ATHABASCA UNIVERSITY

BIG DATA INNOVATION MECHANISMS IN THE CANADIAN TELEVISION INDUSTRY

BY

DERRICK TREVOR GRAY

A DISSERTATION

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF BUSINESS ADMINISTRATION

FACULTY OF BUSINESS

ATHABASCA, ALBERTA

AUGUST, 2019

Athabasca University
FACULTY OF GRADUATE STUDIES

The future of learning.

Approval of Dissertation

The undersigned certify that they have read the dissertation entitled:

BIG DATA INNOVATION MECHANISMS IN THE CANADIAN TELEVISION INDUSTRY

Submitted by:

Derrick Trevor Gray

In partial fulfillment of the requirements for the degree of

Doctor of Business Administration

The examination committee certifies that the dissertation
and the oral examination is approved

Co-Supervisors:
Dr. Alain May
Athabasca University

Dr. Terry Beckman
Athabasca University

Committee Member:
Aleksi Aaltonen
Temple University

External Examiner:
Mike Chiasson
University of British Columbia

August 20, 2019

1 University Drive, Athabasca, AB, T9S 3A3 Canada
P: 780.675-6821 | Toll-free (CAN/U.S.) 1.800.788.9041 (6821)
fgs@athabascau.ca | fgs.athabascau.ca | athabascau.ca

Dedication

This dissertation is dedicated to my family for their ongoing love and support through this journey. I would not have accomplished this without your help. To my son, Hudson, may you always strive to reach your goals, no matter how difficult they may seem. Melissa, thank you for the love, patience, and support you provided me through this challenge. Mom, you always pushed me to work hard and provided me the guidance and encouragement to set my goals high.

This dissertation is also in memory of my inspirational grandparents, Lenna and Frank Baker.

Acknowledgements

They often say that it takes a village to raise a child. A similar thing could be said about completing a doctorate. It is no small feat, and only possible through the support, encouragement, assistance, and guidance of many. It is essential to acknowledge all of those who helped me through this journey – each in different ways.

The supervisory committee is the backbone of any dissertation. These individuals tirelessly committed time and energy to review my work, providing corrections and suggestions, guiding thought, suggesting references, and most importantly encouraging me. Many hours were spent on phone calls and skype meetings, all of which helped me become a better student and researcher. Thank you to Dr. Alain May, Dr. Aleksi Aaltonen, and Dr. Terry Beckman for filling this role. I am most appreciative of your support and the role you have played.

To the cohort of 2013, thank you for the constructive debate we enjoyed through our coursework. I drew a great deal of inspiration from all of you. You all provided support and encouragement that will never be forgotten.

To my family and friends, I cannot thank you enough for your ongoing patience and encouragement. None of you ever questioned why I needed time to myself to study, read, write, or why I was taking this journey. Instead, you only encouraged me to continue and provided a sympathetic ear for when I needed it.

Lastly, I need to acknowledge Dr. Ricardo Gomez-Insausti, for it was his belief in me and his encouragement that led me down this path. Ricardo, I will be eternally grateful for you pushing me along this journey and allowing me to grow as a researcher and academic.

Abstract

As a response to growing fragmentation, niche programming, and increasing competition from other forms of media, the Canadian television industry is undergoing rapid changes through digital innovation. Existing audience information systems are being enhanced with big data in order to allow the television audience marketplace to gain thicker and richer insights about television audiences. This evolution has allowed broadcasters to manufacture new forms of the television audience product with many features that were previously absent in the traditional television audience product. This study investigates the various generative mechanisms allowing Canadian television broadcasters to successfully innovate by enhancing their systems with these new sources of data. Supported by critical realism, affordance theory, and a stepwise analysis method, semi-structured interviews were conducted across three Canadian television broadcasters as a means to understand this digital innovation process. Five generative mechanisms are identified through the digital innovation process allowing for a better understanding of digital innovation with big data, particularly related to the audience product. These findings build on previous work by expanding the current understanding of the digital innovation process as well as the digital infrastructure mechanism by highlighting the central role in which digital infrastructures can play within an industry. Concurrently a new understanding of audiences is further developed by providing evidence that the audience is a manifestation of the underlying data itself – a significant reconceptualization of the audience product. These findings, as well as the analysis process, provide an empirical example of the role of affordances with big data. Despite

many calls for research, the role of big data in digital innovation is a significantly underdeveloped area of research. Lastly, by leveraging a quantitative method for pattern identification and grouping, the study further develops the existing critical realist methodology by building upon the analysis process for the identification of generative mechanisms.

Keywords: audience information systems, mechanisms, digital innovation, critical realism, big data, affordances

Table of Contents

List of Tables

List of Figures and Illustrations

List of Abbreviations

AIS – Audience Information System

BDU – Broadcast Distribution Undertaking

CR – Critical Realism

CRTC – Canadian Radio-television and Telecommunication Commission

IS – Information Systems

JIC – Joint Industry Committee

RPD – Return Path Data

STB – Set-top Box

Chapter 1. Introduction

While many business models exist to fund mass media[1], one of the most common and essential is advertising. An advertisement is an opportunity for an advertiser to provide a message to potential consumers in the hopes of influencing purchasing behaviour. When advertisers, therefore, purchase advertising time within a mass media, they are purchasing the opportunity to expose these potential consumers to their advertisement. Therefore, it is this opportunity to be heard by potential consumers that form the core of the audience product – ultimately, the product sold by a mass media organization to an advertiser.

One of the principal components of the advertising industry is what is known as the audience marketplace. This marketplace is the forum where *audiences* (i.e., the audience product) are bought and sold upon by advertisers and media organizations (Napoli, 2003). The audience marketplace is unique since the traded commodity is not only intangible but effectively virtual as in the sense that the commodity only exists in certain senses through the market transactions. Due to the form of this product, the *currencies of the audience marketplace* are the audience estimates provided by audience measurement organizations – a representation of the audience product. These audience estimates are traditionally the product of survey samples which take the form of audience measurement panels.

In Canada, Numeris – an industry-owned tripartite organization (i.e., joint industry committee [JIC]) – provides television audience estimates. The estimates of television audiences for the top six Canadian television markets[2], as well as for Specialty and Digital channels, are derived from Numeris' Personal People Meter (PPM) electronic panel of approximately 11,000 Canadians. The data produced from this sample are then projected to the Canadian population in order to be used to facilitate the selling and buying of advertising time through the usage of Audience Information Systems (AISs). An AIS is any system that facilitates the economic trading of advertising within mass media markets (Napoli, 2011). These systems can take various forms, from highly sophisticated meters (e.g., peoplemeters) used to capture media consumption of a sample of individuals, to various forms of software (e.g., software development kits) used to track media activity across a broad population, or even complex databases which allow for the analysis, interpretation and creation of information particular to an audience. It is these AISs that form the backbone of the economic activity for the television industry and are the primary artifact of interest for this research study. Because AISs are complex systems, often consisting of multiple systems, artifacts, and data sources, these systems can also be considered to be digital infrastructures – defined by Henfridsson and Bygstad (2013) as a collection of interconnected systems.

While television has been the dominant form of media for advertising in Canada – representing $7.3 billion in revenue (Canadian Radio-television and

Telecommunications Commission [CRTC], 2017) – it is currently experiencing challenges. The media landscape is experiencing a growing degree of fragmentation – both from the introduction of new distribution channels for media, and a dramatic increase in the number of media outlets available to consumers. This fragmentation is resulting in a dramatic diversification of audiences (Napoli, 2003; Picard, 2000; Webster, 2005) within the television industry, and across other media markets, resulting in a dramatically skewed distribution of audiences amongst the various media outlets. This skewed distribution is a phenomenon coined the *long-tail* of media (Taneja & Mamoria, 2012).

Napoli (2011) describes two critical types of media fragmentation, intra-media fragmentation, and inter-media fragmentation (see Chapter 3). Inter-media fragmentation refers to the phenomenon where the number of media delivery platforms begins to increase. This type of fragmentation is particularly important within the television industry since as the line between television and video begins to blur (e.g., YouTube can compete for similar audiences as traditional broadcast television stations) video delivery platforms over the digital space (e.g., Netflix, Facebook) are beginning to compete directly with traditional broadcast television.

The digital audience product is rapidly growing, primarily driven by the growth of Google and Facebook – coined the digital duopoly (Bond, 2017; L.

O'Reilly, 2017). Part of the growth is due to the many features provided to advertisers by this advertising channel which were previously not available in traditional broadcast television. While television is a mass reach advertising medium, the digital audience product allows advertisers to micro-target segments of the population, thereby reducing waste in advertising purchases. Advertising messages can be delivered dynamically through these emerging media and can be transacted in a fully automated fashion directly through computers, thereby no longer requiring human effort and time.

