Is it too early to learn lessons from the developed world on the potential of big data technology: Harnessing and nurturing intuition in organisational decision makers

Dr Zahid Hussain
The University of Bradford, Bradford, UK.
Z.I.Hussain@bradford.ac.uk

Mateen Asad
c/o: The University of Bradford, Bradford, UK.
mmasad9@gmail.com

Dr Hassan Baz Chamas
c/o: The University of Bradford, Bradford, UK.
hassan.shamas@gmail.com

Abstract

As big data (BD) and data analytics gain significance in Europe, the industry expects that executives will eventually move towards evidence based decision making, and consequently would build sustainable competitive advantages for their organisations. Therefore, the lessons learned from experiences of European executives can be key for human development and also economic development. However, it also seems that in some cases decision makers in Europe seem to not use business intelligence systems at all. Since, executives are intelligent human beings with credible and proven expertise, it seems to raise a question mark on effectiveness of business intelligence systems, and the potential it has in human and economic development. Furthermore, repeated evaluation of literature pointed out that ultimately executives in Europe make decisions by intuition, and this leads to the question whether big data would ever replace intuition. In this paper, the mind-sets of executives about application and limitations of big data have been explored, by taking into account the cognitive factors in decision making. By using this, it is evaluated whether BD technologies can use to accelerate intuition development of the executives, and consequently lead to faster and sustainable economic development in the developing world.

Keywords: big data; decision making; decision support systems; information technology; economic development; human development

Introduction

The Opportunity of Economic Development and Human Development

Since the beginning of capitalism, many firms have risen in Europe and US, some to unprecedented commercial growth, and met their end. In the new modern disruptive capitalistic landscape, the corporate life of corporations and tenure of their industry leadership has become shorter. Despite that many firms have survived for over a hundred years, and important factor that contributes to their longevity is innovation (Greenberg, McKone-Sweet, & Wilson, 2011). Because of innovation, not only small firms are able successfully compete with global conglomerates originating from Europe and US, but also helped some of these conglomerates to stay competitive in this new global competition (Rao, 2012).

A study of high growth founders revealed that most of them not only had good education, but also had significant work experience of between 6 to 10 years in their respective industry. Further analysis of data about high growth entrepreneurship suggests that innovation is always started by a presence of a giant, multi-national corporation. For example, the relocation of Shockley semiconductors resulted in 129 semiconductor spinoff firms (Rao, 2012).

The analysis of data presented suggests two things. Firstly, the modern competitive landscape certainly provides opportunity to build globally competitive firms in developing countries, and these firms can definitely lead to spinoff firms, consequently accelerating and sustaining economic development. The challenge is to build successful giant firms, and the leaders to lead them and steer them through the competition. A way to do that is to transfer knowledge gained from practice in Europe, and use it. In this context big data based information technology seems to provide the answer.

Big Data & It's potential

Big Data (BD) is a term used to refer to digital data that is huge in size, usually in terabits, comes from various sources, such as, media and digital, and keeps on increasing in size. The three dimensions of BD are referred to as 'volume', 'variety' and 'velocity'. Organisations have used this data to generate insights and used it to grow their businesses at an unprecedented rate, and across markets that never were thought to exist before. For example, Amazon have used the data gathered from the data collected from the visitors of their site, and used it to transform their organisation completely (Davenport, 2006).

The initial success of the internet based companies, started a movement; companies started mining for data, analysing it to grow market share or differentiate themselves in the market (Davenport, 2006). Examples like, target using data to find out one of its customers were pregnant even before her, point out to immense potential of BD analytics in providing insights to decision makers that are state-of-art and exceptional (Anderson & Rainie, 2012).

Therefore, BD based IT technologies used for strategic decision making seemed to have resulted in gaining remarkable insights that lead to building a sustainable competitive advantage.

