**THE IMPACT OF DATA QUALITY IN INDUSTRY-A QUANTITATIVE ANALYSIS OF DATA PERFORMANCE IN B2B MARKETING**

ABSTRACT

This article examines management science literature’s observation of the reality of data abundance and its quality criteria of marketing decision making, (Hofacker et al., 2016; Sivarajah et al., 2017; Chintagunta et al., 2016; Skiera, 2016) and reports findings from a quantitative study conducted on one hundred marketing decision makers in a B2B context, to examine the effect of the perceived data quality on the performance of decisions made. The study asks two questions: (1) Is there a relation between the improvement of information quality perceived by actors in the industry and their organizational results? (2) What effects of interaction between the various aspects of improvement of the MIS (Marketing Information System) information quality and strategic organizational profits?

A model will be presented and it adduces empirical support for its validity. The research supplies empirical details of stakeholder perception of the relation between information quality and organizational outcome. The findings support Wang and Strong’s (1996) observation that the multidimensional construct of data analysis is appropriate as a measure of the impact of the data usefulness on organizational benefits, if the quantity variable has been excluded.

This paper suggests B2B marketers should develop new skills about abundance to improve the quality of decisions and promote reflection on the relevance (Value / Velocity) of the data gathered, rather than the Volume.

**Keywords :** Information Quality, B to B, Marketing Decisions, Information Systems

1. INTRODUCTION

The abundance of data has become an exponentially growing reality; this accelerating movement has become a major trend in our society, impacting marketing decisions as evidenced in management science literature in the field of marketing (Hofacker et al., 2016; Sivarajah et al., 2017; Chintagunta et al., 2016; Skiera, 2016). In the teaching of B2B marketing much emphasis is placed on Relationship marketing and the complexity of organizational networks during the buyer decision making process (Brennan et al., 2007; Habibi, 2015) The Internet economy has reinforced and developed this central aspect of the B2B sector and marketing which Achrol (1997) and Kotler and Pfoertsch (2007) argued “will reshape markets through technology convergence and electronic commerce, organize consumer communities, and aggregate consumer information and demand into saleable business assets”. We can align his statement with that of Kotler and Pfoertsch (2007) and highlight the responsibility of marketers to develop significant data management skills to anticipate this market evolution (Eid et al., 2002, 2006; Chaffey, 2010; Rice, 2002; Zaïdi-Chtourou, 2018).

The Internet boom at the turn of the century also brought about what Kotler and Pfoertsch (2007) described as “a knowledge driven society”. The new economic currency of this society would be that of knowledge. Their projection included a new type of marketing faced with a continued development of network economies.

As Berthon et al. stated in 1998, the World Wide Web will prove to be an effective tool for B2B marketers in the industrial purchasing decision making process. The reason for this is because the fundamental purpose of the World Wide Web is to broadcast and to publish, therefore generating a two-way flow of communication (Berthon et al., 1998). This reinforces observations made on the smart evolution of the Internet and the development of 'conversations' between sensory captors that in turn are producing data sets i.e. information that marketers will need to transform into knowledge (Wiersema, 2013; Hoffman et al., 2017; Zaidi Chtourou, 2018). By exploring this concept further, we can concede that the role of marketing will be to convert these conversations from casual exchanges into qualified demands (Berthon et al., 1998).

This study asks two questions: Is there a relation between the improvement of information quality perceived by actors in the industry and organizational results?

What are the effects of interaction between the various aspects of improvement of information quality of the MIS (Marketing Information System) and strategic organizational profits?

A model will be presented and it adduces empirical support for its validity. The research supplies empirical details of stakeholder perception of the relation between information quality and organizational benefits.

As part of marketing decision making, the integration and organization of data quality is a factor of efficiency. A quantitative study conducted on a hundred marketing decision makers shows the effect of the perceived data quality on the quality of decisions made. Major significant differences have been identified and studied among industry marketing managers. If the *usability* and *usefulness* are explanatory factors for better marketing decisions, the *soundness* and the *dependability* of the information are not.

The B to B sector estimates that information *usefulness* with the variable *relevancy* of the *usefulness* have a positive impact on the organization's results.

The data analysis provided empirical evidence for the validity of the proposed model. However, the *quantity* variable is not determined as a significant variable in improving organizational outcomes. This study challenges the *quantity* criterion of information widely used in the *usefulness* dimension of the information quality products and services performance model (Lee et al, 2002, Kahn et al. , 2002). The multidimensional construct of data quality (Wang and Strong, 1996) seems appropriate as part of a measure of the impact of the usefulness of the data on organizational benefits if the quantity variable has excluded it. The quantity criterion of the information is defined in the model as the degree to which the data volume is appropriate. The actors of the companies in our study do not perceive this criterion as useful for a better quality in the strategic and operational decision making. The scope of this assertion is original in view of the focus that marketing directors bring to the customer’s attention through the multiplication of data collection sources. This result supports the finding that there is no questioning of this accumulation of data by the customers who find only a limit in the technological systems and databases available to the company.

This paper suggests the development of new skills in abundance to improve the quality of decisions and promote reflection on the relevance (Value / Velocity) of the information rather than the Volume.

1. LITERATURE REVIEW

2.1 A KNOWLEDGE DRIVEN SOCIETY

The Internet of Things, connected technology and Artificial Intelligence have enabled an accelerated transformation of manufacturingprocesses. Where some considered these technologies a threat (Joy, 2000), value creation is their fundamental purpose. Bill Joy stated that “the future does not need us anymore” (2000). His concern focused on the transforming technologies of the 21st century: genetics,nanotechnology and robotics (GNR). Compared to 20th century technologies (nuclear, biological, chemical) which were costly and required the transformation of raw materials, GNR technologies have the potential to self-replicate at little cost.Digital technology is cheaper and enables small groups of communities to create massive disruption (or destruction). Itis therefore man's responsibility to determine his added value in order to develop an effective integration of digitalplatforms alongside the human workforce. Wilkinson however, argues that it is not possible to automate everything that humans do (2018).

The smart evolution of the Internet has enabled a rapid development of connected technologies within the last decade. “Conversations” now take place between connected objects, smart technologies and machine-based learning, resulting in the creation of massive data sets. The value of this data stemming from the “conversations” occurring between the billions of sensory captors will only be measured if companies understand that data analytics are an essential part of their strategy (Zaidi-Chtourou, 2018; Grover *et al.*, 2018; Lehrer *et al*., 2018; Kitchens *et al*., 2018). Literature develops the importance of data and the need for companies to develop effective relationships between marketing and Management Information Systems (MIS), the company’s technology infrastructure, its internal culture and ability to collaborate with strategic partners (Eid *et al.,* 2006; Chaffey, 2010; Grover *et al.,* 2018; Zaidi-Chtourou, 2018).

