was iterative in nature; iteratively – driven, and end-user centered involving multiple perspectives of specific business processes for supporting the design of useful process perspectives and basis. Although and as mentioned Horita et al., (2017) and in reference to the existing literature; useful guidelines for elucidating and unraveling conceptual elements and modeling the business process of an organization are been given and highlighted but did not include specific guidance and lacking specific instructions for the modeling of business decisions or the relationship between decisions and data sources.

It can be deductively reached and inferred each data sources and cognizant of the big data realm should be optimally used, adapted or blended and applied towards making the most utilized management applications and effective decision making and enhancing processes or events towards the right strategic direction and organizational fit.

Big Data & Origin

The big data dwells and being embellished in an abstraction realm composed of abstracted and concealed layers or shells in segmenting the data which might seemingly make it more complex in extraction despite its tremendous usefulness.

Business intelligence: 'BI, analytics and big data are three closely related concepts that have resulted from information and communication technology tagged ICT Cheng et al. (2012).

Data essentially is however aggregated or built as composites into useful or utilized forms (Feehan, 2016).

While re–iterating as extremely useful as the big data could be; however a major complication seen is the expertise required.

Traditionally, the business process analyst adopted an interview based approach and method or device for extracting data from decision-makers and modeling their business processes Antunes et al. (2013); Becker et al. (2000). Other works proposed the use of a tool-based re-engineering (Santoro et al., 2000). In contrast Front et al. (2014) adopted a design approach, which was iterative and end-user centered and involved multiple perspectives of specific business processes for supporting the design of useful process perspectives agile and iteratively driven or propagated.

Although the existing literature provides useful guidelines for eliciting and inundating conceptual elements and modeling the business process of an organization, it does not include specific guidance for the modeling of business decisions or the relationship and bearing existing between decisions and data sources.

Secondary source and extractions from big data might also be highly prone and susceptible to some complications and specialized expertise required to unravel and resolve the inherent complexities seen and met. Often cases, sometimes often and usually, the competent extraction would be required from 'Excel base and other visualization devices - infrastructures or networks.

Primary data might be seemingly a bit more time consuming and hectic to some extent in acquiring and some specialized design sometimes required to capture and do a field questionnaire acquisition, poll or interview contrast to the secondary sources that can be mined,

drawn or extracted from the pre – existing and available data base and sources or the big data stream.

For a number and ranges of management decision making and within organizational contexts; the use of the secondary data source might be swift and rapid enough but the complexities sometimes as mentioned earlier to extract precisely from the big data sources could be inherent especially with the expedient and exigent need of the right competence, adroit or skills, finesses and expertise.

The primary data apart from its time consuming features, sometimes hectic or rigorous to capture and more resource inputs in human efforts and funds allows direct access to the source and right from the field capture can unveil some more important and essential information.

Further illustration: **Essence of Decision Making**

Roles of Data in Decision Making Process & Disaster Aversion

Expiating further on the failed 'NASA space mission and attempt from the burnt 'O –ring that unleashed the fatal catastrophe, there is a bearing and link with falling out of rational objectivity and to some extent selfish and personal interests.

The management team properly wanted to impress the 'Congress and House Chambers of a space launch and unfortunately ended in an outright failed and catastrophic mission.

Risks and benefits emanating and resulting from management decision makings worth been evaluated.

There seems not a precise scale to do this; however risks could be assessed and described in terms and the extent or degree of the damages done, loses incurred and adversity resulting.

Another reference point to group think was the 1996 Pig Bay invasion in the Cuban Island among other recorded examples and historical points.

Risks from group think and fatal decisions in administrations and management – leadership can be extremely damaging and binging huge – massive loses in human lives, financial resources, capital and investment losses; the enormous amount of financial resources the 'US congress & Administration pumps into wars and military attacks and missions cannot be underestimated running into billions of dollars that could possibly have been diverted and utilized in more meaningful and developmental physical and capital projects or aids and grant donors to needy communities in foreign fields.

Deductively; 'group – think is a very crucial, pertinent and important course or occurrence to take strong cognizance of in management – leadership, organizations and administrations for its potential and massive damaging dangers, adverse effects, fatal and catastrophic losses that could be brought and incurred when such happens or experienced.

Benefits and overall gains of management decision making could be assessed and measured as the gains accrued, returns, profits captured, growths and developments seen and brought to organizations among others.

A strategy map and balanced scorecard can be 'highlighted and presented as key and essentials to analyzing and assessing risks and benefits of management decision making and point to as crucial and extremely significant tools or devices.

Having a strategy map can be a potential guideline and check or tool to manage affairs, control group events and avert the dangers of group think I suppose if this was rightly enforced the 'NASA O –ring disaster could have been averted.

A compromise should be ensured to balance "*risks – benefits vs. loses – gains*" and trade off risks for benefits.