By adopting these technologies can help executives in the developing world build competitive institutions that can stimulate innovation, consequently accelerating economic development. Indeed a study of Brazilian firms indicated that adoption of IT technologies increased labour productivity (Alves de Mendonça, Freitas, & de Souza, 2010).

However, executives have not always made right decisions, the most notorious being the investment decisions that lead to the financial crunch of the late 2000s. But, decisions within organisations have also gone wrong. Examples include, yahoo deciding to let go of the opportunity to buy Microsoft, and General Motors bringing the wrong cars to the market. An explanation presented is that since executives are high in the hierarchy of organisations, usually the decision making process is a 'black box' (Davenport, 2009) and therefore not subject to analysis and overhauling (Davenport, 2009). Surveys about opinions and plans about BD have indicated that executives see huge potential in using BD analytics to reveal unique insights that can help them transform organisations and ultimately build a sustainable competitive advantage (Davenport, 2006). This seems to point out to the possibility that executives are actually overhauling the decision making process to base their decision on factual evidence.

BD based decision support systems so far seem to promise sustainable economic development, but the basic assumption behind this is that technology deployed would be rapidly adopted and absorbed. However, a study of return on investment in the IT sector in African firms seems to cause doubts on its validity. The study collected data from various organisations working in Africa over the investments done in the IT sector showed that the relationship between IT adoption and firm performance was insufficient (Ngwenyama & Bollou, 2010)

Asad & Hussain (2016) have also concluded that in order to use BD effectively to make unique and competitive decisions, the information systems have to be transformed to support not only faster decision making, but also faster learning. To predict whether this would work or not would an understanding of the decision making process by executives in Europe is developed in the next section.

Executive Decision Making
Literature search suggests that there are various methods that lay down rules for rational and complete decision making. The most extensive one, perhaps, is the framework laid down in (Davenport, 2009), as it covers all aspects from multiple, perspectives, but also the psychological and behavioural perspectives that underlie decision making processes. However, the reality of human decision making is different, and subjected to many limitations.

People usually make decisions by two cognitive means. The first one is reasoning. This usually involves defining the problem, defining the criteria of decision, and identifying the most important one, finding alternatives, evaluating alternatives based on the criteria, and finding the best alternative. The process hence requires time, conscious effort and logic (Bazerman & Moore, 2012). A similar method of identifying issues about which decision has to be made, prioritizing them and getting diverse, multi-disciplinary perspective to find the best alternative is also laid down by Davenport (2009).

The second one is intuitive where decision making is subconscious. Executive decision making is usually intuitive because decisions by intuition are fast, automatic and don't require a lot of effort. Since executives are busy and have limited time on their hand, their decisions are mostly intuitive (Bazerman & Moore, 2012).

Identification of this fact raises the question that is intuition-based decision making somehow inadequate method of decision making that always leads to problems. Previous research has found out that in reality executives only use intuition because their primary job is to interact and converse with many people during the day. Because of this they have limited time in which they are bombarded with diverse information (Kuo, 1998). Sterman (2000, pp. 598-603) explains that the human cognitive capability to process information is limited, and in most cases much smaller than that which the problem at hand requires. Because of this, excess information can overwhelm the attention. Despite these limitations, executives can effectively absorb and process even a little ambiguous information and make effective decisions. Executives can only manage this by employing intuition (Benbasat & Todd, 1993).

However, as mentioned before, executives have not always made good decisions. This, along with the decision making processes suggested by Davenport (2009) and Bazerman and Moor (2012), suggest that intuitive decision making might be actually problematic. This is because executives, having time and information processing capacity constraints, are using intuitions. If the decision is intuitive and wrong, then perhaps executives were not engaging their rational abilities, even if BD is incorporated. Does this mean that intuitive decisions are not smart decision? In the upcoming sections an understanding of intuition is developed. Using this understanding the advantages of intuitive decision are discovered, and also its short comings are uncovered. By doing this, it could be seen whether BD is relevant in decision making process and how BD can be engaged to improve decision making process.