The value of the Internet of Things (IoT) industry will surpass $3 trillion in 2025 with over 27 billion heterogeneous objects connected to the internet (Meyer, 2016). Hoffman et al., (2018) describe how IoT is becoming increasingly integrated into our everyday lives as smart objects interact with all of our consumption activities. This clearly illustrates the notion of conversations moving from people connected on social devices to objects and people sharing conversations with packets of data flowing from device to data management information systems (MIS). This has been referred to as a new type of industrial assemblage (Delanda, 2016). The key consideration here is that during this smart evolution building multiple channels of data collection, there is a unique data collection experience as Hoffman and Novak explain (2018) between the data captured and analysed by the smart object and the customised experience gained by the user. Companies will need to acquire additional expertise as the data traffic generation from each user experience will multiply endless data sets (Hoffman *et al*., 2018; Zaidi Chtourou, 2018).

2.2 THE BIG DATA LANDSCAPE

To understand what Big Data is and its role in marketing decision-making, we must first understand why we have big data and how it is created. As some authors point out (Sivarajah et al. 2017, p. 265), the concept of "Big" is difficult to define, in part because what may seem "Big" today will be called routine in the near future, as computing power advances. Big data is often commonly defined by "3V": large volumes of data generated at high speed by a variety of sources. Sivarajah et al. (2017) offer an extended list of “Vs”adding veracity, visualization and value. Hofacker et al. (2016) add the notion of volatility to this list.

Faced with information processing, marketing decision-makers are perplexed. The skills of marketing decision-makers and technological resources require adjustments because big data will allow managers to have a much more radical knowledge and measurement of their activity and thus transform this knowledge into improved decision-making and performance (McAfee & Brynjolfsson, 2012).

However, the question is raised by marketing decision-makers about the perceived or anticipated dangers of an over exploitation of data. Consequently, data often remains underused in marketing decision making. In the late 1990s, the implementation of CRM projects frequently ended in failure. Data experts promised impressive results if companies implemented information systems capable of collecting ever-increasing volumes of data about their customers. The promised performance results were slow to come as systems remained stubbornly siloed. Managers distanced themselves from complex decisions requiring the additional task of processing (Barton and Court, 2012). Yet Big data resonates as a new potential for improving customer knowledge. However, the different data formats are not always easy to understand and managers do not always know how information can be used in decision-making. Creativity occurs to apprehend new external data (Barton and Court, 2012) revealing a part of subjectivity in decisions.

2.3 THE EVOLUTION OF B2B MARKETING IN A DATA DRIVEN SOCIETY

When discussing B2B marketing, key concepts need to be identified as theoretical milestones for this marketing practice. Hadjikhani (2013) develops a historical perspective of B2B marketing and identifies the two main theories that underpin its practice. Exchange theory, which is based on transactions between two or multiple parties, and Behavioral theory, that focuses on the relationship between individuals, firms and entities. Relationship marketing which is the practical application of Behavioral theory has been at the forefront of marketing practice applied to this sector for the last 30 years. (Brennan *et al.,* 2003; Sheth, 2008; Hadjikhani *et al*., 2013). Hadjikhani (2013) points out that criticism on Exchange theory as a basis for B2B marketing was founded on market transactions no longer being wholly rational nor based purely on profit maximization. Behavioral elements such as uncertainty and mutual satisfaction became elements to consider in B2B marketing practice. This view supports additional literature that examines the evolution of relationship marketing (Eid *et al.,* 2002, 2006., Grönroos 1994; Gummesson, 1987, 2002). External factors such as increasing diversity or radical changes in business environments can trigger crises and therefore require marketing to adjust its practices to respond to such developments.

Cooke (1986) argues that B2B buyer behavior has more organizational constraints and is more rational. Purchasing risk factors make professional buyers more accountable than consumer buyers. Due to the concentration of players within B2B markets, buying relationships are longer term and more engaging than consumer purchases (Habibi, 2015). Since buyers are looking for a steady, reliable source of product and or service they typically build relationships with 2 or 3 suppliers therefore making it complicated for new suppliers to enter the market. Cooke (1986) also underlines the notion of reciprocity that exists in B2B markets and not in B2C. Many governments have tried to crack down on this activity and it is by no means contractually binding but it is a practice that continues to exist, making barriers to entry for new suppliers more challenging.

Literature on B2B marketing is unanimous about how transactions and interactions in B2B networks are built on demand stemming from the final user of the product or service(Cooke, 1986; Brennan, 2011, 2012; Kotler and Pfoertsch, 2007; Hakansson, 1982). This interaction builds knowledge communities (Hakansson, 1982) that create appropriate value for the final customer (Kotler and Pfoertsch, 2007). As demand fluctuates, so does the intensity of each relationship within the business network. Hadjikhani (2013) discusses the fluctuation in network connections and their impact on the business relationship and efficiency. This idea of the intricate nature of industrial networks is further backed up by contemporary literature (Anderson *et al.,* 1994; Ford, 2002; Hakansson and Snehota, 1995). B2B marketing literature also places much emphasis on Relationship marketing and the complexity of organizational networks during the buyer decision making process (Brennan *et al*., 2007; Habibi, 2015) The Internet economy has reinforced and developed this central aspect of the B2B sector and marketing which Achrol (1997) and Kotler and Pfoertsch (2007) argued “will reshape markets through technology convergence and electronic commerce, organize consumer communities, and aggregate consumer information and demand into saleable business assets”. Scott McNealy’s, former founder and CEO of Sun Microsystems commented in 1995 that “the network is the computer”, and defining thus a turning point in the economic model of the Internet. We can align his statement with that of Kotler and Pfoertsch (2007) who highlighted that the responsibility fell on marketers to develop significant data management skills to anticipate this market evolution (Eid *et al.*,2002, 2006; Chaffey, 2010; Rice, 2002; Zaïdi-Chtourou, 2018).

