EMBA 10

Dissertation

"The value proposition of Mobile Business Intelligence in question"

Presented to

The Graduate School of Business

University of Cape Town

In partial fulfilment of the

Executive MBA 10

By

Stéphane PIMIENTA

For

Prof. Tom RYAN

Created By: Stéphane PIMIENTA – PRNSTE003

Total pages: 132

UCT GRADUATE SCHOOL OF BUSINESS

UNIVERSITY OF CAPE TOWN

GRADUATE SCHOOL OF BUSINESS

APRIL 5 2010

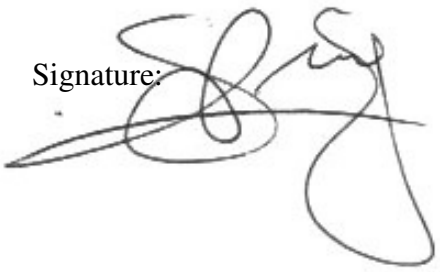
DECLARATION

1. I know that plagiarism is wrong. Plagiarism is to use another's work and pretend that it is your own.

2. I have used a recognised convention for citation and referencing. Each significant contribution and quotation from the works of other people has been attributed, cited and referenced.

3. I certify that this submission is all my own work.

4. I have not allowed and will not allow anyone to copy this essay with the intention of passing it off as his or her own work.

Signature:  Date: May 9 2010

UCT GRADUATE SCHOOL OF BUSINESS

Abstract

"The value proposition of Mobile Business Intelligence in question"

While mobile technologies are spreading exponentially in work and life context, while Business Intelligence (BI) practices are generalizing in business organization, while major BI vendors have Mobile BI offering in place and despite an increase of mobile workers, Mobile BI uses remain extremely anecdotal. The level of adoption of Mobile BI is not consistent with the rapid expansion of its related technologies, mobile and BI. However, business users are actually aware of the functionality which is usually part of the standard functionalities they expect from a BI solution. Nevertheless, only few implement Mobile BI as part of a larger BI initiative and even fewer make this functionality their central initiative.

Based on this observation we can wonder why Mobile BI practice is not taking off. This question is raising a major concern which is the value proposition of such functionality.

This research is aiming to explore the intrinsic value proposition of Mobile BI. I am not concerned about the value proposed by software vendors or by consultants or analysts. Neither am I concerned about the current perception of value from the users' perspectives. The research is aiming to reveal the mechanisms influencing the level of added value of Mobile BI because it is not clear whether it is actually bringing significant value to the business user. The question I am answering in this dissertation is the following: "To what extent could Mobile Business Intelligence add value to the final business user?"

As a professional of the Business Intelligence market, I am concerned about the evolution of the market and more particularly regarding the area of innovation that can generate business opportunities. I thus chose this topic to give me the opportunity to apply my EMBA learning onto a concrete and tangible subject which could raise new business ideas.

This research project has been conducted according to the following theoretical framework. I chose to adopt *Post-Positivism* and more particularly the *Critical Realism* (Bhaskar, 1975) research approach because I am aiming at discovering the observable and non-observable mechanisms generating the events I identified in the market. From an ontological perspective, I consider that I know that reality is only imperfectly comprehensible and therefore I need to triangulate from many sources of information to get to know it. From an epistemological perspective, I believe that the findings of my research are possibly true but that they are

potentially tinted with my own beliefs and values. From a methodological perspective, I chose to adopt the Qualitative approach and more specifically the *Grounded Theory* approach (GT) (Glaser & Strauss, 1967) as the research methodology. I integrated GT with *Soft Systems Methodology* (SSM) (Checkland, 1981) to allow me working with various perspectives. SSM proposes a creative, intuitive approach to problem-solving, where the outcomes are learning and a better understanding, rather than just providing 'a solution'.

Additionally, I used complementary systems thinking methodologies or approaches to enrich the methodological framework. One of them is *Critical Systems Heuristic* (Ulrich, 2005) that I used to determine the "boundary judgments" i.e. the 'reference system' which gives meaning to the situation and conditions its validity. I also used *Work Systems* from Hoebeke (Hoebeke, 2000) to help me categorize the perspectives of the various stakeholders and give a complementary light on the purposes, the values and the individual reference systems.

The paper is organized in five Chapters. In Chapter I, I present the context of the research and give an overview of the research using the SCQArie structure: the research Situation, the Concern, the research Question, the Answer and an Evaluation of the research in three points, the Relevance, the Implications in terms of utility and trustworthiness and the Ethical implications. In Chapter II, I present a literature review aiming at situating my research findings into a broader body of knowledge. In Chapter III, I describe the integrated methodological framework I built for the realization of the research and the rationale behind these choices. In Chapter IV, I describe the Answer to the research Question. This is the research results presented in the form of a theory. In the last chapter, Chapter V, I conclude the research by comparing the theory to the reality to come up with recommendations. I finally discuss the meaning and implications of the findings as well as an evaluation of my work.

The application of the research framework allowed me to collect and analyze information on the value proposition of Mobile BI. I collected data through an iterative process consisting of observation, interviews, and readings. I analysed and coded the data gathered to come up with categories. After several reduction processes, I finally extracted four core categories which compose my Theory. In the form of a Causal Loop Diagram (CLD) the Theory accounts for the real world mechanisms driving the value added by Mobile BI to the business user.

The first variable requires Mobile BI to be *appropriate for new work style*. Whether the solution proposed to the final user allows him to properly face the challenges generated by new business practices is a central concern. In order to be considered as a valuable business solution, Mobile BI will first have to fulfil the requirements for mobile activity such as usability, constant connectivity, portability or security of information. It will also have to

offer strong collaborative capabilities to ensure communication and coordination with other team members while in situations of mobility. Mobile BI solutions will have to enable pervasiveness of business information to ensure seamless information flows. Mobile BI will have to offer the user the instrument to increase his reactivity and his performances.

The second variable addresses the requirements for Mobile BI to be *consistent with new social paradigms*. New social models are emphasizing immediacy and pervasiveness of information, new communication flows and the quest for ubiquity of individuals. Mobile BI will have to be consistent with these values if it wants to convince business users. Mobile solutions will need to be conducive to social networking, i.e. propose collaborative capabilities allowing the user to establish and maintain the contact with other members of his/her community. Technological solutions will have to be "physically and cognitively available" (Waller & Johnston, 2009, p. 130) so that its use remains easy, natural thus efficient. Mobile BI solutions have to provide the ability to reduce space and optimize time to respect the new pace of communication and life in general. This will mainly be ensured by constant connectivity and the respect of a balance between apparent simplicity and sophistication of functionalities.

The third variable requires Mobile BI to deliver the *ability to react on the go*. In order to maximize this ability, Mobile BI must provide high levels of interactivity. First, interactivity between the user and the information by providing powerful simulation capabilities to anticipate consequences of decisions, sophisticated Human Computer Interfaces (HCI) to offer the user complete functionalities in a user friendly environment, rapid response time to be able to react on time to business requests. Then, Mobile BI must provide interactivity between the user and his environment mainly in the form of collaborative capabilities allowing collaboration, coordination and communication. Finally, Mobile BI must be able to provide interactivity between the device and its environment by means of context-awareness capabilities.

The fourth and last variable requires Mobile BI to *offer Operationality.* Business Intelligence has long been a strategic decisions enabler for top managers. It has now expanded at all levels of the organization and is becoming an operational instrument as well. Mobile BI will then have to provide specific capabilities in order to be seriously considered by operational users. It will have to offer real time or near real time information and capacity of intervention for the user. As a result, it will have to interoperate with other IT systems, mainly transactional systems. The quality, freshness and exhaustivity of information will be critical to give the required reaction capacity to the user. Providing collaborative capabilities will also participate in action taking and consequences control beyond the decision. Finally, in order to ensure the operationality of the solution, it will have to maximize the user experience to increase the usability in situations of mobility.

Through this research, I gained the conviction that Mobile BI could deliver high value added to the business users. Even though critical improvements are required to maximize the potential of these mobile practices, the evolution toward unique solutions suitable for local and remote use is inevitable. As a professional of Business Intelligence I learnt through this research that it is too soon now to expect immediate expansion of these practices. Technological, organizational and cultural limitations make the current solutions incomplete. But, soon, various drivers such as technological innovations (tablets) or development of Operational BI will give Mobile BI its credibility.

The primary intention of this research was to contribute to the body of knowledge around the value proposition of a specific domain of my market, the Mobile BI. I approached the topic from a perspective of value generation for which I have not been able to find similar examples in the literature. Additionally, I extracted actionable knowledge from the study which could be used by the various stakeholders to improve the problem situation. In that sense, I believe my research fulfilled its objectives.

UCT GRADUATE SCHOOL OF BUSINESS

Table of contents

UCT GRADUATE SCHOOL OF BUSINESS

Illustration index

UCT GRADUATE SCHOOL OF BUSINESS

Glossary of Terms

BI: Business Intelligence

CAGR: Cumulated Annual Growth Rate

CLD: Causal Loop Diagram

CSH: Critical Systems Heuristic

DCS: Demand-Control-Support

DSS: Decision Support System

DWH: Data Warehouse

EIS: Executive Information Systems

EPM: Enterprise Performance Management

GPS: Global Positioning Systems

GT: Grounded Theory

HCI: Human Computer Interfaces

IT: Information Technology

OLAP: On-line Analytical Processing

PDA: Personal Digital Assitant

POS: Point Of Sale

ROI: Return On Investments

SMS: Short Message System

SSM: Soft System Methodology

UCT GRADUATE SCHOOL OF BUSINESS

Acknowledgments

EMBA at UCT has been an amazing experience to me. It has been an incredible journey out of my mental and physical borders, in a foreign language and above all, out of my usual mind-set! It allowed me expanding my boundaries and comprehending the world differently. I can say with no hesitation that the EMBA learning transformed me in a way I couldn't imagine. It affected the way I think, the way I deal with others, the way I react to surrounding events, the way I consider myself and my abilities. It is difficult to objectively and precisely measure the changes I've experienced, first, because the subject of study is me and my subjectivity may alter reality, second, because time goes and some learning became so natural, almost evident, that it is difficult to imagine other way, as if I always applied these principles.

EMBA journey has also been one of the most hectic period of my life. As most of my peers, in parallel of an extremely demanding program, I had to face a very challenging professional environment, heading a small and dynamic consulting company and also had to preserve as much time and space as possible for my family.

I would like to direct my profuse thanks to Caroline, my wife, for providing me the support I needed to go through the process and for magically creating an environment free of constraints and pressure to allow my coping with my EMBA and professional obligations. Without her love and faith, I wouldn't have been able to make it. I would also like to thank my children Apolline and Célestin for their patience and understanding for my long absence during modules and my too limited availability during intermodules. I'm particularly sorry that I had to leave for Africa only two months after your birth, Célestin and that I could not attend your second birthday, Apolline.

Thank you also to my parents and my brother who believed in me and provided me with the energy I needed to face the challenge and complete the program.

I'm also very grateful to Christophe Viarnaud who convinced me to follow the EMBA and encouraged me, in his manner, during the program.

I would like to thank all the contributors quoted or not in this paper who provided me with brilliant reflexion and interesting perspectives on this topic. A special thanks to Lindsay Wise (Wise Analytics), Alexandre Schneider (Prelytis), Madan Sheina (Ovum), Philippe Nieuwbourg (Nieuwbourg) and David Hatch (Aberdeen).

I would like to thank my EMBA peers for their contribution, their support and their friendship. Finally, I would like to thank all EMBA staff for their support, guidance and dedication for making us more effective executives and better people.

CHAPTER I. INTRODUCTION AND OVERVIEW

The objective of this section is to present an overview of the research topics and the key findings. I am first introducing my personal background in relation with the research subject. I also give a short description of the research framework I choose to deal with the research.

I - 1 CONTEXT AND ORGANIZATION OF THE RESEARCH

1 - a ***Background of the research***

I am CEO of a consulting firm I founded with associates in 2004. After almost 5 years of hard work to develop the company I decided to apply to UCT EMBA to give me the opportunity to step back from my work and challenge the way I was thinking and making decisions.

As a professional of the Business Intelligence market, I am concerned about the evolutions of the market and more particularly regarding the area of innovation which can generate business opportunities. I thus choose this topic to give me the opportunity to apply my EMBA learning onto a concrete and tangible subject that could raise new business ideas.

1 - b ***Research paper layout***

This paper is organized around five chapters.

In the current chapter, Chapter I, I present the context of the research and give an overview of the research using the SCQArie structure: the research Situation, the Concern I am dealing with, the Research Question and Answer, further detailed in Chapter 5 and an Evaluation of the research in three points, the Relevance, the Implications in terms of utility and trustworthiness and the Ethical implications.

In Chapter II, I present a literature review aiming at situating my research findings into a broader body of knowledge.

In Chapter III, I describe an integrated methodological framework I built for the realization of the research and the rationale behind these choices.

Chapter IV, describes the Answer to the Question asked in Chapter I. This is the research results presented in the form of a theory.

In the last chapter, Chapter V, I conclude the research by comparing the theory to the reality to come up with recommendations. I finally discuss the meaning and implications of the findings as well as an evaluation of my work.

I - 2 SITUATION

2 - a ***The problem situation unstructured***

The first step of SSM is the informal exploration of the situation. It is an unstructured expression of information based on my readings, interviews and observations.

This research aims at exploring a specific domain of Business Intelligence, the Mobile Business Intelligence. We first need to define the parent discipline. What is Business Intelligence? Business Intelligence (BI) or Decision Support Solutions (DSS) are neither a product nor a system, instead it is a set of tools, principles and methodologies aiming at transforming data into information to deliver decision makers the knowledge they need to make better decisions.

BI groups methodologies and technologies aiming at leveraging the important amount of data available in companies, produced by transactional systems or coming from external sources. BI initiatives help transform huge amounts of data into useful information improving the decision making process. The core idea behind Business Intelligence (BI) is what Sun Tzu's Art of War claimed for: in order to win a war you have to have complete knowledge and understanding of your strengths and weaknesses as well as those of your enemy (Tzu, 2010). A company must know itself better than anyone else and know its customers and competitors better than anyone else (Flanglin, June 2005).

Data is collected, stored, cleaned, transformed and organized so that it can be presented in a meaningful and efficient format to the final user. Anyone making decisions, from the operations to the Board, could draw benefits from BI solutions: financial controllers getting summarized information of the profitability of a product family, Procurement manager able to produce a top 10 of his providers according to efficiency criteria he setup, a sales person getting the latest information regarding the revenue generated with a customer, an Energy manager able to forecast the electricity consumption of his factories according to the production planning produced by the industrial planners, etc.

BI market

BI is a specific niche within the Information Technology (IT) market. In the 1960's researchers began studying the use of computerized quantitative models to assist in decision making and planning (Raymond, 1966; Turban, 1967; Urban, 1967, Holt and Huber, 1969), (Power, 2007). Since then, Decision Support System has adopted many formats, from the late 70's Executive Information Systems (EIS) to the 90's Data Warehouse (DWH) or On-line Analytical Processing (OLAP). It became 'BI' for 'Business Intelligence' in 1989, when Howard Dresner from the Gartner Group coined and popularized the term. Thanks to recent innovations in data storage, data processing, increased capacity of hardware and software and mainly the emergence of the Web, BI became powerful enough to pretend serving the needs of anyone in the organization.

BI became a huge market, one of the most dynamic of the IT market. BI software market maintained a CAGR close to 8% for more than 5 years in Europe or the United States and is expected to be more than 15% by 2011 in the Asia Pacific Region(Ho, 2008). It should grow to nearly $14 billion by 2014 according to Forrester Analyst, Holger Kisker(Kisker, 2009).

My research aims at exploring a particular aspect of this market that appeared a few years ago and materializes the combination of two markets, BI and Mobile technologies.

Mobile Market

But what do we exactly mean by Mobile Technology? Mobile technology is basically what the name implies: technology that is portable. In this category, we can find for instance:

- Laptop computers,
- Personal Digital Assistants (PDA),
- Mobile phones and smartphones,
- Game consoles,
- Portable Media Players,
- E-book readers,
- Global Positioning Systems (GPS).

Mobile devices are more and more capable to communicate. They can use various communication technologies such as Wireless Fidelity (WiFi), Third Generation (3G), global system for mobile communications (GSM) or Blue Tooth to remain connected to other computers or to the Internet. Mobile devices are thus able to communicate voice, data or both.

For the purpose of this research only PDA, mobile phones and smartphones technologies are considered. Actually, laptop computers are very similar to desktop computers in terms of computing capacity and often run identical operating systems. Traditional BI solutions are

equally suitable for Desktop and Laptop utilization. The real challenge comes in the transport of BI on handhelds such as mobile phones or smartphones. Computing power, screen size, design of the device by itself makes the utilization of BI a very different experience for the user. The other mobile devices are not suitable for professional uses or are dedicated to specific purposes such as GPS.

What makes mobile phones particularly interesting in the context of our research is that they are the consequence of a profound tendency on many technology markets: *the convergence*. On Mobile technology market, this tendency characterizes the evolution of devices toward identical purposes. When mobile phones appeared in the 1990's they were dedicated to voice communication. Carried along by a strong and always increasing demand initially from business users and then from private users and thanks to miniaturization of technologies, mobile phones capabilities extended way beyond voice communication. Mobile phones became more and more intelligent and lead to the emergence of a new family of device, the Smartphones. Symbol of the convergence of mobile technologies, Smartphones groups many devices in one with functionalities as varied as emailing, SMS, camera, GPS, voice recorder, calculator, agenda, multimedia player or Point Of Sale. It becomes the most versatile digital instrument ever created.

Mobile phone evolution has been driven by a very dynamic market and has created a reinforcing loop by generating new users expanding the borders of the initial market and revisiting its initial purpose. "From a pure media perspective, mobile is a mass medium with a rapidly growing audience and a wide variety of attractive brand engagement environments. The International Telecommunication Union estimates that 4 billion people had access to a mobile phone at the end of 2008 – that's about two-thirds (61 percent) of the world's population. At the millennium, penetration was only 12 percent. That's an increase of more than 400 percent" (Birckner, 2009, p. 15).

Mobile phone becomes less a phone than a computer: mobile computing emerges. As analysed by Morgan Stanley, next computing technology cycle, Mobile computing, should be supported by more than ten times more devices than the previous cycle with more than 10 billion devices (including smartphones, tablet PC, car electronics, etc) (Morgan Stanley, 2009).

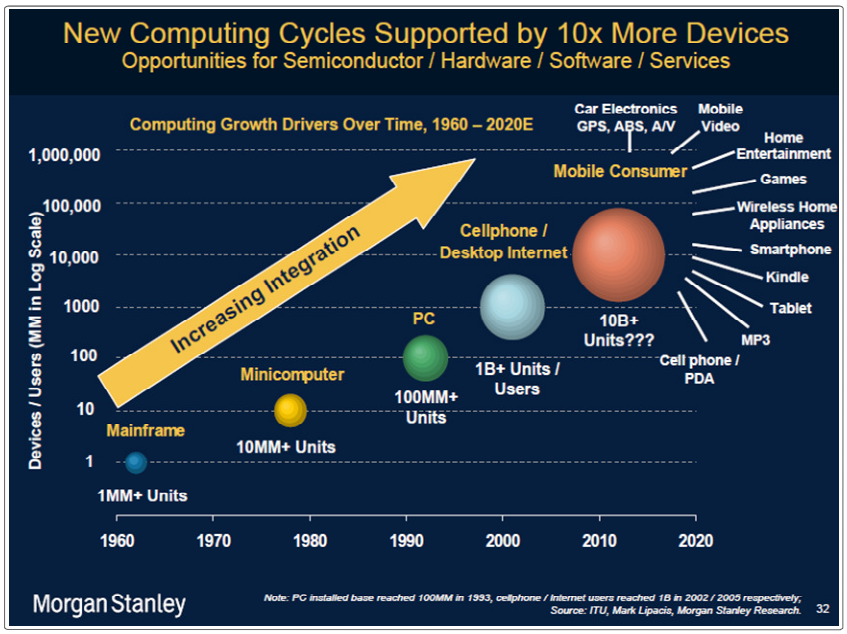


Figure I-1: New computing cycles.

Source: (Morgan Stanley, 2009).

Data traffic symbolizes this transformation of mobile phone purpose. Recently, mobile data traffic growth has experienced unprecedented acceleration with the advent of recent smartphones such as the BlackBerry from RIM or the Iphone from Apple: mobile data traffic increased by 50 times in the past 3 years on AT&T's mobile network(Morgan Stanley, 2009).

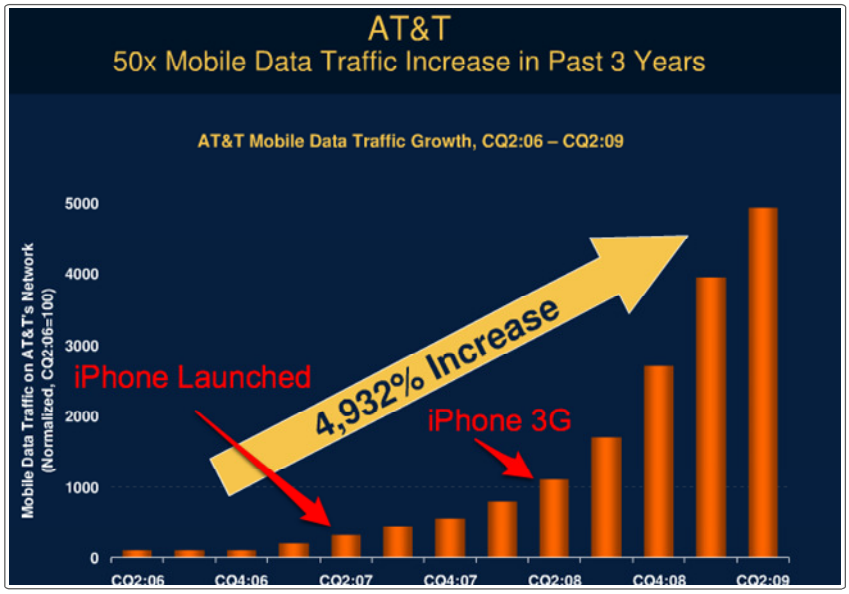


Figure I-2: Mobile Data Traffic Growth.

Source: (Morgan Stanley, 2009).

Mobile data user number should experience a cumulated growth rate of about 130% between 2008 and 2013 according to Morgan Stanley projections (Morgan Stanley, 2009).

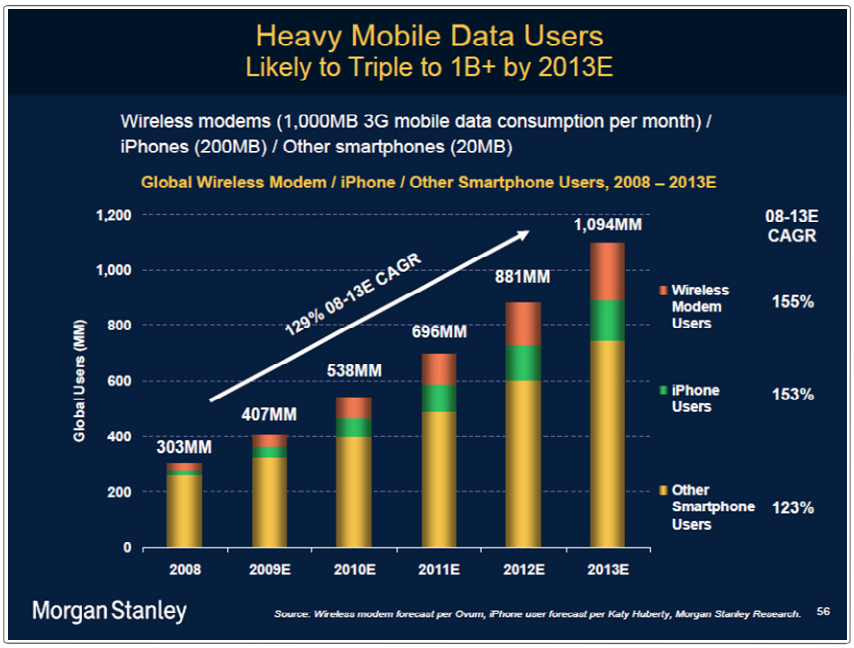


Figure I-3: Mobile data users growth.

Source: (Morgan Stanley, 2009).

The shift toward mobile computing is also materialized by the device market evolution: smartphones market grows by 4.2% in France in 2009 compared to a decrease for traditional mobile phones according to a survey realised by IDC (Chicheportiche, 2009). Microsoft plans for 75% growth in 2010 in shipment of devices operating on Windows Mobile, i.e. capable of providing mobile computing (Microsoft, 2009).

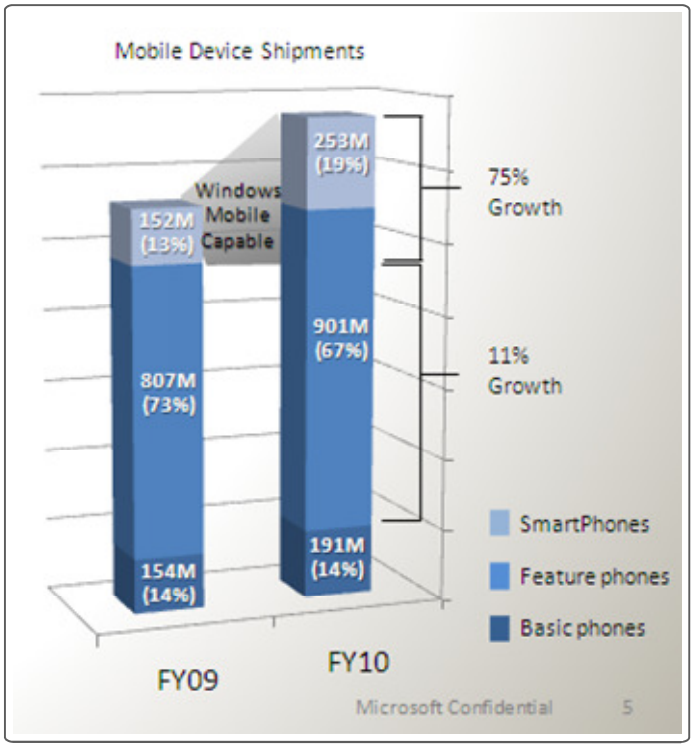


Figure I-4: Smartphone market in 2010.

Source: (Microsoft, 2009).

Mobile technologies fundamentally changed the space and time relationship. It also greatly influenced the way we behave, we communicate with others and we access information from a business as well as from a private perspective.

Mobile technologies support a shift in our relationship with the workplace. The worldwide mobile worker population is set to increase from 758.6 million in 2006, accounting for 24.8% of the worldwide workforce, to 1.0 billion in 2011, accounting for 30.4% of the workforce (IDC, 2008). The increase in mobility of workers could be mainly explained by economic reasons – increase in oil prices, corporate pressure for costs savings – globalization, cultural attitude, improvement in technologies or convergence of IT and telephony systems.

Business Intelligence answers to the increasing requirement for business information to support decisions. Mobile technologies provide the users with the ability to access information from anywhere at any time. Observing the rapid growth of mobile uses and BI

practices, we can expect the Mobile Business Intelligence market to follow the same evolution.

What is Mobile Business Intelligence? Mobile Business Intelligence stands for organization, practices, dedicated software solutions or functionalities proposed by traditional solutions supporting the use of Business Intelligence in situations of mobility. Mobile BI is providing the user with the ability to access his key business information to make decisions from a handheld such as a PDA or a mobile phone. The information could be made available to the final user in many ways: from a dedicated application on his device; from a web page he visits; from a report he obtained by email, etc. The main use of Mobile BI is visualization of figures in tabular form or graphical form such as a dashboard. Depending on the solution, the user is able to navigate into the information, capture data, comments and send information back to the BI system.

Mobile BI appeared with the emergence of mobile computing in the late 1990's. Initially made for PDA users, it migrated to mobile phones taking advantage of the connectivity of the latter.

Despite growth of mobile technologies and Business Intelligence practices, despite an increase in demand for mobility in Business and while the major Business Intelligence vendors have mobile BI offerings in place – Oracle's mobile BI, Information Builders Inc. with WebFocus Mobile Favourites, IBM's Cognos 8 Go Mobile, MicroStrategy Mobile – Mobile BI remains extremely anecdotal. The level of adoption of Mobile BI is not consistent with the expansion of related technologies on the market. Mobile BI never really took off, owing to a combination of social and technical barriers, according to Mark Smith, CEO at Ventana Research (Smalltree, 2007). According to David Hatch from Aberdeen Group (Hatch, 2008) mobile users are the single most underserved group of BI end users. Only one third of best in class companies offer alert messaging and e-mail for BI today while two thirds plan to adopt those capabilities in the coming years.

However, Aberdeen confirms the legitimacy of Mobile BI from the user's perspective. Companies are expecting to gain efficiency and business benefits from Mobile BI initiatives.

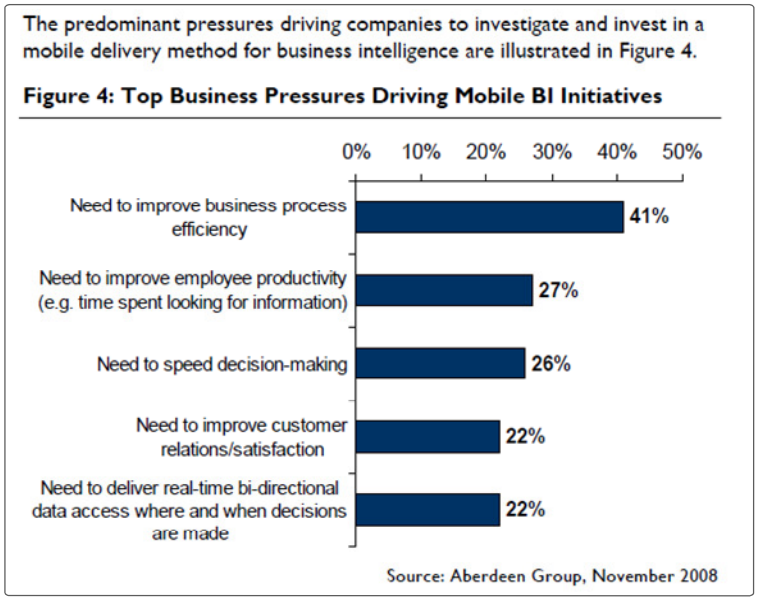


Figure I-5: Business pressures driving Mobile BI adoption.

Source: Aberdeen Group (November 2008).

Additionally, results of Mobile BI initiatives reports positive results. According to the same study, Aberdeen underlines the results from Best in class companies deploying mobile BI technology (Hatch, 2008):

- 5.39% mean average customer satisfaction increase (more than 4.8 times greater than average companies),
- 3.61% year-over-year mean average employee productivity increase (20 times greater than average companies),
- 4.33% year-over-year employee retention increase (10 times higher than average companies),
- 4.81% increased flow of new sales opportunities into the pipeline (three times greater than average companies).

Based on this unstructured information I have defined the broad scope of my research. The following section uses various system thinking tools and the second step of SSM to define the research Situation more accurately.

2 - b ***The problem situation expressed***

SSM proposes a set of tools to structure the exploration of the problem situation. I identified a problem on the market: the adoption of Mobile BI is particularly slow. I can find explanation attempts blaming technological hurdles or security issues, but having interviewed many prospects on their interest for Mobile BI, I can wonder if the root causes of the problem are not related to the ***value proposition of Mobile BI***. The following section aims at exploring the problem situation to confirm or invalidate this proposition and refine the research Concern, the research Problem and the research Question.

I am using Mitroff's five strategies as a guide to avoid mistakes in the formulation of my problem (Mitroff, 1997). Mitroff's strategy consists in the following 5 traps that one should avoid:

- Failing to think systematically (i),
- Setting the scope / boundaries of the problem too narrowly (ii),
- Picking the wrong stakeholders (iii),
- Selecting too narrow a set of options (iv),
- Phrasing the problem incorrectly (v).

I am using Mitroff's approach as a check list along with the tools prescribed by the SSM methodology.

i. Failing to think systematically

A rich picture is used to help thinking holistically and systematically about a problem situation. Its objective is to gain creative understanding of the problem situation (Jackson, 2003).

My rich picture is composed of 3 groups: the mobile technologies market, the BI market and the Mobile BI market. The doubt about the value added by Mobile BI is expressed in this last group.

Despite the high growth of related markets, the Mobile BI market cannot find its users. Market professionals are shared between considering Mobile BI as a true revolution or as a gadget for technology addicted executives. Is the technology developed for its own purpose or is it truly answering customer needs? Is there actually a market for Mobile BI or is this just another functionality of traditional BI?

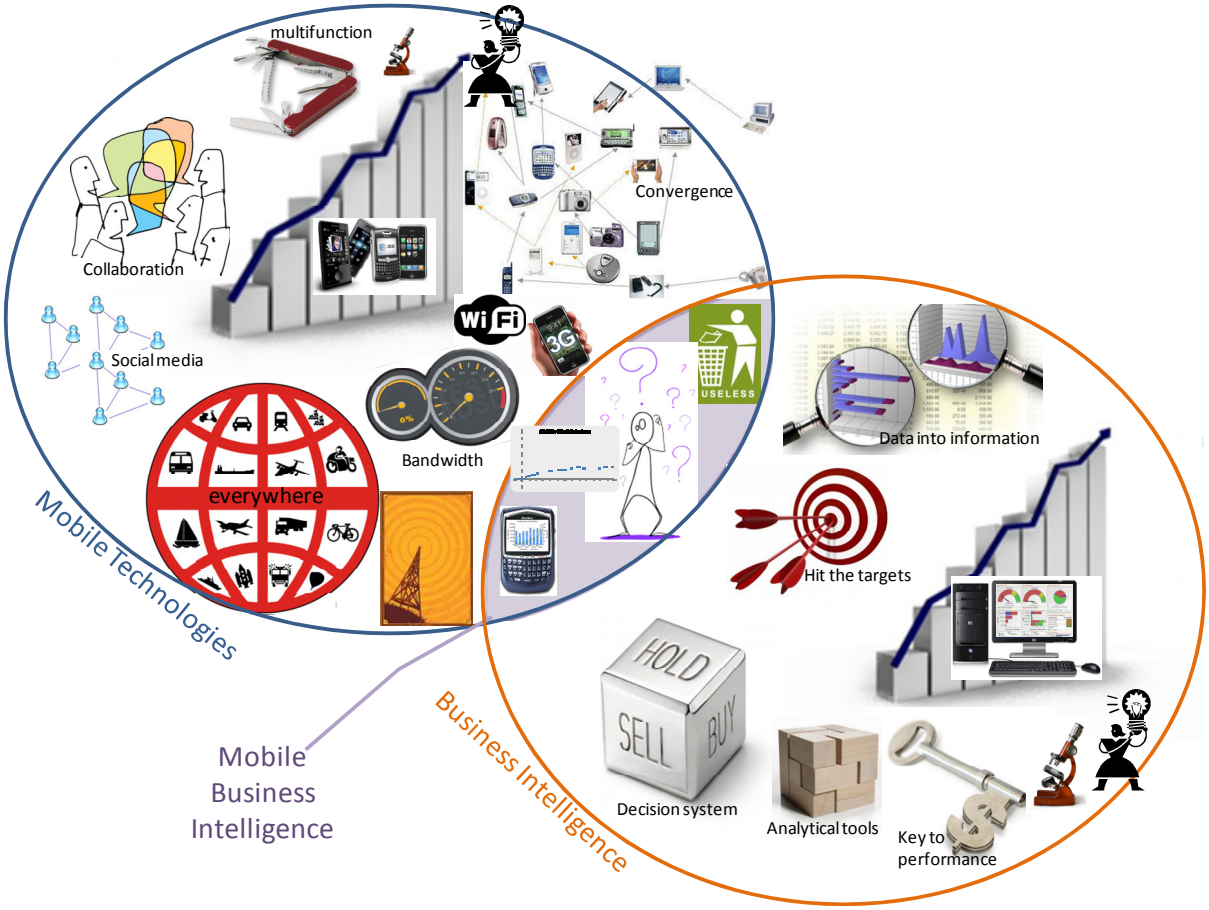


Figure I-6: Rich Picture of the problem situation.

Source: Stéphane PIMIENTA.

Rich picture helped me to define the scope of problem. I need to narrow down the scope of the situation.

ii. Setting the boundaries of the problem too narrowly

I am using *Critical Systems Heuristic* (Ulrich, Critical Heuristics of Social Planning: A New Approach to Practical Philosophy, 1983) to properly set the boundaries of the problem situation. By answering the 12 boundary questions proposed by Ulrich's approach, I am able to determine the reference system, the facts and values conditioning my definition of the problem situation.