It is advised and suggested organizations should hypothesize tests, and revise casual chains as reported (Humphreys et al., 2016), that is strategic learning and also in Kaplan & Norton, which was presented in 1996 and time delay information (Humphreys et al., 2016).

It was revealed (Humphreys et al., 2016) that organizations can implement a balanced scorecard without firstly or previously developing a strategy map or other casual models (Ittner & Lacker, (2003).

As presented and findings revealed (Humphreys et al., 2016); developing a strategy map can facilitate and enhance managers mental models of developing casual relationships strategies and models reflecting in strategy and enhancing profit generations (Humphreys et al., 2016).

As a key step and direction in developing a strategy map in management decisions; it is essential or expedient, thus exigent and crucial for organizations to pay attention (Ittner & Lacker, 2003).

As pointed – out and enumerated (Humphreys et al., 2016) organizations do not validate the link or relational ties in their strategy and casual models (Ittner & Lacker, 2003) and this do not accurately reflect their business models Malina et al., (2007); Huelsbeck et al. (2011).

A Framework for Actionable Data – based oriented Decision Making Process

McAfee & Brynjolfsson (2012) claim that skillful use of data analytics and big data can radically improve a company's performance.

Deductively right and appropriate finesse and adroit use of data bases organizations can maximally benefit, implement and make optimized decisions crucial to organization's growth, development and transformations leading to achieving the set goals, objectives and aims within its scope or vision and strategic - fit.

In a related direction and perspective; Davenport & Patil, (2013) stated and mentioned that it is important and imperative to understand or comprehend how to fish out answers to crucial business questions from the tsunamis of unstructured information around and that abounds.

As there is a tremendous amount or massive pool of information out there; dissecting the information can be overwhelming, tasking or hectic.

This is most likely usually when the information comes from different sources and may not be accessible to everyone who needs it.

Big Data can help synthesize demystifying this information and provide users with the exact data they need to make informed, intelligent decisions. Knowing how to capture the Big Data and make it useful is the key.

Big Data Sources, Roles & Essences

Big data, information, data base sources and right information archives can play tremendous roles in diverse areas including mitigation and disaster control and management. Thus, the push for an actionable decision making frame data driven & oriented becomes more pertinent and aggressive.

The 1990s saw the emergence of what evolved and a basis for metamorphosis and transformations big data from 'Online Analytics & data mines which harnessed more sophisticated statistical machine learning and data visualization Cheng et al. (2012).

Such tools are described as discovery tools and cam enable fluids in searches for information (Frisk et al., 2017) which can be guided or semi – guided, unguided or self-learning.

Big data can further be expressed, defined and described as a discrete package and reinforced massive database built and formulated around synthesized and hybrid or nexus and pool of diverse resources accumulated from online base and information conglomeration and aggregation with data mines.

In Brazil, preventive countermeasures have been taken and adopted to mitigate loss and damage, as well as to improve the coping strategies of communities against floods, droughts, and landslides as identified and enumerated by Horita et al. (2017). One of these countermeasures was to set up and establish Cemaden (2011), which aims to develop, implement, and operate monitoring or control measures and systems for the issuing of warnings of imminent natural disasters to the National Center for Disaster Risk Management (CENAD, in Portuguese), and thus support disaster management in Brazil.

Herbert Simon argued and contested decision – making is in three stages comprising; intelligence, design and choices.

While intelligence is about gathering information and data in connection or related to the decision making process, design is about analyzing alternatives and how possibly or outcomes that would affect the decision making, choice is about selecting alternatives available and pertaining to the decision making.

Shim et al., (2012) also corroborated the fact that the third phase is about making decisions and choices between or among alternatives towards the decision making Simon mentioned neglecting either of the two phases makes complex and difficult choices and decisions.

A number of researches and recently have given huge significant and much attention to the third phase of choice receiving attention in literatures among;; with the work of Kahneman & Tversky also including (Tversky & Kahneman, (1986); Tversky et al., (1990); Kahneman, (2011).

Simon (1960, 1982) coined the term "*bound rationality*" within the limitations of decision making as he criticized managers for thinking of decision making as being purely logical.

Despite the growing lists of researches on rational decision making and behavioral economics in recent times and over the past 2 decades Mullainathan & Thaler, (2000) and the psychology of decision making gave rationality a place.

While idealized decision makings in real practice do occur or truly happen they are only exception to the rules or game and as identified real idealized and truly ideal models of decision makings do come with problems Tversky & Kahneman, (1986); Tversky et al. (1990).

Apart from cognitive bias and otherwise information are not either fully available, incomplete or unclear, unstructured and inaccurate humans are cognitively limited as pointed – out and identified by Hahn & Aragon - Correa, (2015) and a long problem described as information overload Ednunds & Morris, (2000).