The increased pressure on broadcasters from both media fragmentation and the digital advertising product has resulted in television broadcasters looking for ways to remain competitive. At the same time, the ability of organizations to capture, store, and process information has been increasing. This dramatic increase in data capture and processing has led to what is commonly referred to as *big data* (Schroeck, Shockley, Smart, Romero-Morales, & Tufano, 2012). Advances in data storage and transmission have eased the capture, storage, and ability to analyze extensive datasets, in many cases exceeding petabytes (i.e., one quadrillion bytes), as well as a variety of data forms (e.g., images, relational, transactional. social). Having access to a more significant amount or variety of data has been suggested to lead to stronger and more productive data-driven decision making (e.g., Tambe, 2014).

Within the media industry, digital cable and satellite television set-top boxes (STB) allow the return of information to the cable or satellite provider. This data is commonly known as return-path data (RPD). Due to the amount of data RPD provides it was previously not practical to store; however, it can now not only be captured, provided the correct infrastructure is in place, but also stored and analyzed. RPD is referred to as "census-like" because almost the entire population, or subscriber base, of households equipped with the necessary equipment, can produce data. The resulting *sample sizes* are huge in contrast to existing audience measurement tools, to the point where the associated standard errors on audience estimates can become quite small as the estimates converge closer to the actual audience parameters.

By taking advantage of new technology and their ability to deal with more substantial and more complicated forms of data, television broadcasters have begun a process of digital innovation whereby their existing AISs are enhanced with new information (i.e., additional data sets). This innovation is resulting in a more refined audience product, one which these broadcasters are expecting will allow them to remain relevant and competitive within a rapidly changing video audience marketplace.

Digital infrastructures and digital innovation are growing topics of interest in the MIS body of literature over the last decade. Since Tilson, Lyytinen, and Sorensen's (2010) call for further research on digital infrastructures, the volume

of literature on the subject has considerably grown. The literature can be classified under two distinct streams – either theoretical streams (e.g., Henfridsson & Bygstad, 2013) or practical streams (e.g., Constantinides, Henfridsson, & Parker, 2018). Digital innovation, as a separate form of innovation, has recently started growing in the MIS literature as well – due to its distinct nature which challenges many traditional assumptions regarding innovation (Yoo, Boland Jr., Lyytinen, & Majchrzak, 2012). As the body of literature has grown, several research agendas have appeared (see Chapter 4). This research aims to add to these bodies of literature through studying innovation in the context of AISs.

Scope of the Study

There has been a recent push in Canada to explore the possibility of adopting RPD as either the primary or a complementary source of audience estimates. As part of the "Let's Talk TV" hearing held by the Canadian Radio-television Telecommunications Commission (CRTC), the commission required the formation of an industry working group to develop an AIS based on RPD (Canadian Radio-television and Telecommunications Commission [CRTC], 2015d). This working group has begun meeting and conducted a test in the Toronto/Hamilton Extended Market (EM) with Numeris to assess the feasibility of merging and integrating multiple RPD sources. Given this momentum, it is very likely that RPD, in one way or another may become an important data source within the Canadian media and advertising industries. As such, it is essential to understand what this data may bring to advertisers, consumers, media

organizations, and audience measurement organizations. The goal of the research study is to understand the mechanisms that allowed for the successful innovation of AISs with big data.

Research questions. In light of the motivations, as mentioned above for the research, the research project aims to develop an understanding of how television broadcasters are successfully innovating their AISs with big data. Using a CR framework and the methodological approach presented by Bygstad et al. (2016), the research seeks to understand how this innovation is occurring by answering the following questions:

> RQ1: How has big data led to successful innovation of AISs and the television audience product?
>
> RQ2: What is the sequence of events or causal mechanisms leading to the digital innovation occurring in the Canadian television industry?

By answering these questions, the goals are to understand what the resources are – as well as the constraints – that allow for this action of digital innovation to occur. More simply put, it will help to answer *how does innovation with big data occur*?

Research Approach. This question is answered through a study of the Canadian broadcast television industry with a focus on data-driven advertising, or advanced advertising, products created through the enhancement of existing AISs

with big data. The underlying metatheory and methods are described in Chapters 5 and 6.

The qualitative study consisted of three Canadian television broadcasters. These three broadcasters had developed digital eco-systems consisting of additional data sources, including RPD data, in order to enhance their existing AISs. AISs rely on both natural and physical structures. It is not only the underlying data and processing software but also the sensemaking interpretation of the estimates, that allow broadcasters and advertisers to understand their audiences. Therefore, mechanisms must be in place to allow data users to accurately reconcile the known audience estimate (i.e., referred to by Napoli (2003) as the estimated audience) to the unknown audience parameters (i.e., referred to by Napoli as the actual audience). At the same time, using past audience estimates, data users must interpret trends and patterns in order to make sense of the future audiences (i.e., referred to as Napoli as the predicted audience) which form the basis of the buying and selling of audiences. It is due to both the natural and social structure of these systems, as well as the fluid and intangible nature of the audience product, that Critical Realism (CR) was chosen as the underlying meta-theory to explore this topic (explored in detail in Chapter 5).

CR, explored in detail in Chapter 5, addresses many of the challenges presented by AISs. CR recognizes the existence of an independent world and at the same time, the subjectivity of human actors and the world that they create

(e.g., Mingers, 2004b). This stratification allows for the physical structures and technological artifacts (e.g., the data, the processing system) to reside independently of thought; while at the same time allowing for the sensemaking and interpretation made by the end-users of the AIS. CR also fits very well with Napoli's three audiences in which the actual audience is unobservable and exists independently of humankind, whereas the measured audience and the predicted audience are observable through data.

Contribution to the Literature

Using CR, affordance theory, and a theory of social mechanisms, this study presents empirical research that provides an understanding of audiences, digital innovation, and big data. These understandings are achieved through the abstraction of the various affordances and generative mechanisms that allowed the Canadian television industry to expand their AISs using various sources of big data successfully, thereby effectively evolving the television audience product, increasing the value of their product, and changing the decision making processes in their organization. These findings allow for several contributions to academic bodies of literature. The study provides a detailed empirical view of the various affordances related to big data, an understudied area in the literature. A contribution to the literature on digital innovation is also made through providing an expansion of the digital infrastructure innovation mechanism. Finally, a new understanding of the audience manufacturing process emerges, providing a new understanding of audiences and the audience product.

Despite supporting a massive industry with significant revenues, AISs also represent an under-developed area of study within the MIS literature. While some work exists on the using data-pools to enable the sale of advertisements (e.g., Aaltonen & Tempini, 2014; Aaltonen, 2011) there is no literature on the usage of RPD in Canada or internationally. Both Aaltonen and Tempini (2014) and Aaltonen (2011) focused on the generative mechanisms, which allowed a telecommunications company to build audiences through their data tokens. This research project extends this work by understanding the generative mechanisms which allow for the manufacturing of television audiences (a different type of audience) through RPD (a different form of data), all within an environment which a currency audience already exists. These mechanisms provide an understanding of how television broadcasters leverage a new form of data (i.e., RPD), thereby effectively changing the television industry and the definition of what constitutes the television audience product.

It is also assumed that given the existence of a currency audience, the enhancement of the AIS with RPD must bring some additional value to the individual or organization. Both the concept of affordances as a particular type of generative mechanism (Volkoff & Strong, 2013) as well as guidance on identifying generative mechanisms through affordances (Bygstad et al., 2016) has been reviewed in the existing MIS literature. The research also builds upon that literature by providing an example of the usage of affordances to develop a deep understanding of the generative mechanisms which allow for the creation of

television audiences. A novel classification process is used to abstract affordances to higher level generative mechanisms, building upon the methodological guidance by providing a tool for researchers to aid in the abstraction of the affordances to higher level mechanisms.

Structure of the Dissertation

This dissertation is structured over five main sections. The first section, chapters 2 through 4, presents a review of the literature of three bodies of literature – all key bodies which directly relate to the research project. The first section is on data-driven decision-making, a body of literature that provides an overview of how data provides value to an organization. This study is directly focused on the digital innovation occurring at television broadcasters in which data is being used to provide additional value within existing AISs. As the primary technological artifacts of interest are AISs, a review of the literature surrounding the audience marketplace and its systems then follows. This review allows the reader to understand the bigger marketplace and the economic environment in which AISs and the resultant audience product reside. Finally, a review of digital infrastructures and their innovation follows. This literature directly supports the research question as it focuses on the underlying digital innovation of AISs – a digital infrastructure.

