Making Sense of Business Intelligence: Proposing a Socio-Technical Framework for Improved Decision Making in Not-for-Profit Organisations

Dale MacKrell
University of Canberra, dale.mackrell@canberra.edu.au

Martijn Van Den Boogaard
Capgemini, martijn.vandenboogaard@gmail.com

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Dale MacKrell
Faculty of Information Sciences and Engineering
University of Canberra
ACT, Australia
Email: dale.mackrell@canberra.edu.au

Martijn van den Boogaard
Capgemini
Canberra
ACT, Canberra
Email: martijn.vandenboogaard@gmail.com

Abstract

The authors of this paper argue that human intuition alone cannot be relied upon for strategic decision making in today's business environment and that quality data intelligence is an imperative. The proposed project described in this paper is research-in-progress, action design research (ADR), to implement an appropriate information systems (IS) enabling enhanced organisational decision making. ADR is a new research method that draws on action research and design research in an organisational setting. In phase 1 of the project, a socio-technical 'sense-making' approach is used to gather and analyse information and decision needs in a not-for-profit (NFP) association, Connections ACT. In phase 2, requirements are designed and modelled to build a conceptual framework that guides NFPs in improving business performance and reporting capability. Phase 3 is the evaluative stage when the framework is reflected upon and refined, with intervention in the organisation's processes as a promising outcome.

Keywords

Business analytics, business intelligence, sense making, not-for profit, socio-technical.

INTRODUCTION

Not-for-profit (NFP) organisations are a critical part of the Australian economy and society. There are over 600,000 organisations operating nationally and more than 1 in 15 Australians work for a NFP[1]. Yet, we live in the information technology (IT) era and for many NFPs, making the most of technology in the conduct of the organisation's activities is a mystery. This is a serious problem because NFPs traditionally focus their energies on front-end service delivery activities but are required to demonstrate that they are achieving grant outcomes and meeting governance requirements. Therefore, NFP's require information systems (IS) such as business intelligence (BI) systems to fulfil their legal obligations.

While much IS research tends to focus on the design, development, implementation and use of a technical artefact or software product, the socio-technical approach, which brings into focus human interaction with technology in its social setting, suggests that the technology-driven approach to solving organisational IS needs can be counterproductive. Influences such as the organisation's preparedness to adopt a new IT system, and an organisation's way of working, deciding, managing and thinking about IS (organisational memory, intuition, experience, culture and so on), matter a good deal in determining whether the adoption of IS will be successful, and thereby fulfil its objective to improve organisational performance and reporting responsibilities. These sense-making factors are rarely taken into consideration in traditional IS research.

The **goal** of the proposed research is to design and build a conceptual framework that supports not-for-profit (NFP) organisations to improve business and reporting performance. It will achieve this by developing new knowledge about how NFPs make decisions, and what kinds of decision support technology are most appropriate for this process. In brief, the specific **aims** (as three study phases) are to:

Phase 1) **Identify the information requirements** of a NFP organisation using sense-making theories to understand its individual, organisational, social and cultural requirements for advanced technologies such as BI.

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[1] Source: http://www.probonoaustralia.com.au/

This is the socio-technical approach to IS implementation, distinct from the traditional technology-driven approach.

Phase 2) **Construct an analysis of IS needs** of the organisation as a business case from information requirements gathered in phase 1. This is based on appropriately modified for-profit frames of reference including business process models and mapping, gap analysis, and a technical roadmap to indicate organisational needs, directions, and progress on a timeline. As well, a conceptual framework will be constructed as an artefact to guide NFPs in the design and implementation of BI.

Phase 3) **Evaluate and transfer knowledge** by reflecting, refining and articulating the processes from phase 2 for replication in the NFP sector. The consequences of technology transfer into the NFP environment will be evaluated through a mid-range theory of technology appropriation.

The research project provides an opportunity to further build this approach as a more complete conceptual framework for small financially-constrained NFPs for whom the uptake of appropriate IS is an imperative. In this paper, the authors argue that intuition alone as a tool for long-term strategic decision making cannot be relied upon in today's business environment, and that the application of BI software for data storage, analytics, and reporting is essential for providing insight and understanding to make informed actionable decisions. This is followed by a discussion on the theoretic approaches in the study - sense-making, design science and technology appropriation - and action design science research as a research strategy.