Intuition

Intuition is the unconscious transfer of knowledge developed by past experiences. In complex, dynamic and unstructured scenarios, which real world scenarios mostly are, this unconscious transfer enables decision makers to analyse the situation and synthesise conclusions without need of analytical structures. Thus decision makers can make new conclusions, and take action on them, feeling as if they came across this by chance. In this context, perception and experience are at the core of intuition (Kuo, 1998)

Traditionally perception is defined as a psychological process that enables decision makers to extract information directly by using their senses to make a decision, but recent research has revealed that perception also enables decision makers to extract meaning from situations. This usually involves taking an overall 'bird's eye' view of the situation, and use cues to extract information. Intuition achieves this by simplifying a complex situation by subtracting irrelevant information, and filling in missing clues of information by adding abstract concepts. This results in perceptions translated immediately into action, based on the state of environment. This is also the reason why people transfer the intuitive insights in forms of 'metaphors' (Kuo, 1998). Therefore, intuition can be seen as a complex process that requires coordination of the

decision makers' senses and also subconscious cognitive processes in the brain. These processes perform both inductive and deductive reasoning using mental models, the stored information about similar situations. This is achieved by practice and decision makers putting themselves in different situations. Thus, intuition is built by years of experience. By experiencing the situation in different environments, decision makers can immediately focus on the right information in the proper environmental context, and also combine different mental models based on where they are applicable. However, intuition, particularly the action taken as a result of intuition is governed by values, goals and emotional state of the decision maker (Kuo, 1998).

Knowledge Vs Intuition

The cognitive and psychological description of intuition suggests that the term intuition is actually interchangeable with knowledge. Davenport and Prusak (1998) have differentiated between data, information and knowledge to present a working definition of knowledge. Data is a collection of facts, such as, the profit of a company or yearly revenue, and information is transfer of that data, along with the opinions about it. Thus, stating the company will earn the same amount of revenue this year because the product has the same demand, is information. Similar to intuition this information is interpreted is based on the mental models created from the perception of the environment, and the values and goals of the decision makers. Knowledge is defined as the process to receive and evaluate information using the mental models, values and goals, in order to take actions. Thus knowledge, like intuition, is also closest to action than data and information. Similar to intuition, knowledge is also developed by years of experience, as experience develops the contextual frames to absorb and interpret knowledge.

Intuition relies on perception, and generates bias. Therefore, intuition can become static and thus stop evolving, resulting in decisions being always wrong. Intuition is used by decision maker because it requires less time and less effort to process information and take decisions. This may result in executives compressing too much information and increasing the error in decision. If executives continue to rely on intuition they would never be able to look at their biases, and continue making the wrong decisions (Kuo, 1998).

Knowledge on the other hand seems to be dynamic. Data and information are static parts of both the executive's experiences and environments, and as knowledge interacts with different environments the information and data processing evolves. Thus, if knowledge is static, it actually downgrades to data or information. So, knowledge would be developing by not only taking actions, but also evaluating the difference between the expected outcome and actual outcome, to get insights and develop new capabilities and competences (Davenport & Prusak, 1998)

Kuo (1998) acknowledges that managers apply both analytical and intuitive thinking in practice, they usually have to make a choice between the two. However, it seems that knowledge is careful combination of both analysis and intuition. By taking action intuition can be trained, and analysis can uncover and question the biases subconscious reasoning processes used to achieve that reasoning. Strategically, since knowledge is adaptive and difficult to develop, the knowledge of executives can be a sustainable competitive advantage, that would enable

organisations to sustain profitability in rapidly changing environments (Davenport & Prusak, 1998). The challenge apparently is translating linguistic formation of a problem for analytical problem solving into an abstract model for intuitive thinking (Kuo, 1998).

The above discussion implies that to upgrade executive decision making process from intuitive decision making to knowledge-based decision making, the translation of data into more abstract models is necessary. Executive decision support systems, also known as business intelligence (BI) become relevant in this case, as they not only serve as channels for collecting and transmitting data, but also to present it in a way for executives to make decisions.