	"Is" mode answers	"Ought" mode answers
SOURCES OF MOTIVATION		
(1) Who is (ought to be) the client or beneficiary? That is, whose interests are (should be) served?	-business users and mainly top management and key decision makers -solution vendors, -device vendors, -consultants and system integrators -telecom operators	-Every category of business users including operations -solution vendors, -device vendors, -consultants and system integrators -telecom operators
(2) What is (ought to be) the purpose? That is, what are (should be) the consequences?	-users are looking for solutions to access key business information in situation of mobility to make decisions -other stakeholders are looking at this functionality as another opportunity to sell extra products/services	-users should also consider Mobile BI as a day to day operational tool to collaborate, coordinate and operate and improve overall performances -other stakeholders ought to think in terms of value proposition for the final user to improve the efficiency of their products and the appropriateness of the offering
(3) What is (ought to be) the measure of improvement or measure of success? That is, how can (should)we determine that the consequences, taken together, constitute an improvement?	For the users -customer retention, -productivity of workers, -business process efficiency, For the vendors -adoption ratio amongst current user	For the users -customer retention, -productivity of workers, -business process efficiency, -adoption as a communication media For the vendors -adoption ratio amongst current user -number of pure Mobile BI solutions deployed (excl. traditional BI users)
SOURCES OF POWER		
(4) Who is (ought to be) the decision-maker? That is, who is (should be) in a position to change the measure of improvement?	-device vendors are setting the tone of the market	-final users should be the one setting the tone of the market
(5) What resources and other conditions of success are (ought to be) controlled by the decision-maker? That is, what conditions of success can (should) those involved control?	-final users are undergoing vendors offering -software vendors have the ability to adapt their offering but are limited by the availability of appropriate devices -device vendors have the ability to develop suitable devices -operators have the ability to set the availability and attractivity of wireless connectivity	-final users must be able to clearly define their requirements in a proactive way and set the tone of the specifications of software and hardware and services
(6) What conditions of success are (ought to be) part of the decision environment? That is, what conditions can (should) the decision-maker not control (e.g. from the viewpoint of those not involved)?	-device vendors are limited by technological hurdles -Software vendors cannot control the evolution of devices, i.e. not enough power to impose specifications to device vendors	-device vendors will always be limited by technological hurdles -software vendors should be able to impose specifications to device vendors -final users should be able to impose specifications to both vendors

	"Is" mode answers	"Ought" mode answers
SOURCES OF KNOWLEDGE		
(7) Who is (ought to be) considered a professional or further expert? That is, who is (should be) involved as competent provider of experience and expertise?	-software vendors are considered as the experts	-final users should be considered the holders of the knowledge: they are the ones to define their needs
(8) What kind of expertise is (ought to be) consulted? That is, what counts (should count) as relevant knowledge?	-technical competencies are considered the relevant knowledge	-business competencies should be the one relevant to be able to properly define the requirements
(9) What or who is (ought to be) assumed to be the guarantor of success? That is, where do (should) those involved seek some guarantee that improvement will be achieved – for example, consensus among experts, the involvement of stakeholders, the experience and intuition of those involved, political support?	-the availability of the appropriate hardware technology to support the desired software	-the clear definition of the expectations around the mobile practices is the only one driver to start with
SOURCES OF LEGITIMATION		
(10) Who is (ought to be) witness to the interests of those affected but not involved? That is, who is (should be) treated as a legitimate stakeholder, and who argues (should argue) the case of those stakeholders who cannot speak for themselves, including future generations and non-human nature?	-Market analysts are observing the situation and asking questions about the consistency between demand and offer	-Market analysts will remain the observer of the situation
(11) What secures (ought to secure) the emancipation of those affected from the premises and promises of those involved? That is, where does (should) legitimacy lie?	-the IT capabilities of the users allow them to fulfill their requirements with the limitation of the solutions provided by vendors	-only business considerations should be involved
(12) What worldview is (ought to be) determining? That is, what different visions of 'improvement' are (should be) considered, and how are they (should they be) reconciled?	-Software and Hardware vendors consider solutions must be as complete and powerful as possible. They consider solutions as IT solutions, i.e. for specialists	-Software vendors should think solutions as simple and efficient as possible. -Mobile BI shouldn't be a domain for IT specialists. It should be a domain for business users with no IT skills

Figure I-7: Boundary questions.

Source: adapted from W. Ulrich (2000).

I need to narrow down the scope of my research. Previous steps in this chapter allowed me to identify the borders of my study.

The research is focusing on today's situation, in 2010. I obviously need to consider the past, since the emergence of mobile technologies, and try to project into the future to complete the exercise.

Business Intelligence is a common term referring to a large number of practices. As defined in the first part of this Chapter, I use the term Business Intelligence to include methodologies, practices and IT solutions aiming at delivering decision support. The term could be expressed by a more recent expression: Enterprise Performance Management solutions (EPM).

I am limiting the study to the business environment even though personal BI is probably going to gain popularity in a near future.

The research is focusing on all various means used to get BI in situations of mobility: dedicated applications or just mobile functionalities delivered by traditional BI solutions.

As presented in the first part of this chapter, I am focusing the research on certain mobile technologies only: handhelds such as Mobile Phones, Smartphones, PDA, E-books or Tablets.

The scope of this research is limited to markets I know or on which I can collect enough information to properly feed my analysis: Western Europe and North America are very similar in terms of uses and level of penetration of mobile technologies and Business Intelligence.

The stakeholders involved in the problem situation are described in the following section.

iii. Picking the wrong stakeholders

Picking the wrong stakeholders is one of the traps Mitroff alerts the researcher to. A thorough analysis of the stakeholders gives understanding of the situation mainly with the power/interest quadrant which situates the involvement of each in the problem situation. My stakeholders analysis aims at clarifying the power/interest forces regarding Mobile Business Intelligence value proposition.

As we have seen earlier, particularly in the rich picture and the CSH analysis, Mobile Business Intelligence is at the intersection of two markets, mobile technologies and Business Intelligence and is consequently involving varied stakeholders often with diverging interests.

The following paragraph defines each stakeholder in terms of setting, people, processes and issues. I locate each one in the Work Systems domain (Hoebeke, 2000) to which I consider he belongs.

Customers: this is the actual or potential client of Mobile Business Intelligence. He is at the centre of this research as he is the one targeted by the value proposition of Mobile BI. He is usually primarily a customer of traditional Business Intelligence. He represents a business organization. He is buying licenses from the software vendors; buying devices from the mobile technologies vendor; buying services from the consultant/system integrator to design and setup the Mobile BI solution; he is buying airtime from a telecom operator. He is indirectly impacted by the telecom regulator (determines the rules of the game on the market) and by the analysts (could influence the customer's decisions) He belongs to the Value

Added domain with short term concerns regarding the problem situation and operational management issues.

Analysts: they are not directly involved into the problem situation as they are observers and their influence is limited. They are market analysts presenting technological, functional or business perspectives. They comment market news and try to inform the various stakeholders of the specific ecosystem. Analysts are usually more operating in the Innovation domain and the Value Systems domain focusing on value creation for the future or creating the space for debate between different worldviews.

Telecom Regulator: this stakeholder is indirectly involved but is highly influential. Regulators operate at the level of the nation by imposing market regulations. They influence the attractiveness of the wireless connectivity by setting the rules the operators have to follow. They operate in the Value Systems domain.

Mobile technologies vendors: they provide the market with mobile devices. They are multinational firms operating worldwide. They are leading the market in terms of innovation. They sell their devices via the telecom operators or directly to the final users. They specify, design and build their products. They usually choose a unique operating system to run on their device (Apple, RIM, Microsoft, Google's Android, Palme pre, Nokia's Symbian being the main). They operate in a very dynamic and competitive market where innovation is critical. They operate in the Innovation domain.

Consultants, Systems integrators: they operate for customers and often in partnership with software vendors. They deliver consulting and help customers in the integration of their information systems. They have a limited influence in the value proposition as they are dependent on software and hardware vendors' solutions. They usually operate in the Value Added domain providing help to the customers.

Software vendors: they are at the centre of the problem situation as they are designing, developing and providing the Mobile BI solutions. Profiles of companies are varied, from the small firm acting on local markets to the multinational operating worldwide. They provide Mobile BI solutions embedded in traditional solutions or as a separate solution depending on the strategy followed. They directly provide the solution to the final customer or are supported by system integrators. They usually depend on the capabilities provided by the mobile devices and also depend on the operating system used by the device. They use to operate on the Value Added domain as well as on the Innovation domain.

Telecom Operators: They provide air time to the final customers. They usually are important firms and are licensed to operate on a local market. They depend on regulators for the acquisition of licenses. They influence the attractiveness of mobile solutions by the price of

their service. They can provide a package including device and plans to the final customer. They operate in the Value Added domain as well as in the Innovation domain.

I can classify the stakeholders identified into the following categories:

- Primary stakeholders: are those ultimately affected, either positively or negatively by an organization's actions.
- Secondary stakeholders: are the ‘intermediaries’, that is, persons or organizations who are indirectly affected by an organization's actions.
- Key stakeholders: (who can also belong to the first two groups) have significant influence upon or importance within an organization.

Stakeholder category	Stakeholder	examples	Power	Interest
Primary - Key	Customer	MIC, Johnson controls, Rhodia, Eutelsat...	Customers are highly influential in the value proposition of Mobile BI as it is primarily defined at their level. Their maturity, desire and ability to absorb innovation, their ability to formulate their needs determines the value proposition of Mobile BI.	Customers have a high interest in the potential value proposition of Mobile BI. They could be highly interested in the improvement of the value proposition of Mobile BI.
Secondary	Analyst	Ovum, Wise Analytics, Aberdeen, Nieuwbourg...	Analysts have a medium power to influence the value proposition of Mobile BI. They can support the spread of a technology by communicating on it but they cannot participate in creating core added values.	Analysts have a low interest in the improvement of Mobile BI value proposition. Their business is not at stake.
Secondary - Key	Regulator	ACERP (Autorité de Régulation des Communication Electronique et des Postes) in France or FCC (Federal Communications Commission) in the US	Regulators are highly influential regarding the value proposition of Mobile BI. By promoting wireless broadband for instance, regulators are highly impacting the value added by mobile devices allowing powerful remote applications.	Regulators have a medium interest in the increase in value added by Mobile BI. As independent agencies their interest is more related to the promotion of fair distribution of communication technologies rather than to an economic benefit.
Primary - Key	Mobile technologies vendor	Apple, RIM, HTC, Nokia...	Mobile technologies vendors have a pretty strong influence on the value Mobile BI could add to the final customer. Their ability to deliver ergonomic and versatile devices are directly impacting the benefits the customer could gain from Mobile BI.	Mobile technologies vendors have a very high interest in the development of the value proposition of Mobile BI. The higher the value proposition, the higher the spread of Mobile BI and the more products they could sell.
Primary	Consultant, Systems integrator	CSC, Atos, IBM Global Services, B&D, Micropole Univers, Keyrus, Methys...	Consultants & Systems integrators have a moderate power on the value proposition of Mobile BI. As analysts, they can prescribe the technology and raise its strength and benefits but the core value will remain the same. However, they can help the customer formulate their requirements in terms of values expected from this technology.	Consultants, Systems integrators, however, have a pretty strong interest in the improvement of the value proposition of Mobile BI in the sense that they could increase their sale in services to advise and integrate those technologies.
Primary - Key	Software vendor	SAP, IBM, Oracle, Qliktech, MeLLmo, Prelytis,	Software vendors have an extremely strong influence on the value Mobile BI could add to the final customer. They can succeed in translating the customer requirements in their Mobile BI solutions. However, they are quite dependent on the ability of Customers to formulate their requirements and on Mobile technologies vendors and regulators.	Software vendors have an extremely strong interest in increasing the value added by Mobile BI to the final customer. Their business model is based on the sale of licenses or maintenance services to the final customer. Their business directly depend on their ability to fulfil customer needs.
Primary - Key	Telecom Operator	AT&T, Orange, Telecom Italia, British Telecom...	Operators have a pretty strong influence on the ability of Mobile BI to deliver added value as they are setting the cost of the technology. By increasing or decreasing the cost of broadband communications, Operators can influence the ability of Mobile BI to deliver its added value.	Operators have a strong interest in the development of the value proposition as it should increase the use of the technology and thus the consumption of mobile communications.

Figure I-8: Stakeholder analysis support.

Source: Stéphane PIMIENTA.

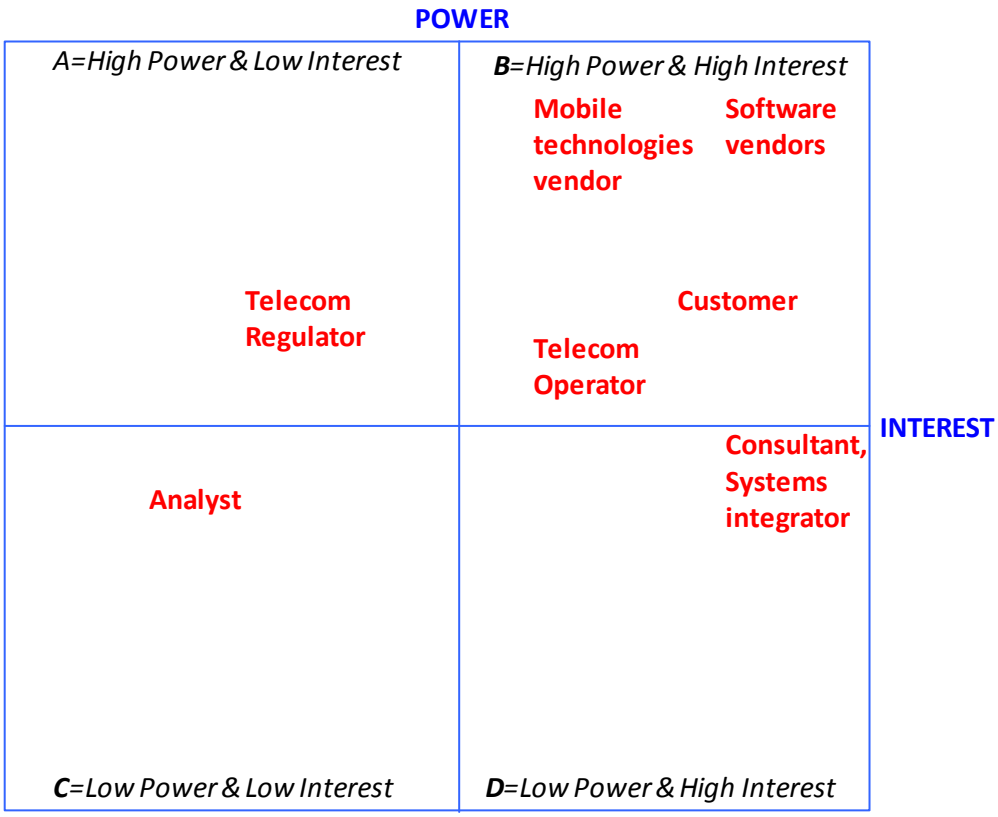


Figure I-9: Stakeholder Analysis.

Source: Stéphane PIMIENTA.

Stakeholder analysis gives interesting insight when comes time to collect information from them. Knowing their position into the power/interest quadrant, having analysed their individual perspectives, completed by the CATWOE analysis, provides critical observation. We can conclude that the game is played between four stakeholders and that between them, Device Vendors and Software Vendors are the key players. Together, they hold an important part of the potential value proposition of Mobile BI.

iv. Selecting too narrow a set of options

Once introduced by the stakeholder analysis exercise, the various stakeholders are challenged on their individual perspective regarding the problem situation. Using of CATWOE allows avoiding the fourth trap: “selecting too narrow a set of options”.

Stakeholders	Customer	Actors	Transformation process	World View	Owner	Environmental constraints
Customer	Themselves. Compare the value proposition of Mobile BI to their own needs.	The software vendors, the Mobile technology vendors	Put BI into mobile devices. Get their business information on the go. Change the way they used to work and collaborate. Increase their awareness.	Immediate business performance management. Look for performance improvement by accessing their information and BI functionalities on the go. Are highly influenced by the Value Added Domain (Hoebeke) Are motivated by cost effectiveness, quick ROI. Are afraid of complexity, security issues.	The software vendors who are not convincingly proposing high value added	There are technological constraints: usability of mobile devices for these purposes, availability of broadband. There are market constraints: depends on BI market spread and mobile device spread. There are cultural constraints: mobility in business, availability of BI platform able to provide BI information.
Analysts	The business users	The software vendors, the Mobile technology vendors	Expand the use of BI, increase the principles of mobility in business	Are not all convinced of the real value of this technology. Are used to challenge innovation against reality. Have a perspective from the Value Added domain, the Innovation Domain and the Value Systems Domain (Hoebeke)	The customers who are not clear about the real added value of Mobile BI. The Software vendors who are not capturing the core requirements of their customers	A market who is not convinced by the added value of Mobile BI due to technical limitations and cultural gaps.
Regulator	All mobile technologies stakeholders : final users, operators, device vendors...	Operators	Deliver broadband to the largest population. Ensure fairness and respect of market rules.	Need to provide the conditions for a competitive, innovative and fair market. Are usually situated in the Value Systems Domain.	The State who decides the rules, the available bands...	Limitation of available bands, collaboration with foreign authorities, national security constraints.
Mobile technologies vendor	Residential and business customers	Operators, regulators, software vendors	Provide appropriate devices to the final user, aim at convincing about its usability for this purpose.	Give access to mobile services anywhere, anytime. Positioned on a very competitive market. Are highly influenced by the Innovation Domain (Hoebeke) Innovation is the fuel of their market.	The customer who has the purchase decision	Market regulation constraints, technology limitations (cost/benefit ratio)
Consultant, Systems integrator	The final business user	The software vendors, the Mobile technology vendors, operators	Find the core benefits of the technology to advise accordingly. Manage to integrate the technology to optimize the customer installed base.	Are trying to maximize the value proposition of Mobile BI to fit customers' expectations. Are observing the market in search for new areas of development. Are highly influenced by the Value Added Domain.	The customer who can decide for a go or no-go.	A market which is not convinced by the added value of Mobile BI due to technical limitations and cultural gaps.
Software vendor	The final business user	Consultant, Systems integrator, the Mobile technology vendors, operators	Observe long term trends, observe competition, observe customers and invest in R&D to transform the requirements into reality. But are limited by various constraints (technical, cultural)	Provide performance management tool to improve efficiency of their customer. Positioned on a very competitive market where innovation is critical. Have to find the right balance between R&D constraints and core benefits for the users. Are influenced by the Value Added Domain and also strongly by the innovation Domain.	The customer who finds what he was looking for in the software. The integrators or consultants who believe in the software and prescribe it.	Technical limitation of mobile devices and networks. Time lag between the identification of a need and the delivery of the solution.
Telecom Operator	All mobile communication customers	Mobile technology vendors, regulator	Through infrastructure and mobile licenses, provide services to final communication client	Act on a very competitive and ruled market. Constrained by heavy financial investment in 3G licenses or important infrastructure. Operate in the Value Added domain and are highly influenced by the Innovation Domain.	Final customer who has the ability to switch from one operator to another.	Market regulation.

Figure I-10: CATWOE of stakeholders.

Source: Stéphane PIMIENTA.

CATWOE analysis underlines the various perceptions of the problem situation by the stakeholders. The interpretation of the transformation process of the system in question is directly determining the potential value proposition of the system. The worldview is giving background to this interpretation.

I - 3 CONCERN

v. Phrasing the problem incorrectly

Based on the previous analysis, I can confirm that the problem I want to focus on to explore the reasons of a slow spread of Mobile Business Intelligence is its value proposition. My concern could be phrased as: ***it is not clear whether Mobile Business Intelligence is bringing significant added value to the business user.***

My concern could be measured with a variable: the level of value added by mobile Business Intelligence to the final business user.

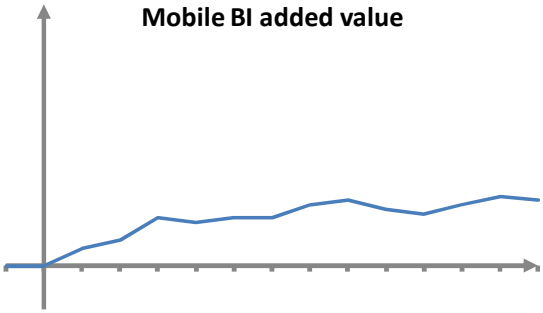


Figure I-11: Concern variable: level of value added by Mobile BI to business users.

Source: Stéphane PIMIENTA.

The sense attached to value in the context of this research is the following: from the perspective of the final user the *Value* represents the core reasons making the user buy and use the solution. The *Value Added* would then be the core benefits the user can draw from the utilization of the product or service. The *Value Proposition* would then be the statement presenting the full set of core benefits that the user is expecting to draw from the utilization of the product or service.

Previous sections helped me defining the problem context and the stakeholders involved and/or impacted by the concern. The finding could be summarized in the following figure presenting the research project:

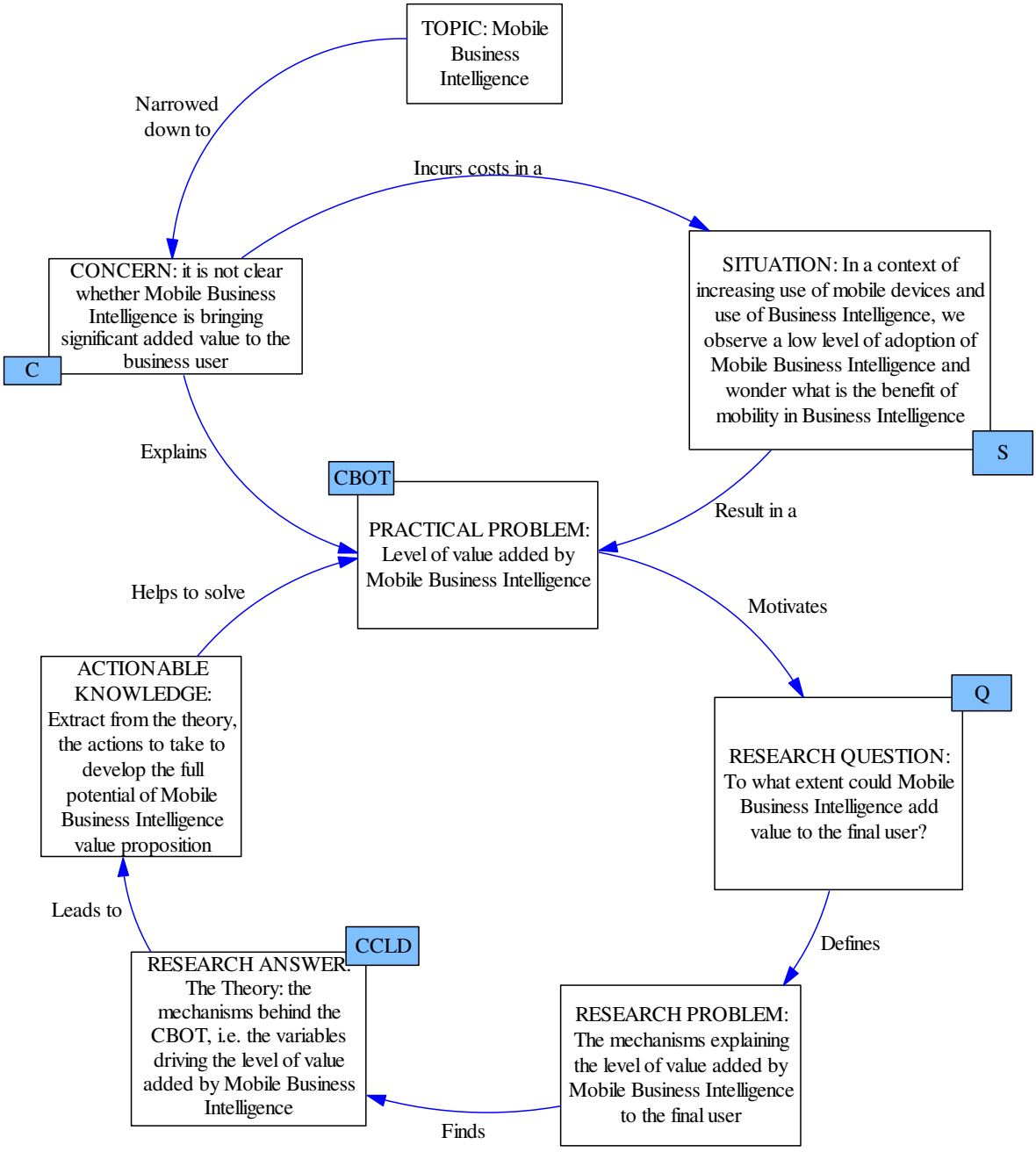


Figure I-12: Research process.

Source: inspired by Tom Ryan (2009).

The use of this diagram helps me visualizing the relationships between the various components of the research and clarifying the formulation of the research problem and the related question. Such a research process representation finally helps mitigating the fifth risk expressed by Mitroff "phrasing the problem incorrectly".

The research problem could be expressed as "The various mechanisms explaining the level of value added by Mobile Business Intelligence to the final business user".

I - 4 QUESTION

The purpose of the research is to discover the intrinsic value proposition of Mobile BI. I am not concerned about the value proposed by the solution editors or by the consultants or analysts. Neither am I concerned about the current perception of value from the users' perspectives. The research is aiming at revealing the mechanisms influencing the level of value Mobile BI could add to business users.

The research question could be expressed as "To what extent could Mobile Business Intelligence add value to the final business user?"

I - 5 ANSWER

I apply an integrated research framework composed of a combination of SSM and GT methodologies to explore the research problem and find my answer to the question. My research methodology is presented in detail in CHAPTER III. The result of the research is a Grounded Theory which addresses my concern and provides an answer to the research question.

The Theory accounts for the mechanisms operating in the real world and generating the behaviour of the phenomenon, i.e. the significance of Mobile BI value proposition. The Theory models these mechanisms.

The Grounded Theory

The application of the research framework allowed me to collect and analyze information on the value proposition of Mobile BI. I collected data through an iterative process consisting of

observation, interviews, and readings. I analysed and coded the data gathered to come up with categories. I finally extracted the core categories after several reduction processes. The four resulting categories represented as a Concern Causal Loop Diagram (CCLD) are composing my Grounded Theory. The diagram represents the real world mechanisms driving the value added by Mobile BI to the final user. The model is presented in detail in CHAPTER IV.

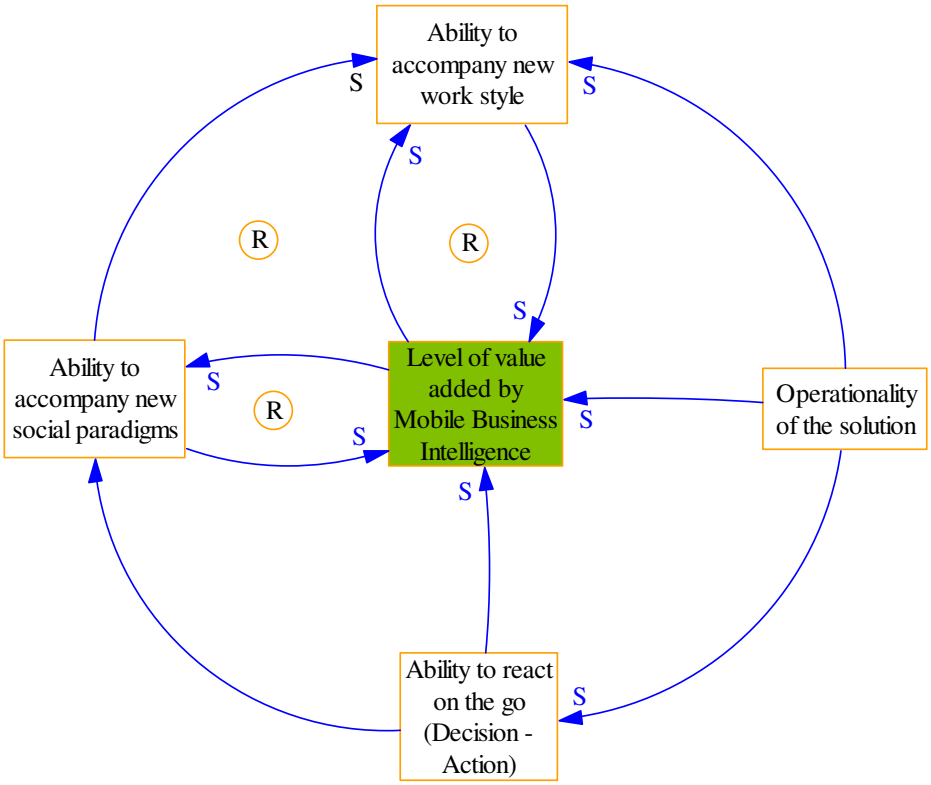


Figure I-13: The Grounded Theory.

Source: Stéphane PIMIENTA.

Ability to react on the go

The ability to react to business events in situations of mobility appears to be influencing the value added by Mobile BI to the user. The term "react" must be considered in a broad definition including decision making and action taking. In order to maximize this ability, Mobile BI must provide high levels of interactivity. First, interactivity between the user and the information by providing powerful simulation capabilities to anticipate consequences of decisions, sophisticated HCI to offer the user complete functionalities in a user friendly

environment, rapid response time to be able to react on time to business requests. Then, Mobile BI must provide interactivity between the user and his environment mainly in the form of collaborative capabilities allowing collaboration, coordination and communication. Finally, Mobile BI must be able to provide interactivity between the device and its environment by means of geolocalization or other forms of context-awareness capabilities (ability to sense and react according to the identity of the user, his activity, the time)

Operationality of the solution

Business Intelligence has long been a strategic decisions enabler for top management. It has now expanded at all levels of the organization and is becoming an operational instrument as well. Mobile BI value added is consequently strongly influenced by the ability of the solution to become a mobile practice at the service of operational issues. Mobile BI will then have to provide specific capabilities in order to be seriously considered by operational users. It will have to offer real time or near real time information and capacity of intervention for the user. As a result, it will have to interoperate with other IT systems, mainly transactional systems. The quality, freshness and exhaustivity of information will be critical to give the required reaction capacity to the user. Providing collaborative capabilities will also participate in action taking and consequences control beyond the decision. Finally, in order to ensure the operationality of the solution, it will have to maximize the user experience to increase the usability in situations of mobility.

Appropriate for new business and social paradigms

Two out of the four core variables are related to the way we work and live. In order for Mobile BI to increase its value for the final user, it will have to be able to support new work style and be consistent with new social paradigm.

The “Ability to accompany new work style” represents a direct driver of the value proposed by Mobile BI. Whether the solution proposed to the final user allows him to properly face the challenges generated by new business practices or not seems to be a central concern. In order to be considered as a valuable business solution, Mobile BI will first have to fulfil the requirements for mobile activity such as usability, constant connectivity, portability or security of information. It will also have to offer strong collaborative capabilities to ensure communication and coordination with other team members while in situations of mobility. Mobile BI solutions will have to enable pervasiveness of business information to ensure seamless information flows. Mobile BI will have to offer the user the instrument to increase his reactivity and his performances.

A new social paradigm is rapidly establishing itself in our modern, technologically sensitive society. The model is mainly based on immediacy and pervasiveness of information, on new communication flows such as social media and on the quest for ubiquity of individuals.

Mobile BI will have to be consistent with these values if it wants to convince business users. Mobile solutions will need to be conducive to social networking, i.e. propose collaborative capabilities allowing the user establishing and maintaining the contact with other members of his/her community. Technological solutions will have to be "physically and cognitively available" (Waller & Johnston, 2009, p. 130) so that its use remains easy and natural. Mobile BI solutions have to provide the ability to reduce space and optimize time to respect the new pace of communication and reactivity. This will mainly be ensured by constant connectivity and the respect of a balance between apparent simplicity and sophistication of functionalities.

In this section I presented the answer to the research question in the form of a Causal loop Diagram representing my Theory. Based on this theoretical model, I am challenging the reality expressed in the situation presented in CHAPTER I to extract actionable knowledge which may positively impact the Mobile BI value proposition.

I - 6 ACTIONABLE KNOWLEDGE

After having finalized my theory, I applied the last steps of SSM, steps 5 and 6, to compare theory with reality to identify the gaps and come up with recommendations, I believe, could improve the level of added value of Mobile BI to business users and consequently its adoption level. The detailed analysis is presented in CHAPTER V.

The need for collaborative solutions.

Mobile solutions designer should be inspired by social media to provide the business user a collaborative experience to improve performances of decisions and execution of action plans.

The need for seamless flows

Mobile BI should be seamlessly integrated with existing traditional BI solutions and with operational systems. Traditional BI solution has started evolving to integrate operational constraints. Mobile BI would have to become fully integrated with traditional BI and not a separated process for peculiar users. Desktop and mobile solutions must merge into one unique serving both sedentary and nomad world.

The need for cultural changes.

Full decision and operation chain would have to be revised to make it consistent with mobility through shorter and lighter workflows, remote capture of operational decisions or remote follow-up with action taken. This cultural evolution would need to be supported by collaboration capabilities of Mobile BI solutions and by improvement of devices usability.

The need for more appropriate devices

Mobile devices would have to evolve to offer an extended user experience. Apple is about to revolutionize a second time mobile device market with the Ipad. This new kind of product family, named 'Tablet', may open new possibilities providing natural navigation with large portable multitouch screens. Tablet may represent the missing link Mobile BI needed. Mobile BI solution vendors would have to be prepared for this evolution and propose software solutions able to exploit these new possibilities.

The need for improved user experience

In an operational context where high complexity reigns, users are expecting their solutions to be user-friendly and yet powerful. Software vendors need to make ergonomics their central concern to be able to deliver great user experience without compromising the capabilities their solutions can offer.

In this section I presented the learning I have extracted from the research which could possibly be used to apply changes on the design of technologies and practices of Mobile BI so that its value proposition could be improved.

I - 7 RELEVANCE, IMPLICATIONS AND ETHICAL IMPLICATIONS

In CHAPTER V I provide in detail a reflection on the meanings and the implications of my findings. I also give an evaluation of the paper and cover relevance, utility, trustworthiness and ethical implications of the research answer.

7 - a ***Meanings and implications of the findings***

I contend that the objectives of the research have been reached as I intended to contribute to the body of knowledge around value proposition of a specific domain of my market, the Mobile BI. I applied an approach by the value to the research problem for which I could not find similar examples in the literature. Additionally, I extracted actionable knowledge from the study which could be used by the various stakeholders to improve the problem situation. In that sense, I believe my research fulfilled the initial objectives.

7 - b ***Relevance, utility and trustworthiness***

The Situation is thoroughly described at the beginning of this chapter using various system thinking tools. The question has been asked once the research problem has been clearly defined using Mitroff's strategy. These arguments demonstrate the relevance of my paper.

My research answer has been formulated using information collected from stakeholders and documentary research and rigorously selected and exploited using GT and SSM. It provides a theory explaining the mechanisms in play influencing the level of value added by Mobile BI to the user. The knowledge generated by the research process allowed me to come up with recommendations to improve Mobile BI value proposition. I can claim that my research is useful.

I provide arguments to demonstrate the trustworthiness of my research paper by demonstrating that it is credible, transferable, dependable and confirmable.

I finally evaluate the ethical implications of my research answer by assessing the moral standards applied to each stakeholders using Velasquez approach (Velasquez, 2006): is my answer maximizing social utility, respecting moral rights, distributing burdens and benefits justly and exercising care? Through this analysis, detailed in CHAPTER V, I contend that my research answer is morally sound.

CHAPTER II. LITERATURE REVIEW

II - 1 INTRODUCTION AND OVERVIEW

This section presents the literature review on the research problem that locates my findings into a relevant wider body of knowledge.

Literature review aims at exploring literature in search for theories and concepts confirming and expanding my research findings. It has been realized based on a specific process represented by the following diagram.