BACKGROUND

This research project will be based on a case study of *Connections ACT* Incorporated. This organisation is keen to collaborate with the university on this project. The relationship between UC and *Connections ACT* began in early 2012, when the EO (Executive Officer) of *Connections ACT* approached the first author as Internship Convenor to assist with its deteriorating database systems.

Connections ACT, located in Mitchell, Canberra, is an NFP community organisation committed to helping needy families and communities, and to effective functioning in a government environment. *Connections ACT* utilises a paid workforce of 18 people to assist over 3,000 people annually through two services: CanFaCS, for single and homeless fathers and their children, and First Point, the central intake point for homeless in the ACT. Through these two services, data is generated in multiple media formats, which the organisation needs to regularly collate for purposes of organisational decision making and government reporting. IS in *Connections ACT* consist of:

- Excel program, Housekeeper, which stores data for managing properties for CanFaCS

- SQL database with Web-based interface built by a Melbourne-based external consultant for the collection of demographic data for First Point

- Outlook Web application for emails but with limited functionality

- Three Websites – *Connections ACT*; First Point; and CanFaCS

The data from these IS applications are not consolidated in a central data repository. This leads to poorly integrated and relatively inflexible business processes of significant consequence. On the one hand, these limited software applications lack the capability to support effective and efficient organisational and managerial decision making. On the other hand, and of even greater concern, are the legal implications. As the EO of *Connections ACT* indicated: "... without the data for reporting, we'd be in breach of our contract to the ACT Government [who] require this data". NFP organisations usually have limited resources. It is recognised that designing, building and implementing BI systems is costly and time-consuming. Klawans (2006) recommends open-source BI as a solution for avoiding those pitfalls with software freely available.

NFP associations are fundamentally different from organisations in the private sector. NFPs have different organisational structures and cultures, relationships with clients are different, as is the motivation of staff and volunteers (Kilbourne & Marshall 2005). The quality organisational data, not just for compliance reporting but also for strategic decision making, is often limited in these organisations for several reasons. Firstly, many smaller NFPs, given their inadequate human and financial resources compared with larger organisations, outsource their IT systems thus reducing their in-house IT capabilities. Secondly, the elementary nature of NFP's data collection, storage, analysis and reporting methods and systems often results in data replete with errors, duplications and omissions. Thirdly, data is frequently located in several media forms including paper-based (letters, memos, documents etc) and electronic-based (spreadsheets, texts, emails etc), making it difficult to collate or understand holistically for performance query and reporting purposes. These issues are critical to rectify if a NFP is to be able to attract continued funding, yet it is not so easy since data needs to be integrated and consolidated (Merkel et al. 2007).

LITERATURE REVIEW

The world is on the cusp of a data revolution. The number of people and devices interconnected is set to grow massively in the next few years. All this data is creating an opportunity for business intelligence (BI) to become essential in the decision-making process with the aim of improving the outcome of these decisions. The scholarly literature contains numerous definitions of BI. Watson (2009, p.491) characterises BI systematically as "… a broad category of applications, technologies and processes for gathering, storing, accessing, and analysing data to help business users make better decisions". Wells (2008, p.2), on the other hand, claims BI gives an organisation the ability "... to reason, plan, predict, solve problems, think abstractly, comprehend, innovate, and learn ...".

Business Analytics or Business Intelligence

Business analytics (BA) is the latest buzzword for promoting applications that aim to assist businesses in unlocking the potential available in existing data. While a search for the words 'business analytics' will generate abundant results, a clear definition is almost impossible to find. Nevertheless, there seems to be a consensus on what business analytics is trying to achieve: "... provide the insight and understanding to support informed decisions and confident actions, and provide the feedback that is needed to create a learning organization" (Wells 2008, p.3).