Business Intelligence: The Executive Decision Support Systems
There are two core functions of BI; collecting and distributing data from within the organisation and the environment it operates in, and also presenting this information to support decision making by executives. From technological point of view, BI includes technologies to extract internal as well as external data, and tools to analyse and present it (Pourmojib, et al., 2013).

From the earlier exploration of cognitive decision making, and consequent exploration of intuition and knowledge, suggest that regardless of technological capability, the choice to use the BI by an executive in the developed world would depend on the executive, and probably the executive would use BI either if it fits intuitively into the decision making or if it can be used to develop knowledge. Indeed, research on BI has continuously pointed out the importance analysing BI systems in the perspective of human-machine interaction, and usage of the BI in light of the situation and the internal and external business environment (Orlikowski, 1992).

This is known as the managerial perspective of technology, and has been used extensively to analyse technology. This paper aims to look at the effect of incorporating BD in BI systems to executive decision making process. In this perspective a number of interesting insights have been observed by research.

Regarding integrating decision making and BD, it has been observed that it is indeed difficult, casting doubt on the view of BD as the 'magic pill' of building sustainable competitive advantage. The most successful cases use BD based BI to develop experiments and test them (Davenport, Competing on Analytics, 2006). Indeed a study of US manufacturers and Japanese manufactures have concluded that BD based BI will not replace hypothesis testing. This is because BD analytics has its roots in statistics, and for prediction based on statistical mathematics there should be a strong link between variables. In real world, this link could represent a very special case, and therefore predictive statistical analysis would not give a guaranteed answer (Apgar, 2013). Therefore in situations where there is high ambiguity and complexity, and task is non routine, BD might be used to get insight, but executives still rely on intuition (Kowalczyk & Buxmann, 2014).

Based on the understanding of intuition and knowledge, and comparing it to the research on BD and BI, and its use in decision making process, it can be seen that executive in Europe and US still rely on intuition to make decision. However, BD based BI also has the potential to provide insights that lead to new inductive and deductive conclusions. Perhaps BD could be a

tool for knowledge development for executives, and therefore is an excellent tool for human development in the developing world.

Implications for Using BD based IT for Economic and Human Development

From literature review it can been seen that BD can be used as a learning tool for intuition development, and this can be done by deploying BI. The applications of BI range from policy making and accelerating economic development. By using BD based BI decisions can be evaluated in real-time. In realm of building competitive advantage, it can be used to rapidly iterate decisions till sustainability is achieved (Höchtl, Parycek, & Schöllhammer, 2016). However, the research on impact of BD based IT on development is theoretical in nature, employing theoretical models and their interaction (Höchtl, Parycek, & Schöllhammer, 2016). In fact previous research indicate that perhaps effort minimisation to gather and analyse data, rather than providing in-depth analysis is perhaps how BI would support decision making (Benbasat & Todd, 1993).

Summary of Previous Research & Research Questions

The published research presented above is summarised in the table 1.

Table 1: Literature Summary

Ultimately, executives make decision by gaining perspective of the environment and the position of organisation within that environment. Thus to use BD, to enhance development and nurturing of intuition, the BD based information systems should be able to provide executives quick learning from their decisions, enabling them to nurture their intuition, and turn their organisations into sustainable and competitive organisations.

Methodology

This research aims to take the practitioners point of view to whether employing BD based IT resulted in improving strategic decision making in Europe, and what lessons can be learned that can help implement BD based IT to accelerate economic development as well as human development in the context of nurturing intuition of executives. By doing the gap between theoretical literature and its practical relevance can be narrowed, as it has been found that only a very small number of this research has any practical relevance (Arnott & Pervan, 2008). This paper deals with decision making by executives, and exploration of their cognitive processes and intuitive processes. Therefore, to ground this in reality, the opinions of executives about the potential and limitations of BD, and their plans with BD are going to form the foundation of analysis.