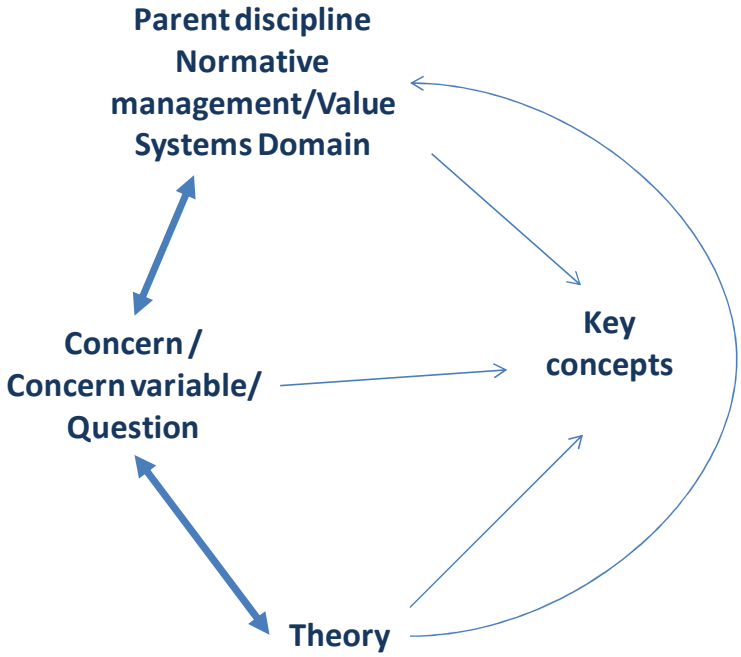


Figure II-14: Literature Review process.

Source: inspired by Tom Ryan (2009).

II - 2 PARENT DISCIPLINE

The objective of this section is to extract from literature the theories relevant to the parent disciplines of the research situation. A Semantic Definition and Constituent of the concept of

Mobile Business Intelligence allows me to identify the related concepts. The following representation of the definition shows the belonging of Mobile BI to parent disciplines.

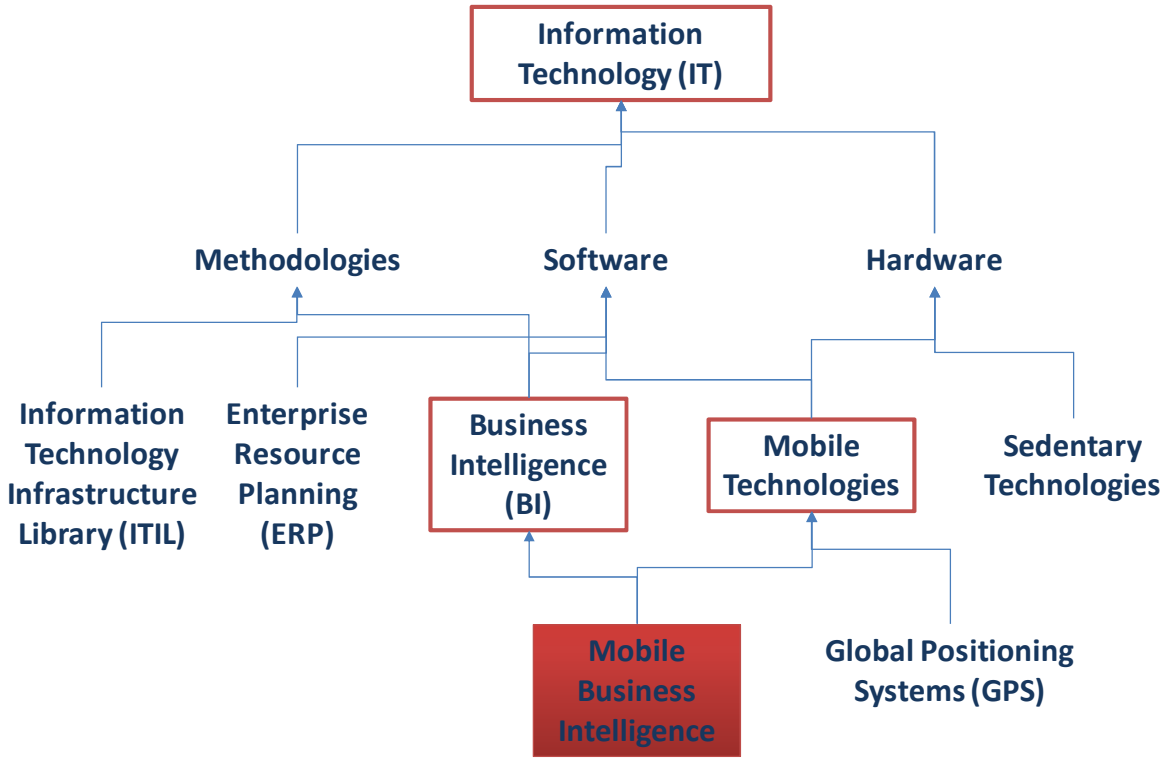


Figure II-15: Semantic and Constituent representation of Mobile BI.

Source: Stéphane PIMIENTA

I am reviewing in the next 3 sections, the 3 parent disciplines of Mobile Business Intelligence identified in Figure II-15.

2 - a ***Value added of Information Technology***

For the past decade, organization have significantly increased their investment in Information Technologies, expecting high return on investments in the form of increased value for the operations as well as for the organization as a whole. The scope of the performance measures goes beyond simple direct economic benefits as it is considered to be able to enhance the value customers get through improved product and service offerings (Ravinchandran & Lertwongsatien, 2005) In their study, Ravinchandran & Lertwongsatien, are trying to draw from Resource Based Theory the causal relationship between IT resources, IT capabilities

and IT use with firm performance. They provide empirical evidence of the strategic value of core IT functions and posit that IT resources and IT functional capabilities are directly driving the way IT is implemented and used in the organization, which in turn can affect firm performances. DeSanctis & Poole go further and try to determine the relationship existing between Advanced IT and the social structure within the organization. According to their research, Advanced IT solutions, in contrast with traditional computer systems (accounting, billing, inventory management...), support coordination amongst people and provide procedures for accomplishing interpersonal exchanges in the workplace. In this sense, advanced information technologies have greater potential than traditional business computer systems to influence the social aspects of work (DeSanctis & Poole, 1994). For instance, Decision Support Systems, by integrating the work of multiple parties, participate in the setting and the maintenance of relationship within the organization. IT is thus expected to deliver Hard or Tangible values – increase in profitability, productivity, customer satisfaction, etc – as well as Soft or Intangible values in the form of social and organizational benefits.

2 - b ***Business Intelligence***

Jerry Kurtyka presented in his article "A systems Theory of Business Intelligence" (Kurtyka, December 2005) how Business Intelligence, this specific domain of IT dedicated to decision support, was contributing to the cognitive process in play in organizations. He noted that organisations are *cognitive systems* in dialog with their environment. Actually, in order to learn from their experience and evolve, organizations need to perform important cognitive tasks:

- Sense and monitor their environment,
- Relate the information collected to the operating norms that guide the business,
- Detect deviation from these norms,
- Initiate corrective actions when deviation exceeds defined level of acceptance.

The mechanisms in play to perform the interactions between organizations and their environment are answering to the three laws of Cybernetics*: Requisite variety, Feedback and Homeostasis.*

- The law of requisite variety states that the degree of complexity of the controller must match the level of complexity of the environment in order for the controller to manage the environment,
- The Feedback law states that all important outputs in the system have feedback loops,
- The homeostasis or the Self Organizing law states that complex systems organize themselves.

Business Intelligence Solutions could be described as the artefact allowing these cognitive processes to operate. BI brings to organizations the requisite variety to handle the dynamic, volatile environment. BI solutions are based on an iterative learning process where feedback on past activities is used to predict future and apply corrective actions to strive for viability. The actions and interactions of the systems' parts are aiming at stabilizing the organization.

Business Intelligence is a specific domain of Information technologies which supports problem solving and decision making processes. Intelligent decision-support using advanced decision and optimization technologies are becoming increasingly important in business management (Sakalauskas & Zavadskas, 2009). Intelligent decision making requires access to information, generalization of empirical data, deductive inference using knowledge and an optimal choice from a set of alternatives. These steps could be grouped into an iterative process applying the principles advocated by William Edwards Deming's *PDCA* (Plan Do Check Act)(Deming, 1986). Based on these principles, Frolick and Ariyachandra presented a framework made of four core processes: Strategize, Plan, Monitor and Analyse and Take corrective actions (Frolick & Ariyachandra, 2006).

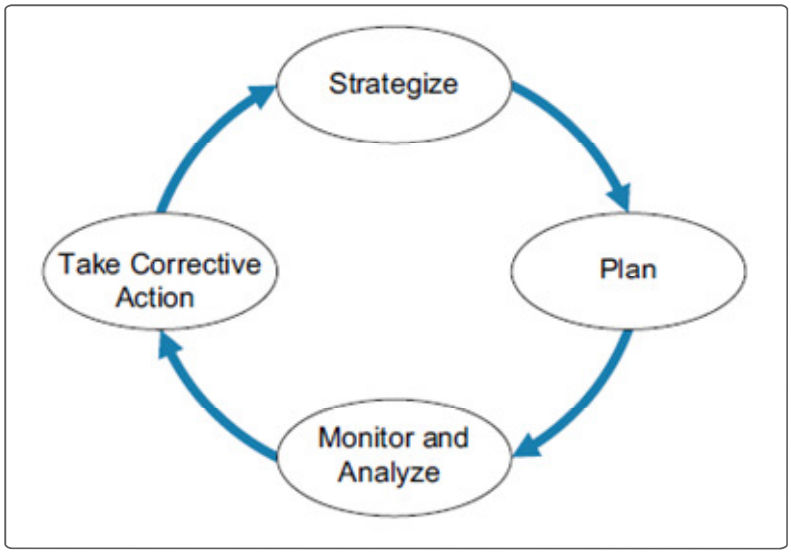


Figure II-16: the BPM Framework.

Source: (Frolick & Ariyachandra, 2006).

The Strategize step describe the key activity of a BPM initiative: identify and categorize the key value drivers required to attain strategy. The Planning consists in setting up the plan of

action to carry out the business strategy. Monitoring and analysis consists in monitoring the actual results against the targets. Finally the last step consists in amending the action plan to take corrective action and optimize results. Companies have recognized the value of Business Intelligence to help achieve strategic targets and the initiatives in the domain keeps increasing (Schiff, 2007).

From a process perspective, BI approach could be seen as a set of advanced inference processes. BI provides support to decision making in a five stages process (Jarrad, 2003):

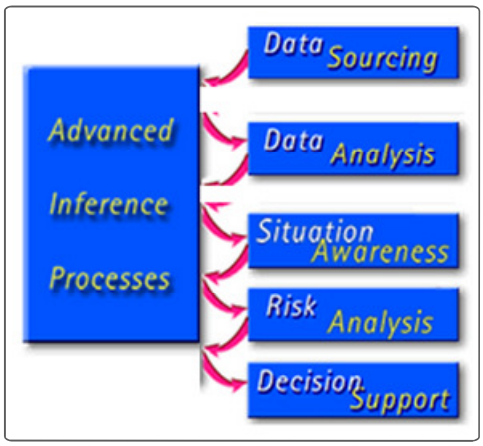


Figure II-17: Five stages to decision support.

Source: CSIRO Australia (Jarrad, 2003).

- Data sourcing: Extracting electronic information from text documents, databases, images, media files and web pages.
- Data Analysis: Synthesising useful knowledge from collected data using data mining, text understanding and image analysis techniques
- Situation Awareness: Linking the useful facts and inferences and filtering out irrelevant information.
- Risk Analysis: Identifying reasonable decisions or courses of action based on the expectation of risk and reward.
- Decision Support: Employing software to identify good decisions and strategies.

Jerry Kurtyka applied Systems Theory to firms and situated BI as the component of the Institutional memory of the firms. The firm is seen as a human system in its relationship to (Kurtyka, December 2005):

- The larger world system in which it is embedded,
- The external environment with which it interacts (providers, competitors, customers for instance),
- The resource base which includes everything the firm owns, uses or buys,
- The boundaries of the firm that includes its Business Model and its Business Actions.

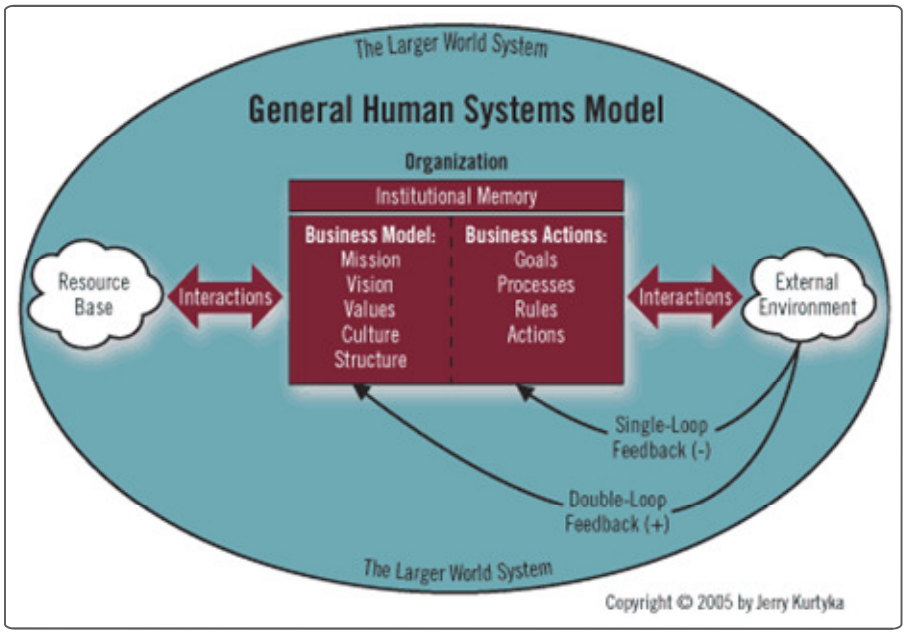


Figure II-18: General Human Systems Model.

Source: (Kurtyka, December 2005).

BI acts as the technical artefact that holds the results of these relationships of the firm with all the components of its system. BI dashboards for Finance, Sales, marketing are delivering feedbacks from operations interacting with the External Environment that trigger management decisions – represented by the single loop feedback. Double-loop feedback impacts and challenges the firm's more basic assumptions and commitments resulting in deeper inquiry into experience to examine how it could evolve. BI is involved into the second loop as a catalyst for evolutions of the firm's business model (Kurtyka, December 2005).

2 - c ***Mobile computing***

Since recent developments, Mobile technologies are providing nomad users with capabilities so far only available to sedentary users. Mobile computing, also coined *ubiquitous computing* allows accessing to information from anywhere at anytime.

Vivienne Waller and Robert B. Johnston draw on the German philosopher Martin Heidegger's theory of action called the *Situated Theory of Action* (Heidegger, 1977) to demonstrate the need for a different conception of mobile computing (Waller & Johnston, 2009). Mobile computing devices are still designed according to traditional model, i.e. to the *Deliberative Theory of Action* (Waller & Johnston, 2009) which advocates for the following principle: humans reflect on the world before acting. Traditional artifacts are basically designed to provide us with a representation of the world we can reflect on before action, i.e. they require us to move away from the world to use the computer and make sense of the world. Heidegger's theory of action, on the contrary, is based on the principle that we are deeply involved in the world and seldom have the ability to thoroughly reflect on the world before acting. We basically do not have time to form a mental model about how to use technology. As Norman said "I do not want to use a computer, I want to accomplish something" (Norman, 1999, p. 75). Heidegger introduces the concept of availability of equipment to characterize the need for devices or interfaces that disappear from our awareness. Design of Human Computer Interfaces (HCI) must apply this principle and become *Physically* and *Cognitively* available (Waller & Johnston, 2009). Physical availability groups the external design of the equipment while cognitive concerns the amount of interpretation required to use the equipment. Mobile computing will deliver value to the final user when its use will not turn the user's attention away from his original purpose of doing.

II - 3 CONCERN & QUESTION

As we seen earlier, design of current mobile computing devices is more consistent with traditional model than with a pervasive model that would finally disappear for the benefit of the initial purpose of the use (Weiser, 1991). "The risk is that in focusing on the technical capabilities, the end result is a host of advanced applications which bear little resemblance to Weiser's original vision. This is a classic case of not seeing the forest for the trees" (Waller & Johnston, 2009, p. 127).

Hardware and software vendors need to focus on core benefits more than on technological feat. According to two surveys carried among 2,500 electronic purchasers in the United States "two-thirds of consumers were more interested in core benefits and attractive prices

than in often-unused bells and whistles" (Dua, Hersch, & Sivanandam, 2009). The value added by some technologies could be questioned and Mobile BI seems to be victim of these principles. Available for more than 10 years, mobile BI solutions are way behind their real potential. While Business Intelligence market and mobile market have experienced extremely rapid growth these past decade, Mobile BI remains anecdotal.

Geoffrey Moore's theory about the "Chasm" could illustrate the market cycle Mobile BI is experiencing. In his book "Crossing the Chasm", G. Moore offered a particular insight on the traditional product life cycle (Moore, 1991). He proposed a new vision of the cycle for IT products where innovation is a strong market driver. He actually proposed to fine tune the traditional cycle to reflect the adoption pace of these technologies underlining the extremely tricky first phase of product life. Moore represented the first part of the cycle crossed by a Chasm as the principal hurdle the product will have to overcome. Moore added an interesting dimension to his approach: the product life cycle does not only depend on the product itself but additionally on the user. He proposed a typology of users:

- Innovators and Technology Enthusiasts drive the initial market and are focused on new technologies,
- Early Adopters are visionaries. They know technologies and can anticipate future successes or failures. They have a rational approach and know how to wait and observe,
- Then, Pragmatists and Conservatives are prudent and they expect reliability, convenience and value from the technologies.

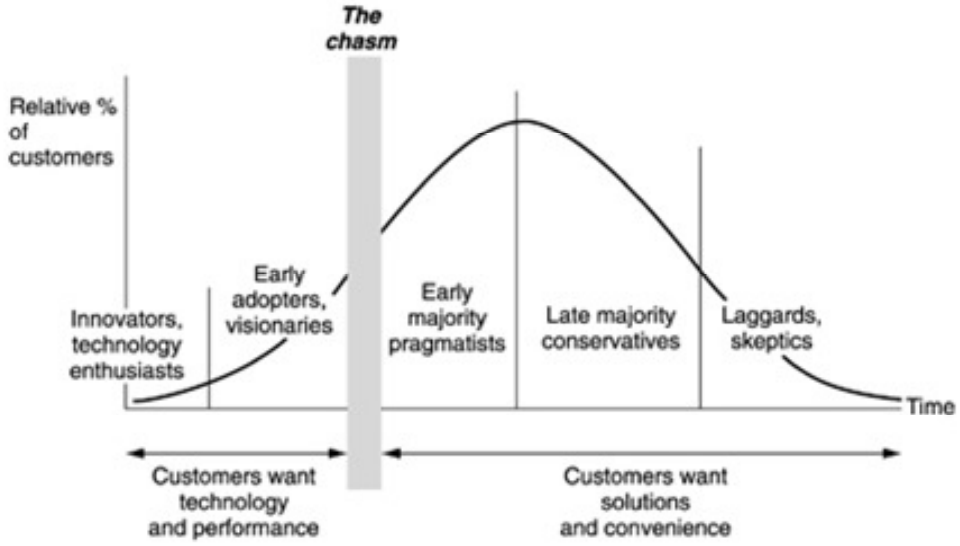


Figure II-19: IT product life cycle.

Source: (Norman, 1999) modified from Moore (Moore, 1991).

The first phase involves consumers that represent a small share of the market. The biggest part is represented by Pragmatists and Conservatives. The chasm is between the early and late adopters and requires a different marketing and communication strategy. Mobile BI could actually be stuck in the first part of this cycle unable to bridge the chasm until it has proven its value to the pragmatists.

II - 4 THEORY

The objective of this section is to locate my theory in a wider body of knowledge. For this, I am identifying concepts and theories relating to the components of my Grounded Theory in literature.

4 - a ***New social paradigms***

Mobile BI fits into a global trend and has to respect its rules to be able to convince the users.

A new term has been created to group the various recent technologies which facilitate collective actions and social interaction, *Social Computing* such as wikis, social bookmarking, peer-to-peer networks, open source communities or online business networks. "Collectively, social computing represents the next step in the evolution of the Web, with great potential for social and business impact" (Parameswaran & Whinston, 2007, pp. 762-763). In their study, Parameswaran & Whinston argue that "social computing holds tremendous disruptive potential in the business world and can significantly impact society, and outline possible changes in organized human action that could be brought about". It empowers users and invites them to engage in social interactions, sharing their expertise, their creativity, their material and this with low requirement for IT competences. It provides new communications media extending the possibilities of interaction. "For executives, having a blog is not going to be a matter of choice, any more than using e-mail today," according to Jonathan Schwartz, COO and President, Sun Micro Systems (Schwartz, 2005). In his book "*Tendances*" Dominique Cuvillier demonstrates that in a society of immediacy of the information, of ubiquity, with plurality of media, the power is not only held by specialists, everyone equipped with a connection to the internet is able to give his piece of advice and to inform others (Cuvillier, 2008). This phenomenon also transforms the development processes as it becomes partly collective and based on voluntary contributions. It transforms the way information is processed and disseminated by making it much more dynamic and mobile

through the participations of a larger public able to interact from an array of devices. Social technologies and among them mobile technologies spread through our societies so quickly and so deeply that Mary McDowell underlined the cultural and generational gulf between "digital natives" and "digital immigrants" (McDowell, 2007). Mobile became part of our day to day lives and its use has considerably expanded. "It is the special relationship mobile users have with their devices that is so powerful. People feel naked when they've left their mobile at home and hardly ever turn off their "link" to the outside world."(Birckner, 2009, p. 15).

Roger Fidler illustrated the process of technological evolution in support for these new communication practices in his book "Mediamorphosis". He explains that "Mediamorphosis is a unified way of thinking about the technological evolution of communication media. By studying the communications system as a whole, we will see that new media do not arise spontaneously and independently — they emerge gradually from the metamorphosis" (Fidler, 1997). The evolution we experience today with the emergence of these mobile media are the result of the process he describes as "when external pressures are applied and new innovations are introduced, each form of communication is affected by an intrinsic self-organizing process that spontaneously occurs within the system" (Fidler, 1997). This process creates new forms and new channels of communication.

Mobile BI is part of this evolution and based on this idea Lyndsay Wise concludes "because social media is shaping the way people and organizations interact with each other and outside entities, BI applications must mimic these uses to maintain and increase the value they provide to organizations. One way this is done is through mobile BI" (Wise, 2009).

4 - b ***New work styles***

As demonstrated by several studies, mobility in business is a fundamental evolution. "PwC believes the business mobility market will enable business transformation on a grand scale to a large customer base. Mature, standardized applications and pervasive high-speed connectivity to employees, vendors, customers and other enterprises will impact a wider array of business processes than ever before and generate new mobile business models reminiscent of today's Enterprise Web 2.0." (McDowell, 2007, p. 25). In its survey the Economist Intelligence Unit, found that more than 75% of the participants were considering human factors such as the ability to attract best talent or to improve customer services as the main argument for deploying mobility in their organization (Unit_Economist_Intelligence, 2007). According to the same study, nearly 40 percent of executives surveyed said that at least one in five of their company's workforce could be considered a mobile worker, spending an average of one day per working week away from the office (McDowell, 2007).

In this context, Charles-Henri Besseyre des Horts and Henri Isaac studied the real impact of mobility on professional activities. For this, they used the Demand-Control-Support

framework (DSC) (Karasek & Theorell, 1990). The DCS model is a multidimensional model which examines the interactions between an individual and his environment in a business setting. The model is composed of three dimensions. The Demand refers to the amount of workload and responsibilities placed on the individual. The Control represents the level of autonomy of action and of means to realize these actions. Finally, the Support refers to the level and the type of assistance the individual is receiving from his management. The culture of the organization and the policy associated to it is driving the nature and the importance of each dimension in the model and consequently the stress that results from the work situation. The study exploits this model to underline the numerous benefits of the implementation of mobile practices in business organization (reduction of spatial and time constraints, productivity, flexibility gains, increased collaboration for instance). However, it seems that drawbacks have also been identified. Mobile technologies can symbolise a pervasive "hierarchical chain" or a "digital traceability" to increase the control over the workers even after work and out of the office. The use of mobile technologies can also be disruptive and increase the stress related to the culture of speed and immediacy of information. The mix of personal and business activities, resulting in a phenomenon known as "blurred boundaries" challenges work life balance and can also generate stress and frustration (Cousins & Varshney, 2009).

Organizations would have to take specific initiatives to ensure the smoothest integration of mobile technologies to support mobile workers. But today, too many organizations are addressing the mobile strategy opportunistically rather than strategically or holistically (McDowell, 2007).

Technology can also provide help in this domain. The principles of context awareness can build virtual bridges to help the user make the transition between, work and life: let the users manage their accessibility (choose their preferred media) and let the tool setup the accessibility depending on the location of the user (Cousins & Varshney, 2009).

4 - c ***Ability to react on the go***

Based on the Situated Theory of Action from Heidegger presented earlier, (2 - c) Vivienne Waller and Robert B. Johnston developed the concept of "Affordances" to present the possibilities for action available to the user. Unlike traditional systems, Heidegger's approach does not propose to support action by providing a representation of the world but by providing the affordances to the user. Affordances help the user identify the opportunities for action available in his context. The design of Information Systems can be influenced by this notion in the sense that two aspects of the affordances need to be controlled: making the affordances present and making the affordances known. The first aspect is aiming at computing which actions are feasible based on the information of his environment and the second aims at revealing to the user which actions are actually feasible. Making the

affordances present increases the physical availability of the solution and making affordances known increases the cognitive availability of the solution. If both conditions are met, the user will not have to be distracted from his original purpose for action and the ubiquitous computing solution will fulfil its purpose. Mobile BI could extract value from these principles mainly in the context of operational intervention where the BI solution would present information to the user based on his identity and his physical location for instance while walking in the stocks of a warehouse or visiting a customer.

4 - d ***Be operational on the go***

An intensely global competition obliges business organizations to react faster to environment changes and thus to improve their decisional and operational processes. They naturally focused their Business Intelligence systems on day to day operations to extract more value from their IT systems. The concept of "Right-time BI" refers to the principle of delivering the right information to the right people at the right time. Right-time BI optimizes flows, processes and architectures to shorten latency between the data generated from the operation systems to the dashboard of the final user and consequently to the action taking. Operational BI intends to close the gap between analytical applications and operational applications. To do so, "organizations need to select underlying technology that will support the basic requirements of the environment: speed, scalability, flexibility, low operating cost, and fast backup and recovery" (Dreyer, 2006).

According to a study from BeyeNetwork, the state of the art of Business Intelligence would need to meet the following requirements. Firstly, Operational BI must be able to seamlessly collect information from the operational systems without compromising their performance. Secondly, it must be flexible enough to support frequent changes in order to meet business changes. Thirdly, it must be able to support event driven analytics to tend towards real-time. Fourthly, Operational BI must be able to provide sound environment to offer scalability, high performance, security and high availability. Lastly, Operational BI must be supported by processes and management practices in line with the new challenges: flexibility, dynamism and agility (Davis, Imhoff, & White, 2009).

"Rest assured, the current era of BI is coming to an end and will be succeeded by a BI 2.0 era that promises simplicity, universal access, real-time insight, collaboration, operational intelligence, connected services and a level of information abstraction that supports far greater agility and speed of analysis. The motivation for this version upgrade for BI is the need to move analytical intelligence into operations and to shrink the gap between analysis and action."(Raden, 2007).

This Chapter allowed me to build a body of knowledge that is relevant to my topic and locate the theory that emerged from my research in it.

CHAPTER III. RESEARCH METHODOLOGY

III - 1 INTRODUCTION AND OVERVIEW

The objective of this section is to establish the ontological and epistemological foundations for this paper and present the research framework adopted to answer the research question.

I summarized my research design in the following representation inspired from Joseph Maxwell model (Maxwell, 2005). *Goals*, *Conceptual Framework* and *Research Question* are covered by CHAPTER I; *Trustworthiness* aspects of the paper are dealt with in CHAPTER V and put into perspectives with the Literature Review in CHAPTER II. Finally *Methods* are covered in the current CHAPTER. All sections are aiming at delivering an Answer to the Research Question presented in CHAPTER IV.

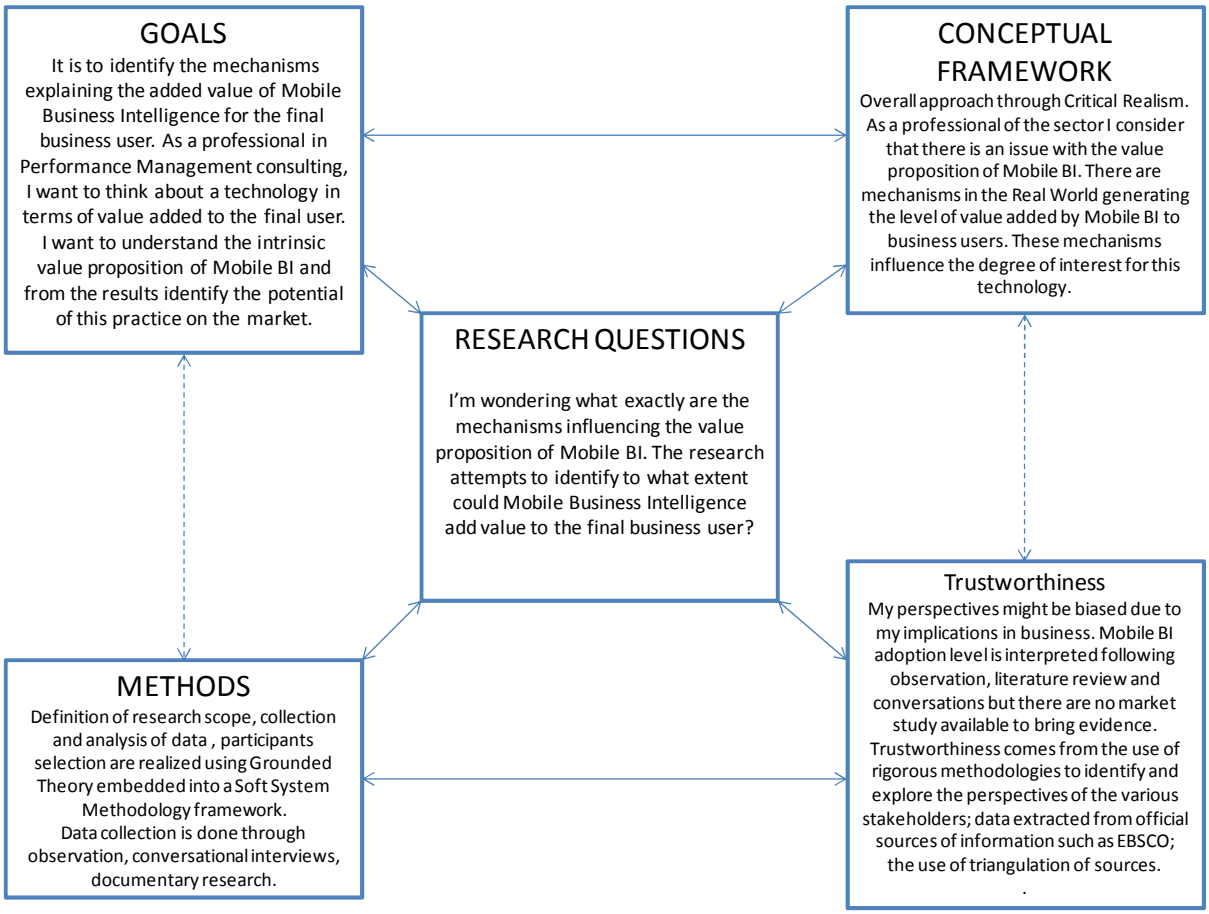


Figure III-20: Research design of the paper.

Sources: inspired by Maxwell's model (Maxwell, 2005).

III - 2 OVERARCHING PHILOSOPHY

This section is establishing *ontological* and *epistemological* foundations of the research paper.

Why do I need to define the overarching philosophy of my paper? Because identifying the ontology and the epistemology underpinning my research allows me define my *worldview* and therefore enables me to choose the most appropriate methodologies I need to use to answer my research question. The worldview – from the German term *Weltanschauung* – refers to my perception of the world and to the framework of ideas and beliefs allowing me to interpret the world and interact with it.

In the context of an academic research, the worldview has been categorized into *research paradigms.* A paradigm is not a methodology; it is rather "a set of basic beliefs that deal with ultimate or first principles. It represents a Worldview that defines for its holder, the nature of the world, the individual's place in it and the range of possible relationships to that world and its parts" (Guba & Lincoln, 1994, pp. 105-108).

The four competing theoretical paradigms

I can situate my worldview using the four competing research paradigms classified by Guba and Lincoln: Positivism, Post-Positivism, Critical Theory and Constructivism (Guba & Lincoln, 1994).

The following figure shows the paradigm continuum.

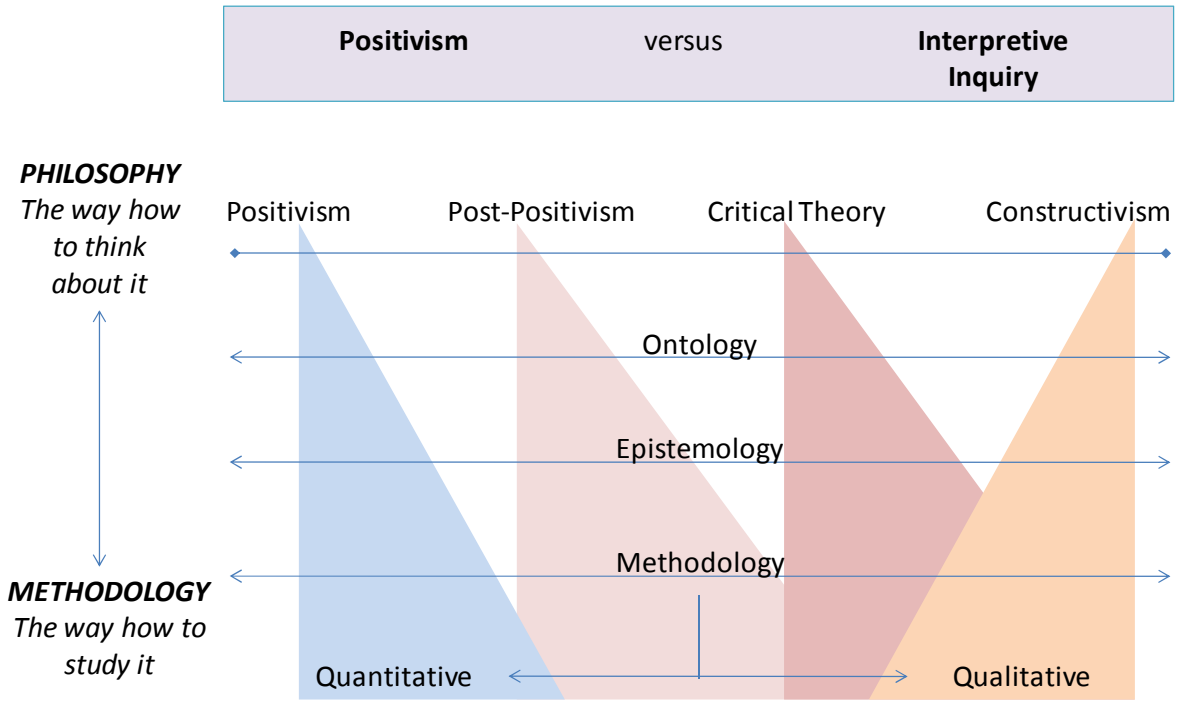


Figure III-21: Research paradigms.

Source: inspired by Guba and Lincoln (Guba & Lincoln, 1994).

To summarize the continuum, from one extreme to the other, the Positivism is advocating that the objective of knowledge is to describe the phenomena that we experience. This position values hard science for Inquiry; the Constructivism is a position that holds that no objective reality exists as knowledge is socially constructed and varies from individual to individual.

The paradigms in the continuum are not exclusive and are actually completing each other. As Earl Babbie wrote: "we are not forced to align ourselves with either of these approaches. Instead we can treat them as two distinct arrows in our quiver. Each approach compensates for the weaknesses of the other by suggesting complementary perspectives that can produce useful lines of inquiry." (Babbie, 2001, p. 44).

The four paradigms differ in their ontological, epistemological and methodological definitions.

Definition of Ontology, Epistemology and Methodology

Ontology is the study of the nature of being. The term comes from the Greek ὄν: of being and λογία: science, study, theory. It is a model of world that describes how it is structured and how it functions.

Epistemology is the study of the nature of knowledge. The term epistemology comes from the Greek word epistêmê, for knowledge. Epistemology is the philosophy of knowledge or of how we come to know.