An accepted distinction between BI and BA is that BI focuses on a consistent set of metrics to measure past performance and guide business planning while BA focuses on developing new insights and understandings. Nevertheless opinions vary. Turban, Sharda and Delen (2011) position BA as a subset of BI between the data warehouse environment and performance reporting. Davenport (2010), on the other hand, considers BA to be the use of data analysis for performance reporting. Wells (2008), however, describes BA as an integral part of BI, extending through the knowledge stage for analysis and understanding as in Figure 1. In this paper, we are not so concerned with these various viewpoints and even use the terms interchangeably, primarily recognising the value to be gained from BA when BI systems are adopted.
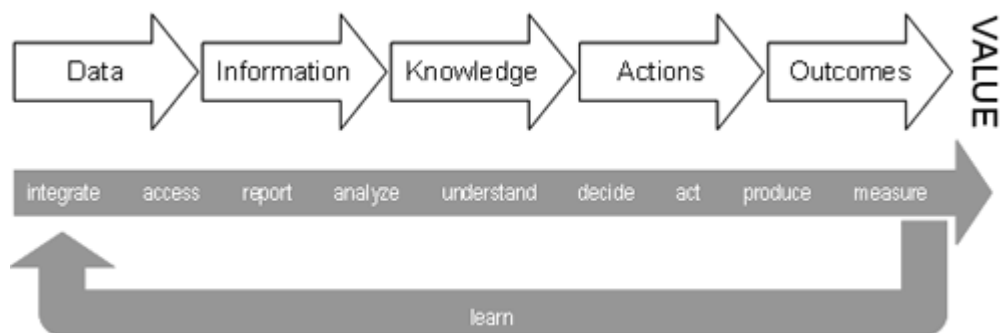

Figure 1: Business Analytics – Getting the Point (Wells 2008)

Businesses are cautious about IS investments, and demand that IS applications provide solutions and benefits to business problems. Most BI benefits are intangible since studies have shown that companies do not necessarily regard cost or time savings as primary benefits when investing in BI systems (Negash 2004). When implemented correctly, BA has been able to provide value through revealing new and purposeful patterns in existing, often historical data (Kohavi et al. 2002) that have not been recognised before and are counter-intuitive. These analytical techniques in combination with lessons learned from the past afford the insight to make successful informed strategic decisions. Another important driver for BA is the usability of tools. Online Analytical Processing (OLAP) tools are traditionally difficult to use for the average manager. The new generation of BA tools seeks to improve the ease of use and aligns the tools with business needs enabling managers in all levels of the organisation to leverage the value of BA (Kohavi et al. 2002). Despite the importance of tools and techniques, there is a reliance on analysts to apply logic and mental processes to deliver business value from the data. While the sole use of BA will not guarantee success, it will ensure a competitive edge for businesses trying to unlock new markets or improve on existing markets. Like any other decision support systems (DSS), BA used in conjunction with suitable tools and techniques will assist the decision maker to make more effective decisions (Alavi & Henderson 1981).

Businesses are wary of idealistic software solutions and performance improvement promises by software vendors. This wariness arises from a history of failed BI projects that did not deliver the return on investment which businesses were promised. Furthermore, in recent years, BI in organisations has been maturing.

Businesses now expect more value out of IS/IT departments, and IS applications must serve to solve business problems instead of IS problems solely (Caulfield 2008). As the CIO's role is now more about strategy than technology, IS in turn is becoming more about business than technology (IBM 2009).

With BI applications touted as the key to many strategic decision-making issues, it is important not to forget the human factor. The problem is that strategic decision making demands insight. Insight can be discovered from information but without the interpretation of human beings, the information is, in most cases, worthless. The facts and figures should be interpreted and not taken at face value. With knowledge of the domain area, the business user is the expert who will be able to turn the information into actionable data. However, the challenge is to have business leaders accept the importance of analytics and rely less on 'entrepreneurial impulses' (Davenport 2006, p.7). Consequently, it will take a cultural shift to embed BI in the decision-making processes of an organisation.