Boland & Collopy, (2004) summarized Simon's views on this as follows;

Simon's views on this thus:

[…] humans have a limited cognitive capacity for reasoning when searching for a solution within a problem space. Given the relatively small size of our brains' working memory, we can only consider a few aspects of any situation and can only analyze them in a few ways. […] The problem space that a manager deals with in her mind or in her computer is dependent on the way she represents the situation she faces.

Addressing the identified problem 'Boland and Collopy differentiated between what they described as decision attitude and design attitude.

A traditional decision attitude is the one rested on rational choices based on the usual presumptions of familiar choices, methods and techniques, algorithms assuming the best alternatives are always in play.

While describing this as passive in the traditional context; they presented and asserted that if managers at the Meta - level adopt a design attitude and ask the questions why are we doing this? Imbibing and incorporating stakeholders, relevant collaboration and consider human satisfaction and commitment the world of business would be a better place.

Mintzberg (2009) also argues that decision-making is not only a process of thinking going on inside the head of the decider, but a collaborative process involving design as a way to define the issue(s), develop courses of action and decide upon outcomes.

Wastell (2010) described and stresses the importance of incorporating design into the mindset of the managers which can significantly impact decision making process.

He contested that a shift is imminent and necessary from control and monitoring towards workplace design and the system at work. Noland et al., 2008 emphasized design as a powerful tool and instrument for innovation and a cognitive mode that should be nurtured in the management practice and education. In line with the extant and growing lists of literatures I made the following propositions and presented the resulting models within the data driven actionable context and design attitude approaches of decision making process.

A design attitude implies involving and engaging all the different stakeholders impacted and influenced by the decision, and in this way communication as imbibed and labeled in the presented model can play a significant and key role as a vital and key tool in doing and achieving this goal and role.

It therefore means balancing formal tools developed a Meta - level and analytical tools at domain expertise (Frisk et al., 2017).

Drawing on Boland & Collopy, (2000); the following 5 phases are presented as depicting a design attitude among; "*representing & designing*", representing is to have a better understanding of how decisions are been made and identify existing issues or possibilities while designing has 3 sub – stages as enumerated as follows and described:

1. Conscious and aware of existing methods and knowledge which might be used to develop a SDMP
2. Sensing: 'this stage involves the sensing and selection to determination of how the decision process would be carried – out and implemented
3. Implementation of the solution from the design phase

Another stage is evaluating, which is the stage in which the outcomes of the alternatives and choices are evaluated and analyzed

Proposition 1: Organizations, management and leadership should imbibe and adopt an actionable data - based oriented decision making scheme and plan by absorbing dynamicity, data utilization maximization, which inculcates ethics, openness and arrive at optimality in decision makings.

This proposition has been illustrated schematically in Figure 1 below identifying and showing the key elements, traits and attributes of an actionable optimal data – based driven actionable decision making platform.
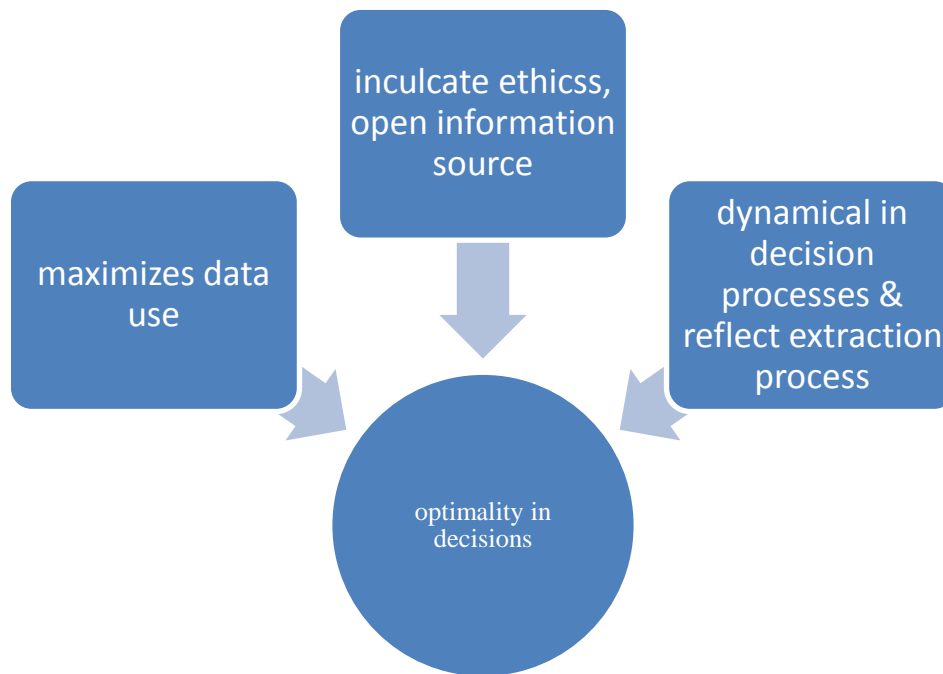
FIGURE 1
A DECISION MAKING FRAME FOR ACTIONS.