Methodology is the study of practice, procedures and rules. Methodology is also concerned with how we come to know what we know but from a practical perspective: the specific means we can use to understand our world better.

Ontological definition of the four paradigms

While Positivism ontology states that the reality is 'real' and apprehensible, Critical theory advocates that history shapes the reality through the crystallization over time of social economics, ethnic political, cultural and gender values. Constructivism ontology advocates for a critical relativism there are multiple local and specific constructed realities. Finally, Post-Positivism advocates for *Critical Realism* (Bhaskar, 1975) where reality is real but only imperfectly and probabilistically apprehensible and so triangulation from many sources is required to know it.

Epistemological definition of the four paradigms

From an epistemological perspective, Positivism is objectivist as research findings are considered true and objectively certain. Critical theory epistemology is subjectivist and considers researcher interpretation to form knowledge. Constructivists contend that knowledge is constructed by scientists and not discovered from the world. Post-positivists are modified-objectivist as they consider that research findings are probably true but remain aware that the researcher and their observations could be biased by their own perspectives.

The methodology driven by the context and the theoretical paradigm

The circumstances to be researched and the perspective adopted by the researcher determine the methodology to be employed in a research project (Christie, Rowe, Perry, & Chamard, 2000). The ways the researcher sees the world and the way he considers how to acquire knowledge will influence the tools he will use to build his research project. The positivist believed in empiricism – the idea that observation and measurement is the core of the scientific endeavour. The key approach of the scientific method is the experiment, the attempt to discern natural laws through direct manipulation and observation. The positivist is thus more inclined to use quantitative research methodology whereas the Constructivist is more disposed to use Qualitative research methodology.

Qualitative research definition

Qualitative research is multimethod in focus, involving an interpretive, naturalistic approach to its subject matter (Denzin & Lincoln, Handbook of Qualitative research, 1994):

- One of the epistemological foundations of qualitative research is that there is no objective truth,
- Relationship of the researcher to the research,
- Made of Complex context dependent variables,
- Assumes multiple and dynamic realities, contextual,
- Inductive approach,
- Holistic orientation,
- Grounded.

Its ontology denies the existence of an external, objective reality. Its epistemology comes from the definition of its ontology. Since the researcher cannot embrace an objective reality but rather a subjective reality, he cannot embrace an objective epistemology: knowledge comes from its interpretation of reality through a deep understanding of the subject – Verstehen – of the data and of the context.

Introduction to Critical Realism

One of the major shifts in the scientific perspective and consequently in the philosophy of science is the shift in theoretical paradigm from Positivism to Post-Positivism. One of the most common forms of Post-Positivism is the Critical Realism. It differs from the positivist approach in the sense that the critical realist is critical about our ability to know reality with certainty. Where the positivist believed that the goal of science was to uncover the truth, the post-positivist critical realist believes that the goal of science is to hold steadfastly to the goal of getting it right about reality, even though we can never achieve that goal! (Trochim, 2006).

Critical Realism is a socially sensitive realist philosophy developed by Bhaskar (1975) which combines elements of Positivism and Constructivism (Perry, Alizadeh, & Riege, 1997).

Bhaskar argues that realism sees the world in terms of *Mechanisms, Events* and *Experiences* in three domains of reality: the *Real domain*, the *Actual Domain* and the *Empirical Domain* (Bhaskar, 1975). Bhaskar uses the term *Ontological Stratification* to describe these three overlapping domains of reality.

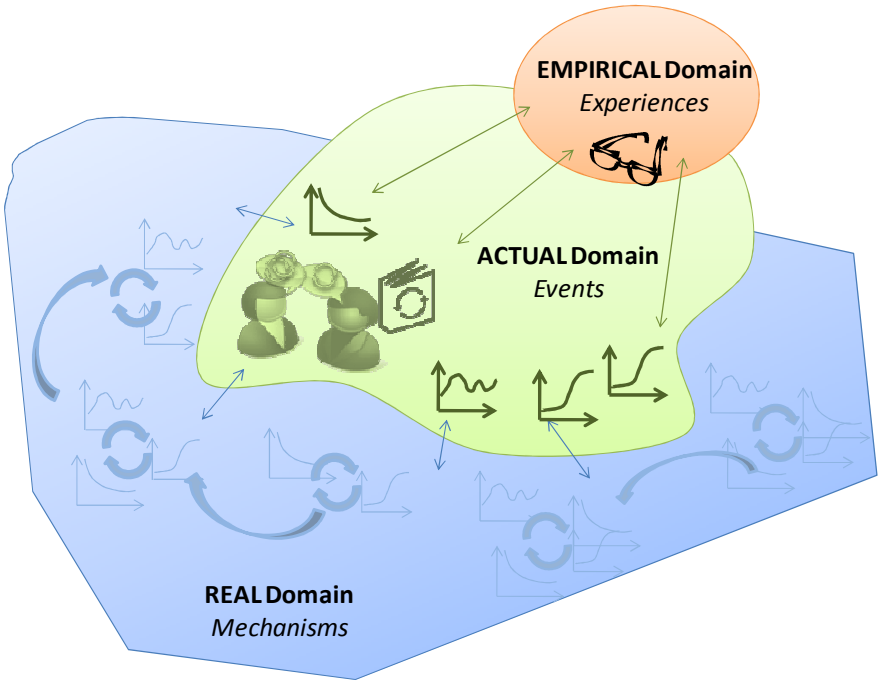


Figure III-22: Critical Realism.

Source: Stéphane PIMIENTA.

	Domain of Real	Domain of Actual	Domain of Empirical
Mechanism	•		
Events	•	•	
Experiences	•	•	•

Figure III-23: Ontological assumptions of Realism.

Source: adapted from Bhaskar (1975).

The Empirical domain or world is made up of the experiences we can obtain by direct observation. The Actual world is made up of events that we can observe or not, produced by the interacting complex causal mechanisms in the real world. The Real world consists of the inaccessible complex processes and causal mechanisms which generate the observable events of the real world.

Now that I have defined the extended theoretical environment I need to situate myself as a researcher in this competing paradigm continuum. Answering this interrogation is important to properly identify the reality into which I will conduct my research project, the way I will generate knowledge and the potential bias I may display in the process and finally the means I will deploy to realize the research.

I chose to adopt Post-Positivism and more particularly Critical Realism research approach because I am aiming at discovering the observable and non-observable structures and mechanisms generating the events I identified in the research situation. However, I know that reality is only imperfectly comprehensible and apprehensible and thus I need to triangulate from many information sources to get to know it. This is from an ontological perspective. From an epistemological perspective, I believe that the findings of my research are possibly true but that they are potentially tinted with my own beliefs and values. From a methodological perspective, I chose to adopt the qualitative approach and more specifically the Grounded Theory as the research methodology.

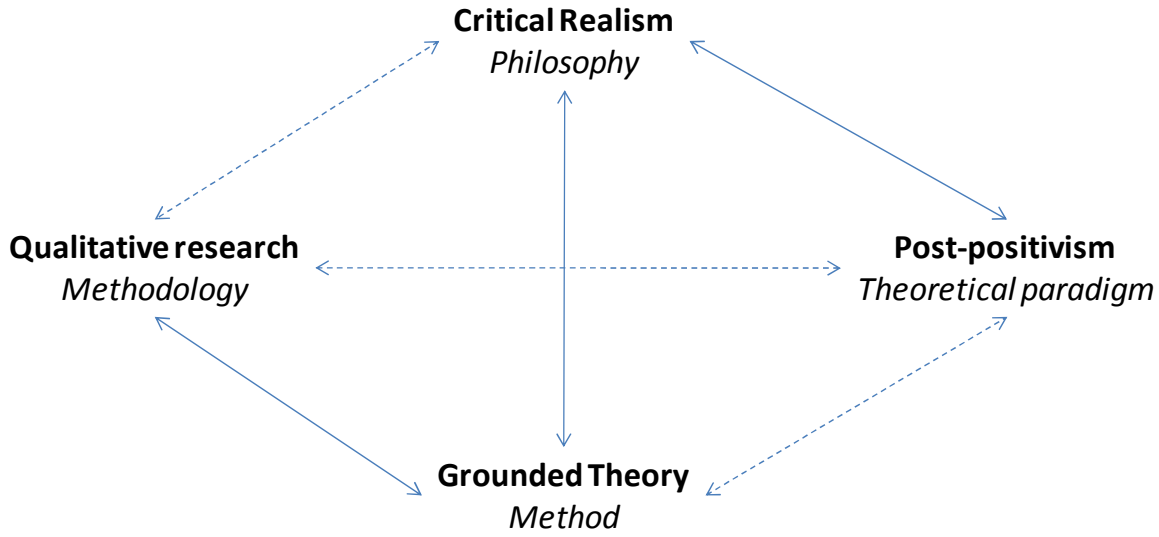


Figure III-24: Research theoretical framework

Source: Stéphane PIMIENTA.

III - 3 A METHOD FOR REALIST RESEARCH: THE GROUNDED THEORY

This section is about integrating Grounded Theory into Critical Realism to explain the process I will follow to answer the question why the phenomenon I have observed is actually happening. Grounded Theory will help us giving an account for the mechanisms that are occurring in the Real world and that are generating the phenomena.

What is Grounded Theory?

Glaser & Strauss developed this qualitative research approach in 1967. This model is a form of "field research" as it proposes a qualitative research method that explores and details phenomena in naturalistic settings.

Its purpose is to explore social process with the goal of developing a theoretically complete explanation about the phenomena, object of the research. The aim, as Glaser in particular states it, is to discover the theory implicit in the data.

Although essentially inductive, the methodology combines inductive and deductive approach (Glaser & Strauss, 1967). As for an inductive perspective, the theory emerges from the data and as for a deductive approach, the theory can be tested empirically to develop predictions. The basic principle of the GT is that the researchers do not start their study from a theory but instead from a collection of data from which the theory will emerge.

The emerging theory can be either Substantive – empirical – or Formal – conceptual.

The Grounded Theory offers mediation between theory and practice. First, because theory must be grounded into empirical evidence: they must be abstracted from concrete or empirically observable phenomena. Second, the realist research would be guided by a quest for theory rather than by an utter empiricism (Wai-Chung Yeung, 1997).

We can differentiate GT from other qualitative methodologies from the following differences(Stern, 1980):

- The conceptual framework is generated from the data rather than from previous studies,
- The researcher tries to discover a social process rather than describe the phenomenon,
- The researcher compares all data with all other data,
- The researcher can modify data collection according to the advancing theory,
- The researcher can start writing the report from the first data collection.

Description of the process

- ***Collection of empirical data***

The researcher collects data from multiple sources: interview (structured or informal), observations, journals… The examination of data can also be realized using various techniques and through a system of constant comparison. As researchers extract hypothesis, they consult literature for already developed theories that relates to the hypothesis of the study in progress. The objective of the GT is the definition of a Core Variable which is the foundational concept for the formation of the theory. The following steps are aiming at developing the core variable.

- ***Concept formation***

The researcher collects codes and analyses data from the beginning of the study in a circular mode. The coding of the data is made in three steps:

  - Level 1 coding: in search for processes. The data is analysed line by line and the text is coded to identify the processes in the data. The codes could come from the vocabulary used by the participants or from the researcher's coding himself,
  - Level 2 coding: categorizing is the process of classifying, comparing and clustering the data into categories. Then each category is compared to all other categories,
  - Level 3 coding aims at describing the Basic Social Processes (BSP).

- ***Concept development***

There are three major steps to let the core variable emerge from this point: reduction, selective sampling of the literature and selective sampling of the data.

  - Reduction: the reduction consists in grouping the great number of categories extracted from the previous phase into a limited number of broader categories,
  - Selective sampling of the literature must be done after data analysis (or at least in parallel) but should not be realized before. The literature review allows comparing the emerging theories with the one already produced by the literature to fill the gaps and complete the new theory,
  - Selective sampling of the data. As the main concepts are appearing we can compare to the emerging theory to determine if the concepts are central to the theory. Additional data can be collected to further develop the categories up to saturation.

The core variable emerges from this process. The concept of Core Variable refers to a category which accounts for most of the behaviour of the phenomena.

- ***Concept modification and integration***

This phase is realized in two steps, the *theoretical coding* and the *memoing*. The theoretical coding consists in reviewing the data in theoretical terms rather than descriptive terms to enhance their abstraction and ease the extraction of the theoretical explanation. The memoing consists in producing memos to preserve the ideas of the researcher when time will come to write the report.

- ***Production of the research report***

The GT report presents the theory which is supported by the data from field notes. The report should give an idea of the source of data, how it was exploited and how the concepts were extracted. The reader should be able to grasp the meaning of the theory and apply its concepts.

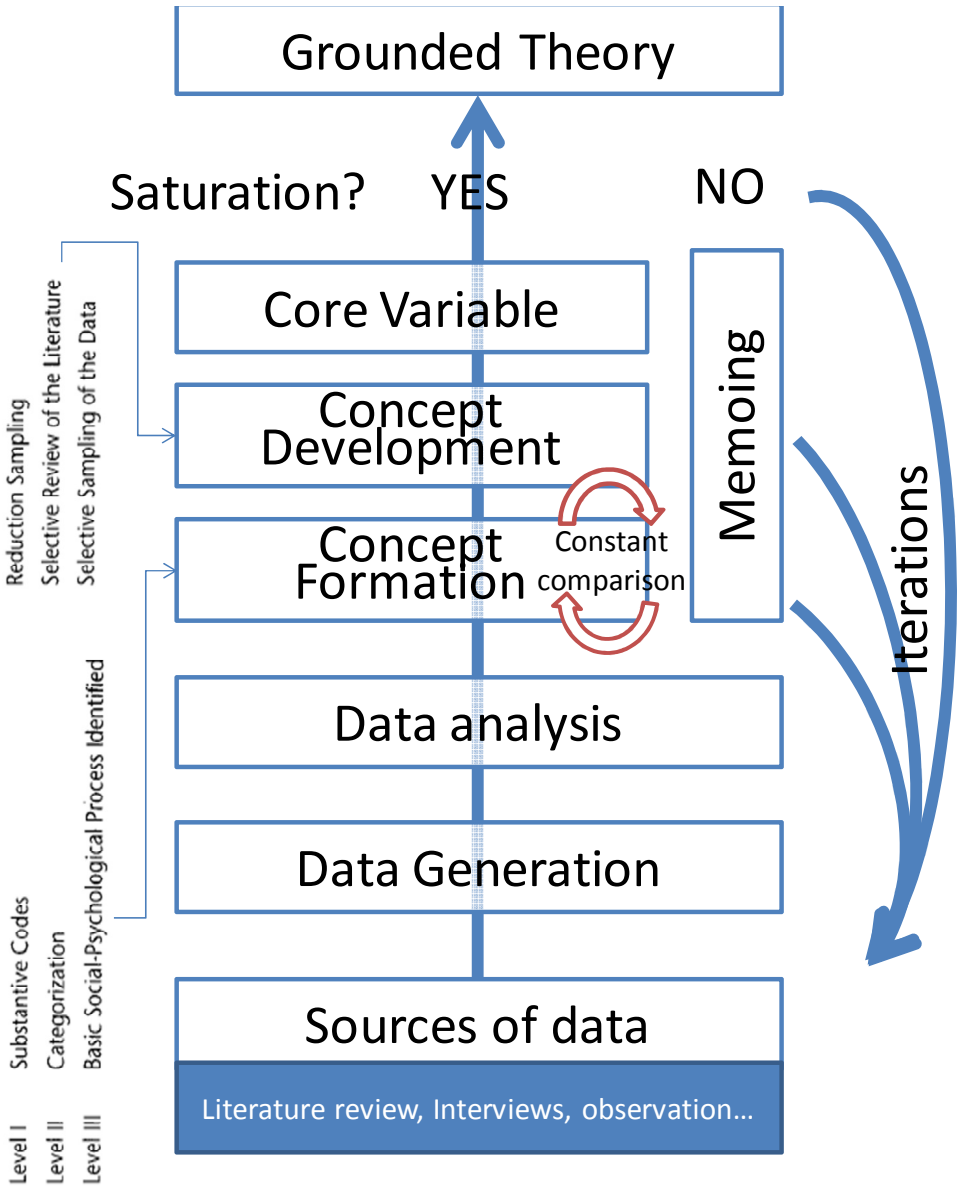


Figure III-25: Grounded Theory process.

Source: Stéphane PIMIENTA.

Integrating Grounded Theory with Critical Realism

The objective of the method is to let the theory emerge. The theory accounts for the causal mechanisms generating the phenomenon, object of the research.

Definition of the concept of Ladder of Inference

The ladder of inference is a metaphor created by Professor Chris Argyris (Argyris, 1990) to characterize the mental process followed when one leaps rapidly to conclusion with little data and limited thinking as if climbing at a ladder in his mind. The use of system thinking methodologies helps the researcher follow a consistent process of data collection, construction of assumptions and conclusions thus limiting the risk of misconception and misjudgement.

Grounded Theory is used as a ladder to build a map of the territory as grounded as possible. In the process aiming at building the judgement, it is key to keep a critical eye on the map and not confuse the territory with the map. The map is a conception of the territory.

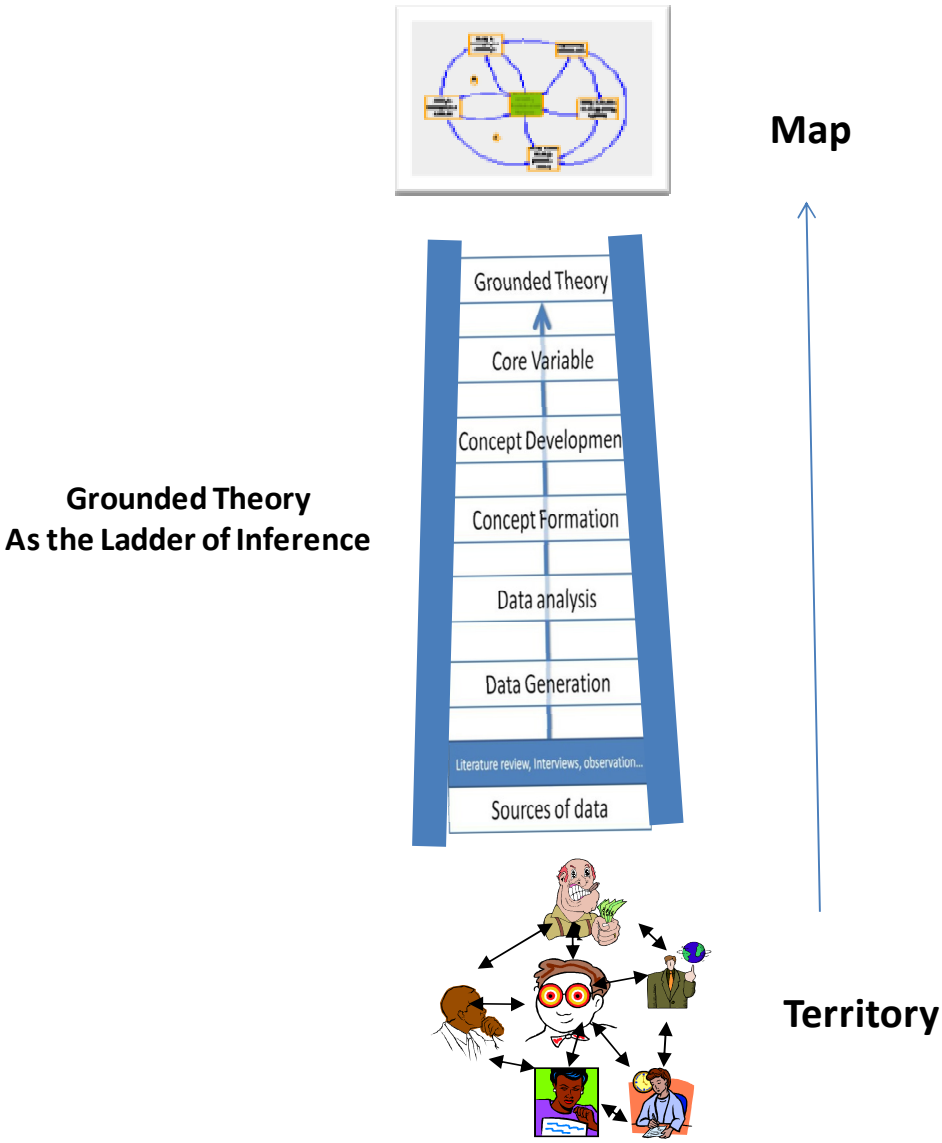


Figure 26: Grounded Theory as the ladder of inference.

Source: inspired by Tom Ryan CR & GT.ppt (2009).

Integration of the Critical Realism, the Grounded Theory and the ladder of inference

From the territory I select the data I consider contributing to the understanding of the research situation and to answering the research question. The Grounded Theory is used to help me in the collection process as well as in the analysis of the data. The resulting map is not only based on my bias but on a combination of other stakeholders' perspectives. It gives an account for the causal mechanisms in the real world.

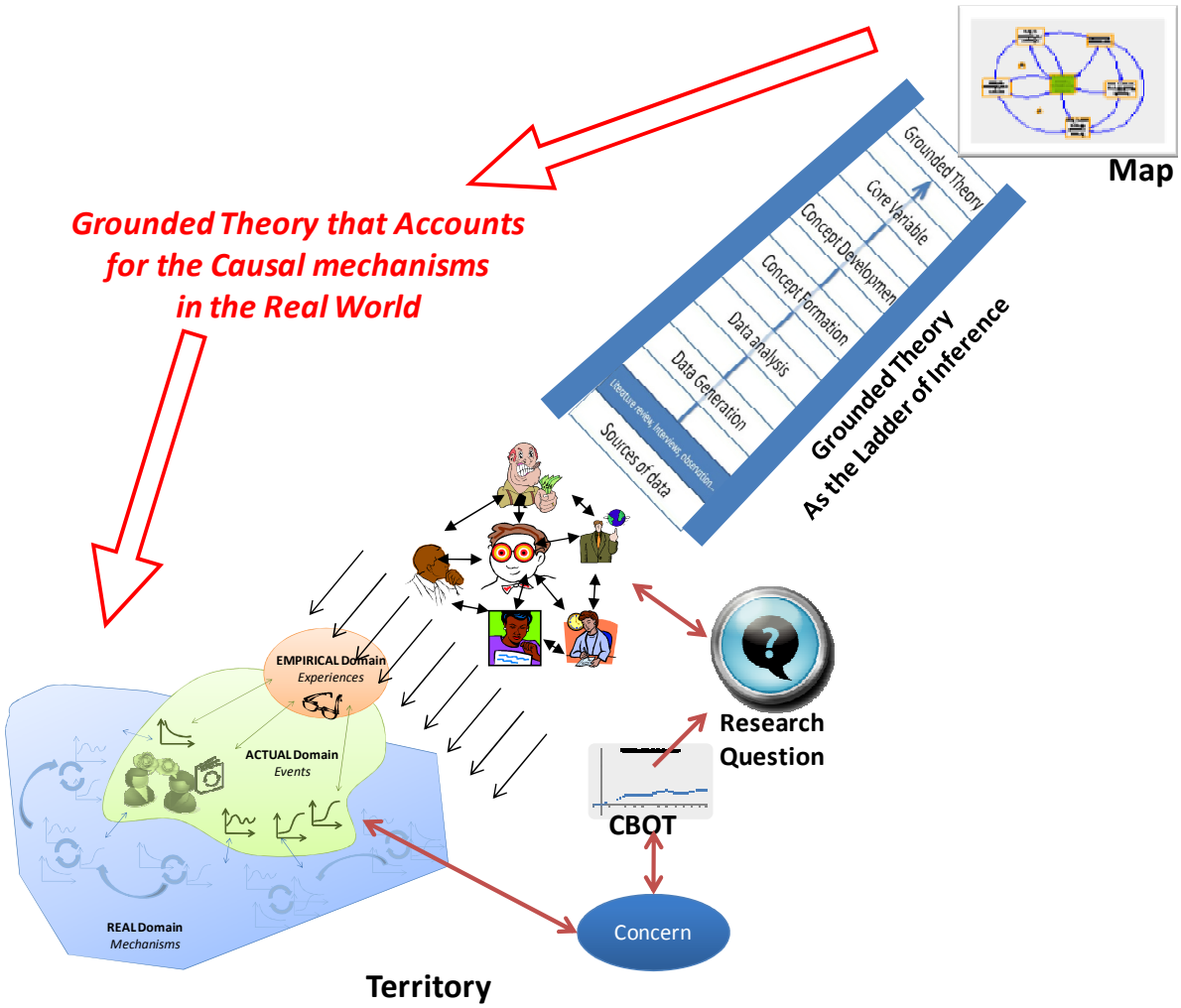


Figure III-27: Grounded Theory integrated with Critical Realism.

Source: inspired by Tom Ryan CR & GT.ppt (2009).

Conclusion

GT process uses a qualitative research approach and its epistemological assumptions make the traditional measures of reliability not applicable. When judging qualitative work the usual canons of 'good science' require redefinition in order to fit the realities of qualitative research (Strauss & Corbin, 1990, p. 267). The causes and consequences of this reliability issue are presented in the section III - 6 "Evaluation & Conclusion" below.

III - 4 A METHODOLOGY TO UNPACK THE COMPLEXITY: THE SOFT SYSTEM METHODOLOGY

Soft Systems Methodology (SSM) is a methodology founded by Peter Checkland proposing an approach which enables intervention in ill-defined problem situations facilitating a systemic process of learning instead of a systemic process of optimizing (Checkland, 1981). SSM seeks to work with various perspectives to create generative discussions and comparisons that can lead to definition of actionable knowledge in pursuit of improvement.

SSM proposed a seven steps process to explore a problem situation starting from conceptual perspectives ending with actions. First step aims at identifying the problem situation. A second step requires the expression of the problem situation in the form of a Rich Picture. In a third step, we identify relevant human activity systems corresponding to the stakeholders' perspective on the problem situation. These essential activities are captured in *Root Definitions* and are explored using CATWOE approach (Customer, Actors, Transformation process, Worldview, Owners and Environment). In a fourth step, the root definitions are used to build *Conceptual Models* representing the minimum activities that are necessary to operate the Transformation process. The fifth stage consists in comparing the conceptual models with what is perceived to exist and captured in the rich picture. Step 6 consists in developing potential changes that are both desirable and feasible. Finally a seventh step sees the action that could be taken to deal with the dysfunctions and improve the problem situation.

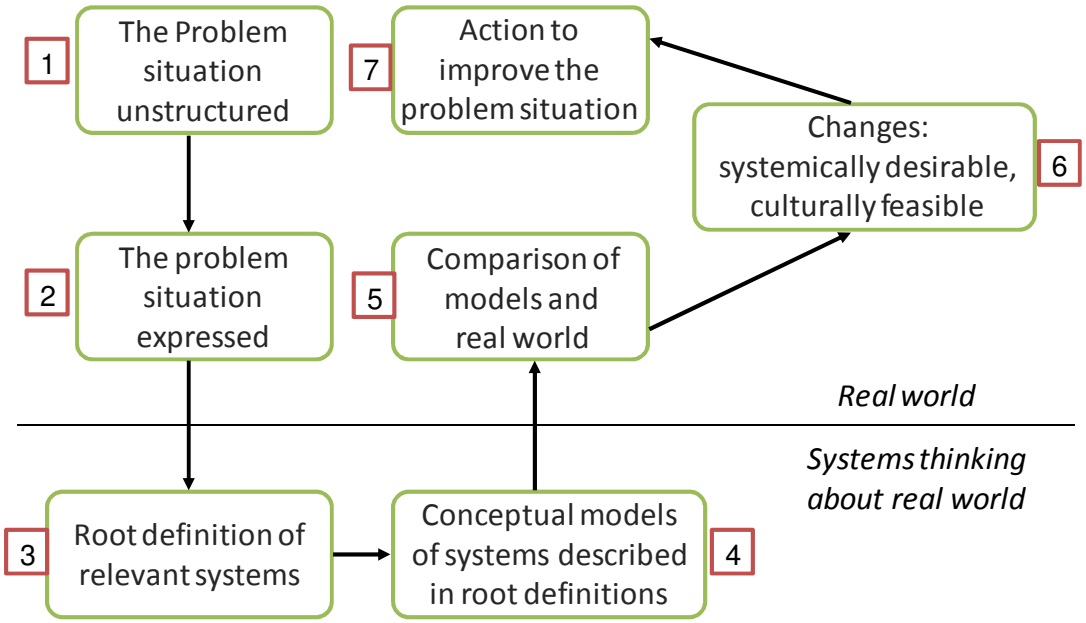


Figure III-28: Soft System Methodology.

Source: (Checkland, 1981).

I choose to use SSM because it helps dealing with messy situation (Ackoff, 1981), poorly defined, where stakeholders interpret problems differently i.e. there is no objective reality and where human factors are important. SSM proposes a creative, intuitive approach to problem-solving, where the outcomes are learning and a better understanding, rather than providing 'a solution'.

SSM is used in pluralist context where collaborative thinking is required amongst shareholders in order to find actions leading to improving the problem situation. Integrating SSM with Grounded Theory allows me to create a framework able to deal with varied and sometimes contradictory perspectives of stakeholders. SSM allows thorough exploration and analysis of stakeholders' purposes and perspectives and thus offers a 'soft' approach to the 'mess'.

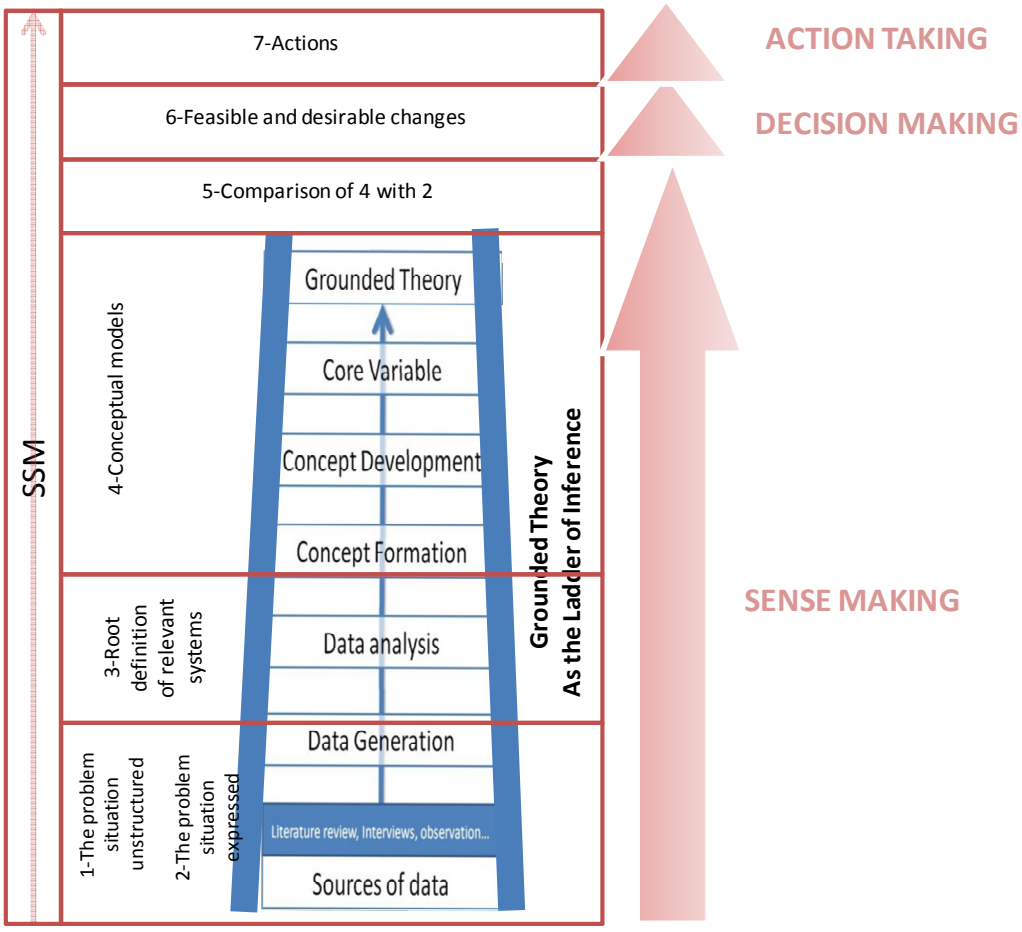


Figure III-29: Integrating SSM with Grounded Theory.

Source: Stéphane PIMIENTA.

Additionally, I am using complementary systems thinking methodologies or approaches to enrich the selected methodology.

One of them is *Critical Systems Heuristic* (Ulrich, 1983). CSH is used to determine the "boundary judgments" i.e. the empirical observations and the value consideration I judge important and the one I decided to exclude from the definition of the problem situation. All these facts and values compose the "Reference System" that gives meaning to the situation and conditions its validity.

The reflection through the triangle composed by the Reference System, the Values and the Facts (the *Eternal Triangle*) is named *Systemic triangulation* process.

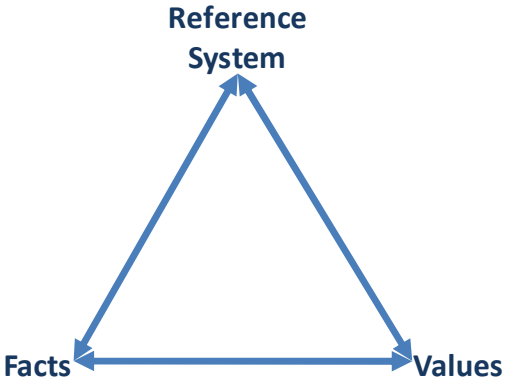


Figure III-30: The Eternal Triangle.

Source: (Ulrich, 2000, p. 6).

The Eternal triangle symbolises the way boundary judgements drive judgement of facts and of values, and inversely. It represents the following argumentative process: "Whenever we propose a problem definition or solution or raise any other claim with a practical intent, we cannot help but assert the relevance of some facts and norms as distinguished from others. Which facts and norms we should consider depends on how we bound the reference system, and vice-versa; as soon as we modify our boundary judgments, relevant facts and norms are likely to change, too" (Ulrich, 2005, p. 6).

I also use *Work Systems* from Hoebeke (Hoebeke, 2000) to help me categorize the perspectives of the various stakeholders and give a complementary light on the purposes, the values and the individual reference systems.

Work Systems is framework founded by Luc Hoebeke aiming at describing human activities through transformation processes being the expression of the basic purposes of these activities. Hoebeke defined the Work System using its basic elements: the work capacity strata as defined by Eliott Jacques in his various researches. Each work stratum corresponds to a Process Level. Hoebeke organized the Process levels according to their relations with time span. The Added-Value Domain with activities from stratum 1 to stratum 3 with a time span of 1 day to 2 years; the Innovation Domain with activities from stratum 3 to stratum 5 with a time span of 1 to 10 years; the Value-System Domain with activities from stratum 5 to stratum 7 with a time span of 5 to 50 years and finally the Spiritual Domain with activities from stratum 7 to stratum 9 with a time span greater than 20 years.

A detailed analysis of the stakeholders involved in the problem situation showed that they were highly influenced by one or more of the following three domains: Value Added Domain, Innovation Domain and Value Systems Domain.