Intuition and Decision Making

There are times where people in business have an idea that enters their head, an emergent revelation that clarifies an issue under consideration. This unconscious revelation is also known as intuition and has been the subject of study for a number of years (Gobet & Chassy 2008; Agor 1986; Bonabeau 2003). Research shows that intuition should not be seen as something 'magical or mystical' (Burke & Miller 1999, p. 91; Khatri & Ng 2000, p. 3), or based on sixth sense (Prietula & Simon 1989). Similarly, Sinclair and Ashkanasy (2005) argue that intuition implies an absence of any awareness of the process used to reach a conclusion. Rather intuition is supported by past experience (Khatri & Ng 2000), based on 'learned behaviour sequences' (Isenberg 1984, p. 85), involving a deep knowledge of the problem domain (Dane & Pratt 2007) which taps into the patterns of information buried deep inside the unconscious (Klein 2003). Burke and Miller (1999, p. 93) assert that "intuition may be thought of as a cognitive conclusion based on a decision maker's previous experiences and emotional inputs."

Intuition causes decision makers to feel fulfilled when a successful decision is made purely by using intuition. It is associated with higher levels of management and lifts organisational decision making out of the dull world of 'number crunching' and spreadsheet calculations (Bonabeau, 2003 p. 118). Cartwright (2004) states intuition becomes more useful and necessary higher in the organisational hierarchy. Consequently, managers in executive positions find themselves alone at the top, as they feel they have the sole ability and experience that allows them to make strategic decisions based on intuition. As a result, people perceive their managers as a special breed of people who have mastered their abilities to the highest degree, a guru.

This segregation of low and high level management is explained by the fact that managers may start out thinking analytically, before they gather the requisite experience to rely on intuition. Only after a significant time in the workplace, once managers have attained the relevant experience, can they rely on intuition (Cartwright 2004). This is attested by Fernández-Aráoz (2007) who argues that relying on intuition without having proper experience will most likely result in poor decisions, although situations of turbulence (instability, randomness, and uncertainty) increase the reliance on intuition and heuristics (Weick 1995, p.88). Duggan (2007) describes two different types of intuition: (1) expert intuition, which is swift and works in known situations, and (2) strategic intuition, which is slower and works in new situations. However, strategic decisions rarely need to be made overnight and are more effective with considerable thought. This style of intuition contradicts the idea of intuition being a sudden revelation.

In today's organisations, a large number of managers still depend on intuition rather than data as input for strategic decisions (Bonabeau 2003). More than 45% of managers rely on intuition when making strategic decisions in an organisation (Bonabeau 2003; Burke & Miller 1999). Agor (1986) argues that managers who are skilled in the use of intuition have an increasing ability to recognise opportunities in any given situation, and this technique works best in 'rapidly changing environments or crisis settings.' Furthermore, Agor (1986) describes how top managers rely on intuition and therefore they have a general feeling that intuition is invaluable in certain circumstances.

The authors of this paper argue that intuition as a device for long term strategic decision making cannot be relied upon solely in today's business environment. Although there is a place for intuitive decision making, nevertheless, with a growing amount of data and increasing complexity of data relatedness, intuition combined with business analytics in BI software convincingly adds value to effective and efficient decision making.

Sense Making and Decision Making

Having established that intuition is linked with decision making, we now ascertain the link with sense making. Sense making, as explained by Weick (1995), is the process by which people reduce the complexity of their environment to a level they can understand and by which people as human actors give meaning to experiences. Sense making differs from interpretation since sense making applies at an earlier more tentative stage than

interpretation. People draw from their experiences to use what they know for interpreting problematic situations that are ambiguous, uncertain and make no sense. In so doing, they seek and exchange information, ascribe meanings, interpret and explain situations, to determine the required action (Weick 1995). While courses of actions imply the making of decisions, a decision is actually based on locating, articulating and ratifying an earlier determination, being "an act of interpretation rather than an act of choice" (Weick 1995, p.185). Sense making takes place at a different time to decision making. Sense making is backward looking, making things that have already happened meaningful, while decision making is forward looking, concerned with making a choice amongst alternative courses of action (Boland, 2008). Feldman (1989; cited in Weick 1995, p.5) insists that sense making does not necessarily result in action, claiming that it "may result in an understanding that action should not be taken or that a better understanding of the event or situation is needed".