As represented in schematics above; a decision – making frame for actionable decision should imbibe and embed 3 – key attributes represented and presented identified as; "*ethics, maximized data use & dynamicity in decision processes*" rested and driven on data – based oriented template towards an actionable decision – making pathway and trajectory.

This reflects on Horita et al., (2017): bridging the gap between big data and decision making models.

Rather than falling outright or fully only on intuitions for a sizeable or considerable number of decisions key and central to the organizations; management – leadership should look into and embrace maximized data used within an analytical context.

This invariably would bring about improved and better accuracy in decisions made based on facts and existing data or certified data bases and can put in better shape the ethical frame for decision making while also reaching a goal and reach of optimal decision making void of flaws and known for better precisions.

Proposition 2: Organizations, management and leadership should imbibe and adopt an actionable data - based oriented decision making scheme and plan by absorbing dynamicity, data utilization maximization, which inculcates ethics, openness and move beyond decision attitude to design attitude effectively enhancing communication and collaboratively work in teams and shared knowledge vision in maximized data use to arrive at optimality in decision makings.

An optimal decision tag or key is the trigger and basis for actionable decision making shaped and as a convergent limit around the 3- mix(s) or elemental combinations and compositions explicitly and vividly shown in the diagram and schematically illustrated and presented as; "*maximized data usage, ethical inculcation and dynamicity coined and merged with design attitude as a propeller of communication device and tools in decision making process*".

Dynamical in decision making implies being flexible, responsive and adaptable to changing situations and surroundings around the decision making processes, pathway and trajectories

driven around the strategies and every mix(s), combinations and elements involved for the most effectively taking decisions towards 'optimality. As shown in fig. 1 above; this implies dynamic – flexibility and iterative driven platform for an actionable decision making, path, trajectory and process.

Data Base, Bounds of Rational Choices & Models

Decision making can be in design mode or individual; it is not however not easy to follow decision making collaboratively.

In far eastern organizations and bloc such as Japan, China or Korea decision makings tend to be collective or consensual contrast to the 'West in which the individual manger is often seen as the locus of decision making Lok & Crawford (2004); Weber & Hsee, (2000); Martinsons & Davison, (2007).

In the cases discussed in this research highlight done and outlined (Frisk et al., 2017) a further complication was a culture that favored and supported rapid decision-making.

This phenomenon reflected the role and function of the organizations, i.e. the provision of fire and rescue services. Collaborative decision-making is relatively slow. In his book:

"*Organizational Culture and Leadership*", Schein (2010) observes that cultures that serve organizations well at certain stages and at best in their development or in dealing with certain classes of problem issues or situations can themselves become an obstacle and stumbling block when circumstances change. They can also be an obstacle and resistance when a problem is different from those the organization has previously gone through or faced in the past. Organizations often fall back on what has worked before (or worked elsewhere in the organization), failing to recognize that the new situation needs a different approach or perspectives (Harvey-Jones & Tibballs, 1999).

Schein (1996) also argues that organizational culture plays a critical role when organizations attempt to improve their operations in response to new data.

For a number of reasons, changing a decision-making culture from the individual to the collaborative is not an easy task to accomplish.

One reason is that perceptions of reality will differ between groups and individuals (Schein, 2010).

Another is that such changes often result in changes in the power structure and in individual roles, both of which may be resisted Krovi, (1993); Lapointe & Rivard, (2005).

Furthermore, what constitutes truth and information depends on a shared knowledge of formal language, context and consensus.

Schein notes that: "*For a group to be able to make realistic decisions or pragmatic in their dealings and approach there must be a degree of consensus on which information items are relevant to the task at hand*" (p. 122). The presence of several different subcultures within a given organization (Trice, 1993) implies that communication and dialogue are of critical importance and significant essence in order to arrive at a shared understanding of different views and ultimately at an agreement reaching – out and far on how best to proceed, head or go.

The use of design thinking to address this problem is a promising recent development. In recent years a teeming number of scholars including Boland & Collopy (2004),

Boland et al. (2008); Wastell (2010); Mintzberg (2009) have turned their attention and keen interests to design as a way and approach or technique to improve decision-making as evident in literatures. Boland & Collopy (2004) claim that taking a design attitude means starting from a Meta level and asking the question "*What do we want to do or achieve*?"

Rather than using a default method/model, a formal strategic decision-making process (SDMP) is designed at a Meta level and tailored to the specific decision plan and its context. This is done by considering both the know-how of relevant literature and existing templates, facts or expertise underlain.