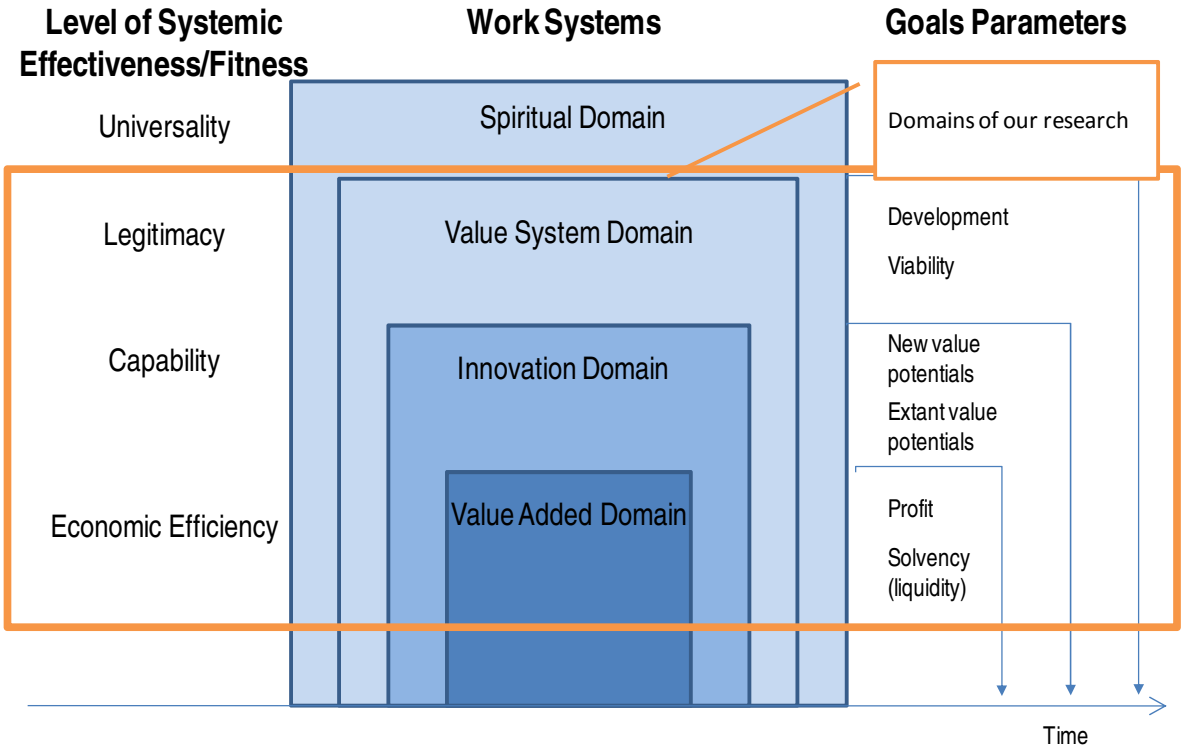


Figure III-31: Work systems of my research.

Source: inspired by Tom Ryan (2009).

III - 5 THE COMPLETE RESEARCH FRAMEWORK

The combination of these various methodologies and techniques composes my complete research model, presented in the following figure.

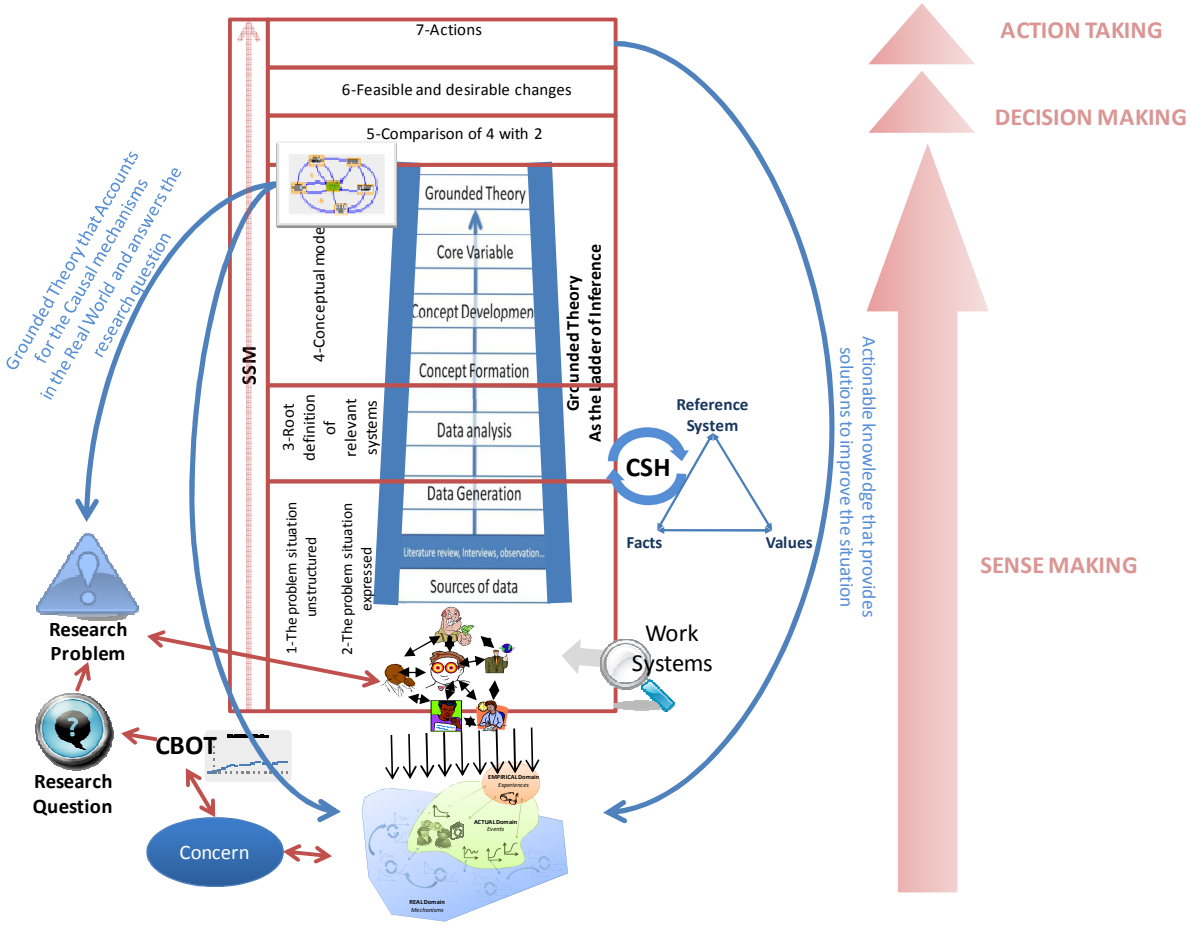


Figure III-32: Complete research framework.

Source: Stéphane PIMIENTA.

The process

Each part of the paper, from Chapter I to Chapter V, is exploiting the results of the various steps of the complete research framework. The first steps of SSM and GT helped me define what is presented in Chapter I: the Situation, the Concern and the Question. The results presented in Chapter IV have been produced using the following steps of SSM and GT. Finally, Chapter V material has been obtained by the application of steps 5 and 6 of SSM. As explained in the following paragraph, step 7 of SSM, Action taking, is not part of the research.

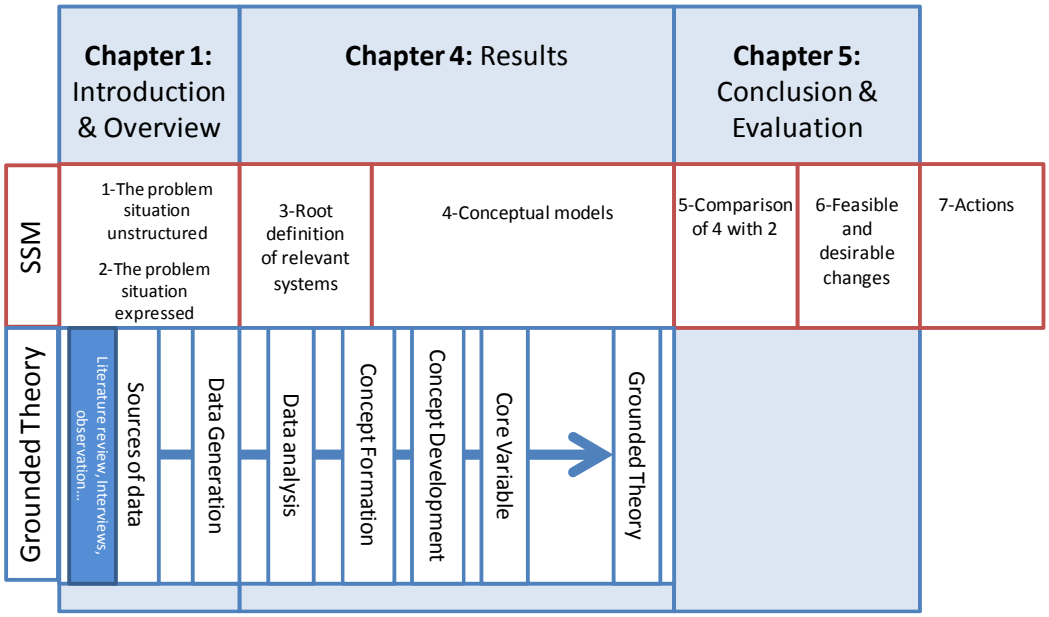


Figure III-33: The process in applying the research methodology.

Source: Stéphane PIMIENTA.

The methodology is used to explore the research topics in three main steps: Sense making, Decision making and Action taking. Considering the specific topic I am dealing with in this paper, Action Taking is not covered by the research. Actually, my position as a service provider does not allow me to take actions to efficiently influence the value proposition of this technology on the market. Thus, the main part of the paper is dealing with the Sense Making of the situation and the phenomenon (Chapter I and Chapter IV) and the conclusion is covering the Decision Making with recommendations on how various stakeholders should consider exploit the potential of Mobile Business Intelligence (Chapter V).

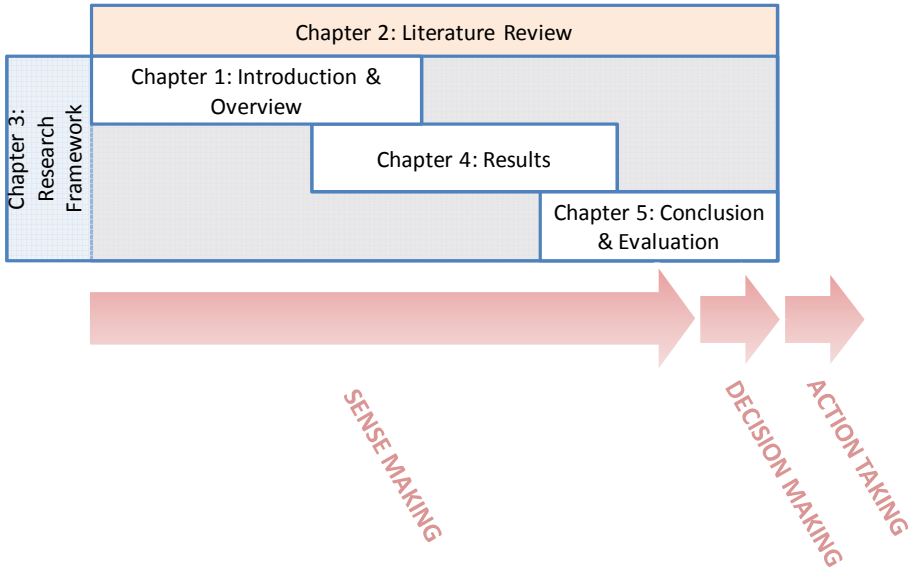


Figure III-34: Paper organization re. Sense Making and Decision Making.

Source: Stéphane PIMIENTA.

III - 6 EVALUATION & CONCLUSION

This section aims at explaining how I am trying to minimize the threat to the validity of the paper or how I am trying to maximize the trustworthiness and concludes the Research Methodology Chapter.

Ensuring Trustworthiness

The use of "Validity" and "Reliability" criteria are commonly used and accepted in Quantitative research in the social sciences. Since these criteria are applied in positivist perspective, they must be redefined to suit qualitative inquiry. Validity is characterized by the rigor with which the research has been conducted and the extent to which the researcher has explored the alternative explanations of the phenomena studied. These criteria are referred to as "internal validity". Validity is also characterized by the degree to which the results of the research could be applied in a different setting, i.e. generalizable. This is referred to as "external validity". Reliability could be defined as:

- The degree to which a measurement, given repeatedly, remains the same,
- The stability of a measurement over time,

- The similarity of measurements within a given time period (Kirk & Miller, 1986).

Validity appears to be inappropriate in a qualitative context as it reflects a concern for acceptance within a positivist concept of research rigor. Some qualitative researchers reject the idea that there is a reality external to our perception of it. Consequently, they consider that there is no point demonstrating the truthfulness of a phenomenon with respect to an external reality. The concept of replicability encompassed in the notion of reliability does not concern the qualitative researchers (Glesne & Peshkin, 1992). Additionally, reliability issue concerns measurement then it has no relevance in qualitative research (Stenbacka, 2001).

Instead qualitative researchers defined their own evaluation criteria: "Trustworthiness". A qualitative research fulfils the criteria of trustworthiness if it demonstrates that the research results are "worth paying attention to" (Lincoln & Guba, Establishing Trustworthiness. Naturalist Inquiry., 1985). Four criteria are defining trustworthiness:

- Credibility: when the results of the research are considered a credible or believable conceptual interpretation of the participant's perspective,
- Transferability: when the results could be generalized to different settings, beyond the context of the research,
- Dependability: measures the quality of the integrated process of data collection, analysis and theory generation,
- Confirmability: measures how well the theory generated is confirmed by the data collected or corroborated by others.

Lincoln and Guba propose a process qualitative researchers can follow to ensure that their results are Credible, Transferable, Dependable and can be Confirmed (Lincoln & Guba, 1985).

I am using these various criteria to ensure the trustworthiness of my research paper in CHAPTER IV.

Conclusion

The research framework developed in the context of this research allowed me combining various methodologies and tools learnt during the EMBA program. The idea is not to integrate all the EMBA learning into a consistent whole but rather, use the most appropriate tools to develop a credible and useful answer appropriate to the research topic, the context and my potential biases.

From an ethical point of view, my research methodology preserves the rights of the various stakeholders because it is based on a method advocating for multiple perspective analysis.

CHAPTER IV. RESEARCH RESULTS

IV - 1 INTRODUCTION AND OVERVIEW

This chapter aims at exploring the results obtained by the application of the research framework exposed in CHAPTER III. I present the answer to the research question by making sense of the mechanisms of the real world generating the behaviour of the concern variable.

Mobile Business Intelligence functionalities have been proposed to BI users for several years by software vendors. However, it appears that this mobile practice has not taken full advantage of the rapid growth of its related sectors, BI and mobile technologies. Business users seem to take this functionality into account when selecting a Business Intelligence solution, as part of the standard functionalities they expect, but, actually, few implement them as part of a larger BI initiative and even fewer make this functionality their central initiative.

Based on this observation we can wonder why Mobile BI practice is not expanding faster. This question is raising a major concern which is the value proposition of such functionality. This is the concern I am addressing in this research. It can be expressed by the following variable: “level of value added by Mobile BI to the business user”.

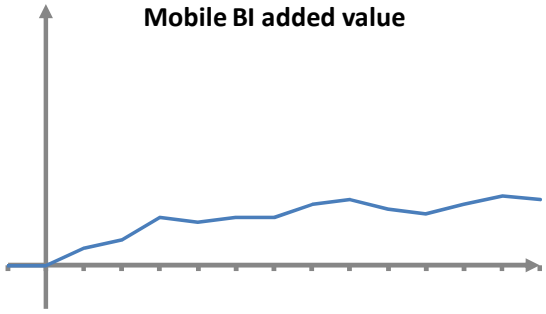


Figure IV-35: Concern variable: level of value added by Mobile BI to business users.

Source: Stéphane PIMIENTA.

In order to address this concern, I have to focus my research on the exploration of value proposition of Mobile BI. By answering the question “To what extent could Mobile BI add value to the business user” I should be able to clarify the theoretical value proposition of

Mobile BI. Then, the observation of Mobile BI current market should allow identifying the actual gap between theory and reality and defining recommendations to mitigate it.

Through the application of a combination of the Grounded Theory process and the Soft System Methodology I am building a Theory aiming at explaining the mechanisms originating the behaviour of the concern variable. The Theory is built in the form of a Causal Loop Diagram (CLD or CCDL for Concern Causal Loop Diagram) presenting the various variables influencing the level of value added by Mobile BI to the final user.

IV - 2 THE BUILDING OF THE THEORY

The objective of this section is to develop the conceptual canvas of the relevant system. This will be my Grounded Theory. This Theory accounts for the mechanisms of the Real World and gives an explanation of the behaviour of my Concern variable, the level of value added by Mobile BI to the final user. Through the exploration of the data collected in the field – Empirical and Actual World – I form and develop the concepts that will compose the core of my Theory.

2 - a ***Data collection process***

The data collection process consists in an iterative collection of information through interviews, observations and readings. The information is then classified and organized to extract 'concepts'.

Based on the analysis presented in CHAPTER I where I explored the situation and identified the main stakeholders and their particular perspectives, I have collected information from interviews and documentary research.

The building of various mind maps (e.g. in appendix Figure APPENDIX-57: MindMap of the key concepts) allowed me to clarify the key concepts around the research topic and start collecting information.

I used Grounded Theory approach to ensure a rigorous data generation and data analysis. I clearly referenced the sources of information that I detailed in the appendices.

2 - b ***Root definitions of relevant systems***

This section aims at defining the various systems of the research problem. Root definitions intend to divide the complex problem situation into relevant individual system functions. In the SSM process, it is the 3rd step, following the structured expression of the situation made in CHAPTER I.

These definitions are meant to be exhaustive and I am using CSH and CATWOE processes to ensure the exhaustiveness of the study. CSH and CATWOE have been respectively used in CHAPTER I.2 - bii and CHAPTER I.2 - biii. These analysis lead to the formalization of the Root Definitions.

A system to do X	By means of Y	In order to Z
Accompany new work style	Providing connection to the company's network anytime from anywhere	To allow mobility to workers, answering to new information requirements
Provide interactivity with information: let the user access information in a dynamic way so that he could enter new information, navigate into existing information to select the interesting one, transfer information, receive information	By proposing user-friendly interfaces and interactive functionalities such as alerts, write back...	To offer a powerful mobile information management system to the mobile user
Increase user experience	By proposing a simple, ergonomic, dynamic, natural interface	To deliver a user-friendly tool to the many
Increase the operational efficiency of the user	By proposing a high level of integration with operational systems and the necessary level of interactivity (write back, real time data, comfort of use...)	To deliver a performance management tools for operations and increase the efficiency of operational users
Participate into the pervasiveness of BI	By proposing nomad devices and softwarec enhancing the traditional BI	To offer BI functionalities to anyone, anywhere, at anytime
Accompany new requirements for immediacy of information	By offering mobile devices and application able to collect and give access to real time or near real time information on the go	To make sure BI information follows the same evolution as the other highly versatile information available on mobile (social networks, news, business...)
Ensure interoperability with other existing systems and devices	By offering standard, open and flexible protocols	To ensure a high return on investment by exploiting the existing without requiring replacement or redevelopments
Deliver versatile utilization and high added value to the final user	By proposing sophisticated solutions delivering content rich applications with powerful user interface	To ensure user satisfaction, application usability, long lasting investment
Generate business opportunities	By offering business information in critical business context (customer visits, meetings, remote working sessions...)	To increase the awareness of mobile business users on customer opportunities
Let the user use its location to interact with information	By offering GPS functionalities	To exploit the mobility of the user and the device to generate higher interactivity
Benefit the convergence of computer and mobile phone	By using the power of mobile devices in constant evolution toward computing	To provide powerful applications delivering the same added value than a desktop computer
Benefit the extension of broadband wireless networks	By increasing the software functionalities exploiting online information	To provide real time or near real time information delivery
Increase performance of remote work force	By offering a solution increasing the interactivity between workers even in situation of mobility	To ensure efficiency of remote teams
Benefit the expansion of mobile usages	By offering a solution that mimics social uses	To ensure a large adoption by users
Offer secured transactions	By guaranteeing strong protocols and procedures to secure data and accesses to companies' networks	To extend the usage of mobile to any type of information and avoid limiting its application to basic/non strategic information
Benefits all the key information within the company	By guaranteeing openness and large capacity of the mobile system	To allow the exploitation of the important information whatever its size or nature (numeric, text, not-normalized...)
To pull its value from the utilization by numerous business users	By proposing a cost effective solution	To ensure its rapid and large diffusion to various functions within the company (Finance, HR, Supply chain, Sales...) and across companies
To be able to exploit the benefits of various systems	By ensuring standardization and interoperability with various systems and platforms	To optimize integration with the company's IT environment and thus Return on investment,

Figure IV-36: Root definitions statements.

Source: Stéphane PIMIENTA.

The expression of the root definitions captures the perception of the key functions expected by the various stakeholders from the relevant system. Through these root definitions, I can extract a first extraction of the value proposition expected from the various stakeholders.

Various vendors are considering Mobile BI as an extension of traditional BI and as a potential business enhancer. Users are focusing their expectations on the usability as well as on the security aspects of information. They expect performance gains for mobile workers from the use of nomad devices. They also see social and organizational functions attached to the use of mobile technologies in the sense that they expect to collaborate and communicate with their business community through the mobile interface.

In the first two sections of this CHAPTER IV, I have defined the research question, the research problem and the related scope of research, including the classification of the various stakeholders. I have also started collecting data through interviews and literature review as prescribed by GT process and, following an iterative process, I captured the stakeholders' perspectives on the relevant system, the Mobile BI value proposition in the format of Root Definitions. In the following section, I am building the 'Conceptual Model' of the relevant system as per the fourth step of SSM through the 'Concepts formation' and 'development' leading to the 'Core theories' of GT.

2 - c ***The formation of key concepts***

This section aims at detailing the formation of key concepts through data collection, coding and analysis processes.

Level I and II Coding process of the GT allow first, the line by line analysis of the information collected and second, the allocation of the concepts found in the data collection to categories. The root definition statements offered me guidelines to classify, cluster and iteratively compare the categories to one another. The use of an *Affinity Diagram* (AD) helps me in this process to determine relationships and potential grouping of the categories. At this stage, 30 categories remain.

Ability to mimic new social uses	Adapt to new Life style	Accompany new requirements for speed and immediacy	Accompany new Work style	Ability to react on the go	Weight of troublshooting /maintenance	Technical hurdles	Ubiquitous broadband wireless network	Security issues	Companies' maturity	Smartphone market expansion
Conducive to social networking	Mobile internet	Immediacy of information	Instant communication	Business process readiness		Technical unstability	Constant connectivity of mobiles	Data security	Sporadic adoption	Mobile communicatio n and computing readiness
Innovations in social networking and mobile technologies	New communicatio n practices	increase reactivity	Instant access to data			Technical incompatibiliti es	Limited bandwidth	Device security	Workforces not up to speed	Expansion of smartphone market
Mimetism	Work/life balance	surcharge informationne lle	Analyse information anywhere			Data volume	Pervasive Broadband	Security of web apps	Learning curve	Increase of mobile data traffic (50x)
Interactions	Ability of ubiquity		Anywhere anytime information delivery culture			Technological risks (standards war, rapid obsolescence)	Bandwidth challenges	Security blueprint	Organizational culture	Internet trends
sociological factors			Mobile workers			Platforms war	Bandwidth improvement		Planned adoption	Major Computing Cycles
Social media is shaping people and organizations' interactions. Mobi is a response from BI to these new uses.			"You are at office when you travel"			IT department restrictions on employee technology usage			Low level of service delivered to Mobile user	Real-time wireless remote controls
Convergence with social media applications			Collaborative			Improvement in infrastructure			Appropriation by the users	Explosive number of Mobile data users
			Remote working			Deployment			No technological adoption barrier	Equipment rate
			Mobile practices			Norm			IT department reluctance	Influence from Smartphone success
			New way of working						Technical/user support function for mobile workers	General mobility
			Incentive						Formal committee to define requirements for mobile BI	Number of mobile applications increases
			Ubiquity of access to application						Training program	
			ability to communicate, collaborate, coordinate						Track mobile bi usage	
			improved autonomy						Technology management	
			Culte de l'urgence						Culture	
									Organizations policies (resources dedication)	
									Maturity of user	
									Organizational values	
									Remote workforce strategy	

Figure IV-37: Extract of the Affinity Diagram.

Source: Stéphane PIMIENTA.

The *raw conceptual model* is the first step into classification of the important concepts of the research problem. For each category identified in the AD, I identified the minimum set of activities required to fulfil the objectives summarized in the root definition. The following figure presents the array of conceptual models established for each category.

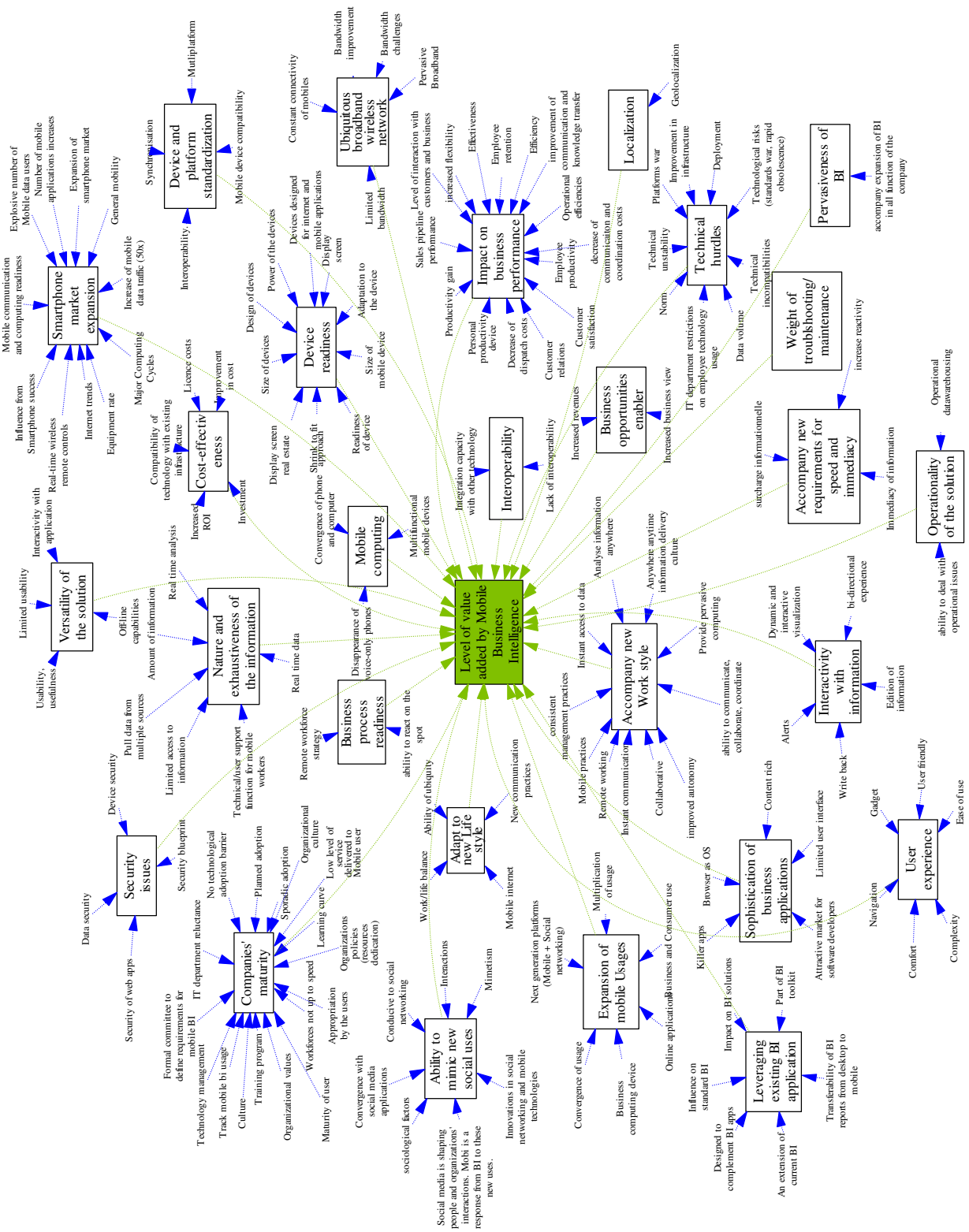


Figure IV-38: Array of raw Conceptual Models as a spray diagram.

Source: Stéphane PIMIENTA.

As an example of the conceptual model represented in the previous figure, Mobile BI could accompany the "shift in work style". This is one of the root definition statements. Mobility is a strong trend on the market in business context. According to IDC the worldwide mobile worker population is set to increase from 758.6 million in 2006, accounting for 24.8% of the worldwide workforce, to 1.0 billion in 2011, accounting for 30.4% of the workforce (IDC, 2008). Companies need to be able to propose mobile technologies to their staff to support this trend. A new work style recently appeared symbolizing this trend the "Digital nomadism". It advocates for flexibility and autonomy for the mobile worker who wants to remain connected to his company and teams while travelling. A Computer Weekly/BT survey found that 78% of companies intend to invest further in wireless, and 60% saying they would invest in PDA and handhelds over the next year, and 40% saying they would do so over the next two years (Savvas, 2005). The minimum set of activities or drivers identified in the conceptual model for this category is composed by:

- Improve autonomy,
- Allow remote working,
- Enable mobile practices,
- Be accompanied by management practices,
- Provide pervasive computing,
- Provide instant communication,
- Be collaborative,
- Provide immediate access to data,
- Allow information analysis from anywhere at anytime.

As another example for the category "interactivity with information", the conceptual model details the minimum set of activities required to fulfil root definitions such as "requirements for immediacy of information" or "operational efficiency of the user":

- Provide alerts functionalities,
- Enable write back,
- Enable comments,
- Provide bi-directional experience,
- Provide dynamic visualization.

2 - d ***Concepts development***

This section aims at presenting the reduction sampling, the selective review of literature, and the selective sampling of the data.

The reduction sampling consists in grouping the categories into a limited number of broader categories. It is done by constantly comparing the various categories and broadening the definition of each. This process helped me reduce the categories from 30 to 13.

1			2	3	4								
Conduciveness to social networking			**Ability to accompany new Work style**	**Ability to react on the go (decision & action)**	**Expansion drivers**								
Ability to mimic new social uses	*Adapt to new Life style*	*Accompany new requirements for speed and immediacy*	*Accompany new Work style*	*Ability to react on the go*	*Weight of troublshooting/maintenance*	*Technical hurdles*	*Ubiquitous broadband wireless network*	*Security issues*	*Companies' maturity*	*Smartphone market expansion*	*Expansion of mobile Usages*	*Cost-effectiveness*	*Device readiness*	*User experience*

5		6			7	8	9	10			11		12	13
Ability to leverage the existing		**level of sophistication of mobile solutions**			**Operationality of the solution**	**Speed of propagation and exhaustiveness of the information**	**Ability to simulate (testing hypothesis)**	**Level of interactivity**			**Pervasiveness of BI**		**knowledge dissemination**	**Time and space ratio**
Leveraging existing BI application	*Interoperability*	*Mobile computing*	*Sophistication of business applications*	*Versatility of the solution*	*Operationality of the solution*	*Nature and exhaustiveness of the information*	*Ability to simulate (testing hypothesis)*	*Interactivity with information*	*Interaction with the environment*	*Interactivity with people (active collaboration medium)*	*Device and platform standardization*	*Pervasiveness of BI*	*As a portable knowledge resource*	*Modify time and space ratio*

Figure IV-39: Reduced categories.

Source: Stéphane PIMIENTA.

Selective review of the literature occurred simultaneously with data analysis in an iterative manner. It is used to compare the concepts and categories identified in the previous steps with the ones literature can provide. This process helped me to reduce further the number of final categories and finalize their definition.

Amongst these 13 categories, 3 are eliminated: Expansion drivers, Ability to leverage the existing and Level of sophistication of mobile solutions. The latter are seen as drivers influencing the spread of Mobile BI more than as providing a real value to the business user. "Technical hurdles" is a sub-category of expansion driver and it directly influences the adoption of Mobile BI by the end user. For many stakeholders this driver appeared to be the

main reason explaining the slow take-off of this mobile practice: low definition and small display, slow communication standards, etc.

Company's maturity is another driver explaining the slow adoption by end-users but can hardly be presented as an objective value driver. However, customers' maturity can explain part of the amplitude of the level of value perceived by the end user. A company which is used to challenge its habits with new technologies is also more able to measure the real benefits of new practices such as mobile use of Business Intelligence. I decided to eliminate this variable in the selection of key categories as it actually influences the perceived value and is not an objective component of the value proposition.

This last variable allows me to stress an important point in the logic of the final theoretical model: the Theory focuses on the key components of the value proposition of Mobile BI. The elements that are influencing the perceived value of Mobile BI are not part of this model but will be used in the conclusion of this research as drivers to be used to improve the overall situation of Mobile BI.

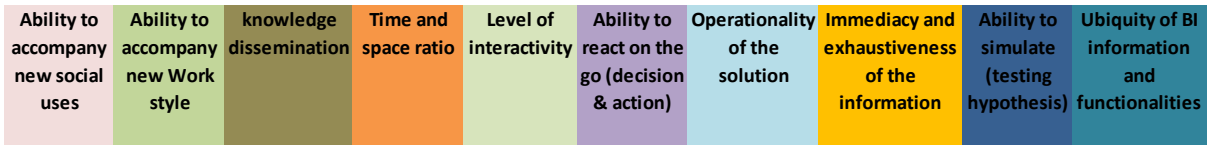


Figure IV-40: 10 final categories.

Source: Stéphane PIMIENTA.

2 - e The complete Causal Loop Diagram and the Core Causal Loop Diagram

The objective of this section is to present the result of the selective sampling through the reduction of the complete Causal Loop Diagram (CLD) to the Core Causal Loop Diagram. I present the core drivers of the reduced CLD and their properties.

Selective sampling of the data consists in comparing the data to the categories to confirm the hypothesis and saturate the categories. After having selected the key categories, I continue the process of reduction and comparison to establish the relationships and the conditions under which the variables interact with each other.

I established the relationships between the variables in the form of CLD. CLD is a way of expressing interconnection between variables in the form of a diagram. It provides a language to express the mechanisms in play in the relationships between several variables by

representing the link and the nature of the dynamic. It is a powerful tool to explore and communicate the causal relationships between components of a specific situation. Loops could be "reinforcing" if the global dynamics between several variables creates an ever increasing or decreasing spiral, or "balancing" if the dynamics is on the contrary stabilizing the situation.

I grouped the categories by theme to form 3 different CLDs, then, I consolidated the 3 CLDs into 1.

Promoting action

In the following CLD, I grouped the categories adding the most value to action to understand the dynamics in play for the level of value added by Mobile BI. To illustrate the CLD I am presenting one of the reinforcing loops represented below.

One of the key expectations around Mobile BI is the ability to shorten the information flows for operational purposes. The CLD presents the strong influence that the immediate availability of exhaustive information ("immediacy and exhaustiveness of information") has on the other variables. In order to properly realize operational tasks, the operator requires complete and reliable information on which he can base his decision and related actions. Let's take the example of a marketing manager analyzing the impact of an advertising campaign while travelling. The Mobile BI solution he is using will not be helpful for managing his operations if only half of the targeted public is represented in the figures or if he cannot have access to the latest results as information needs one week to be processed. This example illustrates the fact that "operationality" of the solution will be partly driven by its ability to provide quick and precise information. In its turn, it is clear that the level of operationality of the solution is directly driving the level of value added by Mobile BI to the user. It is interesting to underline the fact that because value to the final user is recognized, the organization will be keen to integrate Mobile BI in its business processes and consequently extend the use of this technology and related practices. This will thus increase the scope and improve processes of Mobile BI to allow more and better information to be represented. A reinforcing loop between the three variables is revealed.

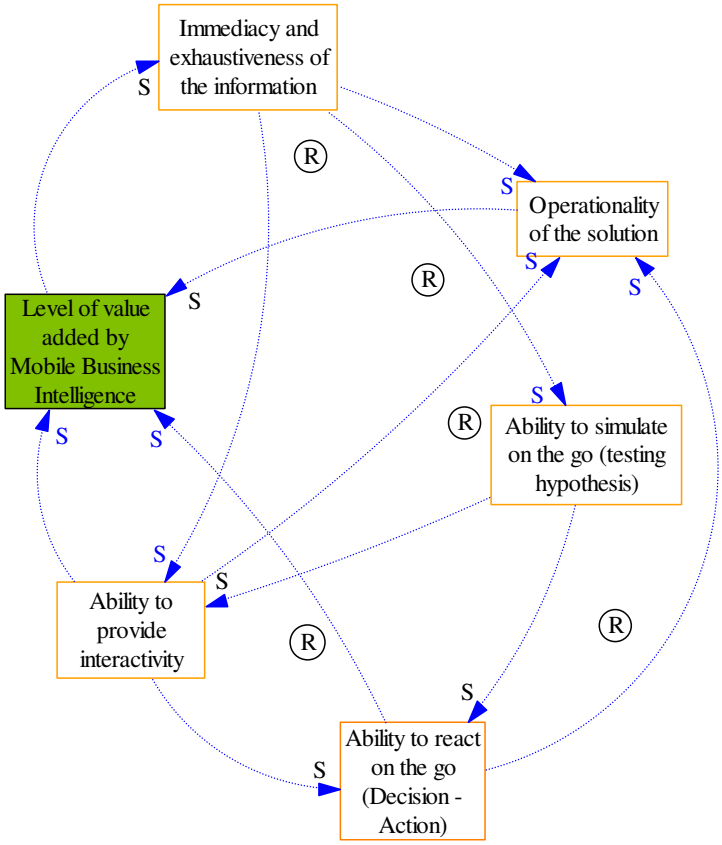


Figure IV-41: Promoting action.