The Internet boom at the turn of the century also brought about what Kotler and Pfoertsch (2007) described as “a knowledge driven society”. The new economic currency of this society would be that of knowledge. Their projection included a new type of marketing faced with a continued development of network economies. In this type of economy marketing will be “pushed closer to being an agent of the customer as opposed to the agent of the firm or seller”. Kotler goes on to say that marketing will have the responsibility of organizing consumers and consumer information on behalf of the consumer and not organizing information for marketing to the consumer. Marketing in a networked economy, will differ significantly from classical B2B marketing (Wiersema, 2013). Although market sensing as described by George Day (1984) talked about the importance of understanding the customer through traditional marketing practices, the notion of market relating i.e. that of building and maintaining a relationship with a customer, will come to the fore in the Internet economy. Achrol (1999) supports this argument by stating that in a knowledge intensive environment, marketing will need to predict technological changes that may influence or impact consumer behavior and will also be exposed to its economic productivity. This will imply that companies will need to incorporate financial criteria in their marketing calculus. We can understand from this that marketing’s role in a data driven society will be to focus its efforts on what Achrol (1999) described as Real time marketing: transforming packets of information captured from the Internet into knowledge for managerial and strategic decision making. Wiersema (2013) considered this to be one of B2B marketing’s biggest challenges and refers to it as the need to “extract and leverage more granular customer and market knowledge”.

B2B marketing is presented with increasing opportunities in the Internet economy (Anderson and Wolff, 2010; Achrol, 1999; Weirsama 2013). As Berthon *et al*. stated in 1998, the World Wide Web will prove to be an effective tool for B2B marketers in the industrial purchasing decision making process. The reason for this is because its fundamental purpose is to broadcast and to publish, therefore generating a two-way flow of communication (Berthon *et al*., 1998). This reinforces observations in 2.2 about the smart evolution of the Internet and the development of 'conversations' between sensory captors that in turn are producing data sets i.e. information that marketers will need to transform into knowledge (Wiersema, 2013; Hoffman *et al.*, 2017; Zaidi Chtourou, 2018). By exploring this concept further, we can concede that the role of marketing will be to convert these conversations from casual exchanges into qualified demands (Berthon *et al*., 1998).

Day *et al*. (2005) ran a survey with 165 senior managers in B2B which concluded that the Internet brought companies an opportunity to build and encourage dialogue and personalize communications. However, it was deduced that most firms would not benefit from these opportunities. Their survey goes on to argue how this ability to dialogue with customers is an essential part of the relationship marketing initiative. This is particularly important to highlight as it supports previous notions drawn from Behavioral theory and market relating and also paves the way to understand how B2B marketers can draw on the knowledge economy to enhance their service offering (Day *et al*., 2005, Kaun*,* 2014). It is important to note at this point that Day *et al*.'s findings pressed upon the idea that Relationship marketing strategy is a cross-functional initiative within companies and the Internet merely acts as a data capture platform, but that the strategy needs to be driven companywide (Achrol & Kotler, 1999; Day *et al*., 2005).

1. RESEARCH MEASURE AND METHODOLOGY

In this context of quantity of data in the B to B sector, it seems appropriate to focus on measuring the quality of information.

Over the past 40 years, researchers have explored a multitude of ways to conceptualize data quality. Gallagher (1974) considered factors such as usefulness, attractiveness, level of significance and relevance, among others, as determinants of the value of information systems. Halloran et al. (1978) focused on accuracy, relevance, perfection, retrieval, security of access and timeliness. They indicated a measurement scale for each of them in terms of the overall system. Other more recent work shows the impact of the quality of information on the performance of the supply chain through dimensions such as usefulness, accuracy, completeness or even reliability (Hartono et al., 2010). Regarding the notion of quality, we choose a perspective based on user perceptions, widely used in information system research and which takes into account the notion of quantity of information. We then define the quality of the information by following two complementary guidelines.

3.1 A COHERENT MODEL OF DATA QUALITY

By the middle of the 1990s research on information quality began to form around a common framework. In particular, Wang et al (1995) proposed a framework derived from ISO 9000 to classify data quality research. They showed an analogy between the manufacture of products and data processing. Indeed, information systems are considered as similar to manufacturing systems. The data are then considered as raw materials and, when treated, when they are sometimes also called information, are considered as finished products. In this model, the storage of data is comparable to the storage of goods. Using the ISO 9000 concept "Description and Conception" Wang et al (1995) translate the necessity of indicating various aspects of data quality, such as criteria of acceptance and refusal, corresponding to management policy and subjected to management processes. Adopting a customer perspective similar to that recommended by Juran (1988), Wang et al (1995) noticed that the use of the term “data product” underlines the fact that the produced data have a value which is transferred to customers, that they are internal or external to the organization. This perspective was later famously adopted by Wang and Strong (1996) "to develop a framework that captures the aspects of data quality that are important to data consumers" (p. 5). They synthesized their results in the following way: the intrinsic data quality indicates that the data have the quality which is appropriate for them. The contextual quality stresses the condition according to which the data must be considered in the context of a precise task. The representative data quality and the accessible data quality underline the importance of the role of the systems. The authors summarize the consequences of their study in the following way: “These findings are consistent with our understanding that high-quality data should be intrinsically good, contextually appropriate for the task, clearly represented, and accessible to the data consumer” (p. 22). Figure A describes Wang and Strong's (1996) model of data quality as a multidimensional concept.