Research Philosophy

However, since the perceptions of executives guide their interpretations of data, the reality is subjective. So, not only the opinions and mental models of executives are important but the

source of their perceptions is important as well. This resonates well with the 'interpretivist' research philosophy, which insists that in real world scenarios, human 'actors' (Saunders, Lewis, & Thornhill, 2012, p. 137) and their behaviours are main determinants of actions.

Therefore, following the research philosophy of interpretivism, the mind sets and opinions of executives shall be collected and analysed objectively. This diverts from majority of research that is published in IS, since IS researchers mostly approach research problem from a positivist philosophy (Arnott & Pervan, 2008). Not only that, using an interpretivist research paradigm, would also enable to critically analyse the state of human actors, and attempt to present a holistic framework adoption BD based IT for development.

Research Strategy

Choosing interpretivist research paradigm implies two important points; the sample size of the data selected is small, and the data investigation is in-depth and through (Saunders, Lewis, & Thornhill, 2012, p. 140). A small sample size, therefore, was chosen, with in-depth interviews. The interviews were objective and empathic to not only understand the mind-sets and opinions of executive, but also the source of their opinions.

To make sure that opinions are analysed objectively, the sample chosen included executives with various backgrounds. This is because different backgrounds implies different situations where the managers have acted, and different capacities in which executives have served. Thus they have developed diverse perceptions, and therefore, varied intuition. By putting together the responses of each of the respondents, related to a similar topic, the data could be critically analysed. Different topics which are discussed as data codes, with a sample question to explain what it explores, and the topic discussed in literature review it refers to.

Data Validation

The insights gathered from the primary sample is compared and contrasted with data gathered by other researchers. This not only evaluates the result of this data sample in comparison to other data samples, but also ensures objectivity by providing other views on the subject as well.

The following secondary data sources were used

- The McKinsey Mind (Rasiel & Friga, 2002) attempts to explain the decision making process used by consultants of McKinsey & Company to support decision making of executives of large multinational companies, by interviewing McKInsey Alumni, most of whom were themselves executives decision makers at various companies during writing of this book.
- Research conducted by Kuo (1998) describes in detail how and why managers use intuition to make decisions, and therefore was also used in the literature review. However, it provides also interesting ideas about designing decision support systems that support intuition.

- Agor (1986) conducted surveys of top executives, and discovered that intuition played a central role for most important decisions made by executives.

Results & Discussion

The participants were contacted and interviews were conducted on email, phone and face-to-face depending on the availability of participants.

Executive Decision Making

All participants agreed that executive decision making begins with defining the problem. By defining the problem, the environment the problem is operating in, and thus what analysis is needed (MVD). This would lead to questions that need to be answered to make a decision, and consequently what data is needed (JA)

> "People come to us with a solution, and sometimes literally a product under their arms. This
>
> means they don't only tell us about the 'what' of the problem, but also the 'how'. We prefer
>
> that they define the problem, and we determine the implementation. The first step is to
>
> determine the problem and the environment in which it exists." - MVD

Rasiel & Friga (The McKinsey Mind, 2002, pp. 12-21) concluded that structure used by the consultants of McKinsey & Company enables these consultants to look at the problem, first from a high, all-inclusive view, also known as the 10,000 foot view (Rasiel & Friga, 2002, p. 11) or helicopter view, and then navigate down in a way to break problem down into 'mutually exclusive, collectively exhaustive' (Rasiel & Friga, 2002, p. 1) components. Once this is done, they form a hypothesis, which is then tested by analysis. This, makes it easy to define the problem completely in light of limited information.

The Time Constraint

The reason that executives want to come to the root causes quickly is because of the time constraint. Building a sustainable competitive advantage in the competitive markets of today requires staying a step ahead of competitors (NA), and get insights before the competitors get it. The effectiveness of BD is therefore dependent on how quickly the data can be retrieved to do the analysis (JA).