The second section, consisting of Chapter 5, is a review of the underlying metatheory which guided the research design and analysis. Research metatheory,

or a research paradigm, provides a structured ontology and epistemology which can then be understood by other scholars and academics. It allows for a clear delineation as to what constitutes knowledge and how is knowledge obtained. Defining this a priori is particularly vital in qualitative research as there is no fixed paradigm and therefore pre-defining these constructs provides support for the validity of the findings. Research metatheory, therefore, guides methodology and directly influences the choice of research methods. These research methods (Chapter 7) and the data collection sources (Chapter 6) form the next section in the manuscript.

The fourth section is the resulting analysis of the data. This section spans three chapters (Chapters 8 through 10) aligning with the step-wise method provided by Bygstad et al. (2016). Chapter 8 explores the key events and entities wrapping up with a reconceptualization of the case. It is then followed by Chapters 9 and 10, which explore the various factors at play corresponding to the phenomenon of interest. The manuscript then concludes with the final section, which presents a discussion surrounding the findings. Four key contributions to practice, literature, and methodology are presented.

Definition of Terms Specific to the Study

Like most industries, the advertising industry finds itself full of jargon and specific terminology. While every attempt has been made to avoid this jargon through this manuscript, there are specific terms which cannot be avoided. These

terms are covered in great detail in later chapters but are presented here to ease the understanding of the reader. Greater detail to advertising industry terminology can be found in the Coalition of Innovative Media Measurement's (CIMM's) Lexicon 3.0 (Wiesler, 2016).

At the core of this study is a concept known as the audience product and the *audience marketplace*. Napoli (2003) defines the audience marketplace as the space in which the audience product is: (a) manufactured by audience measurement and media organizations; (b) sold by media organizations; and (c) in turn purchased by advertisers. The audience product is then the commodity traded within this marketplace. The value of the audience product is derived through the opportunity for advertisers to provide a message to a pool of potential consumers of their product. This product (i.e., audience product) is a relatively complex construct since it is intangible, virtual, and consists of three different components. These components are: (a) the actual audience – the unknown number of potential consumers being exposed to the media; (b) the predicted audience – the number of expected potential consumers to be exposed to the media; and (c) the estimated audience – the projected number of potential consumers exposed to the media as estimated by an audience measurement organization (Napoli, 2003).

Audience information systems (AISs) facilitate the analysis and usage of the audience product. An AIS is any system which is designed to facilitate the selling and buying of commercial advertising (Napoli, 2011). It is "in reference to

the broad array of data gathering and feedback mechanisms used by media industries and advertisers not only to measure audience exposure to media content, but also to predict content preferences and consumption patterns, target content to specialized audience segments , and gather information on audiences' reactions and behavioral responses to content" (p. 10).

One of the organizations within the audience marketplace and core to the creation of the data, which represents the audience product, are audience measurement organizations. These organizations are often *Joint Industry Committees* (JIC). A JIC is defined by the International Association of Joint Industry Committees for Media Research (I-JIC) (n.d.) as "a non-profit-orientated, neutral organization in which all key players of an advertising market" are represented. The JIC may either be entrusted with the "organisation, realisation, monitoring or publication" of audience measurement or be entrusted with the auditing of audience measurement. In the case of Canada, the JIC responsible for television audience measurement is *Numeris*. Numeris is the sole audience measurement organization in Canada for the measurement of radio and video (e.g., television). Numeris is a not-for-profit, member-owned tripartite industry organization which, unlike traditional JICs, directly conducts audience measurement. This measurement is through the usage of a meter panel employing the Portable People Meter (PPM) technology and through Diary surveys in 100+ radio and television markets (Numeris, n.d.-b).

An essential aspect of the phenomenon of interest is data captured through the distribution of television. This distribution typically occurs through a broadcast distribution undertaking (BDU). A BDU is an organization which is licensed and regulated, by the CRTC[3] to deliver video programming, through either a terrestrial (e.g., *digital cable*) or direct-to-home satellite system (i.e., *satellite*), for a subscription fee (Canadian Radio-television and Telecommunications Commission [CRTC], 2011b). Digital cable, also known as DTTV, is defined by CIMM as cable television which offers advanced technological options such as greater content, video on demand, high definition, and on-screen programming guides (Wiesler, 2016). Similar to digital cable, satellite offers similar advanced television features; however, the delivery of the signal is through a satellite dish (Wiesler, 2016).

Often, both of these means of television distribution can capture *return-path data* (RPD) sent to the BDU from the *set-top box* (STB). A STB is defined by the Media Ratings Council (MRC) (as cited in Wiesler, 2012) as a device connected to a television, either externally or internally, enabling the display of video content through a connection to an external digital or analog signal. RPD is, therefore, data aggregated from an STB attached to a *return-path* (Zigmond, Dorai-Raj, Interian, & Navernioukk, 2009). CIMM, citing Nielsen, defines the return-path as the backchannel, or technology, allowing for data to travel from a subscriber to a platform company (Wiesler, 2016).

Chapter 2. The Evolution of Data

To address some of the business challenges and growing competition from digital media, some Canadian television broadcasters have begun to turn to new sources of data to enhance their existing audience information systems (AISs). These data enhancements are happening in an environment where data is more readily accessible and available. Many organizations feel that by utilizing these data, competitive advantages can be had (Schroeck et al., 2012). The academic literature supports these positions by showing that data and information can bring value to organizations by evolving decision making.

This goal of the research project is to understand the mechanisms which allow for these organizations to innovate their AISs through the enhancement with big data successfully. Organizations typically seek to innovate due to an expectation of what the results may bring. Therefore, in order to fully understand and appreciate the observed phenomenon, a review of the growth of data – a phenomenon known as big data – and the potential of data is warranted. It is through these lenses that one can appreciate and understand the organizational goals; thereby, potentially offering insight into the underlying mechanisms that enable the successful innovation.

Value of Information

The seminal work on the value of information is attributed to David Blackwell's 1953 paper, Equivalent Comparisons of Experiments. In his article,

Blackwell (1953) presented a theory applicable to the comparison of experiments. Through this theory, one can determine when an experiment could be deemed more informative than another experiment. While Blackwell's mathematical proofs are theoretically complex and mathematically challenging, they did provide the first approach as to how to determine which information set was more informative than another. Brynjolfsson, Hitt, and Kim (2011) describe Blackwell's contribution as one which enables rational decision makers to achieve a higher payoff due to the ability to identify the subset of information which contains the highest amount of information. This phenomenon thereby leads to potentially more efficient data usage.

Being able to assess the amount of information within a given set is essential since an increase in the uncertainty of a task increases the amount of information required for processing to achieve a given level of performance (Galbraith, 1974). By combining Woodward's (1958) structural contingency theory and Simon's (1957) cognitive limits theory, Galbraith explained the relationship between task uncertainty and organizational form. In his paper, four strategies that an organization must adopt when faced with uncertainty are provided: (a) creation of slack resources; (b) creation of self-contained tasks; (c) investment in vertical information systems; and (d) creation of lateral relations. The first two strategies reduce the actual need to process information, and the second two strategies increase the organization's ability to process information.

The strategy – or combination of strategies – adopted, therefore, affects organizational form and performance level. If an organization fails to adopt a strategy consciously, the first strategy out of the four mentioned above – the creation of slack resources – will happen automatically (Galbraith, 1974). The creation of slack resources thereby results in a reduced performance standard. Reduced performance can also happen when an organization fails to match the information requirements of their tasks with the organization's capacity to process information. Using the information theory proposed by Blackwell (1953), organizations can apply resources to the sets which provide the highest amount of information in an attempt to increase their information processing capacity.

Modern information systems allow organizations to automate information processing thereby increasing their capacity to process information. However, with the evolution of information systems and computing, many socioeconomic issues – such as the effect of technology on the decision making of managers – became urgent questions and areas of concern (Attewell & Rule, 1984). The introduction of information systems in organizations has led to specific areas or portions of organizations to become large decision-making machines or information-processing parts (Radner, 1993).

Radner (1993) introduced a decision-theoretic model of an organization where, due to large portions of staff being specialized in management activities, or supporting these activities, information-processing becomes decentralized.

This decentralization thereby reduces managers to only information processors with limited capacity. In this model, Radner further suggests that the number of information processors and the speed between the receipt of information and the resulting decisions is a measure an organization's actual efficiency.