I'm presenting an umbrella or domain confining decision making and processes which implies an "*extrema*" bound as infimum or supremum as binding and restricting decision making process and trajectory to some choices, factors, parameters and constraints borne internally and externally.

$$l \leq l_{max}$$

$$m \geq m_{min}$$

Introducing and defining a constitutive or set of inequality expressions as bounds of a set or sequences confining decision making to some domains within bounds and beyond rationality or rational limits;

'l_{max} represents a greatest lower bound or infimum

m_{min} represents a least upper bound or supremum.

A closed interval can be defined as well;

$$[a \leq x \leq b]$$

Beyond rationality, bounds and measures or limits of decision making; decisions are limited and rational models don't perfectly work in real life practices but presumed and often the mental sets, mind and psyche of average individuals or mangers and decision makers who most times in real scenarios often tend to overlook some inherent constraints, restrictions, limitations and potential obstacles or impediments.

Following a functional or some functional relationship;

$$|f(x) - l| \rightarrow 0$$

'………….approaches some limit l or converges to 0 as f(x) approaches or reaches l.

Design attitude rather than decision attitude allows incorporation of right communication tools and devices modes for effective dissemination, involvement and engagement of stakeholders with different roles and at different levels. Furthermore elaborating:

As presented in previous works or pre − existing and extant literatures, the use of BPMN, DMN and O&M has been mentioned and pointed − out as stated earlier as a relevant alternative for connecting the business process of an organization to data sources (Horita et al., 2016).

But one thing left out, eschewed and represented as a void or a pitfall and gap as highlighted, recognized and identified (Horita, 2016), they do not describe a process or mechanism for

acquiring and obtaining information about conceptual elements or building framework and unit compositional blocks from decision-makers of the application context or basis.

To rectify or correct this 'pitfall and identified void or crevices; open information source should be imbibed as a combinational mix and constituent of ethics and in addition the dynamic decision process sequences should reflect on the data extraction process for decision – making as listed and illustrated as a vital component in the schematics shown above towards optimization and maximizing decision making processes beyond the limits of rationalized - idealized models within the actionable based – data oriented decision making frame proposed and presented..

CONCLUSION

In conclusion management decision relies on key and essential data while emphasizing the importance and huge benefits of the big data sources in making crucial and key management decisions, the need for high competence and expertise for precise extraction cannot be left out.

Primary and secondary data sources are both useful in making informed management decisions and utilization or use and applications within the organizational and business contexts or other fields.

Although we all fall to intuitions and a number of management decisions are borne -out of intuitive decision making processes and flows as well; however we can't completely rely on intuitions; thus the use of the right data becomes imperative to buttress and enhance our decision making processes managing the limits of rational presumed idealized model and embracing design attitude that enhances collaborative work teams and shared knowledge in management and organizational contexts, business and at large various fields of decision making processes.

Each data source has its benefits and significances and fields of use and applications; a hybrid and combination of both the primary and data sources with the big data context and right management to expertise would be optimally useful and bring tremendous benefits to the most effectively made management decisions and actionable data – based oriented & driven.

Web Resources

https://www.nasa.gov/centers/langley/news/researchernews/rn_Colloquium1012.html
https://www.space.com/31732-space-shuttle-challenger-disaster-explained-infographic.html
https://corporatefinanceinstitute.com/resources/careers/soft-skills/groupthink-decisions/
https://study.com/academy/lesson/group-think-definition-examples.html

APPENDIX

Extrapolating Further Stressing and Stretching

An actionable decision making process and frame can be seen as the right pursuit, key and direction for achieving operational efficiency.

Remarks: **Strategizing & Gaining Competitive Advantage**

Organizations can achieve operational efficiency, boosts - enhancements and have a competitive or clear cutting edge gaining competitive advantage by imbibing and instilling the right ethical decision making and decision making process strategies.

In line with Michael Treacy & Fred Wiersema organizations can facilitate triggering and gain a competitive advantage or edge through operational efficiency as 'highlighted among the key steps and strategies or ways, manner and styles of gaining competitive advantage in organizations among;

1. Product line differentiation and lead
2. Operational efficiency
3. Customer intimacy

In deduction and conclusively; 'the right and strategically enforced and instituted decision making frame, trajectory and contextual layout is a trigger, impetus and significant player towards fostering and achieving operational efficiency and gaining a competitive advantage.

Suggested Readings to Additional Bibliographies

Porter, Michael E. (1985). Competitive Advantage. Free Press. ISBN 978-0-684-84146-5.
Passemard; Calantone (2000), Competitive Advantage: Creating and Sustaining Superior Performance by Michael E. Porter 1980, p. 18
Michael Treacy & Fred Wiersema (1997). The Discipline of Market Leaders: Choose Your Customers, Narrow Your Focus, Dominate Your Market. Massachusetts: Addison-Wesley.