Source: Stéphane PIMIENTA.

Facilitating information spread

In the following CLD, I selected the variables representing the drivers increasing value around information flows. Mobile BI is part of the Information Technologies which by definition serves the diffusion information. I am illustrating this critical value by presenting one of the reinforcing loops represented below.

A central value expected by Mobile BI users would be related to the ability of the solutions to provide immediate and exhaustive information to increase their own knowledge and the one of their team members. The diffusion of this knowledge is central to the idea of Business Intelligence and is equally true in a context of mobility. Decisions and actions must be supported by a sufficient level of information to avoid confusion between the map and the territory as presented in the concept of ladder of inference in CHAPTER III. As an example, a buyer needs to have an array of information available in order to properly negotiate prices and volumes with his provider. It would be hazardous to enter negotiation without having

access to key information such as market information, data concerning his provider, the volume of transactions he made last period with him or the target price used in his budget. Without hard evidence on the context of the negotiation provided by a reliable system, his risk is to infer conclusions based on wrong information – confuse the map with the territory – and consequently make mistakes. By ensuring access to important information and acquire the required knowledge, the user will ensure better conditions for decision making and action taking. He will extract great value from this ability to access to knowledge. Again, as presented in previous section's example, once the value of Mobile BI is recognized, the organization will want to improve its processes to extend the scope of such tools creating a reinforcing loop iteratively improving immediacy and exhaustivity of information, dissemination of knowledge and value added to the user.

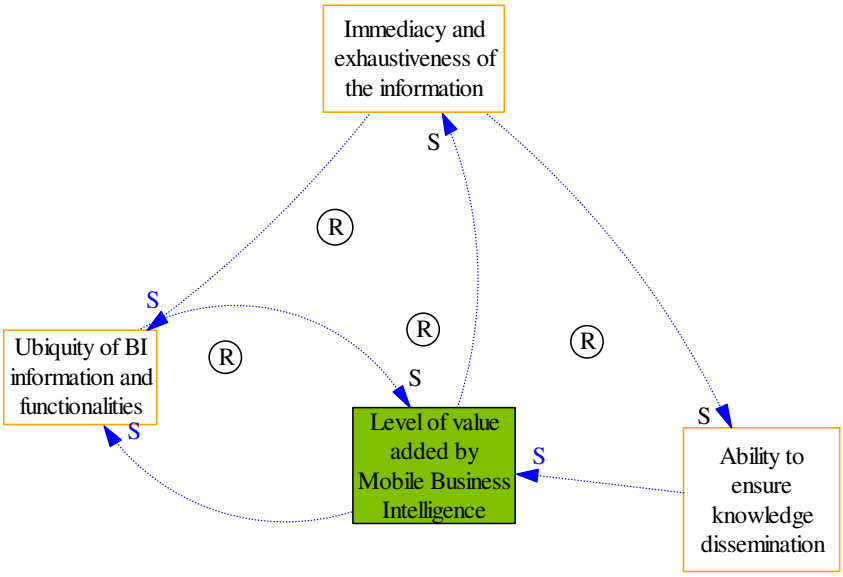


Figure IV-42: Facilitating information spread.

Source: Stéphane PIMIENTA.

Conforming to new life standards

In the following CLD, I selected the categories relating to life standards. Importance of Mobile technologies in our day to day life is constantly increasing. Mobile devices and mobile phones particularly, as results of technological convergence are everywhere, at anytime: alarm clock on the morning, radio, mp3 or video player in commuting, phones, personal assistant (PDA), business application devices at work, networking media after work… I am illustrating this by presenting one of the reinforcing loops represented in the figure below.

Mobile devices allow optimizing time and space ratio by providing pervasive access to functionalities. Pervasive access in this context means: anywhere at anytime access. The user can optimize his time by doing several tasks in parallel – multitasking – or by avoiding slack period while commuting for instance. Mobile BI will provide a constant access to key information on his activity so that he does not have to wait for his coming back to the office to consult information and make a decision or feed his reflection. In that sense, Time and Space ratio optimization will in turn drive the ability of Mobile BI technologies to accompany new work styles. We can define new work styles by an increase in the required reactivity to events, an increase in the communication flows – largely driven by email, instant messaging or social networking – an increase in the quest for performances, an increase of mobility. Mobile BI aims at giving the user the instrument to allow him answering to this new work paradigm challenges. He will extract value from Mobile BI in this process. By increasing the level of value added to the final user, organizations will generalize and expand Mobile BI to other functions and tasks and will therefore increase time and space optimization, closing the reinforcing loop.

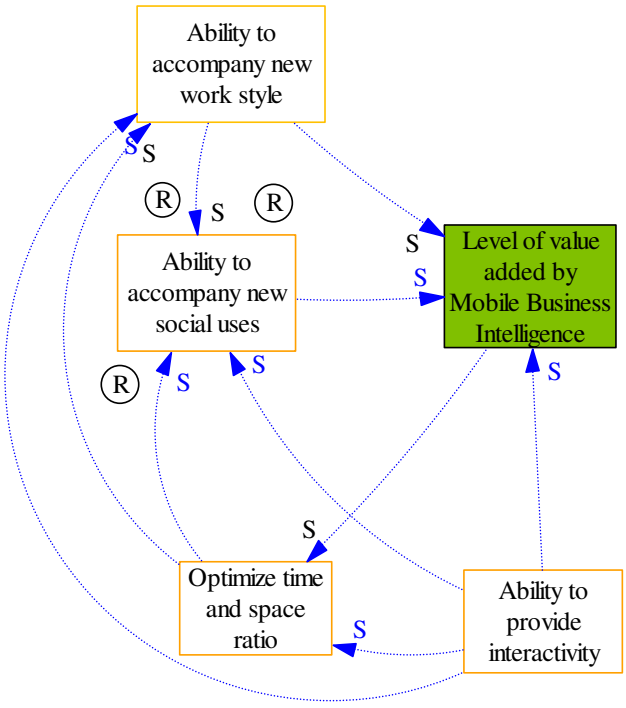


Figure IV-43: Conforming to new life standards.

Source: Stéphane PIMIENTA.

Because the vision of mechanisms in play would not be exhaustive if the interactions between these 3 CLDs were not represented, I created a complete CLD grouping the 10 categories.

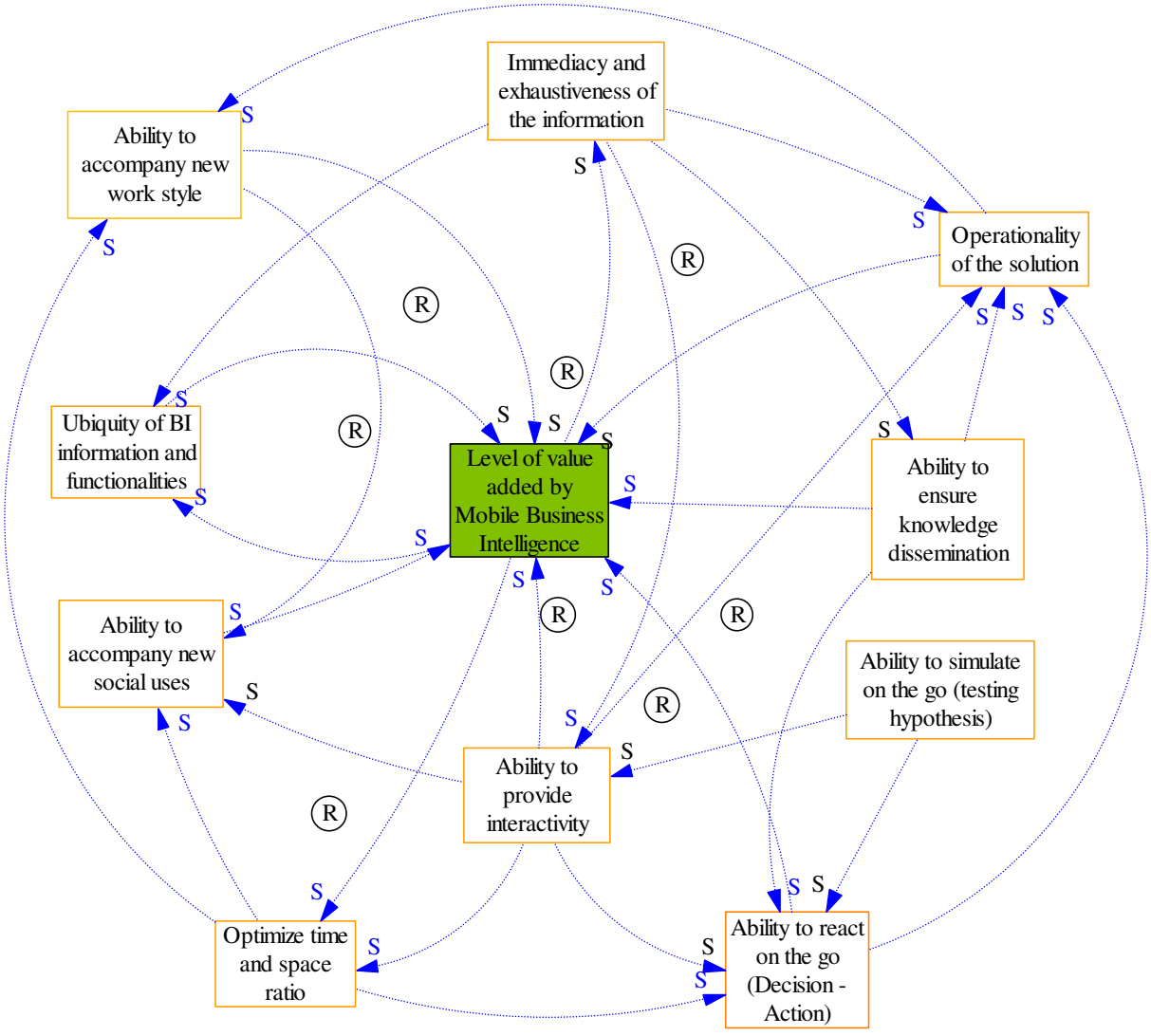


Figure IV-44: Complete Concern Causal Loop Diagram.

Source: Stéphane PIMIENTA.

Once consolidated, the complete CLD shows a high complexity, However, it allows getting a holistic view of the mechanisms influencing the Concern variable. It prepares the following step which consists in ranking the level of influence of each variable on one another.

In order to evaluate the influence of the various categories, I use a tool, the Interrelationship Digraph (ID). It allows evaluating the influence of the variables not anymore on the Concern

variable, but on one another. The objective is to select the most influential drivers to determine the *Core Variables* composing my Theory.

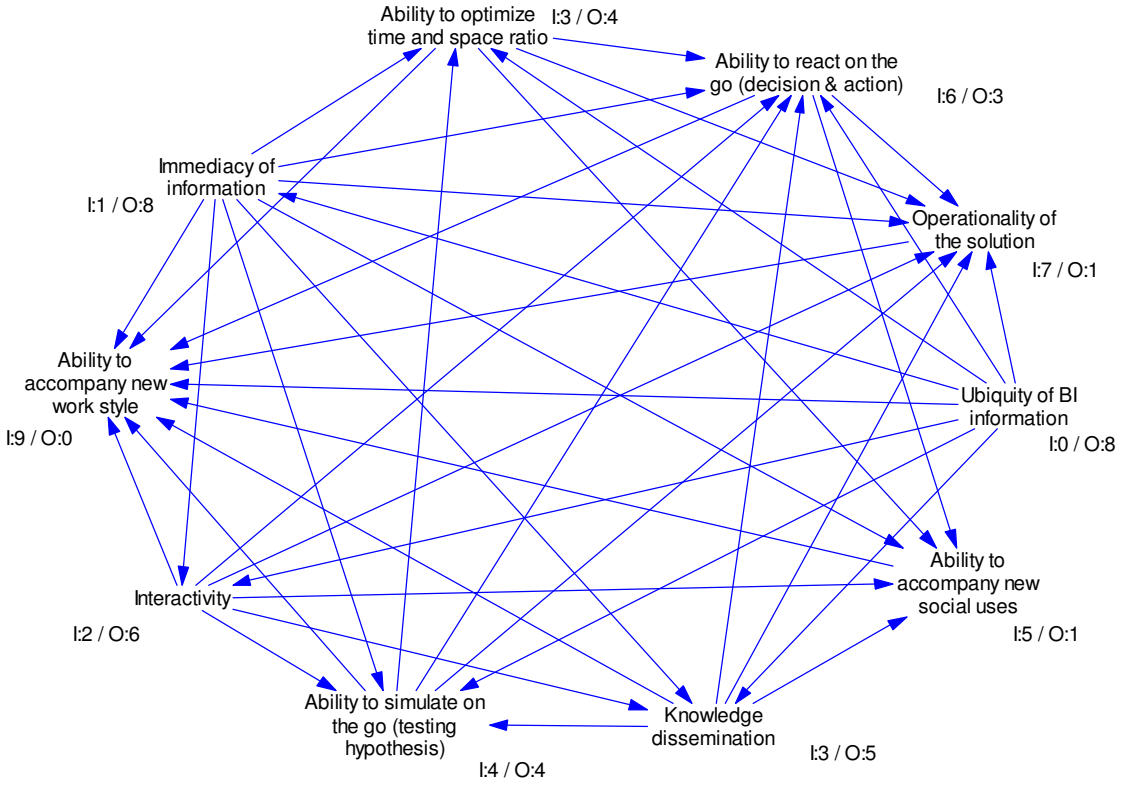


Figure IV-45: Interrelationship Digraph.

Source: Stéphane PIMIENTA.

The ID allowed me to isolate the key drivers and the key outcomes of the problem situation. The core variables are the main outcomes, i.e. the main added values expected by the final business user. I ranked the outcomes according to their influence represented by the number of ingoing arrows in the ID (see Figure IV-46) I selected the first four most influential outcomes as the Core Variables.

	Driver		Outcome
8	Ubiquity of BI information	9	Ability to accompany new work style
8	immediacy of information	7	operationality of the solution
6	interactivity	6	Ability to react on the go
5	knowledge dissemination	5	Ability to accompany new social uses
4	Ability to simulate (testing hypothesis)	4	Ability to simulate (testing hypothesis)
4	ability to optimize time & space ratio	3	knowledge dissemination
3	Ability to react on the go	3	ability to optimize time & space ratio
1	Ability to accompany new social uses	2	interactivity
1	operationality of the solution	1	immediacy of information
0	Ability to accompany new work style	0	Ubiquity of BI information

Figure IV-46: Key drivers and key outcomes.

Source: Stéphane PIMIENTA.

The following table provides the core properties of each core variable: the properties, the context, the causal conditions, the intervening conditions and the consequences.

	Ability to accompany new work style	Operationality of the solution	Ability to react on the go	Ability to accompany new social uses
Properties	New work styles is defined as: • increase in the required reactivity to events, • increase in the communication flows • increase in the quest for performances, • increase in mobility It is the ability to provide required support to face these challenges.	Ability to deal with operational issues, i.e. day to day issues related to business operations. In contrast with strategic issues. Operations concern the Added-Value domain activities as defined by Hoebeke and more particularly the System 1 according to S. Beer.	"React" consists in decision making, action taking. This include the control of consequences of decisions, the simulation of possible consequences of decisions. It also includes a notion of immediacy, real time reaction.	New social uses could be defined as: • Immediacy of information • Ubiquity of information • New social networking practices • Adaptive work/life balance • Ability of ubiquity It is the ability to be compliant to these criterion.
Context	Business context in developed countries. In activities sensitive to change.	Business context. Value-Added domain. Any function in an organization (HR, finance, Sales, production...)	Business context.	Business and life context in developed countries.
Causal conditions	New work style is caused by the following: • Development of communication flows largely driven by email, instant messaging or social networking. • Changes in communication media drive changes in communication speed, driving global increase pace of business. • Globalization of business activities. • Globalization increases competition and quest for performance.	Operational activities are defined with input, processes and output and characterized with a notion of time and place. The notion of accessibility and usability complete the definition. Level of operationality is driven by the degree of appropriateness of the solution to these characteristics of the activity. The more appropriate, the more operational the solution. Ex: Ability to get fresh and reliable information, ability to interact with the information (analyse, capture), ability to collaborate, easy and powerful HCI	This ability is driven by the level of interactivity • between the user and the information (simulation, capture, interaction with transactional systems), • between the user and his environment (collaboration with other users) and, • between the device and the environment (context awareness: location, identify, tasks, time)	This ability is driven by the capacity of the solutions to be consistent with social paradigm changes: Mobile BI must provide the same values than the ones advocated by the new social paradigm: • Offer ease of use: focus on the objective rather than on the doing, • Conducive to social networking: offer collaborative capabilities, • Provide pervasiveness of information, • Reduce time and space ratio.
Intervening conditions	Technological & cultural readiness	Technological & cultural readiness and appropriateness of the context. Business process readiness. Management practices adaptation.	Technological & cultural readiness and appropriateness of the context. Business process readiness. Management practices adaptation.	Cultural consistency: new generations even more than previous Technological readiness: user-friendliness, networks to offer pervasive access to information, screen size...
Actions / interactions or outcomes / consequences	As technologies and practices evolve to support new work style it participates in generating more changes. Reinforcing loop. Work life balance in question. Informational overload. Culture of speed at the expense of quality.	Performance and efficiency of workers. Speed and reactivity of operations. Security of operational information could be at risk. Risks reg. consistency of decision made in situation of mobility.	Performance and efficiency of workers. Speed and reactivity of decisions, actions. Questions about appropriateness of some decisions/reactions in situation of mobility.	Increase in collaboration, coordination, team spirit. Help reduce technological barriers by advocating for natural HCI. Work life balance in question. Informational overload.

Figure IV-47: Properties of the core categories.

Source: Stéphane PIMIENTA.

The four core variables are composing the four final conceptual models.

"Ability to accompany new work style"

Topic sentences: The variable 'Ability to accompany new work style', as defined in the previous section offers values to the final user if the system is able to:

- Deal with new business model based on mobility and remote operations,
- Ensure immediacy of the information to increase reactivity and performance,
- Ensure analysis capability anywhere at anytime to optimize time and reduce space,
- Communicate, collaborate and coordinate to increase team efficiency and social networking,
- Ensure security of the information to preserve key business information.

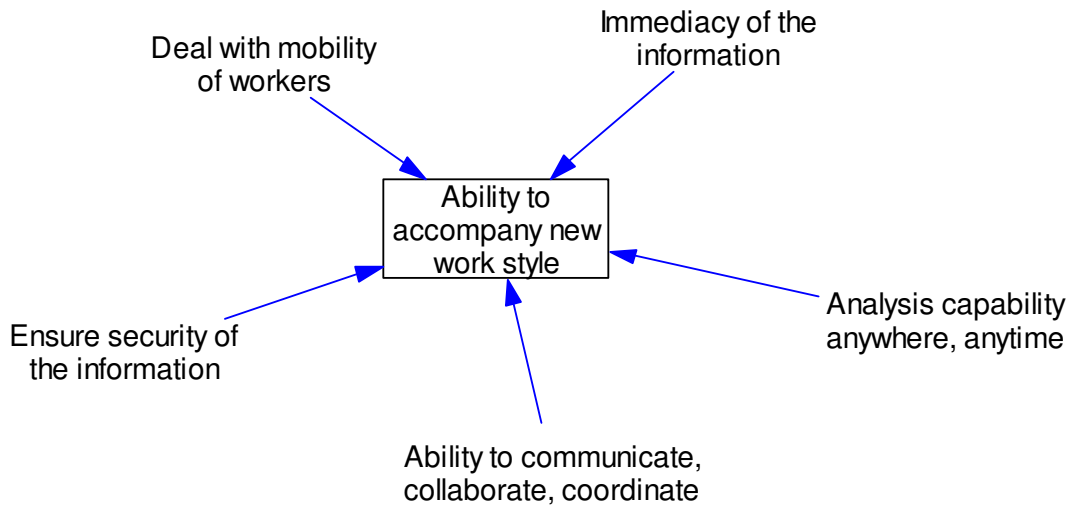


Figure IV-48: Conceptual model for "Ability to accompany new work style".

Source: Stéphane PIMIENTA.

"Ability to accompany new Social Paradigms"

The variable 'Ability to accompany new Social Paradigms', as defined in the previous section offers values to the final user if the system is able to:

- Be conducive to social networking to comply with new social rules,
- Ensure immediacy of the information to comply with new communication uses,

- Allow convergence with social media to optimize interoperability and ensure user-friendliness,
- Mimic social uses to facilitate adoption and support from the users,
- Reduce Time & Space ratio to accompany new pace of life,
- Reduce technological complexity to ensure user-friendliness and usability.

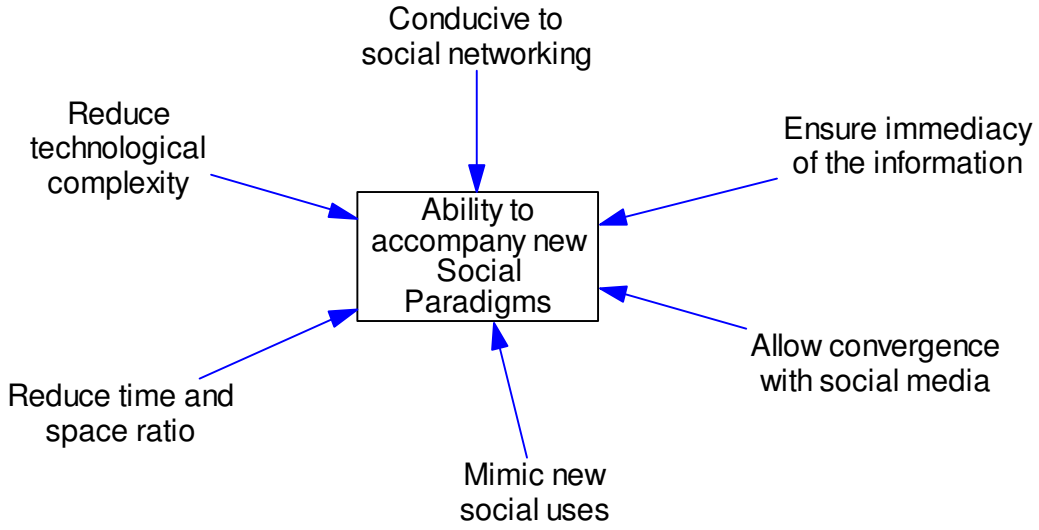


Figure IV-49: Conceptual model for "Ability to accompany new Social Paradigms".

Source: Stéphane PIMIENTA.

"Operationality of the solution"

The variable 'Operationality of the solution', as defined in the previous section offers values to the final user if the system is able to:

- Offer real time information to get closer to "business speed",
- Offer interactivity with information (write backs, alerts for instance) to enable better decision making (testing hypothesis) and better action taking (capture of operational data on the go),
- Allow efficient data visualization to increase usability in situations of mobility,
- Reduce technological complexity to offer better usability to the user,
- Ability to interact with operational systems to reduce the gap between analysis and action,
- Provide exhaustive information as required by operations,
- Conducive to operational BI to bring a mobile dimension to existing operational BI initiatives,

- Offer collaborative capabilities to enable action taking and controlling, collaboration, coordination and communication.

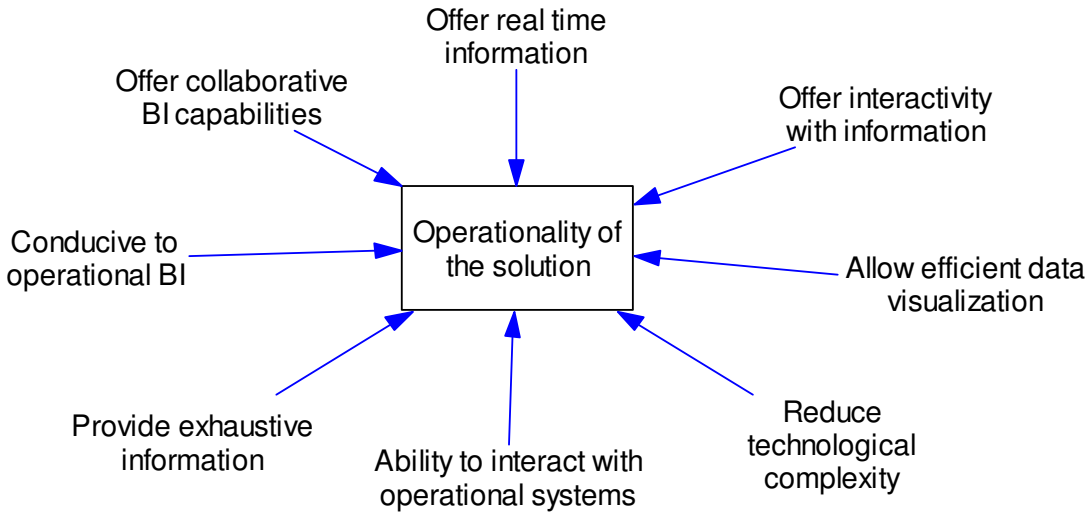


Figure IV-50: Conceptual model for "Operationality of the solution".

Source: Stéphane PIMIENTA.

"Ability to react on the go"

The variable 'Ability to react on the go', as defined in the previous section, offers values to the final user if the system is:

- Supported by business processes to ensure consistency between the decision made and the action taken,
- Consistent with management practices to get support from the full decision chain,
- Consistent with workflow procedures to optimize the ability to make decision and take actions on the go,
- Appropriate to the nature of the decision (strategic vs. operational) because all decisions cannot be taken in a mobile context,
- Allowing hypothesis testing to improve the ability to anticipate and control,
- Offering collaborative BI capabilities to enable action taking and controlling, collaboration, coordination and communication.

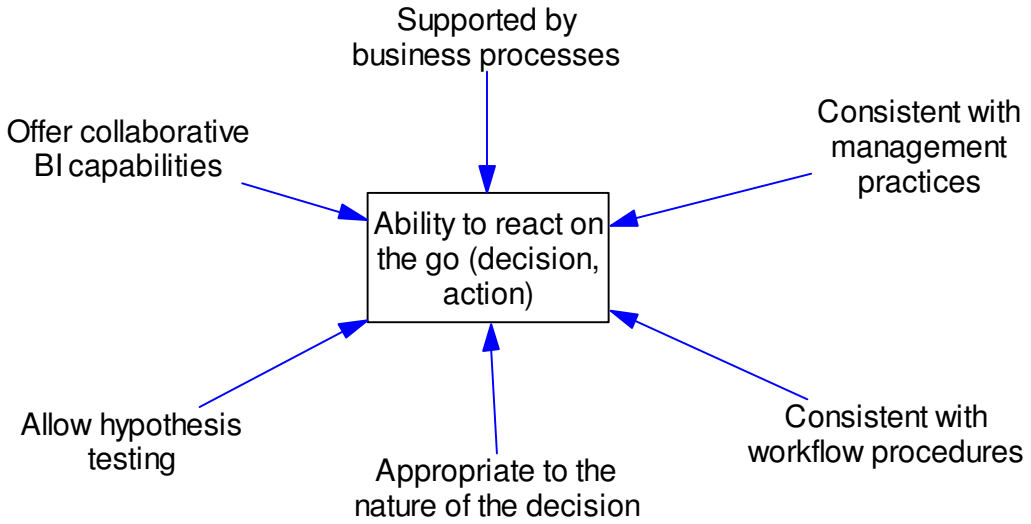


Figure IV-51: Conceptual model for "Ability to react on the go (decision, action)".

Source: Stéphane PIMIENTA.

2 - f ***The Grounded Theory***

The Interrelationship Digraph allowed me to identify the four core variables composing my final conceptual models. The Core CCLD represents the complex interactions between the Core variables and the Concern variable. This core CCLD is the basis of my 'final conceptual model' in the sense that it groups the minimum and most important variables of the value proposition of Mobile BI that seem necessary to carry out the transformations described in the CATWOEs.

The Theory represents the Value proposition of Mobile BI, i.e. the drivers influencing the level of value added to the users.

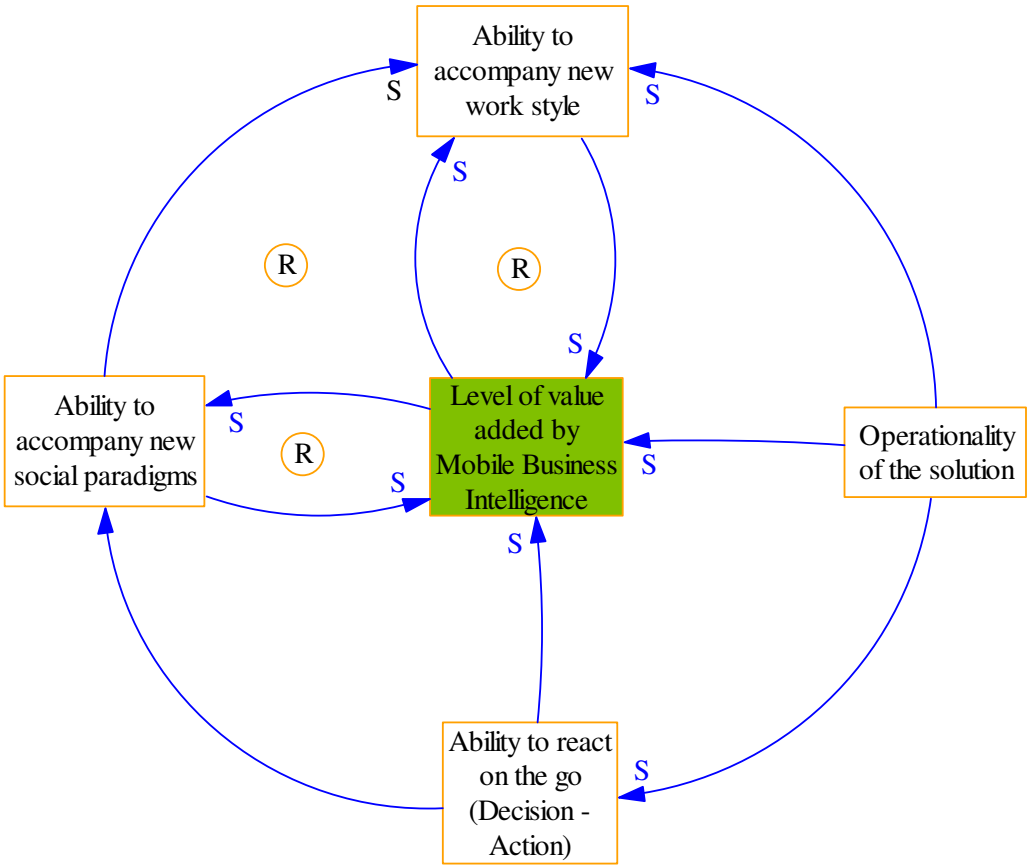
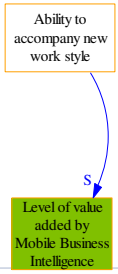
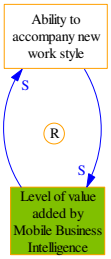
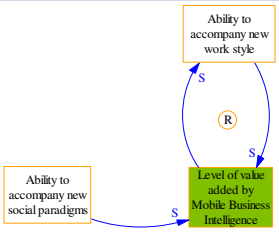
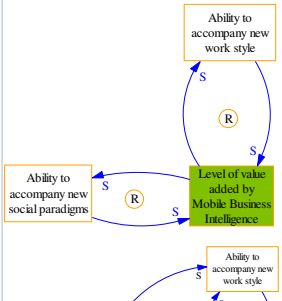
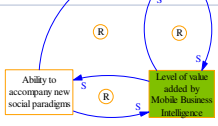
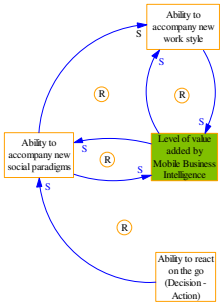


Figure IV-52: Core Concern Causal Loop Diagram.

Source: Stéphane PIMIENTA.

My Theory states that the value proposition of Mobile BI is complete if it maximizes the variable presented in the CCLD. I am using Toulmin's argument structure (Toulmin, 1969) to support the relationships I established between the core variables and with the concern variable in my Theory.

As an example, the level of value added by Mobile BI is influenced by the ability of these solutions to accompany new work styles. This influence is explained by the fact that mobility is identified as a fundamental evolution of the practices in business. The more Mobile BI is capable of bringing mobile functionalities enhancing capabilities of the mobile worker – remote collaboration, access to key information, support for decision making and action taking – the more help it would bring to mobile workers to face these new situations of mobility and thus to accompany new work style, the more value it would deliver to the user.

	Claim	Ground/Data	Warrant	Backing	Qualifier
	Level of added value by mobile intelligence is driven by the Ability to accompany new work style	because Mobility is identified as an important evolution of the way work will be done (the mobile worker population's share of the total workforce worldwide is expected to increase from 24.8% in 2006 to 30.4% in 2011)	Mobile BI by defintion is bringing mobile functionality enhancing capabilities of the mobile worker and can thus directly answer to this new requirement	Mobile BI enable remote collaboration, access to key information, support for decision making in situation of mobility	this value proposition is only true in situations where new work style are involving mobility issues
	The more Mobile BI adds value, the higher its influence on its Ability to accompany new work style	because in general, the increase in adequacy of supporting technologies increase the satisfaction and the utilization and eventually influence the practice. There is a feedback loop.	An increase in the value added by mobile BI will influence users'working behaviour: increasing the use of mobile technologies in situation of mobility, increasing communication and collaboration...	the progresses made on mobile telephony highly influenced the way business users behave.	the influence could be slow and specific to certain population: eg. the influence of social network is not influencing equally the various generations
	Level of added value by mobile intelligence is driven by the Ability to accompany new social paradigm	because recent technologies influence the behavior of individuals in such a manner that Mobile BI must comply with new social norms if it wants to convince	Mobile communications and new social medias defined new rules in terms of social behaviour, communication, access to information	Mobile email, SMS, facebook, twitter, wikipedia... Changed the way individuals interact with people and information	
	The more Mobile BI adds value, the higher its influence on its Ability to accompany new social paradigm	because in general, the increase in adequacy of supporting technologies increase the satisfaction and the utilization and eventually influence the practice. There is a feedback loop.	An increase in the value added by mobile BI will influence users' behaviour: increasing the use of mobile technologies in situation of mobility, increasing communication and collaboration...	Mobile email, SMS, facebook, twitter, wikipedia... Changed the way individuals interact with people and information	the influence could be slow and specific to certain population: eg. the influence of social network is not influencing equally the various generations
	Increasing consistency of Mobile BI with new social paradigms increases its consistency with new work styles			The transfer of functionalities from the private domain to the business domain: social medias like skype, or MSN, SMS...	
	The higher the ability to react on the go the higher the consistency with new social paradigms	Because the ability to react on the go is consistent with the new way of behaving in society: shorter time lag, decrease of slack time, immediate response, ubiquity	Giving the users the ability to react on the go also give the users a consistent way of behaving at work and in life.	The new uses of mobile techologies, beyond BI, are aiming at reducing space and optimizing time : SMS, MMS, Facebook, video conference... The main objective is to maintain seamless contact with others and with information in order to be able to be aware and to decide and react anywhere at anytime to events.	