The application of BD in executive decision making is to test the hypothesis and come to conclusions (Rasiel & Friga, 2002). The hypothesis and the data required to check it is dependent on strategic goals (MK), and these goals are at the core dependent on the internal and external environment of the business organisation (JA).

In addition to it in a practical environment tasks require attention in pockets of time, which are distributed not only on the spectrum of time, but also different locations. This distribution is the

reason why even in ideal situations, there would always be lack of time for making decisions, and executives would be forced to make decisions with gaps in information (Kuo, 1998).

Intuition Vs Knowledge

In dynamic commercial landscape constrained by time, it is indeed justified to use limited analysis and rely on intuition for making decisions. However, this does not mean that intuition and analysis are at loggerheads, and provide two distinct and mutually exclusive methods of decision making. Although executive take major decisions by following their gut feeling, they do need to do analysis to support their decisions. Since they start with the high level view to develop hypothesis, the data analysis is done to proof or disproof the hypothesis (Rasiel & Friga, 2002).

In this context BD analytics provide opportunities to develop and test hypothesis in ways that were not possible before. For example, with BD companies can see where do their products stand in terms of product life cycle (Jalal), or see customer habits and develop products accordingly (PG), and get new insights about internal company processes that are invisible without BD analytic capabilities (LH).

Marc elaborated that BD can be used to develop hypothesis as well. For example, by adding sensors to record movements during a court sessions can lead to new hypothesis that could not be developed and tested without BD technologies. Lex also confirmed that BD technologies makes it easier to combined data that is completely unrelated to gain new insights.

> "Interdisciplinary processes, and research can also emerge. For example, recently a
>
> statistician with no background in traffic management came to remarkable insights by
>
> checking patterns and trends in traffic data." – MVD

While recalling memories of their most effective intuitive decisions, executives actually mentioned letting intuition move freely, and choosing its own analysis, which could sometimes be recalling past experiences, evaluating numbers or evaluating complex concepts and ideas (Agor, 1986). Furthermore executives also use more than quantitative analysis; they also employee techniques like mind mapping (Agor, 1986) and decision trees (Rasiel & Friga, 2002) to formulate the problem and arrive at decision.

Visualisation of Data

Visualisation of data key when it comes to using data for decision making. The 'template' is the method in which data is presented, and contains data presented in the best form to answer the questions asked. He said:

> "The system is not important, but the template that what questions are going to be answered
>
> is important." – JA

Kuo (1998) also provided example of Dr. Jon Snow, who used the map of London to quickly find the water pump that was source of cholera. He simply plotted the number of victims against the pumps to get a 'helicopter' view of situation in its environment.

Conclusion

The information that executives provided and its analysis actually seems to indicate that BD based decision support systems are still new for the developed world, and the full spectrum of their application is still unknown. However, executive still make decisions starting from the highest view, and ultimately following their intuition. However, the intuition and tested and supported by analysis, often by objective consultants.

As seen with other technologies, BD based IT for decision support systems would never replace intuition, because business goals would always be dynamic, and business environment would stay complex, if not becoming increasingly so. It also seems although analysis used by executives may not always be structured and quantitative, but it is inherently part of the decision making process. Therefore, it seems that intuition would lead the process of decision making.

However, it seemed that there were important insights about intuition and applications of BD that the executives can use to develop their intuition, which can deliver positive results when deployed for development. Firstly, executives in the developing world could combine their own intuition and BD analytics to not only develop, but also confirm hypothesis. As a result they can discover and explore markets that are not served by their competitors in the developed world. This would results in sustainable economic development globally. Secondly, by providing quick learning opportunities BD based IT would accelerate intuition nurturing, resulting in faster development of human capital. To do this BD can play a key supporting role by indicating to executives where they and the organisation stand in relation to the environment, that is, the context, and provide visualisations for quick inference, and quick strategic decision making.