Through sense making, people give meaning to the events and actions of an organisation. Choo (1996, abstract) claims that people use "information strategically in three ways: to make sense of changes in the environment; to create new knowledge for innovation; and to make decisions about courses of action". These three ways interweave a rich explanation of organisational information use. On the other hand, as du Toit (2003, p.28) claims, while sense making brings shared objectives and activities to an organisation, prevailing sense-making systems can act as filters which actually hinder new knowledge being embraced and past knowledge being adapted.

Sense making is not necessarily about truth and getting it right since sense making is driven by plausibility rather than accuracy (Weick 1995). Weick, Sutcliffe and Obstfeld (2005, p.141) insist it is about "continued redrafting of an emerging story so that it becomes more comprehensive ...". Weick (1995, p.61) asserts "... an obsession with accuracy seems fruitless, and not of much practical help, either". Certainly, studies assessing the accuracy of managers' decisions are rare and when they are done, suggest that perceptions of managers are highly inaccurate (Weick 1995, p.55; Weick, Sutcliffe & Obstfeld 2005, p.147). Along with sense making at organisational levels, Weick (1995, p.6) notes the occurrence of sense making in individual, social and cultural activities. Dervin (1998; 2003) investigated individual sense making during human-computer interactions in the context of understanding the practices of users for information design. Dervin's theory of sense making, in particular concepts of cognitive situations, and metaphorical 'gaps' and 'bridges' are loosely applied as sensitising devices in the study to analyse the interview data of participants in the study.

THEORETICAL FRAMEWORK

There are three dominant theories used in the three phases of the proposed study. These theories – sense making, design science and technology appropriation - are discussed below.

Phase 1: Sense making

In this phase, the theoretic perspective of sense making adopted by the authors is based primarily on the work of Cecez-Kecmanovic, Bunker and Jap (2008), derived from Weick (1995) and well established in organisation science research. Cecez-Kecmanovic et al. (2008) assert it is useful to distinguish the characteristics of four types of sense making: these are the inter-subjective level (**social**), extra-subjective level (**cultural**), intra-subjective level (**individual**), and generic-subjective level (**organisational**). The social activities of sense making, are depicted by Cecez-Kecmanovic et al. (2008, p.4) as social interactions by human actors who "co-create shared, collective meanings of events and situations, based on which they may take joint or coordinated actions". The cultural aspects of sense making are described by Cecez-Kecmanovic et al. (2008, p.4) as an "abstract idealised organising framework transmitted through social interaction, common experiences and socialisation of organisational members ... to provide a reservoir of background knowledge ...". An individual has "thoughts, beliefs, feelings, desires, intentions, knowledge, skills, etc that determine how he or she makes sense" (Cecez-Kecmanovic et al. 2008, p.4). In any organisation, there are "common generic meanings related to institutional roles, norms and rules ... decision-making processes ... and the like" (Cecez-Kecmanovic et al. 2008, p.4). At the organisational sense-making level, selves are left behind and meanings are synthesised into generic meanings through social interaction (Wiley 1994, p.258).

Cecez-Kecmanovic, Bunker and Jap (2008) have applied this theoretical perspective to for-profit organisations but little research has been done in the fields of decision support technologies and NFP associations (MacKrell 2012). NFPs tend to have limited resources and capabilities to implement these systems despite a critical need for better decision making (Kilbourne & Marshall 2005; MacKrell, Houghton & Campbell 2011).

Phase 2: Design Science

In this phase, a business case and other IS planning documents for *Connections ACT* as well as a conceptual framework to guide NFPs in the design, development and implementation of advanced IS such as BI will be designed and developed based on the analysis of participant interviews and documents captured in phase 1. There is ongoing debate in IS as to whether design science is about the IT artefact - technology-centred as hardware, software, models, processes and the like - or whether design science is human-centred, that is,

incorporating the social, political, and cultural dimensions associated with a technical artefact. The authors of this paper agree with McKay, Marshall and Heath (2010) who advocate that both standpoints have a place as the socio-technical view. This aspect of the study falls within the mid-range theory type v for design and action in Gregor's taxonomy of IS theory (Gregor 2002) in design science research.