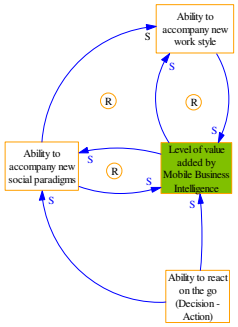
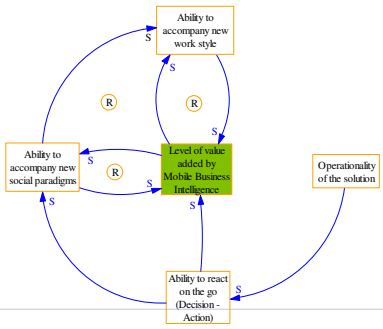
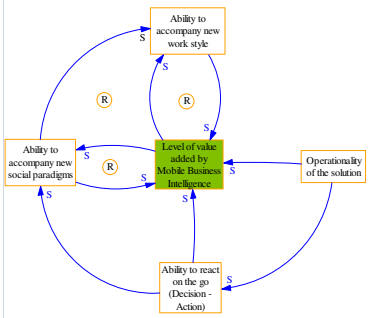
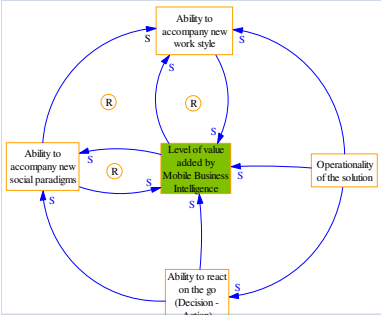
	Claim	Ground/Data	Warrant	Backing	Qualifier
	Level of added value by mobile intelligence is driven by the Ability to react on the go	Because mobility is defined by the access to capabilities formely reserved to sedentary and because Business Intelligence is mainly aiming at providing the key information required to make decisions.	Mobile BI is then mainly aiming at providing the required information to make decisions on the move. It solutions fulfil this basic definition, Mobile BI will add value to the business user.		Decision making could also be understood as: reflection feeding in the sense that decision and action are not absolutely required. Mobile BI solution can just be a solution to provide evidence to help thinking about a topic. It will then also provide added value for the user.
	The higher the operationality of the solution, the higher the ability to react on the go	The characteristcs determining the operationality of a solution are the same than the one driving the ability to react on the go	If the Mobile BI allows to operate in "business speed", if it has exhaustive and reliable information, if it offers collaborative functionalities, then it is providing the necessary capabilities to facilitate the raction in situation of mobility		
	The higher the operationality of the solution, the higher the added value for the business user	Business users are expecting more than summarized information to think strategically about their business. They require solutions to help them in their day to day operational concerns. Operational BI is expanding quickly as well as mobile workers. Mobile workers need mobile BI to help them in operational tasks.	BI has moved from a status of tool made for top managers to a tool made for everyone. Operational BI is a new tendency in BI and is aiming at completing transactional solutions unable to provide summarized information in a suitable format for the user.		Not all operations are concerned by Mobile BI.
	The higher the operationality of the solution, the higher the ability to accompany new work styles	Because delivering the ability to operate in situation of mobility is consistent with the new work style	New work style advocates for reactivity, mobility, collaboration and Operationality is driven by the same criterion.		

Figure IV-53: CCLD argument support (using Toulmins' argument structure).

Source: Stéphane PIMIENTA, inspired by Toulmin (Toulmin, 1969).

The results of the research presented in the current Chapter are showing theoretical Mobile BI value proposition in the form of a Causal Loop Diagram. This Theory accounts for the mechanisms in play in the real world and influencing the level of value added by Mobile BI. In the following Chapter, I extract actionable knowledge that could be applied to improve the existing situation.

UCT GRADUATE SCHOOL OF BUSINESS

CHAPTER V. CONCLUSIONS AND EVALUATION

V - 1 INTRODUCTION AND OVERVIEW

In previous Chapters I have first given an overview of the research exercise presenting the context of the research, the topic and related question, the results and their evaluation following the SCQArie format (CHAPTER I). Through a literature review presented I have located my research findings into a wider body of knowledge to broaden the perspectives of the debate. I then presented in CHAPTER I the research framework I followed to explore the topic, analyse the data collected and come up with a Theory accounting for the mechanisms of the Real World influencing my concern variable. I thoroughly described the results of the research exercise obtained by the application of the research framework in CHAPTER IV. At this stage, I have built my own Grounded Theory presenting the drivers influencing the level of value added by Mobile BI to final business users and answering to the research question. The Theory describes the intrinsic value proposition of Mobile BI, i.e. the necessary conditions to add value to the business user.

The objectives of this Chapter are first to contextualize the research results by presenting a comparison of the reality with the Theory developed in this paper. Based on the gaps identified, I propose recommendations to address these discrepancies and surface possible futures of Mobile BI. I finally conclude this Chapter by delivering a reflection on the results and an evaluation of the research paper.

The work done so far allowed structuring a Theory. As presented in CHAPTER IV, the Theory corresponds to the final conceptual model extracted from the SSM process. The following steps of the methodology allowed me to, first, establish the gaps with the problem situation expressed in CHAPTER I and second, to explore the feasible and desirable changes that could be operated to fill the gaps.

V - 2 COMPARISON OF MY THEORY WITH REALITY

Mobile BI solutions have been around for several years and yet, they failed to demonstrate their value to the business user. Based on the Theory developed in this research paper, I can compare theory to reality. As presented in the *Figure III-29: Integrating SSM with Grounded*

Theory, the 5th step of the SSM is the comparison of the theory with the problem situation expressed. It represents the last step of the *Sense Making* process. It consists in evaluating the level of consistency and compatibility of current Mobile BI proposal with each components of the value proposition presented in my Theory. I am using the essential activities/conditions described in the final conceptual models of each core variable to identify the gaps with reality.

I have done the exercise of comparing each key activity identified in the four final conceptual models to the solutions actually available on the market to try to identify the missing elements.

Core Variables	Essential Activities/conditions	Reality
Ability to accompany new work style	Deal with new business model based on mobility and remote operations	Generalization of mobile devices in companies ease the adoption of nomad practices. Most BI applications don't offer seamless integration between desktop and mobile solutions: require mobile licenses, specific data processes, no interoperability between different mobile devices...
	Ensure security of the information	Most of the solutions are providing security functionalities to access to information. ID and password are required to access to BI information. Both methods present pros and cons: remote access to a central database or off-line application containing the BI information.
	Communicate, collaborate and coordinate	Mobile BI solutions are seldom offering collaborative functionalities such as chat, comments or workflows. Most are dedicated to provide one-way information to the user with no communication capabilities.
	Ensure analysis capability	Screen size and general usability of the solutions are the main restrainer to analysis capabilities.
	Ensure immediacy of the information.	Mobile BI is in most cases an extension of traditional BI solutions and is then dependent on them. Real time or near real time information is still not commonly available. Most of BI plateforms require data cleansing and transformation before broadcasting. Spread of Wifi and 3G networks increase the ability to update or access to information though.
Ability to accompany new Social Paradigms	Be conducive to social networking	Mobile solution are seldom offering collaborative functionalities. Solutions are not based on a communication model. More often users are isolated from each other.
	Ensure immediacy of the information	New uses expect information to be seamlessly pushed to the user. Real time alerts are seldom proposed by mobile BI solutions.
	Allow convergence with social media	No interoperability with existing social network solutions and no alternative proposed.
	Mimic social uses	No ability to interact with information, modify and share information on the spot. Users are isolated from one another.
	Reduce Time & Space ratio	Mobile BI solutions are by nature reducing time and space ratio by proposing remote access to information from anywhere at anytime.
	Reduce technological complexity	Mobile BI solutions are seldom designed for none technical user. Simplicity often resembles poverty of functionalities.
Operationality of the solution	Offer real time information	Often depend on related traditional BI solutions. Also depend on the technology used by Mobile BI solutions: periodic or manual synchronisation of information on mobile application, direct access via browser, separated mobile and sektop BI solutions...
	Offer interactivity with information (write backs alerts..)	Very seldom offer interactivity with information or current devices are not appropriate to comfortable usability.
	Allow efficient data visualization	Device screens are often the limit of the visualization capabilities. Despite the rapid evolution of mobile devices, usability remains limited.
	Provide exhaustive information	Information available remotely is often preapred for mobile usage and limited in depth and width
	Conducive to operational BI	Most Mobile BI solutions are targetting top management community and seldom operational users. Powerful functionalities and userfriendliness are not yet compatible.
	Offer collaborative capabilities	Mobile BI solutions are often isolating the users: no collaborative functionalities
Ability to react on the go	Supported by business processes	Companies are soldom offering business processes appropriate with mobile action taking: remote access of operational systems unavailable, inappropriate procedures
	Consistent with management practices	Culture is often a restrainer to remote decision making or action taking. Spread of mobile practices help adapting management procedures though.
	Consistent with workflow procedures	Mobile BI Solutions are not collaborative and very seldom offer workflow capabilities to communicate decisions or action plans
	Appropriate to the nature of the decision (strategic vs operational)	Strategic decisions are often incompatible with mobility and requires a complex decision chain. Operational decisions could be more appropriate to mobility.
	Allow hypothesis testing	Devices and mobile BI solutions are seldom offering comfortable conditions for scenario testing and simulation.
	Offer collaborative BI capabilities	Mobile BI Solutions are not collaborative and very seldom offer workflow capabilities to communicate decisions or action plans

Figure V-54: Comparison of the conceptual models to reality.

Source: Stéphane PIMIENTA.

Lack of collaborative functionalities

The requirement for more collaborative capabilities has been identified as a key driver for each one of the core variables. It appears that current solutions are not proposing such functionalities and are on the contrary isolating the user with his analysis. Whereas social

media solutions based on Web 2.0 trend like wikis, peer-to-peer solutions (Facebook, MySpace) or blogs (Tweeter) are spreading very quickly offering mobile user the ability to chat on the go, to share any kind of information such as images, text, videos, Mobile BI solutions restrict themselves to information retrieve and thus to one-way only user experience. Current solutions are focusing the bulk of their functionalities on visualization of information and do not give the user the ability to interact with any other participant to increase collaborative experience and consequently team efficiency.

Unsuitability of devices.

In order to become a real extension of the decision making process of management or operations, Mobile BI would need to be operating on efficient portable devices. Current Mobile devices are much too limited for such uses. Despite the emergence of smartphones and particularly the appearance of the Iphone, offering powerful display capabilities, Mobile BI still need mobile technology evolution to be able to offer business users a natural way of accessing business information. Users are expecting efficient visualization of the information, high level of interactivity with the data, user friendliness in the use of various functionalities and navigability. High definition, large screen, multitouch functionalities are essential characteristics for devices holding Mobile BI solutions and very recent smartphones are proposing such functionalities. Nevertheless screen size remains the main hurdle to comfortable use of mobile BI solutions on smartphones.

Incompatibility of business processes and management practices

Mobile BI is aiming at delivering key information to business users in situations of mobility to improve decision making and action taking. But very often cultural dispositions and business processes in place are not appropriate with mobile decision making or mobile action taking. Limited remote access to operational systems deprives the mobile user of taking actions in situations of mobility. Decision workflows are seldom designed to authorize remote decisions making and action taking: complexity and length of the decision chain is often incompatible with mobile situation where simplicity and reactivity are required. But recent increase of mobile workers should participate in improving and generalizing mobile practices.

Incompatibility with real time information

Whether being part of top management or part of the operations, business users require fresh information to make better decisions. The level of dynamism of information flows drives the usability of the Mobile BI solutions. More and more processes, particularly the one involved with the operations, require real time or close to real time information to operate. Current Mobile BI solutions are is most cases not able to operate with real time information. Currently, most of the solutions are depending on at least two layers of transformation of

information. A first layer, linking traditional BI to transactional systems provides the exhaustivity of BI information and the majority of the transformations. A second layer, between traditional BI and Mobile BI, allows data flows and reports to be prepared for mobile use. These two layers of transformation are incompatible with the seamless flows required by operations. Additionally, none-pervasiveness of connectivity currently prevents real ubiquity of Mobile BI. Wireless connections are facing technological difficulties (limited wireless coverage as 3G or WiFi are mainly in cities), and commercial complexities related to operators' subscription plans.

Technological hurdles, software limitations and cultural maturity appear to be the main restrainers to Mobile BI. The variables identified in my Theory are not maximized by the current solutions available on the market and their environment. These gaps could explain part of the problem situation described in CHAPTER I.

V - 3 ACTIONABLE KNOWLEDGE & POSSIBLE FUTURE OF MOBILE BI

Despite the problems identified in the previous section, Mobile BI presents intrinsic qualities confirming its potential. This section focuses on the actionable knowledge to summarize the areas of improvements and propose recommendation and possible futures for Mobile BI. As presented in the *Figure III-29: Integrating SSM with Grounded Theory*, this section represents the sixth step of the SSM which describes the systematically desirable and culturally feasible changes of the problem situation.

Core Variables	Essential Activities/conditions	Reality	What could be done
Ability to accompany new work style	Deal with new business model based on mobility and remote operations	Generalization of mobile devices in companies ease the adoption of nomad practices. Most BI applications don't offer seamless integration between desktop and mobile solutions: require mobile licenses, specific data processes, no interoperability between different mobile devices...	Mobile solutions must be thought not as separate mobile solutions but as an extension of the desktop world: Interactivity between sedentary and nomad world must be seamless. Some very recent software solutions are based on an unique version suitable for desktop and mobile devices.
	Ensure security of the information	Most of the solutions are providing security functionalities to access to information. ID and password are required to access to BI information. Both methods present pros and cons: remote access to a central database or off-line application containing the BI information.	Mobile devices are by nature easier to get lost or stolen. Information on the device must be accessible and manageable remotely so that it could be remotely erased if necessary and is permanently backed up elsewhere. Additionnaly, access to the device and to the BI information must be secured.
	Communicate, collaborate and coordinate	Mobile BI solutions are seldom offering collaborative functionalities such as chat, comments or workflows. Most are dedicated to provide one-way information to the user with no communication capabilities.	Increasing interactivity to propose collaborative user experience. Solutions providers could get inspirations from social media tools such as Facebook or Twitter: the user can access information and immediately capture comments, ask questions, send snap shots of information and get quick response in the same format.
	Ensure analysis capability	Screen size and general usability of the solutions are the main restrainer to analysis capabilities.	Devices of a new kind such as the Ipad from Apple could become the best supporting device for Mobile BI. Powerful display characteristics of the Iphone combined with a larger screen must consequently provide an improved usability and user experience. Tablets could offer mobile BI the legitimacy it needed. Display size could also be resolved using small projectors integrated to the mobile devices (picoprojectors)
	Ensure immediacy of the information.	Mobile BI is in most cases an extension of traditional BI solutions and is then dependent on them. Real time or near real time information is still not commonly available. Most of BI plateforms require data cleansing and transformation before broadcasting. Spread of Wifi and 3G networks increase the ability to update or access to information though.	The spread of real time or near real time BI information platform should help the increase of mobile BI solutions: both technologies are complementary and should create a reinforcing loop increasing the spread of Pervaisve BI (PBI). Spread of wireless technologies should accelerate the phenomenon.

Ability to accompany new Social Paradigms	Be conducive to social networking	Mobile solution are seldom offering collaborative functionalities. Solutions are not based on a communication model. More often users are isolated from each other.	BI solutions could propose collaborative functionalities such as workflow, chat, tweet, SMS or MMS to improve the communication abilty of the user through Mobile solutions
	Ensure immediacy of the information	New uses expect information to be seamlessly pushed to the user. Real time alerts are seldom proposed by mobile BI solutions.	Information must first flow seamlessly and in near real time from operational systems to Datawarehouses to analytical systems. Push information to the user in a simple an dynamic way: use alert style such as pop-up notifications with link access to detailed information.
	Allow convergence with social media	No interoperability with existing social network solutions and no alternative proposed.	Systems must offer the same level of interactivity with other users as new social media tools do
	Mimic social uses	No ability to interact with information, modify and share information on the spot. Users are isolated from one another.	Must offer the ability to create communities of users and become communication media
	Reduce Time & Space ratio	Mobile BI solutions are by nature reducing time and space ratio by proposing remote access to information from anywhere at anytime.	Generalization of mobile solution would increase the optimization of time and reduction of space
	Reduce technological complexity	Mobile BI solutions are seldom designed for none technical user. Simplicity often resembles poverty of functionalities.	Mobile BI solution must focus on the user experience and improve the usability and userfriendliness without compromising the power of analysis it could offer. Ergonomics must be a primary concern particularly with current device size.

Operationality of the solution	Offer real time information	Often depend on related traditional BI solutions. Also depend on the technology used by Mobile BI solutions: periodic or manual synchronisation of information on mobile application, direct access via browser, separated mobile and sektop BI solutions...	Mobile platforms must be thought as integrated platforms offering seamless connections to related systems such as operational systems. Rela time information capabilities must be dealt with all along the chain.
	Offer interactivity with information (write backs alerts..)	Very seldom offer interactivity with information or current devices are not appropriate to comfortable usability.	Mobile solutions must offer powerful functionalities allowing interaction with data: data capture, comments capture, powerful visualization with drill down, slice and dice functionalities.
	Allow efficient data visualization	Device screens are often the limit of the visualization capabilities. Despite the rapid evolution of mobile devices, usability remains limited.	Data visualization is very often said to be the primary function of a Mobile BI solution. User experience must be a central concern for the software providers. Mobile solutions must maximize interoperability with various devices to optimize portability.
	Provide exhaustive information	Information available remotely is often preapred for mobile usage and limited in depth and width	Ful integration between desktop and remote version: no report transformation, no data re-formatting...
	Conducive to operational BI	Most Mobile BI solutions are targetting top management community and seldom operational users. Powerful functionalities and userfriendliness are not yet compatible.	Operational BI just starts to spread amongst operational communities. Mobile BI must be a driver to help the generalization of operational BI. Increasing the usability and the analytical power of the user in situation of mobility should allow Mobile BI to become a standard. The best future of Operational BI would be to be seamlessly integrated to operational systems that would then provide natural remote functionalities instead of separate Mobile BI solutions.
	Offer collaborative capabilities	Mobile BI solutions are often isolating the users: no collaborative functionalities	Must offer the ability to create communities of users and become communication media

Ability to react on the go	Supported by business processes	Companies are soldom offering business processes appropriate with mobile action taking: remote access of operational systems unavailable, inappropriate procedures	The complete operational chain must be revised to allow mobile decisions and actions to be taken. Operational systems must evolve in that direction.
	Consistent with management practices	Culture is often a restrainer to remote decision making or action taking. Spread of mobile practices help adapting management procedures though.	Management practices could impulse changes in the field of collaboration through Mobile BI solutions: create new decision flows, new procedures to support mobile decision making and action taking.
	Consistent with workflow procedures	Mobile BI Solutions are not collaborative and very seldom offer workflow capabilities to communicate decisions or action plans	Collaborative functionalities of Mobile BI solutions must provide the decisions validation capabilities.
	Appropriate to the nature of the decision (strategic vs operational)	Strategic decisions are often incompatible with mobility and requires a complex decision chain. Operational decisions could be more appropriate to mobility.	Mobile BI is not suitable for any kind of decision. Mobile solutions must take into account several levels of decision processes and ease the validation chain by offering powerful collaborative functionalities.
	Allow hypothesis testing	Devices and mobile BI solutions are seldom offering comfortable conditions for scenario testing and simulation.	Mobile BI solutions must offer scenario testing functionalities: data capturing, business rules, save and export data...
	Offer collaborative BI capabilities	Mobile BI Solutions are not collaborative and very seldom offer workflow capabilities to communicate decisions or action plans	Mobile BI solutions must reduce the gap between analysis and action by delivering powerful analysis but also collaborative functionalities able to go beyond the analysis to the action and the follow-up of the actions

Figure V-55: Changes that could improve the situation.

Source: Stéphane PIMIENTA.

The need for collaborative solutions

One of the primary roles of Mobile BI is to maintain the user connected to his/her business information from anywhere at any time. It is then natural to consider that not only the connection to data is necessary but also the connection to people. Software vendors must get inspiration from social media like peer-to-peer solutions or open-source communities to offer community management capabilities to increase collaborative user experience. Mobile BI solutions must exploit the Web 2.0 capacities and come with new communication format such as chat, tweet, or MMS and provide new communication capabilities allowing higher collaboration, coordination such as workflow management to validate and control decisions/actions.

The need for integrated solutions

Mobile BI solutions should not be conceived as isolated remote capabilities with disconnected flows of information and processes – build separate reports to fit with the mobile device, design specific data integration processes to feed mobile solutions. It should rather be considered as functionalities embedded in related systems with seamless flows of

data. Mobile BI must be thought as fully integrated solution to traditional BI solutions or to some extent to operational systems themselves. BI Solutions must be conceived to provide and receive information from a desktop platform as well as from a remote platform. Desktop and mobile solutions must merge into one unique serving both sedentary and nomad world.

The necessary evolution of management practices and organization

Recent increase in mobile workers not only obliged companies to review the equipment they would make available for their workers but also pushed them to thoroughly review their organization and management practices. New management practices should increase collaboration and adapt their decision and operational chains. Organizations must be able to provide the user with the ability to make decisions and take actions on the move and go beyond to control the consequences of the actions. The consequences would then be for the benefit of the whole organization with a reduction of the gap between analysis and action.

The need for better devices

One of the most critical aspects of Mobile BI is the ability of the supporting device to operate with comfort of use and efficiency the possibilities offered by the software solution. We have seen that only recently mobile devices were able to provide the essential display capabilities. The Iphone has been the first of its kind to democratize smartphones. Nevertheless, screen size remains a major concern. Mobile BI key functions such as visualization, data capture or simulation require capabilities that such smartphones can hardly provide for now. Devices of a new kind such as the Ipad from Apple, which at this time has not yet been released, may open new possibilities. It provides the power of a laptop computer and the ease of use and high portability of an Iphone. It offers multi-touch capabilities providing a natural way of navigating and manipulating information directly on the screen. Named *Tablets*, these devices may represent the missing link Mobile BI needed.

The need for more functionalities and more simplicity

On the IT market in general, there is a dominant trend of increasing need for user friendliness. IT solutions are spreading in our private and professional environments gaining the very basic operations of our day to day lives. Consequently, user communities are getting larger and more diverse than they used to be. IT solutions must now be able to provide the same level of sophistication and more but in a much simpler way, accessible to the great number. Mobile BI solutions are subjected to the same rule: they must provide comfortable applications with a high level of usability and yet maintain powerful functionalities. The difficult task of making things simple and still powerful is one of the major challenges of Mobile BI. Mobile BI solution providers must focus on ergonomics and user experience without compromising the power of analysis the tools can offer.

Operational BI is an exceptional opportunity for Mobile BI. It is a major trend in traditional BI and Mobile BI could become the best support for Business Intelligence practices within operational communities. The challenges Mobile BI has to face before it can legitimately be considered as such are summarized in the previous paragraphs. Mobile BI must be able to answer each one of these weaknesses before it can pretend provide high level of value added to the final user.

These last two sections detailed the 5th and 6th steps of the SSM. The first section allowed me to identify the gaps between my Theory and the reality, closing the Sense Making process of this paper. The second section allowed me to detail the potential changes Mobile BI stakeholders need to operate in order to close the gaps and deliver the full value proposition exposed in my Theory, this was the *Decision Making* section of the paper.

The 7th step of the SSM corresponds to the *Action Taking*. The main objective of this research is to provide insight on the problem situation and not to operate myself changes on it. I am acting as a simple observer and do not have the means to directly change the way things are. Consequently, this paper is not dealing with last step of SSM.

The following section aims at delivering an evaluation of the paper and reflecting on the role of this research.

V - 4 EVALUATION OF THE WORK DONE

The first part of this section is delivering a reflection on what I have learnt from this research and an evaluation of its contribution to the body of knowledge and the way research results could be used. The second part of the section aims at evaluating the work done in this paper using the RUVE framework for Relevance, Utility, Validity and Ethical implications. This approach allows delivering a clear process to identify and evaluate the strengths and weaknesses, the biases and inconsistencies of my assumptions and judgements.

4 - a ***What is the meaning and the implications of my findings?***

The first question I am answering here is: Do I have achieved the research goals? The main purpose of the research was to contribute to the body of knowledge of my specific domain of IT, the Business Intelligence. My intent was to clarify the intrinsic value proposition of Mobile BI to deal with my concern which was questioning the legitimacy and the real potential of Mobile BI. I compared the theoretical value proposition my research revealed to

the one offered by the market today. From this gap analysis, I came up with recommendations aiming at clarifying the way forward and underlining the areas of improvement various stakeholders could focus on. The research results dealt with my concern and confirmed the legitimacy of Mobile BI. I believe that I actually achieved the goals initially set by this research.

The second question I am answering here is: How could my research results be used? During the collection of data and the literature review I have not found any document dealing with the approach by the value to analyse the legitimacy of a technology. In that sense, I believe that my research is contributing to the body of knowledge of this specific area.

Through this research, I gained the conviction that Mobile BI could deliver high value added to the business and also to private users. Even though important improvements are required in order to maximize the potential of these mobile practices, the evolution toward unique solutions suitable for local and remote use seems to be inevitable. As a professional of Business Intelligence I learnt through this research that it is too soon now to expect immediate expansion of these practices. Technological, organizational and cultural limitations make the current solutions incomplete. But, soon, various drivers such as technological innovations (tablets) or development of Operational BI will give Mobile BI its credibility.

4 - b ***Relevance***

As a business professional of the sector I know the usefulness of BI for business organizations. I observed the situation on the market regarding Mobile BI and wondered why it does not take off. There are evidences of technical hurdles but is that sufficient to explain the phenomenon? As an actor of Business Performance Management, I have an approach that emphasizes the technical aspects of IT projects as well as the functional aspects. I have to adopt my customer's point of view in order to be able to deliver valuable services to them. By inquiring some of them on the opportunity to implement Mobile BI solutions, the notion of value proposition often occurred. The most evident use, accessing key figures through dashboards displayed on mobile phones, appeared interesting but not interesting enough to justify the investment. It was clear to me that there was an issue about the value proposition of Mobile BI or at least with the value the customers perceived from it. Technological products cycles demonstrate that useless technologies are usually not going across the "chasm" (Moore, 1991) and end up sinking into oblivion. Mobile BI has been around for more than 10 years already and should have disappeared or succeeded. Being supported by traditional BI is not sufficient. There must be some potential in this technology that has not been revealed and exploited so far.

This is based on this reflexion that I chose to develop my research around the attempt to reveal the intrinsic value proposition of Mobile BI by surfacing the mechanisms influencing the level of value added to the business user. My concern has been structured thanks to the strategy proposed by Mitroff to avoid mistakes in the formulation of the research problem (Mitroff, 1997).

4 - c ***Utility, usefulness, value of the answer***

My research answer has been formulated based on the information collected from stakeholders and from documentary and literature resources that have been rigorously selected and exploited using accepted methodologies such as GT and SSM.

The Theory I developed gives an account for the mechanisms occurring in the real world and influencing my concern variable, the level of added value to the user. Constructed in the form of a CCLD, the Theory describes the interactions between the core variables I extracted from the research analysis. Each variable represents a component of the intrinsic value proposition of Mobile BI. The actionable knowledge I have extracted from the comparison of this theoretical model with the situation expressed in CHAPTER I gives ideas for carrying out improvements to the problem situation. It is by iteratively addressing each component of the value proposition that Mobile BI should be able to bridge the "chasm" to finally find its market and deliver the expected value to its business users.

4 - d ***Validity,***

As detailed in CHAPTER III, I am using the four criteria proposed by Lincoln and Guba to assess the trustworthiness of my research results (Lincoln & Guba, Establishing Trustworthiness. Naturalist Inquiry., 1985).

To address credibility of my research I employed the techniques proposed by the Grounded Theory approach which ensures rigorous process for data collection and analysis. This process advocates for data and sources triangulation and collection of data over an extended period of time to ensure saturation of the information. The coding process also advocates for low inference descriptors by preserving participants' phrasing and vocabulary used. The choice I made in the composition of my research framework ensures methods triangulation. The sources of data, which are exhaustively referenced in the appendices, are also ensuring the credibility of the data collected and through the application of a rigorous and clear process, of the results found.

To address transferability of my research, I am providing the widest possible range of information to allow future researcher interested in making a transfer to judge whether the

transfer is possible or not: research detailed process and methodology, APA referencing of sources, detailed appendices.

To ensure dependability and confirmability of my research, I am providing the necessary evidence to allow auditing the methods and the data. The method followed in the research paper is clearly stated. The data is referenced and detailed in the appendixes. After the process of data analysis and during the realization of CHAPTER IV and CHAPTER V, I allowed external examiners, audit my work based on the material available.

4 - e ***Ethical implications,***

I am assessing the ethics of the research results using Velasquez approach of Moral standards applied to each one of the stakeholders. Morality is made of four main kind of moral considerations: Utilitarianism, Right, Justice and Care (Velasquez, 2006). Utilitarianism is a general term used for theory that advocates for actions or policies maximizing social benefits or minimizing social costs or both. The principle of utilitarianism requires to be completed by two other notions in order to take into account the perspectives of individuals: Right and Justice. Rights represent the individual entitlements to freedom of choice and well-being. Justice represents the fair distribution of benefits and burdens among people. Finally, Care emphasizes caring for the concrete well being of those near us (Velasquez, 2006).

Key Stakholders	Utilitarianism	Right	Justice	Care
Customer	The results of my recommendations would improve the time and space ratio i.e. the efficiency of mobile workers and consequently the performance of the organization. Additionally, the answer suggests that Mobile BI increase its ability to accompany social and business evolution. It will add value to the whole community.	I believe the results and the consequent increase in use of Mobile BI may not always respect the moral rights of the users. Mobile tools may sometimes be considered as oppression/control instruments.	The recommendations are emphasizing the collaborative capabilities of Mobile BI which would promote the fair allocation of burdens and benefits between members of the team.	For Mobile BI users, caring for those in concrete relationship might be jeopardized by the threat on work/life balance. However, increasing the ability of Mobile BI to accompany new social paradigm aims at improving the communication, collaboration between members of the team and thus improve the exercise of caring.
Mobile technologies vendor	This group would be affected by the consequences of the answer as mobile uses would increase, generating more business opportunities.	The answer is suggesting market evolution and would be perceived as respecting the rights the vendors have in terms of startegic choices in the development of their devices.	This group would probably find the results unfair as an important part of the lack of value is coming from the unsuitability of mobile devices for mobile BI uses. They would probably consider the distribution of burden and benefits unfair.	They would probably perceive the results as increasing caring for their customers as the whole answer is aiming at maximizing the convergence of their devices on this specific domain.
Software vendor	This group would directly be affected by the implications of the answer as it would maximize the value proposition of Mobile BI and increase the use of their software. They would perceive the results as maximizing social utility.	The answer is suggesting market evolution and would be perceived as respecting the rights the vendors have in terms of startegic choices in the development of their software solutions.	The answer advocates for technological improvements on hardware and software: the would probably perceive the answer to result in a more just distribution of burdens and benefits: part of the improvments should come from hardware vendors and telecom operators.	They would probably perceive the results as increasing caring for their customers as the whole answer is aiming at maximizing the value for their customers.

Key Stakholders	Utilitarianism	Right	Justice	Care
Telecom Operator	This group would be affected by the consequences of the application of my recommendations as mobile uses would increase, generating more business opportunities.	This group would probably perceive their rights to be preserved.	The answer is advocating for technological improvements regarding connectivity. This group may consider the distribution of burden and benefits as unfair.	They would probably perceive the results as increasing caring for their customers as the whole answer is aiming at maximizing the coverage and the access to their services.
Analyst	Although this group is not directly affected, the answer would generate for them new perspectives.	I don't believe this group would be affected.	This group would probably consider that the answer would lead to a more just distribution of burdens and benefits.	I don't believe this group would be affected.
Regulator	This group would probably perceive the answer as maximizing social utility as it aims at bringing instruments to improve efficiency and general performances.	I don't believe this group would be affected.	This group would probably consider that the answer would lead to a more just distribution of burdens and benefits.	They would probably perceive the results as increasing caring for the population as the whole answer is aiming at maximizing the value for the users.
Consultant, Systems integrator	This group would probably perceive the answer as maximizing social utility as it aims at bringing instruments to improve efficiency and general performances.	I don't believe this group would be affected.	This group would probably consider that the answer would lead to a more just distribution of burdens and benefits.	They would probably perceive the results as increasing caring for their customers as the whole answer is aiming at maximizing the value for their potential customers.

Figure V-56: Moral assessment of the results.

Source: Stéphane PIMIENTA.

REFERENCES

Ackoff, R. (1981). *Creating the Corporate Future.* Wiley.

Argyris, C. (1990). *Overcoming Organizational Defenses.* Prentice Hall.

Atre, S. (2003, July). *Business Intelligence: From Theory to Reality.* Consulté le January 2010, sur www.technologytransfer.eu: http://www.technologytransfer.eu/article/26/2003/7/Business_Intelligence_From_Theory_to_Reality_(Part_one).html

Babbie, E. (2001). *The Practice of social research.* Toronto: Nelson Thompson Learning.

Banker, R., Kauffman, R., & and Morey, R. (1990). *Measuring gains in operational efficiency from information technology: A study of the position deployment at Hardee's Inc.* Journal of Management Information Systems.

Bhaskar, R. (1975). *A Realist Theory of Science.* London: Verso.

Birckner, J. (2009). The Revolution Will Be Mobile. *Adweek* , p15.

Checkland, P. (1981). *Systems Thinking, Systems Practice.* John Wiley & Sons, ltd.

Chicheportiche, O. (2009, November 10). *Smartphones : les drôles de chiffres d'IDC pour le 3e trimestre*. Consulté le March 2010, sur ZDNet France: http://www.zdnet.fr/actualites/telecoms/0,39040748,39710661,00.htm

Christie, M., Rowe, P., Perry, C., & Chamard, J. (2000). Implementation of realism in case study research methodology. *Proceedings of Entrepreneurial SMES - engines for growth in the millenium: International Council for Small Business. World Conference* (p. 2). Brisbane: E Douglas.

Cousins, K. C., & Varshney, U. (2009). *Designing Ubiquitous Computing Environments to Support Work Life Balance* . Communication of the ACM.

Cuvillier, D. (2008). *Comprendre les tendances - Ceux qui les font et les défont.* PARIS: Edition du Chêne.

Davidaviciené, V., & Raudeliûnienè, J. (2008). *Formation of Competitive Strategie Decisions in ICT Development Conditions.* Vilnius: Vilnius Gediminas Technical University, Business Technologies Department.

Davis, J. R., Imhoff, C., & White, C. (2009). *Operational BI: the state of the art.* BeyeNetwork.

Deming, W. E. (1986). *Out of the Crisis.* MIT Center for Advanced Engineering Study.

Denzin, N. (1994). *Handbook of Qualitative research.* Thousand Oaks, CA: Sage.

Denzin, N., & Lincoln, Y. (1994). *Handbook of Qualitative research.* Thousand Oaks, CA: Sage.

DeSanctis, G., & Poole, M. S. (1994). *Capturing the Complexity in Advanced Technology Use: Adaptive Structuration Theory.* Minneapolis, Minnesota: Carlson School of Management, Information and Decision Sciences Depart.

Dreyer, L. (2006, Sept 5). *The "Right Time" for Operational Business Intelligence?* Consulté le Dec 2009, sur TDWI: http://tdwi.org/articles/2006/05/09/the-right-time-for-operational-business-intelligence.aspx

Dua, A., Hersch, L., & Sivanandam, M. (2009, october). *Consumer electronics gets back to basics.* Consulté le Dec 12, 2009, sur McKinsey Quarterly: http://www.mckinseyquarterly.com/Consumer_electronics_gets_back_to_basics_2454

Fidler, R. (1997). *Mediamorphosis: Understanding new media.* Thousand Oaks: Pine Forge Press.

Flanglin, R. (June 2005). Business Intelligence 101. *Business Intelligence Journal* .

Frolick, M., & Ariyachandra, T. (2006). *Business performance management: One truth.* Information Systems Management.

Glaser, B., & Strauss, A. (1967). *The discovery of grounded theory: strategies for qualitative research.* New York: Aldine De Gruyter.

Glesne, C., & Peshkin, P. (1992). *Becoming qualitative researches: An introduction.* NY: Longman.

Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. Dans N. K. Denzin, & Y. S. Lincoln, *Handbook of qualitative research* (pp. 105-117). London: Sage.

Hatch, D. (2008). *Mobile Business Intelligence: A Path to Pervasive BI?* Aberdeen Group.

Heidegger, M. (1977). *The Question Concerning Technology and Other Essays.* New York: Harper.

Ho, V. (2008, March 12). *Asia remains lucrative BI market*. Consulté le March 2010, sur ZDNet: http://www.zdnetasia.com/asia-remains-lucrative-bi-market-62038876.htm

Hoebeke, L. (2000). *Making Work Systems Better.* John Wiley & Sons, Chichester, ISBN 0-471-94248-0, 1994.

Holt, C. C., & P., H. G. (1969). *A Computer Aided Approach to Employment Service Placement and Counseling.*

IDC. (2008). *Worldwide Mobi le Worker Popul ation 2007-2011 Fo r e c a s t.* IDC.

Jackson, M. C. (2003). *Creative Holism for Managers.* Hull, UK: John Wiley & Sons, Ltd.

Jarrad, G. (2003, May 28). *Business Intelligence - What is it?* Consulté le January 16, 2010, sur Methemtical and Information Sciences - CSIRO: http://www.cmis.csiro.au/bi/what-is-BI.htm#TOP

Johnson, R. B. (1997). *Examining the validity structure of qualitative research.* Education.

Karasek, R., & Theorell, T. (1990). *Healthy Work: Stress, Productivity and the Reconstruction of Working Life.* New York: Basic Books.