In the mid-1990s, Barua, Kriebel, and Mukhopadhyay (1995) proposed a new process-oriented methodology for measuring the impact of information technology (IT) on strategic business units (SBU) or profit centres. Their proposed methodology allows for the impact of IT on an SBU to be measured relative to a group of SBUs in the same industry. This approach allows a two-stage analysis of intermediate and higher-level output variables. Through this, industry-wide and economy-wide variables can be accounted for. This methodology allowed Barua et al. to recognize that information technology use can drive the productivity of an SBU.

Moving beyond SBUs, several scholars have provided evidence to show how IT can drive the productivity of an entire organization (e.g., Bresnahan, Brynjolfsson, & Hitt, 2002; Brynjolfsson & Hitt, 1996; Kohli & Devaraj, 2003). Bresnahan et al. demonstrate with firm-level evidence that IT and skilled labour are relative complements. Therefore, the interactions between IT, work organization, and human capital interactions and positively predict firm productivity. These findings are in line with those of Brynjolfsson and Hitt (1996), which showed – using methods based on economic theory – that IT

increases productivity and creates substantial value for consumers. These increases in productivity, however, are not consistent across all organizations (Kohli & Devaraj, 2003) but dependent on the industry in which the organization operates. Despite differences in the effect of IT on productivity between industries, IT can drive the productivity of an entire industry (Melville, Gurbaxani, & Kraemer, 2007).

In order to explain the relationship between information technology and performance, Francalanci and Galal (1998) studied the impact of IT investment and worker composition on the productivity of life insurance companies. They found that increases in IT spending are directly associated with increased productivity, provided that they are accompanied by changes in worker composition within the organization. This finding is similar to Bresnahan et al.'s (2002) finding that the effect of IT on productivity is more significant when combined with a complementary workplace reorganization. Highly skilled employee sets are necessary in order to maximize returns from IT.

Melville, Kraemer, and Gurbaxani (2004) developed a model of IT business value based on the Resource-Based View of the firm. This model comprises of three domains, and how the various factors within each of these domains have a direct effect on the value of IT. In the first domain – the organization deploying the IT – factors such as IT resources, complementary organizational resources, business processes, or performance play a direct role. At

the next domain level – the competitive environment – factors such as industry characteristics and trading partner resources, and business processes have an effect. Lastly, within the macro environment domain, the characteristics of the country in which the organization operates can affect the outcomes of IT investment. Thereby, the overall value of IT is dependent on not only internal but also external factors.

While some scholars argue that organizational factors (e.g., Bresnahan et al., 2002; Francalanci & Galal, 1998) or even the combination of organizational and external factors (e.g., Melville et al., 2004) influence the returns on IT investments, others argue that returns come from the actual IT usage rather than IT investment (e.g., Devaraj & Kohli, 2003). Devaraj and Kohli, in a longitudinal examination of the healthcare system, found that the actual usage of technology was positively and significantly associated with hospital revenue and quality. IT usage is a critical variable often missed in IT payoff analyses. This position was further expanded to not only assess the usage of IT, but also the abilities of an organization to access and utilize external information (Tambe, Hitt, & Brynjolfsson, 2012). Tambe et al. (2012) show that in order to maximize the returns from IT, an organization must have the ability to detect and respond to changes in its operating environment. When combined with a decentralized approach to decision making within the organization, these returns are maximized.

Accessing and utilizing this external information can be defined as data-driven decision-making (DDD), which refers to the business practices that surround the collection and analysis of external and internal data (Brynjolfsson et al., 2011). Scholars have begun to analyze the relationship between DDD and performance directly. While many of these analyses to date have been case studies, or even illustrations in practitioner journals (e.g., Davenport & Harris, 2007; LaValle, Hopkins, Lesser, Shockley, & Kruschwitz, 2010; Loveman, 2003), recently scholars have been able to study this relationship empirically.

In one of the first large-scale empirical analyses on the connection between DDD and organizational performance, organizations that adopt DDD have been shown to have output and productivity 5-6% higher than what would be expected given organizational investments and IT usage (Brynjolfsson et al., 2011). Brynjolfsson et al. also show a relationship between DDD and other measures such as asset utilization, return on equity, and market value. Tambe (2014) further shows a direct connection between early investments in Apache Hadoop – a software framework for storage and large-scale processing of data – and productivity growth. Between 2006 and 2011, organizational investments in Hadoop were associated with 3% faster productivity growth, provided that the organization had significant existing data assets and a labour network characterized by significant aggregate Hadoop investment.

Big Data

Recently, much attention has been given to the growing amount of information and data available to companies. The digital world has led to new types of unstructured data (i.e., data that do not have a pre-defined data model or are not organized in a pre-defined manner) such as metadata, audio files, video files, and email messages. Traditional database technologies (e.g., Microsoft SQL Server, Oracle, SAP) and analysis techniques (e.g., analysis of variance, linear regression) are unable to deal with these types of data. At the same time, growth in the sophistication of technologies has led to increases in the ability to analyze and extract information from data not previously possible. For example, whereas it was once the case that little value could be gained from comments appearing on social media websites, with modern technologies organizations can now perform sentiment analysis on these data by analyzing the linguistics and choice of language concerning their brand or product. Before social media and these analysis methods, more costly and time-consuming marketing research would have been required to access similar information.

The amount of data available to and captured by organizations has increased dramatically. eBay currently stores almost 90PB (i.e., petabyte, 1,000 terabytes) of data about customers, both transactional and behavioural (Tay, 2013). At the same time, Walmart handles more than 1 million transactions an hour (Cukier, 2010). Volumes of data these sizes would have previously been too cost prohibitive and too complicated to process (Constantiou & Kallinikos, 2015).

Over the past few decades, the amount of data available to companies has grown at an exponential rate. For instance, telecom capacity per capita has grown from 29kbps in 2000 to 570kbps in 2006 and 2,900kbps in 2010 (Hibert, 2012). In 2011, the amount of data stored per company, in 17 out of 19 sectors in the US, was more than 235 terabytes (Brown, Chui, & Manyika, 2011). This number is impressive since it is higher than the estimated amount of data stored in the entire US Library of Congress. There is so much available data that it is estimated that the US economy requires an additional 1.5 million experienced data managers and almost 200,000 deep analytical talent positions to take full advantage of these data (Brown et al., 2011). The growth in the amount of available data has also resulted in a growth in the importance of information technology within organizations (Horan, 2011)

This phenomenon is known as big data. Big data typically refers to data sets, which are so large and complicated that they become unmanageable using traditional database tools. That said, many different definitions of big data exist. Gantz and Reinsel (2012) define big data through three characteristics: (a) the data itself; (b) the means in how it can be analyzed; and (c) the tools or methods needed to present analyses of the data meaningfully. Alternatively, big data can be defined through the 5 Vs: (a) the volume of the data; (b) the speed (i.e., velocity) in which it is captured and transferred; (c) the variety of forms in which it takes; (d) the uncertainty of the data (i.e., its veracity); and (e) the value that it can bring to an organization (White, 2012). Typically, big data is seen as being unstructured

as opposed to traditional data, which is seen as being structured. Akter and Wamba (2016) exemplify structured data as those related to information such as demographics related to an organization's customers (e.g., customer's name, age, purchase history) versus unstructured data being data such as clicks, voice messages, or even social media data.

Big data is viewed as one of the most significant technological disruptions faced by business and academia (Agarwal & Dhar, 2014; Chen, Chiang, & Storey, 2012) as well as a significant breakthrough for technology (Fichman, Dos Santos, & Zheng, 2014). These types of data can lead to increases in overall efficiencies as well as improvements in operational processes (Chen et al., 2012; McAfee & Brynjolfsson, 2012). At the same time, these data have resulted in a new source of innovation within organizations (Davenport & Kudyba, 2016; McAfee & Brynjolfsson, 2012) – see chapter 4 on digital innovation. This phenomenon has resulted in not only new opportunities but has created many new questions for both academics and practitioners (Agarwal & Dhar, 2014).

Big data analytics and data-driven decision making. While there is no agreed upon definition (Akter & Wamba, 2016), big data analytics (BDA) can be seen as the quantitative analysis of big data (Davenport, 2006) or a "group of tools" (Bose, 2009, p. 156) used by organizations to derive insights and information from big data. Regardless of the definition, BDA allows organizations to leverage big data more effectively (Court, 2015). BDA is

resulting in a revolution in both the realms of science and technology (Ann Keller, Koonin, & Shipp, 2012) but can benefit many industries and domains (Chen et al., 2012).