Phase 3: Theories of Appropriation

In phase 3, the development of a conceptual framework to guide NFPs into implementing advanced IS such as BI will be examined using theories of technology appropriation (Orlikowski 2000). NFPs tend to have limited resources and capabilities to implement these systems despite a critical need for better decision making (Kilbourne & Marshall 2005). The consequences of technology transfer into the NFP environment will be examined through theories of technology appropriation (Fidock, Carroll & Rynne 2010). This framework represents the process of appropriation through which technology is embedded with social and organisational practices.

RESEARCH METHODOLOGY

The guiding aim of the proposed study is to build a conceptual framework for understanding how to develop organisationally meaningful advanced IS (such as a BI system) in a local NFP, *Connections ACT*. The authors were keen to employ a participatory action research approach as a reflective and reflexive process of progressive problem solving. This involves actively participating in an organisational change situation whilst conducting research and is an appropriate research method for the study since the intention is to bring about change in the workplace while learning as research from the process (Bhattacharjya & Venable 2006). Tenets of action research include proper documentation, explicit criteria before conducting the study, and a mutually acceptable ethical framework (Avison, Lau, Myers & Nielsen 1999).

Given the technology-driven and prescriptive nature of much IS design science research (Kuechler & Vaishnavi 2012), this project takes a socio-technical point of view in an effort to comprehensively extend knowledge capture into a societal context, cognizant of the words of Hevner, March, Jinsoo, and Ram (2004, p.99) that "the existing knowledge base is often insufficient for design purposes and designers must rely on intuition, experience, and trial-and-error methods". Sein, Henfridsson, Purao, Rossi and Lindgren (2011) offer a new method for IS design science research called action design research (ADR). ADR is a research method for generating "design knowledge through building and evaluating ensemble IT artefacts in an organisational setting" (Sein et al. 2011, p.40). This method may be a means of overcoming the problems of paradigmatic assumptions associated with combining action research with design science research (Iivari & Venable 2009), and is a challenge which the authors intend to explore further in the study. ADR appears to satisfy the requirements of the study to attain both societal relevance (phases 1 and 3) and technological rigour (phase 2) when designing and constructing an innovative technological artefact in an organisational setting.

Interviews with *Connections ACT* participants will be conducted in phases 1 and 3 of the study from vantage points: executive and senior management, administrative and operational staff, and clients and IT support. The interviewees will be drawn from seven groups of stakeholders, as follows:

1. *Connections ACT* – CEO and Business Manager to provide insight into a range of strategic issues (policy, governance etc)

2. CANFacs – 2 staff in administration roles

3. FirstPoint co-located with Housing ACT Belconnen – 2 staff to provide insight into the operational aspects

4. *Connections ACT* Management Group – 2 members to provide a more objective view

5. Clients of *Connections ACT* – 2 clients and opinion of services, processes etc

6. University (1) BI expert and (1) BA expert to advice the authors on technical and business matters

7. *Connections ACT* IT person and IT external consultant if possible to discuss existing database and outsourcing arrangements

The interviews will be semi-structured, face-to-face, in-depth, and of 30 to 75 minutes duration. An interview guide to steer the interviews will be prepared in advance. Interviews will be at locations suitable to participants and audio recorded for purposes of accuracy and permanency. The first author had used this approach in previous research and was confident it can yield the rich data needed to understand and conceptualise the problem of human and organisational interaction with IS. In keeping with its socio-technical standpoint, the proposed study will employ qualitative methods to analyse the information and decision needs of *Connections ACT*. Codes used

in the analysis will be short phrases or words related to concepts or themes drawn from the literature and theoretical frameworks (Saldana, 2009).

CONCLUDING SECTION

This project makes a significant contribution in both theoretical and practical ways. For theory, the project will offer a conceptual framework that takes into account the importance of human agency and interaction with IS, specifically in the NFP sector. This socio-technical contribution is an important one in which scholars are emerging leaders in the field; the neglect of the 'human factor' in much of the IS and IT literature often results in technology-driven solutions that are costly, inappropriate and redundant for organisations seeking to implement them. For practice, the business case will be specific to *Connections ACT* yet at the same time transferable to the NFP sector.