Based on this a framework for using BD effectively for nurturing intuition of executive decision makers of the developed world can be developed as follows:

- Intuition leads the process of decision making, and the information should support a relaxed environment, such as filtered lights, to induce relaxed state in the executives, which is necessary for enabling intuition (Agor, 1986)
- Information systems should support BD and its visualisation to simulate the complete picture of the context, that is, the internal and external environment (Kuo, 1998)
- Information systems provide BD that confirm or refute the gut feelings of the executives, both in structured and unstructured ways (Rasiel & Friga, 2002)

References

Agor, W. H. (1986). The logic of intuition: How top executives make important decisions. Organizational Dynamics, 14, 5-18. doi:10.1016/0090-2616(86)90028-8

Alves de Mendonça, M. A., Freitas, F., & de Souza, J. M. (2010). Information technology and productivity: Evidence for Brazilian industry from firm-level data. Information Technology for Development, 14(2), 136-153. doi:http://www.tandfonline.com/action/showCitFormats?doi=10.1002/itdj.20091

Anderson, J., & Rainie, L. (2012). The Future of Big Data | Pew Research Center. Retrieved July 19, 2015, from http://www.theguardian.com/technology/2014/jan/22/facebook-princeton-researchers-infectious-disease

Apgar, D. (2013). The False Promise of Big Data: Can Data Mining Replace Hypothesis-Driven Learning in the Identification of Predictive Performance Metrics? System Research and Behavioral Science, 32(1), 28-49. doi:10.1002/sres.2219

Arnott, D., & Pervan, G. (2008). Eight key issues for the decision support systems discipline. Decision Support System, 44(3), 657-672. doi:10.1016/j.dss.2007.09.003

Asad, M., & Hussain, Z. (2016). The arrival of a new era in data processing – can 'big data' really deliver value to its users: A managerial forecast. Paper Presented at UK Academy of Information Systems Annual Conference, Oxford University (St Catherine College). Oxford.

Bazerman, M., & Moore, D. (2012). Judgement in Managerial Decision Making (8th ed.). New Jersey: John Wiley & sons.

Benbasat, I., & Todd, P. (1993). An Experimental Investigation Of The Relationship Between Decision Makers, Decision Aids and Decision Making Effort. INFOR: Information Systems and Information Research, 31(2), 80-100. doi:10.1080/03155986.1993.11732217

Davenport, T. H. (2006). Competing on Analytics. Harvard Business Review, 84(1), 98-107.

Davenport, T. H. (2009). Make Better Decisions. Harvard Business Review, 87(11), 117-123.

Davenport, T. H., & Prusak, L. (1998). Working Knowledge: How Do Organizations Manage What They Know (First ed.). Boston, Massachusetts: Harvard Business School Press.

Greenberg, D., McKone-Sweet, K., & Wilson, H. (2011). The New Entrepnreneurial Leader. San Francisco: Berrett-Koehler.

Höchtl, J., Parycek, P., & Schöllhammer, R. (2016). Big data in the policy cycle: Policy decision making in the digital era. Journal of Organizational Computing and Electronic Commerce, 26(1-2), 147-169 . doi:10.1080/10919392.2015.1125187

Kowalczyk, M., & Buxmann, P. (2014). Big Data and Information Processing in Organizational Decision Processes. Business & Information Systems Engineering, 6(5), 267-278.

Kuo, F.-Y. (1998). Managerial intuition and the development of executive support. Decision Support Systems, 24, 89-103.

Ngwenyama, O., & Bollou, F. (2010). Are ICT investments paying off in Africa? An analysis of total factor productivity in six West African countries from 1995 to 2002,. Information Technology for Development, 14(4), 294-307. doi:http://www.tandfonline.com/action/showCitFormats?doi=10.1002/itdj.20089

Orlikowski, W. J. (1992). The Duality of Technology: Rethinking the Concept of Technology in Organizations. Organization Science, 3(3), 398-427.

Pirttimäki, V. H. (2007). Conceptual analysis of business intelligence. South African Journal of Information Management, 9(2).