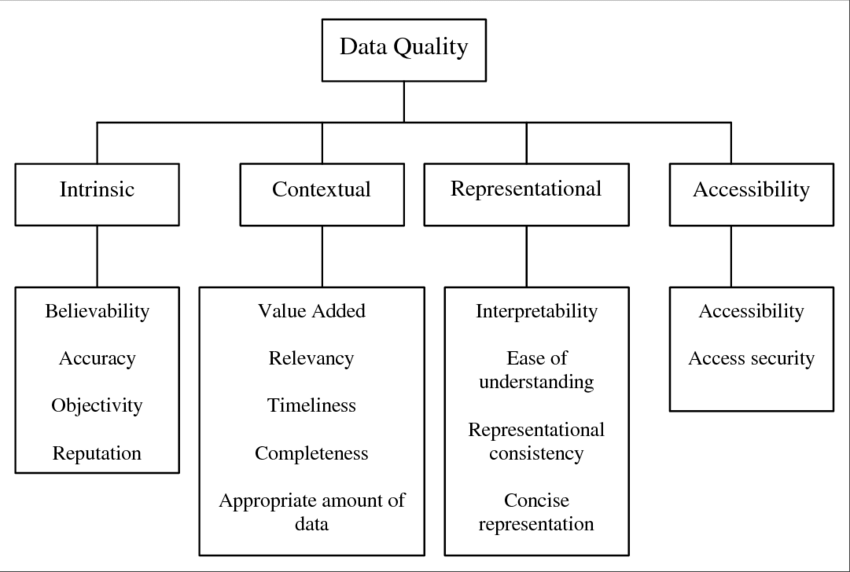
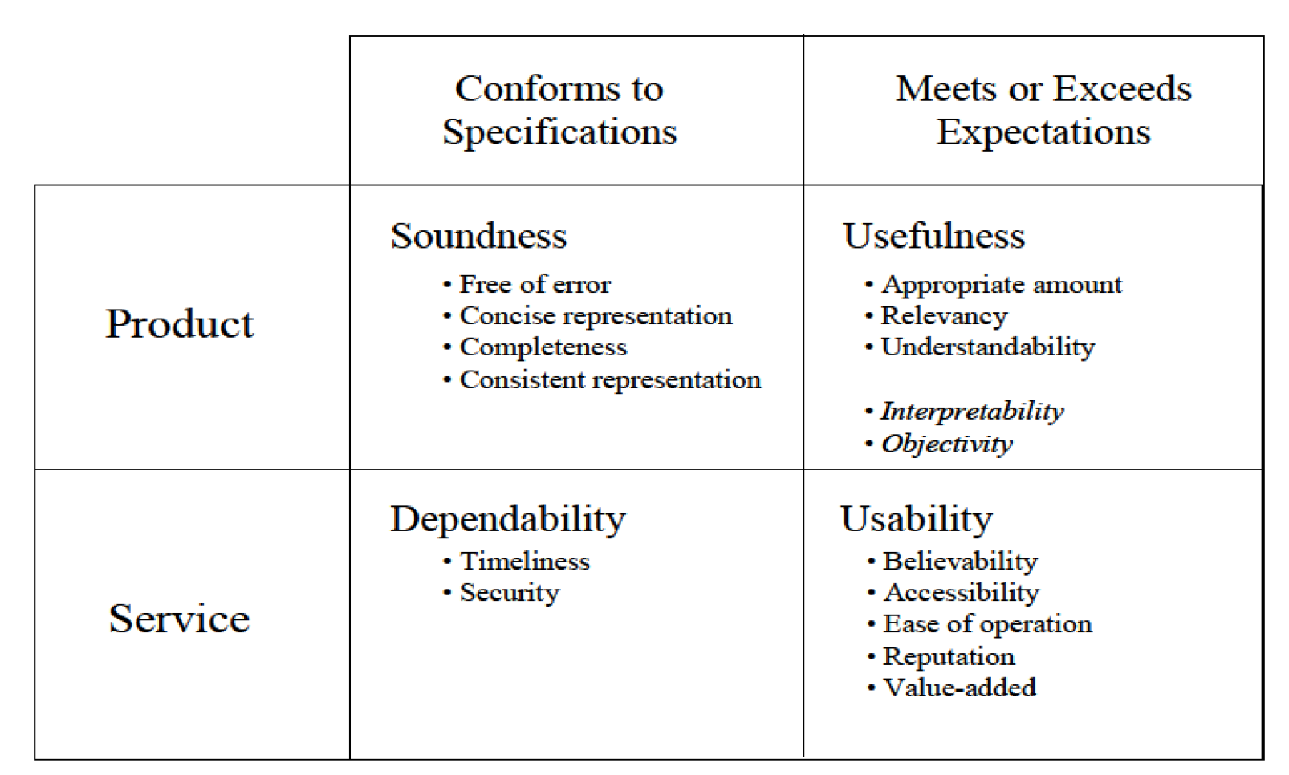


Fig. A. Data quality as a multidimensional construct

3.2 A MODEL OF THE PERFORMANCE OF PROUDCT AND SERVICES FOR INFORMATION QUALITY

Kahn *et al* (2002) recognized that the dominant abstract models treated information as a product; nevertheless, they noted that it “can also be conceptualized as a service” (p. 186). A service, unlike a product, “is perishable, for you cannot keep it; it is produced and consumed simultaneously” (p. 186). Besides identifying the aspects of service of information quality, Kahn *et al* (2002) used general quality literature to identify other ways to characterize it: two of which they adopted for their purposes: “conformance to specifications” (p. 185) and “meeting or exceeding customer expectations” (p. 185). By combining these two definitions with both aspects (product and service) of information quality, Kahn *et al* (2002) developed a significant extension of Wang and Strong's (1996) model, entitled "Product and service model for quality information (PSP/IQ).” The PSP/IQ model is represented by a board with two lines and two columns (Table A). The quality of products and services are presented in lines and the specifications with regard to expectations are presented in columns. The various dimensions of the quality information model developed by Wang and Strong (1996) are schematized by two lines and two columns. Each of the quadrants has been assigned a short, descriptive name. On the product side, the product-conformance quadrant is referred to as “sound information” (Kahn *et al*, 2002, p. 189) and the product expectations quadrant represents “useful information” (p. 189). On the service side, the service-conformance quadrant represents “dependable information” (p. 189), with “usable information” (p. 189) making up the service expectation quadrant. The dimensions in italics in the "Usefulness" quadrant were registered marginally in the cell.

Table A: The PSP/IQ model Kahn et al (2002)



Mirani and Lederer (1998) developed a tool to measure a set of organizational benefits in each of the categories illustrated in Figure A by using two to four survey items per category. A narrower observation of the items which measure the informative advantages indicates that every item reflects one or more of the dimensions identified by the factorial analysis of Wang and Strong (1996). Lee et al (2002) developed a useful methodology to identify aspects of information quality which require particular attention. Their methodology is developed from PSP/IQ to establish benchmarks. It includes two forms of gap analysis. The first one is called “Benchmarking Gap Analysis.” Table B recapitulates the results of this study: the column on the left-hand side shows the informative categories of advantages and links the items described by Mirani and Lederer (1998). The central column shows the dimensions proposed by Wang and Strong (1996) and the facts that correspond with the category "information quality." Finally, the righthand column presents the reserved level of Lee et al (2002).

Table B: Comparison of the informative advantages of Mirani and Lederer (1998), dimensions of Wang and Strong (1996) and levels of the model PSP/IQ of Lee et al (2002)

|  |  |  |
| --- | --- | --- |
| **Mirani and Lederer**  **(1998)** | **Wang and Strong (1996)** | **Lee et al. (2002)** |
| **Information Accessibility :** Faster retrieval/delivery | Timeliness (Contextual) | Dependability |
| **Information Accessibility :** Easier access | Accessibility  (Accessibility) | Usability |
| **Information Quality:** Improve  Management information for  strategic planning | Value-added (Contextual) | Usability |
| **Information Quality:** Improve  accuracy/reliability | Accuracy (Intrinsic) | Soundness |
| **Information Quality:** Improve  information for  operational control | Relevancy (Contextual) | usefulness |
| **Information flexibility:** More  concise/better format | Concise representation  (Representational) | Soundness |
| **Information flexibility:** Flexibility of requests | Facilité d’utilisation  (Aucune catégorie) | Usability |

1. METHODOLOGY

This research describes contextual and conceptual models moving marketing quality information closer to marketing strategy and proposes an empirical study on the relation between the particular aspects of the quality of marketing information and organizational benefits in industrial companies in comparison with other industries. The model (Figure B) identifies a strategic relationship between information quality and organizational benefits. Each of these items constitutes a variable in the abstract model.