Deductively, and conclusively in my assertion and opinion; to reinforce the 'Porter & Wiersema models and basis for achieving competitive advantages in businesses, firms and organizations a focus and place should be carved and made for actionable decision making process 'data – based oriented and driven.

REFERENCES

Antunes., P, Simoes. D, Carri´ co. L, Pino. J.A. (2013) An end-user approach to business process modeling., J. Netw. Comput. Appl. 36 (6) 1466–1479. http://dx.doi.org/10.1016/j.jnca.2013.03.014.
Bhimani, A. (2015). Exploring big data's strategic consequences. *Journal of Information Technology*, 30(1), 66-69. doi:10.1057/jit.2014.29
Bazhenova. E, Weske.M (2015) Deriving Decision Models from Process Models by Enhanced Decision Mining, Proceedings of the 3rd International Workshop on Decision Mining & Modeling for Business Processes (DeMiMoP). pp. 1–12.
Becker, J, Rosemann, M, Uthmann. C (2000) Guidelines of business process modeling, in: W.V. Aalst, J. Desel, A. Oberweis (Eds.), Business Process Management: Models, Techniques, and Empirical Studies, Springer Berlin Heidelberg, Germany, pp. 30–49. http://dx.doi.org/10.1007/3-540-45594-9_3.
Boland, J. Jr & Collopy, F. (2004), Managing as Designing, Stanford Business Books, Stanford, CA.
Boland, J. Jr, Collopy, F., Lyytinen, K. & Yoo, Y. (2008), "Managing as designing: lessons for organization leaders from the design practice of Frank O, Gehry", Design, Vol. 24 No. 1, pp. 10-25.
Chen, H., Chiang, R. & Storey, V.C. (2012), "Business intelligence an analytics: from big data to big impact", MIS Quarterly, Vol. 36 No. 4, pp. 1165-1188.
Cervone, H.F. (2005). Making decisions: Methods for digital library project teams. International Digital Library Perspectives, 21(1), 30–35

Cervone, H.F. (2015). Systematic vs intuitive decision making and the Pareto principle: Effective decision-making for project teams. OCLC Systems & Services: International Digital Library Perspectives, 31(3), 108–111. doi:10.1108/OCLC-05- 2015-0005

Davenport, T.H. & Patil, D.J. (2012) "Data scientist", Harvard Business Review, Vol. 90 No. 5, pp. 70-76

Elbanna, S. (2006), "Strategic decision-making: process perspectives", International Journal of Management Reviews, Vol. 8 No. 1, pp. 1-20.

Feehan, P. (2016). Develop a process to make informed decisions with Big Data. Control Engineering, 63(12), DE3-DE4

Front, A, Rieu. D, Santorum. M.A (2014) Participative End-User Modeling Approach for Business Process Requirements, Proceedings of the 15th Business Process Modeling, Development and Support (BPMDS),. pp. 33–47. (Thessaloniki, Greece). http://dx.doi.org/10.1007/978-3-662-43745-2_3.

Front, A, Rieu, D, Santorum, M. (2014), A Participative End-User Modeling Approach for Business Process Requirements, Proceedings of the 15th Business Process Modeling, Development and Support (BPMDS),. pp. 33–47. (Thessaloniki, Greece). http://dx.doi.org/10.1007/978-3-662-43745-2_3.

Frisk, J.E., & Bannister, F. (2017). Improving the use of analytics and big data by changing the decision-making culture: A design approach. Management Decision, 55(10), 2074–2088. doi:10.1108/MD-07-2016-0460

Gopalkrishnan .V, Steier . D, Lewis .H, Guszcza . J (2012). Big Data, Big Business: Bridging the Gap, Proceedings of the 1st International Workshop on Big Data, Streams and Heterogeneous Source Mining: Algorithms, Systems, Programming Models and Applications (Big Mine), pp., 7 – 11. http://dx.doi.org/10.1145/2351316.2351318.

Gary, M.S., Wood. R.E (2011) Mental models, decision rules, and performance heterogeneity. Strategic Management Journal 32: 569–594.

Gibson, F.P. (2000). Feedback delays: How can decision makers learn not to buy a new car every time the garage is empty? Organizational Behavior and Human Decision Processes 83 (1): 141–166.

Horita, F.E.A, Link. D, Albuquerque. J.P, Hellingrath. B (2016) oDMN: An Integrated Model to Connect Decision Making Needs to Emerging Data Sources in Disaster Management, Proceedings of the 49th Hawaii International Conference on System Sciences (HICSS),. pp. 2882–2891. (Kauai, Hawaii, USA). http://dx.doi.org/10.1109/HICSS.2016.361.