Pourmojib, L., Alizade, S., Ghorbani, Z., Hematian, K., Shafii, F., Khieri, A., & Gholami, T. (2013). An Overview of the Concepts of Business Intelligence (BI) and its Applications. Interdisciplinary Journal of Contemporary Research Business, 5(1), 1043 - 1052.

Rao, J. (2012, May 17). JAY RAO_1A Innovation & entrepreneurship facts. Retrieved from SlideShare.Net: http://www.slideshare.net/clustermanagers/jay-rao1a-innovation-entrepreneurship-facts

Rasiel, E. M., & Friga, P. N. (2002). The McKinsey Mind. McGraw Hill.

Saunders, M., Lewis, P., & Thornhill, A. (2012). Research Methods for Business Students (Sixth ed.). Italy: Pearson Education Limited.

Sterman, J. D. (2000). Business Dynamics. Systems Thinking and Modeling for a Complex World (International Edition ed.). Columbus: McGraw Hill Higher Education.

Tables

Table 1: Literature Summary

Topic	Conclusion	Source(s)
Big Data	Various organisations in Europe and UK have used big data analytics to build sustainable competitive advantage	(Davenport, 2006)
	However, not all organisations have been able to use big data to their advantage. Big data analytics, have also not been able to replace hypothesis testing, especially with regards to decision making in a changing environment	(Apgar, 2013), (Davenport, 2006), (Kowalczyk & Buxmann, 2014)
	In order to accelerate economic development, it is necessary to make competitive institution, which could derive innovation. Big data based IT therefore could contribute to sustainable economic development in the developing world	(Rao, 2012), (Höchtl, Parycek, & Schöllhammer, 2016), (Alves de Mendonça, Freitas, & de Souza, 2010)
Decision Making	Executive decision making in developed world is mostly intuitive as executives are busy people, and intuitive decision making is fast and requires less effort	(Bazerman & Moore, 2012), (Sterman, 2000), (Kuo, 1998), (Benbasat & Todd, 1993),
	Intuition is a psychological process of unconscious knowledge transfer about the perceptions developed from past experience	(Kuo, 1998)
	These perceptions are used to assess the environment and positioning of self in relation to the environment. Based on this questions are formulated based on inductive and deductive thinking, which follow actions	(Kuo, 1998)
	Therefore, intuition gives rise to mental models, which influence the decision. If managers and executives rely completely on intuition, they might develop biases which would result in wrong decisions being made	(Kuo, 1998), (Davenport, 2009)
	Knowledge is similar to intuition, however, knowledge focuses on learning, and therefore, always is aware of the mental models and may question them while learning	(Davenport & Prusak, 1998), (Davenport, 2009), (Kuo, 1998)
Business Intelligence & Information Management	Business intelligence systems, particularly, executive decision support systems, are the tools for collecting digital data, process and analyse it, and disseminate it for decision making.	(Pirttimäki, 2007), (Pourmojib, et al., 2013)
	So, essentially BI contains the supporting analytical tools that could be used to gather data and information to assess perception of	(Kuo, 1998), (Benbasat & Todd, 1993), (Höchtl, Parycek, & Schöllhammer,

	organisation and its position in its environment.	2016),
	However it has been observed in various industries that decision makers try to use the systems as less as possible, and rely mostly on intuition. This has not changed with introduction of big data into BI	(Kowalczyk & Buxmann, 2014), (Davenport, 2009), (Apgar, 2013), (Bazerman & Moore, 2012), (Benbasat & Todd, 1993), (Ngwenyama & Bollou, 2010)
Research on Using Big Data for Economic and Human Development	The theoretical research on big data and its impact on economic indicators present a mostly positive outlook. However, practical research previously done on adopting IT for productivity presents a less positive outlook	(Ngwenyama & Bollou, 2010), (Alves de Mendonça, Freitas, & de Souza, 2010), (Höchtl, Parycek, & Schöllhammer, 2016),