Aspects of information quality

influence + / -

Organizational benefits

Fig. B. Strategic relation between aspects of information quality and organizational benefits

These variables were used to measure user perceptions and the decision-makers of the MIS in terms of importance, current state, and organizational benefits derived from the information quality of their organization.

Analysis allowed us to measure the relation between user perception of information quality at the level of the MIS and organizational benefits, positively oriented organizational outcomes that include strategic advantages and/or transactional advantages.

Strategic advantages include competitive advantage, alignment between the business and information systems, and customer relations improvement (Mirani & Lederer, 1998). It was hypothesized that improvement in various aspects of information quality would positively affect these strategic outcomes. Accurate, relevant, and timely information can help an organization respond to changes in its competitive environment. Information that is relevant, timely, and accessible across organizational units can assist in aligning the organization’s information systems with its business objectives. Customer data that is free of errors can help an organization improve its customer service.

Transactional benefits include communications efficiency, systems development efficiency, and business efficiency (Mirani & Lederer, 1998). It was hypothesized that various aspects of information quality improvement would positively affect these transactional outcomes. Accurate, timely, and believable information can improve an organization’s communications efficiency. Information that is consistently and concisely represented can improve the efficiency with which the organization develops and deploys new systems.

We hypothesized that the improvement in diverse aspects of information quality would positively affect the strategic and/or the transactional advantages. These hypotheses are summarized below:

**H1: Improvements in information quality will be associated with greater strategic advantages measured by industrial activities.**

H1a: Improvements in information soundness will be associated with greater strategic advantages measured by industrial activities.

H1b: Improvements in information dependability will be associated with greater strategic advantages measured by industrial activities.

H1c: Improvements in information usefulness will be associated with greater strategic advantages measured by industrial activities.

H1d: Improvements in information usability will be associated with greater strategic advantages measured by industrial activities.

**H2: Improvements in information quality will be associated with greater strategic advantages.**

H2a: Improvements in information soundness will be associated with greater transactional advantages measured by industrial activities.

H2b: Improvements in information dependability will be associated with greater transactional advantages measured by industrial activities.

H2c: Improvements in information usefulness will be associated with greater transactional advantages measured by industrial activities.

H2d: Improvements in information usability will be associated with greater transactional advantages measured by industrial activities.

4.1 MEASURE VARIABLES

Two types of variables were operationalized for this study: the independent variables measuring various aspects of the usefulness of information, the dependent variables measuring the strategic and transactional organizational results at the level of the marketing function and the entire organization. The independent variables to measure the quality of the information were operationalized on two levels: the dimension level and the PSP / IQ level. The dimension level was measured directly using the items of the information quality assessment instrument (IQA) (Lee et al., 2002). The dependent variables for this study correspond to those used to measure organizational results. The dimensions "strategic advantages" and "transactional advantages" were measured using the items of the instrument developed by Mirani and Lederer (1998) "The organizational advantages of IS projects". Filter questions were used to classify the interviewees according to their quality to participate in this study. The sample is made up of participants who regularly interact with information related to the marketing function. Classification questions were included in this survey to identify the participant’s position, as well as information on the participant’s organization, including industry and size of business.

The data was collected through an online survey of respondents associated with a Marketing function. A total of 552 individuals were invited by telephone to participate in an Internet-based survey and 107 responses were received. These data were evaluated by a combination of multiple regression analyzes. Based on a uni-varied analysis, we determined that 7 cases should be withdrawn due to missing or outliers. The sample was thus reduced to 100 cases useful for the analysis. 63% of respondents work in a service company and 23% in an industrial company. An "Others" variable was created to group together government agencies, health and education, which represent 14% of the sample.

To determine if there were significant differences in the responses according to the different activity sectors, an analysis of variance (ANOVA) was then performed. Items were found to show significant differences at p = 0.01. Because of this model, we determined that a separate analysis for the industrial sector was possible given these differences.

4.2 THE CONVERGENT AND DISCRIMINANT VALIDITY OF THE MEASSURING INSTRUMENT

We also determined the convergent and discriminant validity of each category of the measuring instrument. Cronbach's alpha values were calculated for each set of items “strategic advantages", "transactional advantages" and " information quality" of the study. These values are enumerated in Tables C and D. No adjustments could be made to improve alphas below 0.7 regarding strategic alignment, effective communication, objectivity and intelligibility. Therefore, these items have been removed.

Table C. Organizational Benefits Item Convergence

**Category Dimension Number of items α Cronbach**

Strategic advantages Alignment 4 0.67

Strategic advantages Competitive advantage 3 0.77

Strategic advantages Customer Relations 4 0.86

Transactional advantages Business Efficiency 4 0.77

Transactional advantages Communications Efficiency 2 0.69

Transactional advantages Systems Development Efficiency 3 0.74

Table D. Information Quality Item Convergence

**Niveaux PSP/IQ Dimension Number of items α Cronbach**

Soundness Completeness 3 0,74

Soundness Concise representation 2 0,73

Soundness Consistent representation 3 0,79

Soundness Free of error 3 0,73

Dependability Security 3 0,73

Dependability Timeliness 3 0,75

Usefulness Appropriate Amount 4 0,77

Usefulness Interpretability 4 0,77

Usefulness Objectivity 2 0,61

Usefulness Relevancy 3 0,80

Usefulness Understandability 2 0,56

Usability Accessibility 2 0,72

Usability Believability 2 0,32

Usability Ease of operation 4 0,74

Usability Reputation 2 0,39

Usability Value-added 2 0,42

1. RESULTS

Data analysis highlights the relationship between the quality of marketing information and organizational benefits. These analyses allowed us to validate one (H2) of the two main hypotheses. Concerning the 8 sub-hypotheses which consider the 4 levels of the PSP / IQ model, H1c, H2c & H2d are validated. The hypothesis tests of these 4 validated hypotheses are presented below.