This research project is also innovative in its conceptual and methodological approach. An inductive and socially-embedded approach to developing IS solutions, which are grafted on the organisation's ways of sense-making, is a new way of thinking in this area. An appropriate means of investigating and implementing these "social systems only technically implemented" (Goldkuhl & Lyttinen 1982) is by the action design research method, which involves both the researcher and participants in collecting and analysing data and arriving at technical solutions. It is for this reason that the project is methodologically innovative on one hand, and innately collaborative between the authors and *Connections ACT* on the other hand.

REFERENCES

ACTCOSS, 2003. *The Contribution of Community Services to the ACT Economy*. ACT Council of Social Service Incorporated.

Agor, W. 1986. "The logic of intuition: How top executives make important decisions" *Organizational Dynamics*, (14:3), pp.5-18.

Alavi, M. and Henderson, J. 1981. "An Evolutionary Strategy for Implementing a Decision Support System" *Management Science.* (27:11), pp.1309-1323.

Avison, D., Lau, F., Myers, M. and Nielsen, P. 1999. "Action Research" *Communications of the ACM.* (42:1), pp. 94-97.

Boland, R. 2008. "Decision Making and Sensemaking" ed. Burstein and Holsapple, *Handbook on Decision Support Systems 1.* pp.55-63.

Bonabeau, E. 2003. "Don't Trust Your Gut". *Harvard Business Review.* (81:5), pp.116-123.

Burke, L. and Miller, M. 1999. "Taking the mystery out of intuitive decision making". *Academy of Management Executive.* (13:4), pp. 91-99.

Cartwright, T. 2004. *Developing Your Intuition - A Guide to Reflective Practice.* Center for Creative Leadership, Greensboro.

Caulfield, H. 2008. "Business intelligence by the numbers" iStart. Retrieved from http://www.istart.com.au/index/HM20/AL213/AR211126

Cecez-Kecmanovic, D. 2004. "A sensemaking model of knowledge in organisations: a way of understanding knowledge management and the role of information technologies". *Knowledge Management Research & Practice*, 2, pp.155-168.

Cecez-Kecmanovic, D., Bunker, D. and Jap, T. 2008. "Business Strategy Enactment through an IS: A Sensemaking Approach". *Proceedings of the 16th European Conference on Information Systems (ECIS).* Galway Ireland.

Cecez-Kecmanovic, D. and Jerram, C. 2002. "A Sensemaking Model of Knowledge Management in Organizations", *Proceedings of the 12th European Conference on Information Systems (ECIS),* Gdańsk Poland.

Dane, E. and Pratt, M. 2007. "Exploring Intuition and Its Role in Managerial Decision Making". *Academy of Management Review.*, (32:1), pp.33-54.

Davenport, T. 2006. "Competing on Analytics". *Harvard Business Review.* (84:1), pp. 98-107.

Davenport, T. 2010. *The New World of 'Business Analytics',* International Institute for Analytics.

Dervin, B. 1998. "Sense-making theory and practice: an overview of user interests in knowledge seeking and use", *Journal of Knowledge Management.* (2:2), December.

Dervin, B. 2003. "Chaos, Order, and Sense-Making: A proposed theory for information design". In B. Dervin & L. Foreman-Wernet with E. Lauterbach, (Eds.). *Sense-Making Methodology Reader: Selected writings of Brenda Dervin*, pp.325-340, Hampton Press, Cresskill NJ.

Duggan, W. 2007. *Strategic Intuition: The Creative Spark in Human Achievement*, Columbia Business School Publishing, New York.

Fernández-Aráoz, C. 2007. *Great People Decisions: Why They Matter So Much, Why They are So Hard, and How You Can Master Them*, John Wiley & Sons, Hoboken.