BDA has been shown to increase productivity and innovation and can change the way organizations operate (Gobble, 2013; Loebbecke & Picot, 2015; McAfee & Brynjolfsson, 2012). Examples of the usage of BDA include the identification of key customers, the optimization of pricing or inventory, or even for quality control processes (Davenport & Harris, 2007). Court (2015) has suggested that by leveraging BDA, organizations can increase their operating margins by up to 60% through improved conversion rates and decision making. Due to this, the value of BDA has resulted in it being considered a distinct business competency (Davenport & Harris, 2007). Many organizations now view their data as a business asset (Redman, 2008)

The major challenge in BDA is dealing with both structured and unstructured data types efficiently (Akter & Wamba, 2016). As a result, BDA has become the subject of several academic studies. Two core streams of research on BDA exist: research with a focus on strategy-led analytics (e.g., Biesdorf, Court, & Willmott, 2013; LaValle, Lesser, Shockley, Hopkins, & Kruschwitz, 2011; Schroeck et al., 2012), and research with a focus on the new opportunities that the data itself can provide (e.g., Agarwal & Weill, 2012; Davenport, 2012; Ferguson, 2012).

As mentioned, BDA has increased the ability of organizations to make informed decisions – a phenomenon known as data-driven decision-making (DDD). DDD is viewed as a method of improving both productivity and business output. Through their study of 179 American publicly traded companies, Brynjolfsson et al. (2011) suggest that merely making DDD, output, and productivity increases by 5-6%. Where companies can leverage the potential of big data and analytics, a substantial majority (63%) felt that this had created a competitive advantage for their organization (Schroeck et al., 2012). This result represented a 70% increase over the results obtained by the same survey in 2012 compared to 2010. In addition to economic benefits, DDD can also bring about social value (Sharma, Mithas, & Kankanhalli, 2014) as well as improvements in business strategy (Constantiou & Kallinikos, 2015)

While big data shows excellent potential for increasing the effectiveness of decision making, it does come with many challenges (e.g., business alignment, integration, costs, privacy) and those challenges need to be addressed by organizations (Davenport, 2012; Schroeck et al., 2012; Shah, Horne, & Capella, 2012). Due to the unfamiliarity of front-line employees with data and analysis, it can often be particularly challenging for management to communicate the findings from big data in a transparent and trustworthy way (Barton, 2012). This situation results in organizations needing to rethink how they disseminate DDD and information with their staff.

Research on big data in academia. The broad-scale availability of data, mainly delivered through the internet, has dramatically expanded the ability for academics to understand behaviour, causal structures (Agarwal & Dhar, 2014), and has opened a new field of inquiry. However, to date, most literature has focused on practitioners and is more anecdotal than empirical (Akter & Wamba, 2016). However, with the increased focus on big data in academia, newly defined research agendas have emerged (e.g., Abbasi, Sarker, & Chiang, 2016; Agarwal & Dhar, 2014; Akter & Wamba, 2016). Akter and Wamba (2016) present a research agenda covering research streams for studying BDA within e-commerce organizations. These streams focused on the impact on various departments and functions within the organization, such as marketing and sales, operations management, and human resources. They specifically identified the need to understand the overarching value which big data can bring to the organization.

Abbasi, Sarker, and Chiang's (2016) agenda is more focused on behavioural IS research concerning big data. They focus their agenda on epistemological concerns, on how organizations can derive knowledge from big data, and the various implications of big data on the decisions and actions of actors and organizations. Finally, Agarwal and Dhar (2014) focus their agenda in understanding how big data can assist in the understanding of societal behaviour, rather than organizational behaviour, understanding how technology transforms organizations and understanding the role of big data in social networks as well as in marketing.

In addition to research agendas, Gunther, Mehrizi, Huysman, and Feldberg (2017) have identified six debates in the big data literature. These debates should also further drive and guide academic research into these types of data and their application and use within an organization. The six debates are categorized into three broad themes: (a) how actors and big data interact; (b) how big data impacts organizational structure; and (c) how organizations manage their data, particularly concerning stakeholders.

The Value of Information, Big Data, and Audience Information Systems

The previous review of the literature related to the value of information and the emergence of big data is essential as it sets an understanding of the 'why' and 'what' that could be driving the studied organizations to innovate by enhancing existing systems with additional data. In the case of this study, the datasets are clear examples of big data. These data are extensive, mostly unstructured, take various forms, and require advanced technologies (e.g., Hadoop, Spark) in order to manage. At the same time, the motivation of the observed digital innovation is tied to some value proposition perceived by the organization. Likely, the organization sees that the additional data will provide value to the organization by better informing the audience product sales process or providing value by evolving the television audience product through the additional information provided.

The literature on the value of information allows for an understanding of what additional data can bring to an organization. By understanding how information can transform the processes within the organization, more precise theories as to the various mechanisms being realized can be abstracted. Similar importance is placed on an understanding of the literature related to the data itself. Given that big data is the primary means of enhancement and innovation within these systems, an understanding of the data itself and its nuances can further help with this abstraction process.

Chapter 3. Audience Economics, the Marketplace, and the Systems

The production, buying, and selling of traditional media (e.g., television, radio) – the audience product – takes place in a complex economic system known as the audience marketplace (Napoli, 2003). This system is a unique marketplace and economic environment, primarily due to the features of the product being bought and sold (i.e., the audience product) and the relationships between the many participants of this eco-system. Audience information systems (AISs) play an essential role in this market, and therefore, given the uniqueness of their environment, an understanding of the environment is essential.

This study explored the enhancement of these systems with big data (e.g., return path data (RPD)) in order to understand the mechanisms that allowed for the innovation. A thorough understanding of the innovation and evolution of these systems, therefore, warrants a strong understanding of how the marketplace functions and how these systems contribute to the overall economics of this industry. This chapter, therefore, presents an overview of audience economics, the audience marketplace, as well as AISs. This review focuses primarily on the audience marketplace and typology of audiences as defined by Napoli (e.g., Napoli, 2003, 2011). There is broad acceptance of Napoli's framework within the fields of audience research, mass communications, and advertising.

Audience Economics

There are four primary participants in the audience marketplace: (a) media organizations (e.g., Bell Media, Corus Entertainment); (b) audience measurement organizations (e.g., Numeris); (c) advertisers (e.g., Procter &Gamble, Unilever) or their agencies (e.g., GroupM, Publicis); and (d) consumers of advertised products or services (e.g., Canadian consumers) (Napoli, 2003).

Table 1

Three groups of media organizations in the television industry

Type	Description	Canadian examples
Broadcast television	Television stations or networks that broadcast television stations over-the-air (OTA) or through other means	CTV network, CHCH-DT, CHNU-DT
Cable television networks	Distributors of television signals over networks (e.g., cable networks). Referred to as a Broadcasting Distribution Undertakings (BDUs) in Canada	Shaw Communications, Bell Fibe
Cable television systems	Television stations or networks that are comprised of specialty, pay, pay-per-view stations and VOD services	Sportsnet, Bravo, Vu!, HBO Canada

Media organizations are those that derive revenue from audience and/or content sales. There are three broad groups of media organizations within the television industry (Table 1): broadcast television, cable television networks, and cable television systems (Napoli, 2003). Audience sales come from the sale of the audience product to advertisers, whereas content sales come from subscription fees charged to media consumers and fee-for-carriage fees charged to Broadcast Distribution Undertakings (BDUs) (in the case of analogue specialty, digital

specialty and pay stations). The proportion of revenue between audience sales and content sales between media organizations as well as between the US and Canada differ dramatically (Table 2).

Table 2

Revenue breakdown for advertiser-supported media

Media	Media Organization's Source of Revenue			
	USA		Canada (2017)	
	Audience Sales	Content Sales	Audience Sales	Content Sales
Broadcast Television	100%	0%	100%	0%
Cable Television Systems	15%	85%	0%	100%
Cable Television Networks	60%	40%	48%	52%

Note. Data for revenue breakdown in the United States from Napoli (2003), from Canada from Canadian Radio-television and Telecommunications Commission [CRTC] (2018c).

The different media organizations often work in tandem to create the audience product. Television broadcasters produce media content to attract the attention of consumers, while BDUs increase the potential reach (i.e., number of individuals consuming the media) of the audience product by broadly distributing the content over their distribution networks. These audiences can then be, in turn, sold – in the form of commercial exposure – to the advertisers. The advertisers, or their agencies, purchase the audience product with the hope of influencing the purchasing behaviour of consumers by exposing them to an advertisement for their product. This whole process is connected through the measurement organization that produces data based on a measure of media consumption that serves as the transactional currency for the marketplace.