Horita .F, João Porto de Albuquerque, Victor Marchezini, Eduardo M. Mendiondo(2017) Bridging the gap between decision-making and emerging big data sources: An application of a model-based framework to disaster management in Brazil, Decision Support Systems, http://dx.doi.org/10.1016/j.dss.2017.03.001

Hahn, T. and Aragón-Correa, J.A. (2015), "Toward cognitive plurality on corporate sustainability in organizations: the role of organizational factors", Organization & Environment, Vol. 28 No. 3, pp. 255-263.

Harvey-Jones, J. and Tibballs, G. (1999).Business Blunders, Constable and Robinson, London.

Hevner, A.R. March, S.T. Park, J. Ram, J. (2004). Design science in information systems research, MIS Q. 28 (1): 75–105.

Horita, F.E.A, Albuquerque, J.P, Marchezini, V, Mendiondo, E.M. (2016). A qualitative analysis of the early warning process in disaster management, Proceedings of the 13th International Conference on Information Systems for Crisis Response and Management (ISCRAM),. pp. 1–9. (Rio de Janeiro, Brazil).

Huelsbeck, D.P, Merchant K.A, Sandino. T. (2011) On testing business models. The Accounting Review 86 (5): 1631–1654

Humphreys K.A, Gary M.S, Trotman K.T (2016) Dynamic Decision Making Using the Balanced Scorecard Framework THE ACCOUNTING REVIEW American Accounting Association. Vol. 91, No. 5, pp. 1441 - 1465

Ittner, C.D., Larcker. D.F. (2003) Coming up short on nonfinancial performance measurement. Harvard Business Review 81 (11): 88–95.

Janssens, L. De Smedt, J. Vanthienen, J. (2016). Modeling and Enacting Enterprise Decisions, Proceedings of the 28th International Conference on Advanced Information Systems Engineering (CaISE),. pp. 1–12.

Kleindienst, D. Pfleger, R. Schoch,M. (2015).The Business Alignment of Social Media Analytics, Proceedings of the 23rd European Conference on Information Systems (ECIS),. pp. 1–14.

Kurniawati, K. Shanks, G.G, Bekmamedova, N. (2013). The Business Impact Of Social Media Analytics, Proceedings of the 21st European Conference on Information Systems (ECIS)., pp. 1–12.

Ko´scielniak, H. Puto, A. (2015). Big Data in decision making processes of enterprises, Procedia Computer Science 65 1052–1058. ISSN 1877-0509. http://dx. doi.org/10.1016/j.procs.2015.09.053.

Kolko, J. (2015), "Design thinking comes of age, the approach, once used primarily in product design, is now infusing corporate culture", Harvard Business Review, September, pp. 66-71.

Krovi, R. (1993), "Identifying the causes of resistance to IS implementation: a change theory perspective", Information & Management, Vol. 25 No. 6, pp. 327-335.

Kaplan, R.S. (2009). Conceptual foundations of the balanced score card. In Handbook of Management Accounting Research, Volume 3 edited by Chapman, C. S., A. G. Hopwood, and M. D. Shields, 1253–1269. Oxford, U.K.: Elsevier.

Kaplan. R.S, & Norton, D.P. (1996). The Balanced Scorecard: Translating Strategy into Action. Boston, MA: Harvard Business School Press.

Luft, J.L., & Shields, M.D. (2001). Why does fixation persist? Experimental evidence on the judgment performance effects of expensing intangibles. The Accounting Review 76 (4): 561–587.

Lok, P. & Crawford, J. (2004), "The effect of organisational culture and leadership style on job satisfaction and organisational commitment: a cross-national comparison", Journal of Management Development, Vol. 23 No. 4, pp. 321-338.

Lapointe, L. & Rivard, S. (2005), "A multilevel model of resistance to information technology implementation", MIS Quarterly, Vol. 29 No. 3, pp. 461-491.

Malsbender, A. Beverungen, D. Voigt, M et al., (2013). Capitalizing on Social Media Analysis — Insights from an Online Review on Business Models, Proceedings of the 19th Americas Conference on Information Systems (AMCIS),. pp. 1–9.

McAfee, A. & Brynjolfsson, E. (2012), "Big data: the management revolution", Harvard Business Review, October, pp. 61-68.

Mintzberg, H. (2009), Managing, Prentice Hall and Pearson Education Limited, San Francisco, CA.

Mullainathan, S. & Thaler, R.H. (2000):"Behavioral economics", No. w7948, National Bureau of Economic Research.

Mandviwalla, J.M. Watson,R. (2014). Generating capital from social media, MIS Q. Exec. 13 (2) 97–113.

McAfee, A. & Brynjolfsson, E. (2012), "Big data: the management revolution", Harvard Business Review, October, pp. 61-68.

Martinsons, M.G. & Davison, R.M. (2007), "Strategic decision-making and support systems: comparing American, Japanese and Chinese management", Decision Support Systems, Vol. 43 No. 1, pp. 284-300.