Fidock, J., Carroll, J. and Rynne, A. 2010. "Evaluating Information Systems: an appropriation perspective", in D. Hart and S. Gregor (Eds). *Information Systems Foundation: The Role of Design* Science, ANU ePress, Canberra ACT.

Gobet, F. and Chassy, P. 2008. "Expertise and Intuition: A Tale of Three Theories" *Minds and Machines*, (19:2), pp.151-180.

Goldkuhl, G. and Lyttinen, K. 1982. "A Language Action View of Information Systems", *Proceedings of the 3rd International Conference on Information Systems (ICIS).*

Gregor, S. 2002. "Design Theory in Information Systems", Australasian Journal of Information Systems, Special Issue, December, pp.14-22.

Hevner, A. R., March, S. T., Jinsoo, P., and Ram, S. (2004). "Design science in information systems research". *MIS Quarterly*. (28:1), pp.75-105.

IBM 2009. "The New Voice of the CIO - Insights from the Global Chief Information Officer Study" Retrieved from http://www-935.ibm.com/services/us/cio/ciostudy/

Iivari, J. and Venable, J. 2009. "Action research and design science research – Seemingly similar but decisively dissimilar". *Proceedings of the 17th European Conference in Information Systems (ECIS).* Verona Italy.

Isenberg, D. 1984. "How senior managers think". *Harvard Business Review*, (62:6), pp.81–90.

Khatri, N. and Ng, H. 2000. "The Role of Intuition in Strategic Decision Making" *Human Relations*, (53:1), pp.57-86.

Kilbourne, W. and Marshall. K. 2005. "The Transfer of For-Profit Marketing Technology to the Not-for-Profit Domain: Precautions from the Theory of Technology". *Journal of Marketing Theory and Practice*, (13:1), pp.14-25.

Klawans, B. 2006. "Saving Time and Money – Why Open-Source BI Makes Sense", *Business Intelligence Journal*, (11:4), pp.18-24.

Klein, G. 2003. *The Power of Intuition: How to Use Your Gut Feelings to Make Better Decisions at Work.* The Doubleday Publishing Group.

Kohavi, R., Rothleder, N. and Simoudis, E. 2002. "Emerging trends in business analytics". *Communications of the ACM.* (45:8).

Kuechler, W. and Vaishnavi, V. 2012. "A Framework for Theory Development in Design Science Research: Multiple Perspectives". *Journal of the Association of Information Systems*, (13:6), pp.395-423.

McKay, J., Marshall, P. and Heath, G. 2010. "An exploration of the concept of design in information systems", in D. Hart and S. Gregor (Eds). *Information Systems Foundation: The Role of Design* Science, ANU ePress, Canberra ACT.

Merkel, C., Farooq, U., Xiao, L., Ganoe, C., Rosson, M. and Carroll, J. 2007. "Managing technology use and learning in non-profit community organizations: Methodological challenges and opportunities". *Proceedings of the Computer Human Interaction for Management of IT (CHIMIT) Conference.* Cambridge, MA.

Negash, S. 2004. "Business Intelligence" *Communications of the Association for Information Systems*, (13), pp.177-195.

Orlikowski, W. 2000. "Using Technology and Constituting Structures: A Practice Lens for Studying Technology in Organizations". *Organization Science*, (11:4), pp.404-428.

Prietula, M. and Simon, H. 1989. "The Experts in Your Midst". *Harvard Business Review*, (67:1), pp.120-124.

Saldana, J. 2009. *The Coding Manual for Qualitative Researchers*. Sage Publications, Thousand Oaks CA.

Sein, M., Henfridsson, O., Purao, S., Rossi, M., and Lindgren, R. 2011. "Action design research". *MIS Quarterly*, (35:1), pp.35-56.

Sinclair, M. and Ashkanasy, N. 2005. "Intuition: Myth or a Decision-making Tool?" *Management Learning*, (36;3), pp.353-370.

Watson, H. 2009. "Business Intelligence - Past, Present, and Future", *Communications of the Association for Information Systems*, 25, article 39, pp.487-510.

Wells, D. 2008. "Business analytics – Getting the Point" BeyeNetwork. Retrieved from http://www.b-eye-network.com/view/7133

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