Napoli (2003) uses the term consumer "as a reminder that the advertisers who drive the audience marketplace are fundamentally concerned with reaching potential purchasers of the products and services that they have to offer" (p. 22). While Napoli recognizes that using consumer rather than audience presents a "fairly limited view" (p. 22), it is justified since the subset of total audience who are the potential consumers of the advertised products are the ones that bring value to the advertiser. While there is a great deal of scholarship on the relationship between audiences and consumption (e.g., Butsch, 2000; Webster, 1998), Napoli stressed that from a strictly economic point of view, the audience does not participate in the audience marketplace. Instead, the audience forms the accepted currency of the marketplace and is therefore what Ettema and Whitney (1994) refer to as the "institutionally effective audience" (p. 5) due to its accepted and central trading role in the marketplace.

Napoli (2003) describes the following process in which the participants of the audience marketplace interact (Figure 1):

1. Consumers consume media.
2. Audience measurement firms monitor the media consumption of a sample of consumers.
3. The simultaneous interaction between consumers, media organizations, and audience measurement firms produce the audience product.
4. The audience product is delivered to advertisers.

5. Advertisers, in turn, influence both media organizations and audience measurement firms.

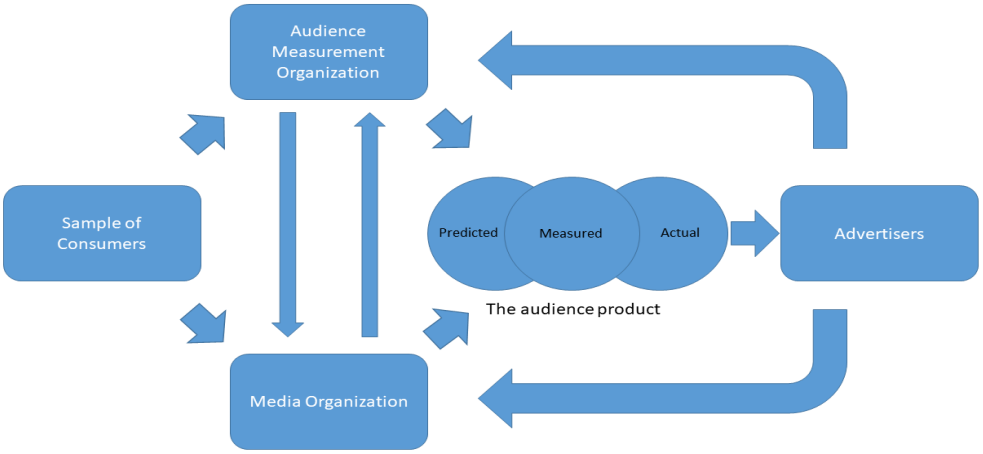

Figure 1. The audience marketplace. Adapted from *Audience Economics: Media Institutions and the Audience Marketplace* (p. 23), by P. M. Napoli, 2003, New York, NY: Columbia University Press. Copyright 2003 by Columbia University Press.

The typology of the audience product. The audience product is different and quite distinct from other products traded in various marketplaces. Unlike many physical products, the audience product is intangible and in a sense, virtual. At the same time, the actual audience for a program is unknown. In order to address the complex reality of the audience product, Napoli (2003) presents a typology of three different forms of the audience. The first – the actual audience – is the form of real interest to advertisers, the second – the measured audience – is the form which is the economic currency of the marketplace and provides the value of ad time, and the third – the predicted audience – is the form which predicates sales of advertisement time. These three forms of the audience

audiences can potentially be entirely different, bringing severe implications to the media industry. Due to this phenomenon, a thorough understanding of what constitutes each component – as well as the role each component plays within the marketplace – is essential.

The predicted audience. The first component of the audience product is the predicted audience. Since the purchase of advertising time (i.e., the time block in which the commercial will air) occurs before the advertisement will air, the transaction between media organizations and advertisers, or their proxy agencies, is based upon an agreed upon prediction, or forecast, of the audience that will be delivered. This transaction process is a unique aspect of the audience marketplace in which "the exchange of goods is based upon what essentially are educated guesses about the size and composition of the product" (Napoli, 2003, p. 29). Therefore, the good that is bought and sold may differ from the good that is received – a key difference from most other markets.

Napoli (2003) outlines two significant reasons as to why the predicted audience is so central to the audience marketplace. The derivation of the audience product is from raw materials that are outside of the control of both media organizations and audience measurement firms. Contrary to common production functions, the media organizations have no actual control over the audience, and as a result, require a deep understanding of audience behavior in order to increase the likelihood of producing the sold audience. Secondly, the audience product

cannot be sold indefinitely since unlike the actual media content, they are inherently perishable. Ang (1991) describes audiences as a product that is almost instantaneously obsolete. These audiences only last for the period in which the media product is consumed. Therefore, if the prediction is too conservative, the 'left-over' product cannot be resold. According to Napoli, this is one of the reasons why media organizations favour ambitious, rather than conservative, predictions.

The measured audience. The measured audience is an estimate of the actual audience produced by the audience measurement firms. The role of the measured audience is to verify the accuracy of the predicted audience – thereby acting as the economic currency of the marketplace and "functions as the coin of exchange within the audience marketplace" (Napoli, 2003, p. 19). It is this form of the audience that provides the value of the advertisement time and is therefore used to reconcile whether the advertiser received the value (i.e., size of audience) that they had paid for when they purchased the predicted audience. Given the importance of the measured audience, this intertwines audience measurement firms within the economic structure of the media industry. The measured audience provides not only the estimated size of the audience product but also its composition (e.g., age-sex composition) – playing a central part of the decision making by media organizations. This type of data-driven decision making drives programming decisions – affecting the content received by audiences – and influences how advertisement dollars are allocated (Napoli, 2003; Taneja, 2013).

These audiences are also the primary input for forecasting exercises since they are a good indicator of future performance.

The actual audience. In the television industry, survey samples are the primary means of estimating the measured audience. Due to this process, the measured audience can vary from the actual audience. Groves (1989) identifies four sources of error in survey samples: sampling error, coverage error, nonresponse error, and error of observation (Table 3). Each of these sources of error can result in a discrepancy between the actual and measured audience. It is possible, to some extent, to control for errors of observation. However, errors of non-observation, in particular, sampling error, are much more challenging to address.

Table 3

Type of errors arising from survey samples

Errors of non-observation		Errors of observation	
Type	Example	Type	Example
Sampling error	The obtained sample is not representative of the population	Error of observation	The measurement tool does not accurately capture the audience
Coverage error	The sampling frame is not complete and missing portions of the population		
Nonresponse error	Segments of the population chose not to be measured		

Note. Adapted from *Survey Error and Survey Costs,* by R. Groves, 1989, New York, NY: Wiley. Copyright 1989 by Wiley.

The relationship between the audience product and the measurement arrangement. As previously seen, the measured audience is an outcome of the measurement activities that the measurement organization undertakes. Therefore, a measurement arrangement is a necessary condition for the existence of the measured audience. However, in order for the measurement to occur, there needs to be an audience to be measured. Therefore, correspondingly, the actual audience can be viewed as a necessary condition for measurement. Since it is the measured audience that ultimately provides evidence of the existence and form of the actual audience, a closed loop is formed (Aaltonen, 2011) (Figure 2). This cycle is a significant relationship and further builds on Napoli's view of the audience product. Aaltonen argues that measurement is a form of institutional classification. The audience product must, therefore, represent an audience of interest to the advertisers in a usable form (e.g., data). For example, Unilever may target females aged 25 to 54 years old for their hair care products. In order for the audience product to have any value to Unilever, it must be able to capture this particular sub-demographic. In the absence of this, the value of the audience product to Unilever decreases. Therefore, it is these institutional classifications that define the actual audience – suggesting that measurement itself is a necessary condition for the actual audience.

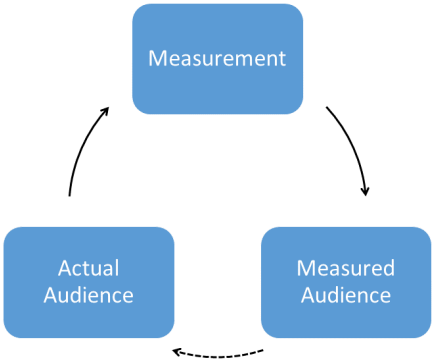

Figure 2. The relationship between the actual and measured audiences. Adapted from "*Manufacturing the Digital Advertising Audience* (Doctoral dissertation)," by A. Aaltonen, 2011, p. 41. Copyright 2011 by A. Aaltonen.