Considering both the level and the dimensions of the quality of the information, we count a total of five presumed explanatory variables. In terms of dimensions, three of the four variables are a significant explanatory variable in at least one regression model. Regarding dimensions, two of the eleven variables are explanatory variables in at least one regression model; nine are not.

**Test of hypothesis**

**H2: Improvements in information quality will be associated with greater transactional advantages measured by industrial activities.**

The independent variables associated with this hypothesis are Soundness, Dependability, Usefulness and Usability. The dependent variable, Transactional advantages, represents the average statistics of variables Business Efficiency and Systems Development Efficiency.

To estimate H2, a stepwise multiple regression analysis was conducted to determine which of the independent variables (Soundness, Dependability, Usefulness and Usability) explain the transactional benefits measured in industrial activities. Descriptive statistics for these variables are presented in Appendix A. The regression results indicate two predictive models.

Model 1 has a tolerance of 1.00 and indicates Usability as a significant explanatory variable for transactional benefits, R2 = 0.21, adjusted R2 = 0.172, F (1.21) = 5.568, p = 0.028. This model explains 17.2% of the variance in transactional benefits.

Model 2, for which we find a tolerance of 0.925, indicates Usability and Dependability as explanatory variables for transactional benefits, R2 = 0.42, adjusted R2 = 0.363, F (1.20) = 7.315, p = 0.014 . This model explains 36.3% of the variance in transactional benefits.

**H1c: Improvements in information usefulness will be associated with greater strategic advantages measured by industrial activities.**

The independent variables associated with this hypothesis are Quantity, Interpretation, and Relevance. The dependent variable, Strategic advantages, represents the average statistics of variables, Competitive advantage and Customer relationship.

To assess H1c, a stepwise multiple regression analysis was conducted to determine which of the independent variables (Quantity, Interpretation and Relevance) explained the strategic benefits measured in industrial activities. The regression results indicate an overall model with an explanatory variable (Relevance) which significantly explains the strategic benefits, R2 = 0.306, R2 adjustment = 0.273, F (1 , 21) = 9.274, p = 0.006.

This model, which allows us to observe a tolerance of 1.00, explains 27.3% of the variance in strategic advantages. A summary of the regression model is presented in Appendix B.

**H2c: Improvements in information usefulness will be associated with greater transactional advantages measured by industrial activities.**

The independent variables associated with this hypothesis are Quantity, Interpretation, and Relevance. The dependent variable, Transactional advantages, represents the average statistics of variables Business Efficiency and Systems Development Efficiency.

We performed a step-by-step multiple regression analysis to assess H2c and determined which variables (Quantity, Interpretation and Relevance) explained the transactional benefits measured in industrial activities. The regression results indicate a global model with an explanatory variable (Relevance) which significantly explains the transaction benefits, R2 = 0.252, adjusted R2 = 0.22, F (1.21) = 7.088, p = 0.015. This model, for which we observe a tolerance of 1.00, explains 22% of the variance in transactional benefits. A summary of the regression model is presented in the Appendic C.

**H2d: Improvements in information usability will be associated with greater transactional advantages measured by industrial activities.**

The independent variables associated with this hypothesis are Accessibility and Ease of operation. The dependent variable, Transactional advantages, represents the average statistics of variables Business Efficiency and Systems Development Efficiency.

To evaluate H2d, a stepwise multiple regression analysis was conducted to determine which of the independent variables (Accessibility, Ease of operation) explain the transactional benefits measured in industrial activities. The regression results indicate a general pattern. This model, for which we observe a tolerance of 1.00, indicates the Accessibility variable as a significant explanatory variable for transactional benefits, R2 = 0.23, R2 adjustment = 0.194, F (1.21) = 6.304, p = 0.020.

This model explains 19.4% of the variance in transactional benefits. A summary of the regression model is presented in Appendix D.

**Summary of hypothesis testing**

The analysis above allows us to support the main hypothesis H2, as well as three additional sub-hypotheses H1c, H2c and H3c.

Table E supplies the relevant summary of support for the main effect hypotheses. Table F supplies a summary of the explanatory variables and their significant relations.

Table E: Summary of Support for Main Effect Hypotheses

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | Sub-hypotheses | | | |
|  | Main Effect  Hypotheses | **H1a** | **H1b** | **H1c** | **H1d** |
| **H1** | No | No | No | Yes\*\* | No |
|  |  | **H2a** | **H2b** | **H2c** | **H2d** |
| **H2** | Yes\* | No | No | Yes\* | Yes\* |

\* p < .05, \*\* p < .01

Table F: Summary of Predictor Variables

|  |  |  |
| --- | --- | --- |
| Predictor variable | Criteron variable | Hypotheses (𝛃) |
| **Soundness**  Completeness Concise representation  Consistent representation  Free of error | None  None  None  None  None |  |
| **Dependability**  Security  Timeliness | Transactional Benefits  None  None | H2 (0,48) |
| **Usefulness**  Quantity  Interpretation  Relevance  Relevance | None  None  None  Strategic Benefits  Transactional Benefits | H1c (0,55)  H2c (0,502) |
| **Usability**  Accessibility  Ease of operation | Transactional Benefits  Transactional Benefits  None | H2(0,46 & 0,59)  H2d (0,48) |

1. DISCUSSION

Improvements in data usefulness are the only variable associated with greater strategic advantages measured by industrial activity. The quantity of data and its interpretation is not considered an improving factor on an organization’s strategic advantage. Strategic advantages, as mentioned in section 4, include competitive advantage, alignment between the activity, the information systems and the improvement in client relations (Mirani and Lederer, 1998). We developed the hypothesis that the improvement in various aspects of the quality of data would positively affect the strategic results. Data which is precise, pertinent and opportunistic can help an organization to respond to changes in its competitive environment. Data which is pertinent, opportunistic and available across multiple levels within an organization, can offer valuable support to company information systems in the aim to fulfil organizational objectives. Flawless client data can help an organization to improve its client service.

The same results occur for the transactional advantages; only the variable ‘pertinence of the data for data usefulness improves transactional advantages. As discussed in section 4 transactional advantages include the effectiveness of the communication, the effectiveness in the development of systems and the effectiveness of the activity (Mirani and Lederer, 1998). We proposed one hypothesis that various aspects of data quality would positively affect transactional results. Accurate, opportunistic and credible data can improve the effectiveness of an organization’s communication. Data that is uniform and concise can improve the effectiveness with which an organization develops and deploys its new systems. Data that is abundant, easily usable and understandable can improve the effectiveness of the activity of an organization.

If we resume, for data to be useful in industry and have an impact on the organizational advantages (strategic and transactional), the data used in the Information system must be relevant (Figure C).