Kirk, J., & Miller, M. L. (1986). *Reliability and validity in qualitative research.* Beverly Hills: Sage.

Kisker, H. (2009, October 23). *Market Overview: The Business Intelligence Software Market.* Consulté le March 2010, sur Forrester: http://www.forrester.com/rb/Research/market_overview_business_intelligence_software_market/q/id/55034/t/2

Kurtyka, J. (December 2005). A Systems Theory of Business Intelligence. *Information Management Magazine* .

Lincoln, Y., & Guba, E. (1985). *Establishing Trustworthiness. Naturalist Inquiry.* Newbury Park, CA: Sage.

Lincoln, Y., & Guba, E. (1985). *Naturalistic inquiry.* Beverly Hills, CA: Sage.

Maxwell, J. A. (2005). *Qualitative Research Design.* Sage.

McDowell, M. (2007). *Business mobility: A changing ecosystem.* New York: Information Knowledge Systems Management.

Microsoft. (2009). *Microsoft Partner.* Consulté le December 2009, sur Microsoft Partner: https://partner.microsoft.com/download/HK/40116145

Mitroff, I. (1997). *Smart Thinking for Crazy Times: The Art of Solving the Right Problems.* San Francisco: Barrett-Koehler Publishers.

Moore, G. (1991). *Crossing the Chasm: Marketing and Selling High-Tech Products to Mainstream Customers.* Harper Business Essentials.

Morgan Stanley. (2009). *The Mobile Internet Report.* MORGAN STANLEY RESEARC H.

Norman, D. (1999). *The Invisible Computer: why good products can fail, the personal computer is so complex and information appliances are the solution.* Cambridge, MA: The MIT press.

Parameswaran, M., & Whinston, A. B. (2007). *SOCIAL COMPUTING: AN OVERVIEW.* Communications of AIS.

Perry, C., Alizadeh, Y., & Riege, A. (1997). Qualitative Methods in Entrepreneurship Research. *Annual Conference of the Small Enterprise Association of Australia and New Zealand*, (pp. 547-567). Coffs Harbour.

Power, D. (2007, March 10). *A Brief History of Decision Support Systems.* Consulté le February 18, 2010, sur DSSResources.COM: http://DSSResources.COM/history/dsshistory.html

Raden, N. (2007, February 1). *Business Intelligence 2.0: Simpler, More Accessible, Inevitable*. Consulté le 01 17, 2010, sur Intelligent enterprise: http://intelligent-enterprise.informationweek.com/showArticle.jhtml;jsessionid=O3EQBN0RQMKF1QE1GHOSKH4ATMY32JVN?articleID=197002610

Ravinchandran, T., & Lertwongsatien, C. (2005). *Effect of Information Systems Resources and Capabilities on Firm Performance: A Resource-Based Perspective.* Journal of Management Information Systems.

Raymond, R. (1966). *Use of the Time-sharing Computer in Business Planning and Budgeting.* Management Science.

Sakalauskas, L., & Zavadskas, E. K. (2009). *Optimization and intelligence decisions.* Technological and Economic Development of Economy.

Savvas, A. (2005). TUNING IN TO WIRELESS RETURNS. *Computer Weekly* , p46-47.

Schiff, C. (2007). *Pulse Survey Results, Part 1: The Impact of Operational Analytics.* www.b-eye-network.com.

Schwartz, J. (2005, November). *If You Want to Lead, Blog.* Consulté le December 12, 2009, sur Harvard Business Review: http://hbr.org/2005/11/if-you-want-to-lead-blog/ar/1

Smalltree, H. (2007, janvier 18). *Mobile business intelligence – Will it take off (for real, this time)?* Consulté le december 2009, sur Search Business Analytics:

http://searchbusinessanalytics.techtarget.com/news/1507260/Mobile-business-intelligence-ndash-Will-it-take-off-for-real-this-time

Stenbacka, C. (2001). *Qualitative research requires quality concepts of its own.* Management Decision.

Stern, P. (1980). *Grounded Theroy Methodology: Its Uses and Processes.* The Journal of Nursing Scholarship.

Strauss, A., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques.* . Sage.

Toulmin, S. (1969). *The Uses of Argument.* Cambridge, England: Cambridge University Press.

Trochim, W. M. (2006, October 20). *Positivism & Post-Positivism*. Consulté le October 11, 2009, sur Research Methods Knowledge Base: http://www.socialresearchmethods.net/kb/positvsm.php

Turban, E. (1967). *The Use of Mathematical Models in Plant Maintenace Decision Making.* Management Science.

Tzu, S. (2010, March). The Art of War. *In Encyclopædia Britannica* . Encyclopædia Britannica.

Ulrich, W. (2005). *A brief introduction to critical systems heuristics (CSH).* Web site of the ECOSENSUS project, Open University, Milton Keynes, UK.

Ulrich, W. (1983). *Critical Heuristics of Social Planning: A New Approach to Practical Philosophy.* Bern: Wiley 1994.

Ulrich, W. (2000). *Reflective practice in the civil society: The contribution of critically systemic thinking.* Reflective Practice.

Unit_Economist_Intelligence. (2007). *Business mobility and the agile organisation: The quest for competitiveness.*

Urban, G. (1967). *SPRINTER: A Tool for New Products Decision Makers.* Industrial Management Review.

Velasquez, M. G. (2006). *Business Ethics, Concepts and cases.* Upper Saddle River: Pearson Education.

Wai-Chung Yeung, H. (1997). *Critical realism and realist research in human geography: a method or a philosophy in seach of a method.* Sage.

Waller, V., & Johnston, R. B. (2009). Making Ubiquitous Computing Available. *Communicaiton of the ACM* , 127, 128, 129 - Vol 52 - N°10.

Weiser, M. (1991). *The computer for the 21st century.* Scientific American.

Wise, L. (2009, July 16). *The State Of Mobile BI*. Consulté le October 16, 2009, sur Dashboardinsight: http://www.dashboardinsight.com/articles/new-concepts-in-business-intelligence/the-state-of-mobile-bi.aspx?page=2

APPENDICES

Mind map of the main concepts:

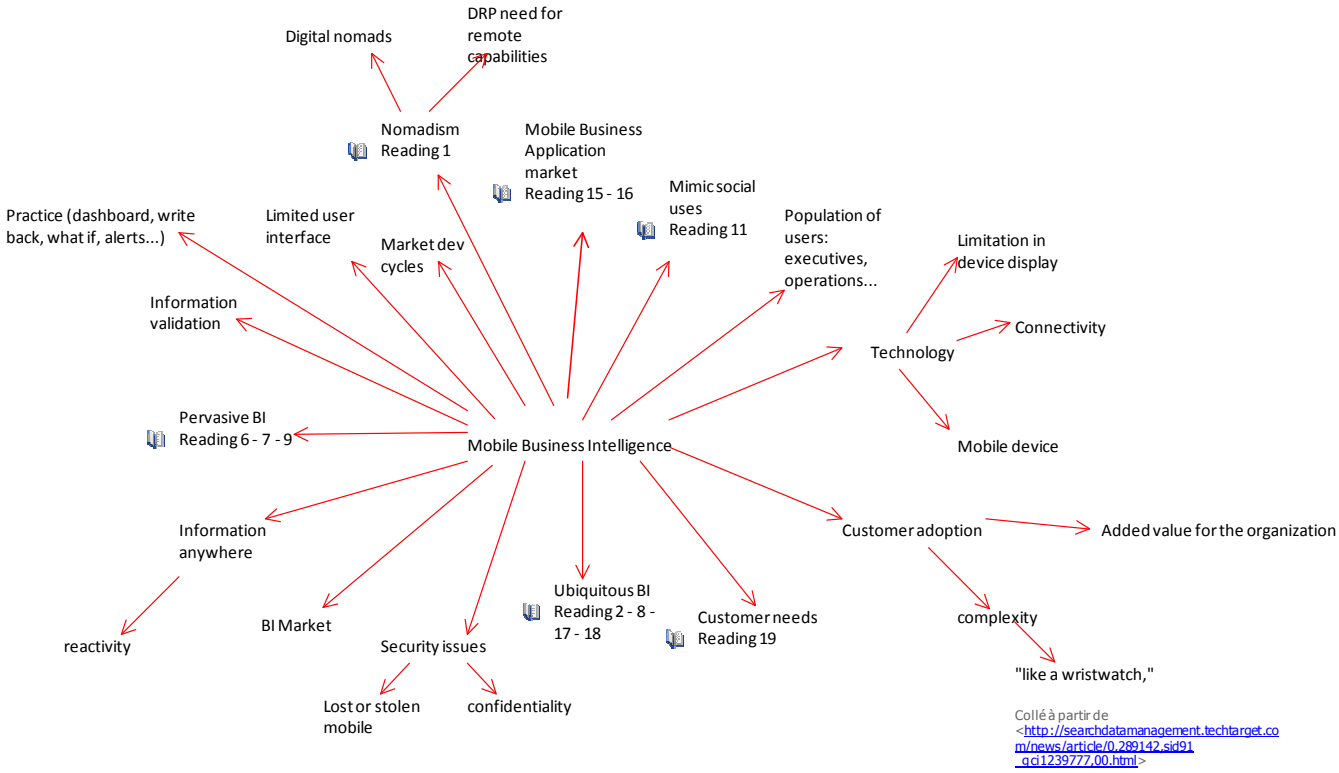


Figure APPENDIX-57: MindMap of the key concepts

Affinity Diagram

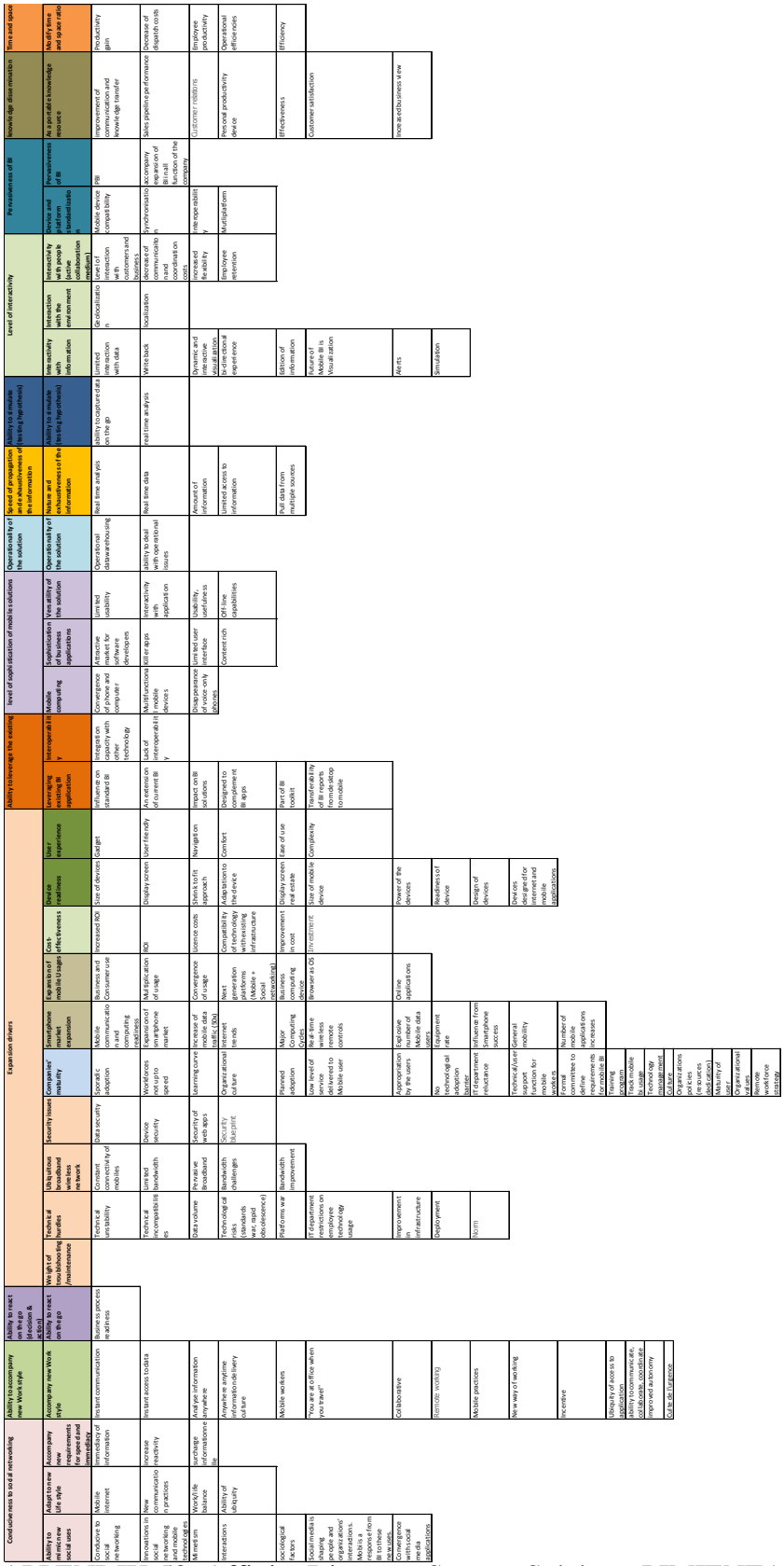


Figure APPENDIX-58: Affinity Diagram. Source: Stéphane PIMIENTA.

CSH, 12 boundary questions according to Ulrich

SOURCES OF MOTIVATION
(1) Who is (ought to be) the client or beneficiary? That is, whose interests are (should be) served?
(2) What is (ought to be) the purpose? That is, what are (should be) the consequences?
(3) What is (ought to be) the measure of improvement or measure of success? That is, how can (should)we determine that the consequences, taken together, constitute an improvement?
SOURCES OF POWER
(4) Who is (ought to be) the decision-maker? That is, who is (should be) in a position to change the measure of improvement?
(5) What resources and other conditions of success are (ought to be) controlled by the decision-maker? That is, what conditions of success can (should) those involved control?
(6) What conditions of success are (ought to be) part of the decision environment? That is, what conditions can (should) the decision-maker not control (e.g. from the viewpoint of those not involved)?
SOURCES OF KNOWLEDGE
(7) Who is (ought to be) considered a professional or further expert? That is, who is (should be) involved as competent provider of experience and expertise?
(8) What kind expertise is (ought to be) consulted? That is, what counts (should count) as relevant knowledge?
(9) What or who is (ought to be) assumed to be the guarantor of success? That is, where do (should) those involved seek some guarantee that improvement will be achieved – for example, consensus among experts, the involvement of stakeholders, the experience and intuition of those involved, political support?
SOURCES OF LEGITIMATION
(10) Who is (ought to be) witness to the interests of those affected but not involved? That is, who is (should be) treated as a legitimate stakeholder, and who argues (should argue) the case of those stakeholders who cannot speak for themselves, including future generations and non-human nature?
(11) What secures (ought to secure) the emancipation of those affected from the premises and promises of those involved? That is, where does (should) legitimacy lie?
(12) What worldview is (ought to be) determining? That is, what different visions of 'improvement' are (should be) considered, and how are they (should they be) reconciled?

Figure APPENDIX-59: CSH, 12 boundary questions according to Ulrich.

Source: Stéphane PIMIENTA.

UCT GRADUATE SCHOOL OF BUSINESS

Extract of sources referencing

ref	Date source	Search engines	Title & Source	Stakeholder	coding
1	03/02/09	Google	**February 3, 2009** **The Rise of Digital Nomads** By Jorina Fontelera Collé à partir de <http://news.thomasnet.com/IMT/archives/2009/02/the-rise-of-digital-nomads-work-anywhere-via-internet.html>	Analyst	ok
2	18/01/07	Google	**Mobile business intelligence – Will it take off (for real, this time)?** Collé à partir de <http://searchdatamanagement.techtarget.com/news/article/0,289142,sid91_gci1239777,00.html>	Analyst	ok
3	8/12/08	Google	**Mobile Business Intelligence: Best-in-Class Secrets to Success** **Companies succeeding at mobile BI delivery share winning practices for process improvement, organization, performance measurement and technology implementation.** By By David Hatch, Aberdeen Group décembre 8, 2008 Collé à partir de <http://www.intelligententerprise.com/channels/business_intelligence/showArticle.jhtml;jsessionid=VFLOG3SBOFMXBQE1GHRSKHWATMY32JVN?articleID=212300110>	Analyst	irrelevant
4	01/08/08	yahoo	**The Path Toward Pervasive Business Intelligence at The School District of Palm Beach County, Florida** ar_idc_case_study_pervasive_bi_at_the_school_district_of_palm_beach.pdf	Analyst	ok
5	9/01/09	yahoo	**BI Implementation is Wide-Spread When Servicing Mobile Workers** **83% of Best-in-Class companies are able to deliver business information to mobile users within the same day that business events take place, compared to 57% of all others.** **Compiled By** Adrienne Selko Jan. 9, 2009 Collé à partir de <http://www.industryweek.com/articles/bi_implementation_is_wide-spread_when_servicing_mobile_workers_18160.aspx>	Analyst	ok
6	19/01/09	yahoo	Providing Mobile Users Access to Business Intelligence Capabilities Drives Adoption and Pervasive Use of BI Customer Management Insights Written by David Hatch Tuesday, 13 January 2009 16:40 Collé à partir de <http://research.aberdeen.com/index.php/analyst-insight/83-customer-management-insights/406-providing-mobile-users-access-to-business-intelligence-capabilities-drives-adoption-and-pervasive-use-of-bi>	Analyst	ok
7	6/10/09	Google	Pervasive Business Intelligence *Operational data warehousing involves new capabilities that enable operational decision making in real time* Tuesday, October 06, 2009 Collé à partir de <http://pcquest.ciol.com/content/techtrends/2009/109100601.asp>	Analyst	ok
8		Google	WindowsPhone_BI%20SD.pptx	vendors	ok
9		Google	**Mobile Business Intelligence Reporting** **A Roadmap for Success** Mobile_Reporting_WP.pdf	Vendors	ok
10	01/11/08	Google	**MOBILE BI , A PATH TO PERVASIVE BI?** 5374-RA-Mobile BI-DH-08-POD.pdf	Analyst	ok
11	16/07/09	Google	**The State Of Mobile BI** **Past, Present And Future** by Lyndsay Wise Thursday, July 16, 2009 Collé à partir de <http://www.dashboardinsight.com/articles/new-concepts-in-business-intelligence/the-state-of-mobile-bi.aspx?page=2>	Analyst	ok
12	24/10/09	Google	by Erick Schonfeld on October 21, 2009 Collé à partir de <http://www.techcrunch.com/2009/10/21/how-the-iphone-is-blowing-everyone-else-away-in-charts/>	Analyst	ok
13	20/10/09	Google	**Economy + Internet Trends October 20, 2009** **Web 2.0 Summit – San Francisco** mary.meeker@ms.com / scott.devitt@ms.com / liang.wu@ms.com www.morganstanley.com/techresearch	Analyst	ok
14	20/05/09	Google	**RoamBi Brings Business Intelligence to the iPhone** **Mobile BI solution combines iPhone App, SaaS and on-premise offerings. System integrates with SAP BusinessObjects and Salesforce.com.** By Doug Henschen mai 20, 2009 Collé à partir de <http://intelligent-enterprise.informationweek.com/channels/business_intelligence/showArticle.jhtml?articleID=217600364>	Software developer	ok
15	10/06/09	business week	**Smartphone Roulette for App Makers** **The market for business apps is booming, but business-software makers face make-or-break choices among BlackBerry, Apple's iPhone, Palm, and others** By Steve Hamm Interview by Peter Elestrom from Business Week Collé à partir de <http://www.businessweek.com/magazine/content/09_25/b4136000849419.htm?campaign_id=rss_tech>	Analyst	ok
16	01/09/09	Google	**For Business Owners, iPhone Apps Abound** **By RIVA RICHMOND** Collé à partir de <http://online.wsj.com/article/SB124881952727688085.html>	Analyst	ok

Figure APPENDIX-60: Extract of sources referencing.

Source: Stéphane PIMIENTA.

Script of an interview: example 1

Source ref	Date read	Notes	coding	concepts	Categorization	Memos
Int.1	30/10/09	*-Le décisionnel mobile n'existe pas* *-c'est une approche technique. C'est comme expliquer un cube à un décideur. Nous nous avons une approche fonctionnelle.* *-C'est le besoin qui importe. Une fois que l'on sait ça, on va trouver la technologie qui doit se mettre au service de ce besoin* *-Les devices mobiles et non mobiles ne se distinguerons plus dans un avenir proche. Les appareils et les usages vont converger. L'Iphone en est un exemple aujourd'hui.* *-Finalement ce sera uniquement une question de synchronisation des informations.* **Pensez vous que le software influencent le hardware ou inversement?** *-les deux avancent par petits à coup et s'influencent mutuellement* *-la convergence et multiplicité des devices va se renforcer.* *-L'OS n'aura plus l'importance qu'elle a aujourd'hui: convergence et interoperabilité.* *-les devices itinérant vont dépasser les capacités des desktop* *-ils doivent fonctionner avec tout OS* *-le gartner disait qu'il n'y aurait plus de leader en 2012* *-nous sommes les seuls à proposer un outil unimodulaire et multiplateforme* *-Les applicatifs devront tenir compte de la multiplicité des OS et de la synchronisation* *-Chrome OS reprend le nom de leur navigateur : la prédiction du patron de SUN dan sles année 90 : appareil connecté, Net PC . Appareil qui ne sont rien sans connexion.* *-navigateur enrichi qui fonctionne sur des bases de standards interopérables* *-Microsoft est la preuve de ce mouvement: ils sont en cours de transformation pour rendre leur offre Office online. Ils sont contraints de proposer cette offre.* *-Le marché n'absorbe les innovations qu'à un certain stade: la bascule se fait quand les grosses entreprises leader sont contraints de faire le pas vers les nouveauté type* *-Avantage pour les entreprises car réduction considérable des coûts de déploiement* *-utilisation via le browser notamment pour les applications professionnelles ou l'aspect collaboratif est important* **Peut-on dire que la BI Mobile existe bien aujourd'hui mais n'existera plus demain car il n'y aura plus de distinction entre les applications desktop et mobile.** *-nous nous sommes déjà passé de l'autre côté: il n'y a pas de distinguo entre les deux applications. Il n'ya pas d'installation.* *-Prelytis a intégré cette notion d'unimodularité sur la même logique que Google Doc our SalesForce* *-vous avez des jeunes gens qui entrent sur le marché du travail, la génération des facebook et google, et on leur dit qu'il faut installer des applications ou publier des rapports pour le web. Il y a un fossé.* **Comment s'affranchir de la taille des écrans?** *-la question est plutôt de s'équiper d'écran mobile adapté pour optimiser le confort.* *-Ubiquitous BI est dans les gênes de Prelytis.* *-La perte ou le vol des mobiles. La limitation du stockage local devrait être une bonne pratique.* **Quel sont les critères de choix ou de non choix de la BI mobile?** *-la sécurité n'est pas un frein selon nous* *-le premier frein pour nous est le taux d'équipement mobile: l'utilisation réelle en situation professionnelle* *-il y a une phase de digestion du marché qui fait que l'adoption n'est pas immédiate. On passe déjà d'Excel à des tableaux de bord web interactif, le pas est déjà assez grand.* *-En situation de mobilité, on n'a pas les même comportement: on est en push d'information. Réception d'alerte. Nécessite de la conduite du changement.* *-Frein culturel donc* **Pourquoi les clients ont besoin d'un temps d'adaptation?** *-c'est un peu comme les réseaux sociaux, il faut l'essayer pour se rendre compte de son utilité.* *-Il y a un manque d'information* *-il faut en voir un intérêt pour pouvoir y investir de l'argent* *-il faut d'abord savoir que cela existe il faut ensuite pouvoir distinguer l'utilité: est-ce du confort ou de l'indispensable?* *-il y a donc une phase de découvert de l'outil et de son utilité.* **Est-ce un manque de communication de la part des software developers et des intégrateurs si la propagation de la BI mobile est plus lente que d'autres techno mobile?** *-Ne voit pas la propagation de la BI mobile comme plus lente que d'autre techno.* *-je pense que le confort d'utilisation est un critère important et les devices ne sont relativement satisfaisant que depuis 2007 ou 2008.* **Mais il y a avait les PDA avant** *-la technologie de la BI mobile avant n'était pas satisfaisante: la solution technique ne correspondait pas à l'usage: obligation de synchroniser par ex. Les usages aujourd'hui sont : manager par exception, être alerté, le temps réel* *-le public de la BI mobile ne peut se limiter à ceux qui veulent faire les malins avec leur BlackBerry.* *-La BI mobile se démocratisera lorsque la BI se démocratisera: la sitation actuelle de la BI: 90% des données de l'entreprise sont en dehors des DWH. Et ces données ne concernent que une faible partie de la population de manager.* *-Il faut communiquer sur l'apport de la techno et non pas sur la techno elle même.* *-Tout le monde se fiche de savoir comment fonctionnent les réseaux sociaux. Mais par contre on sait à quoi ça nous sert.* *-Les editeurs et les intégrateurs ont une part de responsabilité: on aime se gargariser avec la techno.* *-Je crois à l'innovation par l'usage* *-le temps réel est un élément fondamental: pour la finance par forcément, mais pour l'opérationnel oui.* *-Le salut de la BI Mobile c'est ça disparition au profit d'une Ubiquitous BI, présente partout tout le temps quelque soit le support. ça prendra 5 ou 10 ans*	Le décisionnel mobile n'existe pas Software et hardware s'influence mutuellement La multiplicité et la convergence des devices va se généraliser Devices mobile vont dépasser les capacités des desktop Les applicatifs devront être multiplateformes Les appareils vont devenir connectés L'os pourra quasiment se résumé au browser Navigateur enrichi Standards interopérables Application online Avantage pour les clients en terme de déploiement Aspect collaboratif important Pas de distinction entre application mobile et desktop Perte ou vol du mobile Application sans stockage local La securité des données n'est pas un frein Le taux d'équipement mobile professionnel est un frein Le niveau d'aboutissement des appareils mobiles était un frein jusqu'à 2007-2008 Frein culturel Besoin d'un temps d'adaptation, de digestion Il faut d'abord savoir que cela existe, il faut ensuite réaliser l'utilité En mobilité, les comportements sont différents. Les applications ne répondaient pas à ces comportements: manager par exception, être alerté, info en temps réel Mais la propagation de la techno mobile BI n'est pas plus lente qu'une autre La propagation de BI mobile est dépendante de la propagation de la BI Les developers et les intégrateurs sont responsables de l'image de la BI mobiles: approche trop techno pas assez utilitaire Croit à l'innovation par l'usage l'avenir de la BI mobile c'est sa disparition au profit d'une seule BI présente partout tout le temps. Cela prendra 5 ou 10 ans.	Convergence Synchronisation Applicatif unimodulaire Applicatif multiplateforme Who drives who (software or hardware) Appareils mobiles de plus en plus puissants Appareils connectés Browser as OS Navigateur enrichi Online applications No local install required Ease of deployment Professional apps Collaborative Disappearance of the distinction between mobile and desktop apps Security of data with lost or stolen mobile Low mobile equipment rate for professional Level of readiness of devices Cultural restrainer Period of adaptation Being aware of the technology Understanding the usefulness Adoption of Mobile BI depends on adoption of BI Focusing on the technology and not enough on the usefulness Responsibility of stakeholders Innovation by utilization timeframe	Convergence Synchronisation Interoperability Mutliplatform Power of the devices Connectivity Browser as OS Online applications Deployment Business apps Collaborative Security Equipment rate Readiness of device Culture Adaptation period Awareness Usefulness Standard BI Stakeholders' claims	

Figure APPENDIX-61: Script of an interview – example 1.

Source: Stéphane PIMIENTA.

Script of an interview: example 2

Int.4		*What is BI today?* At the beginning BI was much more focused on Executive population or technical users that could navigate into the applications. Newer solution appear to be much more interactive and allow any kind of person to benefit BI and access to data and get more clarity on general performance of the organization. *What are the fundamental requirement the user need to have to get remote access?* It's harder for organization that are built on traditional BI infrastructure. It's so structured in terms of information you can access to and the way solutions are developed. Information is more static. Whereas newer solution, such as Software As A Service solutions, are much more interactive, user friendly and let you get access when you want it and you get create queries on the fly. *Are we addressing the same users with mobile BI?* Yes, it allows to expand the potential users of traditional BI. It's becoming more widely used inside the organization, sales operations department for example. *Do you have real examples of successful implementation of Mobile BI around you?* I've seen a lot of initiative but mainly in early adopter kind of companies. They are searching for the right solutions for them. Are they actually fully used as they could be? probably not. But it takes time to spread. *But why that while Mobile BI is not recent?* Now with better devices, it is easier to prove the added value of Mobile BI. *So you think mobile devices evolution could be a driver to Mobile BI?* Yes, I think so. It's true that technology was there but usability wasn't that acceptable to people. Eventhough before, you could access information, now you could interact with information which increases the perception of added value. *Is it contributing to a change in behavior of business people in the way they are acting and making decision?* Yes, definitely. Because they can have access to information from anywhere, there will be better and quicker decisions based on information people can access remotely from anywhere without being obliged to go back to the office. *It's somewhere related to social media, right?* What's happening is that with the evolution of technology, people start to interact differently with computers. People are expecting technology to drive the experience. People are now expecting to be able to interact with technology. It's not anymore a one way information. *Will it help collaboration or on the contrary isolate the final user?* It mainly depends on the corporate culture of the organization. In organization where you are expected to collaborate, it will clearly help the users to access information and share there decisions and actions. Whereas in other kind of organization, it can reinforce the culture allowing users to act independently on their own by remotely allowing them to access information. *Interaction with the data is key?* That's going to make mobile BI value more attractive, more available. *What business user it will be more helpful to?* Executive and operational ones but in different ways. *Who is creating the market, integrators, service providers, software vendors…?* It's the question of the chicken and the egg. When I ask the question to software vendors, I get answers showing that the strategy to go mobile is half motivated by external factors and half by internal factors: half is motivated by the requirements they have collected from their customers and the other is motivated by the observation of the competitors who are going mobile. You have vendors who are really trying to create new ways of interacting with information. The traditional vendors may not be the one proposing new ways of interacting with information and revolution could come from new challengers. The use of the mobile BI is still very low. Because organization need to do so much things in terms of infrastructure to allow this practice to expand. So the collaborative and interactive aspect of BI will come after the stabilization of the fundamentals. Simplicity and quick application setup could be a driver for the development of mobile BI. *Key words for mobile BI?* Not access to more data. Simply the information they need when they need it. *Do you see any key vendors on the market today?* I don't see any vendor that differentiate from the others.	Executive users vs operational users Navigation into data Static information vs interactive Information User friendliness Better mobile device Early adopters The right solution Added value Technology drives the user experience Traditional vendors vs challengers The culture of the organization The information they need when they need it.	Navigability Interactivity User friendliness Early adopters User experience Cultural factors	Cultural factors User experience Interactivity	

Figure APPENDIX-62: Script of an interview – example 2.

Source: Stéphane PIMIENTA.

Coding process (extract)

Source ref	Date read	Notes	coding	concepts	Categorization	Memos
1	21/10/09	"Digital nomadism" combines the autonomy of telecommuting with mobility for an even more flexible work style. Now more people are ditching the office and using the world as their workspace. While it may sound like it's simply telecommuting, "nomadism" is starkly different, James Ware, co-founder of think-tank Work Design Collaborative, tells the Economist. Telecommuting still ties workers to a place because of the landline phone, fax and dial-up Internet. Rather than being cocooned in an office, they were cocooned at home. Nomads, Ware says, "do not want that: instead they want to mingle with others and to collaborate, though not necessarily under fluorescent lights in a cubicle farm... . [N] omadism combines the autonomy of telecommuting with the mobility that allows a gregarious and flexible work style." **Problem:** Unstable Internet connection. **Solution:** Find out as much as you can about Internet access and infrastructure in your chosen destination(s). While this may limit the places you can go, it's imperative to have a good connection as it can make or break your business.	Flexible work style Digital nomadism Telecommuting Telecommuting vs nomadism Collaborate gregarious and flexible work style Unstable internet connection	Nomadism Telecommuting Collaborate Work style Technical unstability gregarious and flexible work style	Work style Technical unstability	
2	21/10/09	When mobile technology took a "quantum leap" in 2003, with more colorful and functional devices, Craig knew his BI deployment was only a matter of time. His "ubiquitous BI" system was ready to be deployed as a full-fledged application as soon as someone needed it. That didn't take long. Craig learned about a vice president who constantly called the office for the latest sales figures. An employee would read him the data, a time-consuming process. So Craig showed the executive how his mobile BI tool could help. Soon, Craig was deploying a full-fledged version. Now, the vice president uses his Treo 650 to access real-time sales figures by region and drill down on statistics. "If you have a set of metrics for managing your company and they're always available, in your hands, wherever you are, you can make more informed decisions," Craig said. "Our executives are no longer tethered to their desks." The technology has been around since the late 1990s but never really took off, owing to a combination of social and technical barriers, according to Mark Smith, chief executive officer and executive vice president of research with San Mateo, Calif.-based Ventana Research Until recently, companies' adoption of mobile technologies was sporadic. Devices had limited bandwidth and technical incompatibilities, which didn't help the cause. But this may be the year when that all changes, Smith said. BI vendors, including Ottawa-based Cognos Inc. and New York-based Information Builders Inc., are releasing new mobile applications, and organizations are in a better position to appreciate the benefits. "In the previous years of mobile BI, everybody came out with announcements, but companies weren't mature enough and their workforces were not up to speed," Smith said. "Now, look at the number of business professionals that have BlackBerrys going off every 15 seconds. This has become a mainstream technology." Investments in mobile BI are now more cost-effective and useful for a company, Smith said. Workers are comfortable using the devices as part of day-to-day life, so there's less of a learning curve for training and deployment. The technology has advanced too, enabling BI vendors to deliver more sophisticated applications on smaller devices. And executives are warming to the benefits of mobile BI, such as being able to respond to critical issues faster and helping managers more proactively manage projects and people, he said. Choosing a tool probably won't be hard for most companies, Smith believes. Organizations that have a standardized BI provider should evaluate its mobile offerings, because that's usually the default choice. Those looking for a new BI vendor should include mobile features on their request-for-proposals, he said, because they are a must-have. However, deploying mobile BI poses unique challenges, Smith said. Security considerations are very important. Companies must consider what information is going outside of their firewall and how they will protect it, he said. Other IT planning is required, as well. "You have to have the right architectural infrastructure in place, and you may have to have a strategy for the diversity of mobile devices," Smith explained. "And you can't just assume that everybody is ready to digest [mobile BI]. The tools have different approaches, and you need to make sure that it's easy to operate for users." CIO Jim Craig agreed. The technology should work "like a wristwatch," he said. If it's too complex or requires constant troubleshooting, no one will use it. Gathering requirements has also been a challenge for Craig's team because most people have no idea what they want (or don't want) from a mobile BI tool until they see it. Prototyping was helpful, he said, because it helped spark ideas about how mobile BI could be most useful. "Our project was geared not just around mobile technology, but mobile technology for executives," Craig said. "We're very focused on delivering the kinds of BI that our executives need and, frankly, we're still learning what that is."	Leap of mobile technology in 2003 Ubiquitous BI Time-consuming process Set of metrics always available, in your hands Since 1990 Technology never took off Social and technical barriers Sporadic adoption Limited bandwidth Technical incompatibilities Maturity of companies Workforces not up to speed Now more Cost-effective, Useful, Comfortable Day to day life Learning curve for training and deployment More sophisticated applications on smaller devices Respond faster Proactive Mobile features are a must-have Security considerations Firewall IT planning is required Architectural infrastructure Ensure it's easy to operate for end users Must Work like a wristwatch Too complex or require constant troubleshooting Gathering requirements prototyping	Mobile technology Time management Availability Bandwidth Technical compatibility Maturity Cost-effective Useful Comfortable Learning curve Proactivity Devices Fast response Features/functions Security Firewall IT planning Infrastructure End-users Troubleshooting Prototyping Requirements Social and technical barriers Bandwidth Maturity Easy to operate complexity	Social and technical barriers Technical incompatibilities Sporadic adoption Limited bandwidth Companies' maturity Workforces not up to speed Usefulness Cost-effectiveness Learning curve Sophistication of applications Size of devices Comfort Security issues Complexity Weight of troublshooting/maintenance Ease of use	

Figure APPENDIX-63: Extract of coding process.

Source: Stéphane PIMIENTA.