Fragmentation and the long tail. Over the past many years, the sample sizes used to produce data for audience systems (i.e., the measured audience) has remained consistent. At the same time, due to expanding distribution and content offerings (i.e., media fragmentation), the number of available choices to the media consumer is rapidly increasing (Napoli, 2003, 2011; Picard, 2000; Webster, 2005). This expansion is resulting in a vast array of choices, which results in difficulties in recruiting truly representative panels, the standard used by most audience measurement organizations (Napoli, 2012). These challenges come from the fact that measurement organizations collect audience data from samples of consumers. For economic and practical reasons, these sample sizes – while large enough to adequately measure high reach programs and stations – can lack the sensitivity to precisely measure niche stations and programs. For example, in the US, due to sample size limitations of the Nielsen people meter panel, only 80 of

the 500 cable networks in operation are measured. However, the remaining unmeasured networks, represent a significant amount of viewers, aggregately as much as 25% of total television audiences (McClellan, 2008; Napoli, 2011). Similar problems exist with the measurement of radio; whereof the more than 13,000 radio stations in the US, Nielsen Audio[4] can only provide an audience estimate for approximately half (Gunzerath, 2001).

There are two components to media fragmentation (Figure 3). Inter-media fragmentation refers to the increase in the number of delivery platforms. For example, video content was traditionally distributed either over-the-air (i.e., received by an antenna) or via a BDU. Now, video content can be streamed live from broadcaster websites (e.g., ctv.ca, cbc.ca), accessed through subscription video on demand (SVOD) services (e.g., Netflix, Amazon Prime), through websites like YouTube, or through other means such as peer-to-peer (P2P) networks or social media channels (e.g., Facebook). Intra-media refers to the subdivision of choices within the same platform (e.g., an increase in the number of television stations available to viewers) (Napoli, 2011). As the phenomenon continues to grow, the focus of audience attention can begin to shift, resulting in another phenomenon known as audience fragmentation. Napoli quotes an executive of an internet audience measurement organization as follows: “the end result is ‘millions of audiences of hundreds instead of hundreds of audiences of millions’” (p.57).

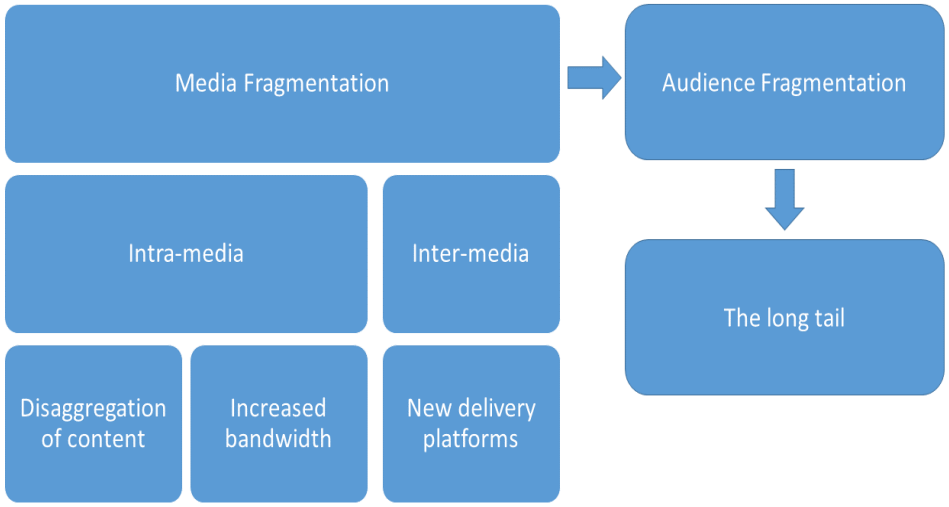

Figure 3. The fragmentation of the media environment. Adapted from *Audience Evolution: New Technologies and the Transformation of Media Audiences* (p. 57), by P. M. Napoli, 2011, New York, NY: Columbia University Press. Copyright 2011 by Columbia University Press.

The first well-known examination in detail of this phenomenon was by Wired magazine's editor Chris Anderson (2006) where he coined the term the long tail of media consumption. In this case, the distribution of the audiences follows a profoundly right-skewed distribution (Figure 4) where the core of the audience centers on a few options, quickly spreading out over the remaining options.

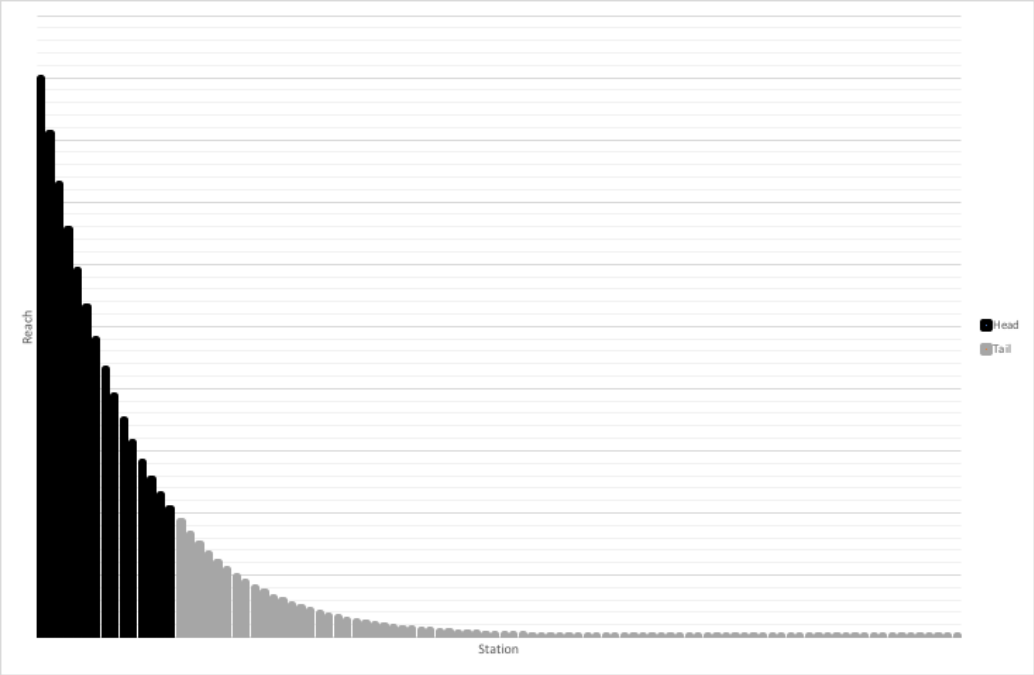

Figure 4. The long tail of media fragmentation. Adapted from *Audience Evolution: New Technologies and the Transformation of Media Audiences* (p. 59), by P. M. Napoli, 2011, New York, NY: Columbia University Press. Copyright 2011 by Columbia University Press.

The long tail of media fragmentation "has been nearly devastating to most media enterprises involved in the production and sale of audiences" (Napoli, 2011, p. 66) and plagues traditional television ratings (Napoli, 2003). This skewed distribution of audiences makes it increasingly difficult for media companies to operate due to the decline in accuracy and reliability of the data produced by their ratings systems (Napoli, 2012). Due to this phenomenon, media outlets with small audiences can often have suppressed (i.e., under-represented) or overstated (i.e., over-represented) audience estimates within the existing rating systems.

Despite the long tail continuing to grow (Anderson, 2006), there is no call to immediate action by advertisers. The lack of action is hypothesized to be due to

the funding models of the systems in the US where the systems and providers are typically funded by large advertisers and media agencies whose primary interests are the behaviour of mass audiences as opposed to niche audiences (Taneja & Mamoria, 2012). The scenario in Canada differs. The funding model for audience measurement includes the vast majority of broadcasters, resulting in a more balanced view of measurement. At the same time, the Canadian Radio-television Telecommunication Commission – the government body which regulates the industry – has mandated the exploration of a solution for the measurement of the long tail (Canadian Radio-television and Telecommunications Commission [CRTC], 2015a). Therefore, the Canadian landscape has more significant pressures to enhance the traditional audience information systems.

Audience Information Systems

An Audience Information System (AIS) is any system which is designed to facilitate the selling and buying of commercial advertising (Napoli, 2011). Media broadcasters use these systems in order to assign a value to their advertising inventory (i.e., airtime allocated to commercials), as well as to aid in programming decisions to ensure that purchased or produced television shows attract the appropriate audiences. Advertisers and their agencies use these systems to purchase advertising space – targeting the viewing opportunity for their commercials to the desired audience segment. These systems also serve as an audit of the audiences that viewed previously purchased commercial spots.