Fig. C. Improving factors on organizational advantages in a B to B sector

In industry the quality of data improves both the transactional and strategic advantages of an organization but only the usefulness of the data is validated for the strategic advantage (not usability, soundness and dependability). In the B2B industrial sector companies are constrained by their internal resources and often lack expertise to develop a strategy to optimize knowledge from data sets. We can deduce that in the B2B sector companies want useful information in the context of their activity, but they are limited to its performance from a strategic perspective possible because of their limitations in data management skills and the need to require knowledge that is not available insight to the firm or might even be hindered by relying on traditional organizational knowledge

Further research could develop this axe and contribute valuable insight into our current research

Concerning transactional advantages, three out of four dimensions of quality are recognized by managers in industry: data usefulness, dependability and usability (the exactitude of data is not considered a quality that improves transactional advantage). One could question whether the evolution in data management skills within B2B marketing will witness soundness of information to become a more recognized dimension over usability (Hoffman et al, 2018; Zaidi-Chtourou, 2018)

If we consider the dimensions usefulness, dependability and usability of data, two of these are represented by variables perceived as improving transactional advantages. Concerning usefulness, we find data pertinence. Concerning usability, we find the variable ease of accessibility. This finding might be related to B2B marketers focus being on business relations and their efficiency in the development of network connections (Hadjikhani, 2013).

What is surprising in these results is that in industry, data quality (useful, usable and dependable) is perceived as a dimension that improves transactional advantages more than strategic advantages of an organization. Can we deduce from these results that operational marketing is more important or at least more valued than strategic marketing in the industry sector? We can suggest that since transactional advantages include customer relations as discussed in section 4, that eligibility is given to these findings and indeed supported by literature, which argues that technology will aggregate consumer information and demand into saleable business assets (Achrol, 1997; Kotler and Pfoertsch, 2007)

Another surprising result is that data security and data precision (data form, structure) are not perceived as factors which improve the activity or an organization and only data trustworthiness improves the operations in industry.

Concerning the services sector, industry perceives data quality as a factor which increases transactional advantage. What the service sector does not recognize is that an improvement in data quality should improve strategic advantages. This result is in line with studies which have proposed that in the knowledge economy marketing will become an agent of the customer and this relationship will come to the fore (Wiersema, 2013; Ketler and Pfoertsch, 2007). We can also support this finding with the very nature of the knowledge economy enabling B2B marketers to enhance their service offering with more pertinent information. B2B marketers must adopt what Wiersema (2013) calls ‘the extraction of very granular customer and market knowledge. The increasing diversity and radical behavioral changes of these markets means that at the operational level marketing needs to adjust its practices to respond effectively to customer demand and build performance-based decisions, which are based on a short-term transactional perspective by the very nature of the business (exposed to time, and resource constraints), rather than from a strategic perspective. We can align this with Achrol’s definition of Real Time marketing (1999) delivering pertinent, useful data into performant, managerial decisions.

1. CONCLUSION

The study of data performance is still in its infancy, there are few studies on this topic available and they provide only a limited understanding of the concept. This study contributes to the extant literature and theoretical models (Wang and Strong, 1996; Merani and Lederer 1998; Lee et al, 2002) on understanding variables in data performance measurement.

The present paper allows us to draw conclusions relevant to academics and practitioners. The research finds and explains that certain variables of data quality are perceived as a measure to improve organizational performance. Empirical evidence is provided to respond to hypotheses on different measures of transactional and strategic benefits of an organization. Thus, the paper's findings develop research in the field of data quality where the link between data quality and organizational performance has not been fully built. The findings also contribute to extant literature on data quality and management by focusing on all types of industrial B2B organizations and not solely on large private organizations

Accordingly, one of the main conclusions of the present research is that pertinence and usefulness of data have been found as a significant mechanism to enhance organizational performance over data quantity. Managers or other executive staff can use these findings as an argument to communicate the benefits of implementing both qualitative data management and customer relationship strategies to improve organizational performance.

REFERENCES

Achrol, R. S. (1997), "Changes in the theory of interorganizational relations in marketing: Toward a network paradigm", *Journal of the Academy of Marketing Science*, Vol. 25, No. 1, pp. 56-71.

Anderson, J. C., Hakansson, H. and Johanson, J. (1994), "Dyadic Business Relationships within a Business Network Context", *Journal of Marketing*, Vol. 58, No. 4, pp. 1-15.

Anderson, C. and Wolff, M. (2010), "The Web is dead. Long live the Internet", Retrieved September 28, 2010, from: http://www.wired.com/magazine/2010/08/ff\_webri/all/1

Barton, D. et Court, D. (2012). Making advanced analytics work for you – A practical guide to capitalizing on Big data. Harvard Business Review, October, 90(10), 79-83. <https://hbr.org/2012/10/making-advanced-analytics-work-for-you>

Berthon, P., Pitt, L., Lane N. and Watson, R. T. (2010), "The World Wide Web as an Industrial Marketing Communication Tool: Models for the Identification and Assessment of Opportunities", *Journal of Marketing Management*, Vol. 14, No. 7, pp. 691-704.

Brennan, D. R., Turnbull, P. W. and Wilson, D. T. (2003), "Dyadic adaption in business-to-business markets", *European Journal of Marketing*, Vol. 37 Nos. 11/12, pp. 1636-1665.

Chintagunta, P., Dominique M. H. et John R. H. (2016). Marketing Science and Big data. Marketing Science, 32 (1), 4–7. doi: 10.1287/mksc.2016.0996

Cooke, E. F. (1986), "What Is Business And Industrial Marketing?", *Journal of Business & Industrial Marketing*, Vol. 1, No. 1, pp. 9-18.

Day, G. S. and Bens, K. J. (2005), "Capitalizing on the internet opportunity", *Journal of Business & Industrial Marketing*, Vol. 20, No. 4–5, pp. 160-168.

Eid, R., Trueman, M. and Ahmed, A. M. (2006), "B2B international internet marketing: A benchmarking exercise", *Benchmarking*, Vol. 13, No. 1-2, pp. 200-213.

Ford, D. (2002), *Understanding Business Marketing and Purchasing,* (3rd edition), Thomson Learning, London.

Gallagher, C. A. (1974). Perceptions of the value of a management information system. Academy of Management Journal, 17(1), 46-55. doi: 10.2307/254770

Grönroos,C. (1994), "From marketing mix to relationship marketing: towards a paradigm shift in marketing", *Asia-Australia Journal of Marketing*, Vol. 2, No. 1, pp. 9-30.