Object Management Group, Business Process Model and Notation (BPMN), v.2, (2013), http://www.omg.org/spec/BPMN/2.0/

Object Management Group, Decision Model and Notation (DMN), (2014), http:// www.omg.org/spec/DMN/.

Open Geospatial Consortium, Observations and Measurements (O&M), 2013, http://www.opengeospatial.org/standards/om.

Othman, S.H, Beydoun, G. (2013). Model-driven disaster management, Inf. Manag. 50 (5): 218–228. http://dx.doi.org/10.1016/j.im.2013.04.002.

Papadakis, M.V., Lioukas, S. & Chambers, D. (1998), "Strategic decision-making processes: the role of management and context", Strategic Management Journal, Vol. 19 No. 2, pp. 115-147.

Piateski, G. & Frawley, W. (1991), Knowledge Discovery in Databases, MIT press.

Schein, E.H. (1996), "Culture: the missing concept in organization studies", Administrative Science Quarterly, NJ, pp. 229-240.

Schein, E.H. (2010). Organizational Culture and Leadership, Vol. 2, John Wiley & Sons

Shim, J.P., Warkentin, M., Courtney, J.F., Power, D.J., Sharda, R. & Carlsson, C. (2002) "Past, present, and future of decision support technology", Decision Support Systems, Vol. 33 No. 2, pp. 111-126.

Simon, H.A. (1969), The Science of the Artificial, The MIT Press, Cambridge, MA.

Simon, H.A. (1982), Models of Bounded Rationality: Empirically Grounded Economic Reason, Vol. 3, MIT press, Massachusetts Institute of Technology

Sackmann, S. Hofmann, M. Betke,H. (2013). Towards a Model-Based Analysis of Place-Related Information in Disaster Response Workflows, Proceedings of the 10th International Conference on Information Systems for Crisis Response and Management (ISCRAM), 2013. pp. 78–83.Baden Baden, Germany

Saeedi, K. Zhao, L, Sampaio,P.R.F. (2010). Extending BPMN for Supporting Customer- Facing Service Quality Requirements, Proceedings of the 2010 IEEE International Conference on Web Services (ICWS), 2010. pp. 616–623. http://dx.doi.org/10.1109/ICWS.2010.116.

Saldana, J. (2015).The Coding Manual for Qualitative Researchers, 2nd ed., Sage Publications Ltda, London.

Santoro,F. M, Borges, M.R.S. Pino, J.A. (2000). CEPE: Cooperative Editor for Processes Elicitation, Proceedings of the 33rd Annual Hawaii International Conference on System Sciences (HICSS), 2000. pp. 1–10. http://dx.doi.org/10.1109/HICSS. 2000.926587.

Santoro, F.M. Borges, M.R.S. Pino, J.A. (2010). Acquiring knowledge on business processes from stakeholders' stories, Adv. Eng. Inform. 24 (2): 138–148. http://dx.doi.org/10.1016/j.aei.2009.07.002.

Sterman, J.D. (2000). Business Dynamics: Systems Thinking and Modeling for a Complex World. Boston, MA: Irwin/McGraw-Hill.

Trice, H.M. (1993), "Occupational subcultures in the workplace", No. 26, Cornell University Press, New York, NY.

Tversky, A. & Kahneman, D. (1986), "Rational choice and the framing of decisions", Journal of Business, Vol. 59 No. 4, pp. 251-278.

Tversky, A., Kahneman, D. & Moser, P. (1990), "Judgment under uncertainty: heuristics and biases", in Moser, K.P. (Ed.), Rationality in Action: Contemporary Approaches, Cambridge, MA, pp. 171-188.

Vieweg, S. Castillo, C, Imran,M. (2014). Integrating social media communications into the rapid assessment of sudden onset disasters, Soc. Inform. 8851 (2014) 444–461. http://dx.doi.org/10.1007/978-3-319-13734-6_32.

Wamba S.F, Akter . S, Edwards .A, Chopin. G, Gnanzou, D (2015) How 'big data' can make big impact: findings from a systematic review and a longitudinal case study, Int. J. Prod. Econ. 165, 234–246. http://dx.doi.org/10.1016/j.ijpe.2014.12.031.

Wastell, D. (2010), "Managing as designing: 'opportunity knocks' for the IS field", European Journal of Information System, Vol. 19 No. 4, pp. 422-431.

Weber, E. & Hsee, C. (2000), "Culture and individual judgment and decision-making", Applied Psychology, Vol. 49 No. 1, pp. 32-61.

You . Z, Si . Y - W, Zhang . D, Zeng . X, Leung .S.C, Li A (2015). A decision-making frame-work for precision marketing, Expert Syst. Appl. 42 (7) 3357–3367.