Gummesson, E. (2002), "Relationship marketing in the new economy", *Journal of Relationship Marketing*, Vol. 1, No. 1, pp. 37-57.

Gummesson, E. (1987), "The New Marketing - Developing Long-Term Interactive Relationships", *Long Range Planning*, Vol. 20, No. 4, pp. 10-20.

Hadjikhani, A. and LaPlaca, P. (2013), "Development of B2B marketing theory", *Industrial Marketing Management*, Vol. 42, No. 3, pp. 294-305.

Habibi, F., Hamilton, C. A., Valos, M. J. and Callaghan, M. (2015), "E-marketing orientation and social media implementation in B2B marketing", *European Business Review*, Vol. 27, No. 6, pp. 638-655.

Hakansson, H. (1982), *International Marketing & Purchasing of Industrial Goods: An Interaction Approach*, John Wiley & Sons, Hoboken.

Hakansson, H and Shehota, I (1995), *Developing Relationships in Business Networks*, Routeledge, London.

Halloran, D., Manchester, S., Moriarty, J., Riley, R., Rohrman, J., Skramstad, T. (1978). Systems development quality control. MIS Quarterly, 2(4), 1-13. <https://misq.org/catalog/product/view/id/97>

Hartono, E., Li, X., Na, K-S, Simpson, J.T. (2010). The Role of the Quality of shared information in Interorganizational systems use. International Journal of Information Management, 3(5), 399-407. doi : 10.1016/j.ijinfomgt.2010.02.007 Hofacker, C. F.,

Hoffman, D. L. and Novak, T. P. (2018), "Consumer and Object Experience in the Internet of Things: An Assemblage Theory Approach", *Journal of Consumer Research*, Vol. 44, No. March, pp. 1178-1205.

Grover, V., Roger H. L., Chiang, Ting-Peng Liang and Dongsong Zhang (2018), "Creating Strategic Business Value from Big Data Analytics : A Research Framework", *Journal of Management Information Systems*, Vol. 35, No. 2, pp. 388-423.

Joy, B (2000), "Why the future does not need us", <https://www.wired.com/2000/04/joy-2/> [last accessed September 2019]

Kahn, B. K., Strong, D. M. et Wang, R. Y. (2002). Information quality benchmarks: Product and service performance. Communications of the ACM, 45(4), 184-192. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.5.4752&rep=rep1&type=pdf>

Kaun, A. (2014). Jose van Dijck: Culture of Connectivity: A Critical History of Social Media. Oxford: Oxford University Press. 2013. Mediekultur, 30(56), 195-197.

Kitchens, B.*,* Dobolyi, D. G., Li, J. and Abbasi, A. (2018), "Advanced Customer Analytics : Strategic Value Through Integration of Relationship-Oriented Big Data", *Journal of Management Information Systems*, Vol. 35, No. 2, pp. 540-574.

Kotler, P., & Pfoertsch, W. (2007). Being known or being one of many: The need for brand management for business-to-business (B2B) companies. Journal of Business & Industrial Marketing, 22(6), 357-362.

Lee, Y. W., Strong, D. M., Kahn, B. K. et Wang, R. Y. (2002). AIMQ: A methodology for information quality assessment. Information and Management, 40(2), 133-146. Repéré à <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.6.2407&rep=rep1&type=pdf>

Lehrer, C., Wieneke, A., vom Brocke, J., Jung, R. and Seidel, S. (2018), "How Big Data Analytics Enables Service Innovation: Materiality, Affordance, and the Individualization of Service", *Journal of Management Information Systems*, Vol. 35, No. 2, pp. 424-460.

Malthouse, E. C. et Sultan F., (2016). Big data and Consumer Behavior: Imminent Opportunities. Journal of Consumer Marketing, 33 (2), 89–97. doi: 10.1108/JCM-04-2015-1399

Meyer, D. (2016), “Why Smartphones Are Bringing Down Internet-of-Things Revenue Forecasts,” Fortune, April 4, http://fortune.com/2016/08/04/smartphones-iot-revenue-machina/.

Mirani, R. et Lederer, A. L. (1998). An instrument for assessing the organizational benefits of IS projects. Decision Sciences, 29(4), 803-838. doi: 10.1111/j.1540-5915.1998.tb00878.x

McAfee, A. et Brynjolfsson, E., (2012). Big data: The Management Revolution. Harvard Business Review, October, 90(10), 60-68. Repéré à <https://hbr.org/2012/10/big-data-the-management-revolution>

Rice, R. (1993), "Media Appropriateness: Using Social Presence Theory to Compare Traditional and New Organizational Media", *Human Communication Research*, Vol. 19, No. 4, pp. 451-484.

Sheth, J. N. and Sharma, A. (2008), "The impact of the product to service shift in industrial markets and the evolution of the sales organization", *Industrial Marketing Management*, Vol. 37, No. 3, pp. 260-269.

Sivarajah, U., Kamal, M. M., Irani, Z. et Weerakkody, V., Weerakkody (2017). Critical Analysis of Big data Challenges and Analytical Methods. Journal of Business Research, 70, 263–86. doi:10.1016/j.jbusres.2016.08.001

Skiera, B. (2016). Data, Data, and Even More Data: Harvesting Insights from the Data Jungle. GfK Marketing Intelligence Review, 8 (2), 10–17. doi:10.1515/gfkmir-2016-0010

Wang, R. Y., Storey, V. C., Firth, C. P. (1995). A framework for analysis of data quality research. IEEE Transactions on Knowledge and Data Engineering, 7(4), 623-640. doi: 10.1109/69.404034

Wang R.Y., Strong D.M. (1996). Beyond Accuracy: What Data Quality Means to Data Consumers. Journal of Management Information Systems, 12(4), 5-33. doi: 10.1080/07421222.1996.11518099

Wiersema, F. (2013), "The B2B Agenda: The current state of B2B marketing and a look ahead", *Industrial Marketing Management*, Vol. 42, No. 4, pp. 470-488.

Wilkinson, L. (2018), <http://blogs.lse.ac.uk/businessreview/2016/05/09/robots-are-a-long-way-off-replicating-human-will-and-imagination/> [Accessed 10 july 2018].

Zaïdi-chtourou, S. (2018), "Effet du volume des données sur la qualité des décisions marketing", *Management & Data Science*, Vol. 2, No. 1, pp. 18-30.

APPENDICES

APPENDIX A - Summary of the regression model H2

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APPENDIX B - Summary of the regression model H1c

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APPENDIX C - Summary of the regression model H2c

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APPENDIX D - Summary of the regression model H2d

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