Given that all market participants use the same audience information systems, these systems are deemed to be institutionally effective systems (Ettema & Whitney, 1994). Therefore, despite any potential limitations, the data from these systems is considered to be the absolute truth. Thus, any deviation in the accuracy or precision of these data can result in significant economic impacts. For this reason, the data produced by these systems need to capture audience behaviour adequately. In the case of Canada, the audience estimates derived from the Numeris electronic PPM meter serves as the currency for Digital and Specialty television stations, and Conventional television stations licensed to serve the top six Canadian television markets[5]. Approximately 11,000 Canadians carry an electronic meter which allows Numeris to produce timely (i.e., daily), minute-by-minute television (and radio) audience information projected to the Canadian population. For other Canadian television stations, the currency audience information comes from Numeris' television diary service. Numeris mails approximately 300,000 personal television diaries to enumerated Canadians during two television 'sweep' periods. This diary service serves 41 smaller Canadian television Extended Markets (EM) (e.g., Halifax EM, London EM, Prince George/Kamloops EM).

Return path, or set-top box, data. A set-top box is a device that is typically connected to a television allowing for the reception of television signals over a distribution network (e.g., cable network, direct-to-home (DTH) satellite network) of a BDU. When STBs are attached to a network that allows for the

return of data from the box (i.e., a return path) to the BDU these data can be aggregated (Zigmond et al., 2009). These data are typically referred to as return-path data (RPD) (Wiesler, 2016) or STB data. These data are typically captured from the many households that subscribe to either digital cable or satellite TV services (Zigmond et al., 2009). In January 2016, the penetration of digital television households, those with either a digital cable or satellite TV service, was estimated to be 84.4% (Numeris, 2016), a significant proportion of Canadian households. However, due to technical limitations, not all digital television households have STBs connected to a return path allowing for RPD. Therefore, the actual proportion of Canadian households able to provide RPD is much lower.

There are also a few more critical limitations on the availability of RPD. The return of data often requires the specific set-top boxes proprietary to the BDU. These boxes are often not present in all of the BDU's subscribing households; therefore, data is only available from the subset of subscribers with the specific boxes. The return of data requires specific infrastructure, which is not always in place for all regions that a BDU serves. Finally, the return of data from satellite STBs requires the usage of a phone line that while practical for retrieving Video-On-Demand (VOD) requests, may not be practical for the return of RPD.

The growth in households able to return STB data, as well as the required technology to enable the return path to their television distribution provider, has resulted in an explosion of interest in the RPD and its potential uses (Bachman,

2009). In the US alone, ten organizations are currently providing audience information from this data (TRA Global, 2011). TRA uses a rating system enhanced with RPD through statistical modelling and data matching techniques (e.g., data fusion) in order to combine traditional single-source rating information with STB data. Using this audience information system, TRA provides insights to 12 clients, including two significant agencies and other niche content providers such as MTV and Discovery Channel. By enhancing rating systems with RPD, the number of data points grows exponentially to levels not possible or practical through sample-based audience measures. This growth results in a significant increase in the precision and sensitivity possible in audience measurement. Often these data are referred to as census-like, recognizing that the immense number of data points closely resembles that of a full census of the population. These census-like data enable users to overcome the limitations of small sample sizes, which plague traditional measurement services by providing more profound insights into increasingly fragmented audiences (Taneja & Mamoria, 2012).

Audience Economics, the Audience Marketplace, and the Research

The focus of this research project is to understand the innovation occurring within the Canadian television industry. This innovation is directly linked to the television audience product – an abstract representation of an intangible and virtual product. In order to fully understand and appreciate the innovation process, a thorough understanding of the product to which the systems of interest support is required. This is enabled through an understanding the audience economics –

the underlying theory supporting audiences as a product – and the corresponding marketplace. This chapter presented a comprehensive overview of these constructs and will allow for subsequent chapters, particularly those related to the analysis of the data, to make sense to the reader. It is through these lenses that the reader will be able to understand the thought process and appreciate the nuance in the data.

Chapter 4. Digital Innovation

Digital infrastructures are information technology (IT) artifacts that enable organizations or industries to function (Tilson et al., 2010). As such, given their central role within the audience marketplace, audience information systems (AISs) are a form of digital infrastructure. Innovation based on these systems is, therefore considered a form of digital innovation. The areas of digital infrastructures and digital innovation have been present in the MIS literature over the past ten years. While the study of innovation has been present and well-studied in organizational science literature, digital innovation with these infrastructures is relatively new and carries distinct differences.

Digital Infrastructures

Increases in processing power and declining costs for data storage have resulted in complex and integrated information solutions (Hanseth & Ciborra, 2007). Many scholars have begun to recognize that these complex systems constitute a new form of IT artifact – the information infrastructure (Hanseth & Lyytinen, 2010). These systems – also referred to as IT infrastructures, e-infrastructures, or digital infrastructures – can be considered as a collection of interconnected systems (Henfridsson & Bygstad, 2013). Hanseth and Lyytinen define an information infrastructure as "a shared, open, heterogeneous and evolving socio-technical system of Information Technology (IT) capabilities" (p. 1). It is important to note that these systems can include not only technological

components, but also human elements (Braa, Hanseth, Heywood, Mohammed, & Shaw, 2007; Tilson et al., 2010).

Bygstad (2008) provides six attributes of information infrastructures: (a) they are permanent in nature; (b) they evolve through daily use; (c) they are often scale-free, allowing for growth; (d) despite being quite open, they are constrained by standards; (e) they can be multi-purposed by actors sharing common goals; and (f) they have low transaction costs. These attributes are all demonstrated in AISs. Due to its central role within the industry, AISs serve a permanent role as they allow for the required information to facilitate the sale and purchase of the advertising product. Within the marketplace they support many organizations (e.g., advertisers, broadcasters) and also meet the need of many teams within an organization (e.g., revenue management, programming, research) – all working towards supporting the advertising industry. At the same time, these systems need to develop in order to support changes in sales strategy as well as changes in market reality (e.g., allowing for the addition of video-on-demand audiences to be included).

An essential feature of digital infrastructures is their relationship with digital artifacts. A digital artifact is an abstract concept due to their lack of a clear identity (Ekbia, 2009). Due to their immateriality, these artifacts are considered quasi-objects (Faulkner & Runde, 2009). There are critical differences between digital artifacts and physical entities or other cultural records: (a) they are

editable; (b) they are interactive; (c) they can be accessed and modified by other digital artifacts; and (d) they are distributed – often existing outside of a single source (Kallinikos, Aaltonen, & Marton, 2013). These differences are due to the modularity and granularity of the eco-systems in which these artifacts belong (Yoo, Henfridsson, & Lyytinen, 2010). It is recognized that physical entities can be modular, however – unlike digital artifacts – physical entities are typically neither function or product agnostic (Tiwana, Konsynski, & Bush, 2010; Yoo et al., 2010). At the same time, these physical entities are seldom granular (Kallinikos et al., 2013).

Research on digital infrastructures. Following Tilson et al.'s (2010) call for further research on digital infrastructures, the body of literature has grown considerably. The literature is broad and covers different industries (e.g., health, telecom, natural resources), levels (e.g., groups, organizations, industries), and technologies (e.g., standards, platforms, the Internet). Most of the research to date has focused on the evolution with respect to social interdependences (i.e., interpretivist studies) or portfolio management or alignment with strategy (i.e., positivist studies), but has developed little understanding of the "contingencies of causal structures in [their] evolution" (Henfridsson & Bygstad, 2013, p. 908).

Henfridsson and Bygstad (2013) have identified four streams of research focusing on the evolution of digital infrastructures. The first three follow an interpretivist paradigm, and the last follows a positivist paradigm:

1. The complexity model – based on complexity theory – suggests that the evolution of these systems cannot be attributed to any single source (e.g., Braa et al., 2007).
2. The network model – based on actor-network theory (ANT) –suggests that the evolution of these systems is driven through the interaction between humans and elements of technology (e.g., Hanseth & Monteiro, 1997).
3. The relational model – based on work practice and learning theory – suggests that infrastructures can only be appreciated through sensemaking of its social actors (e.g., Vaast & Walsham, 2009).
4. The strategic asset model – based on strategic choice theory – suggests that the evolution of infrastructures is the alignment of the technology resources and the organization's strategies (e.g., Broadbent & Weill, 1997).

These themes provided a framework for theoretical research on the evolution of these infrastructures but left little guidance in the way for practical research. This gap was later addressed in a special issue of Information Systems Research where Constantinides, Henfridsson, and Parker (2018) provided five practical research streams on digital infrastructures and platforms:

1. The mirroring hypothesis – understanding how organizational structure and technology artifacts are related and how they constrain digital innovation and value creation.
2. Platformization and infrastructuring – understanding how scaling can occur between infrastructures and platforms and how this impacts the innovation process.
3. Competition and scaling of digital platforms – understanding the interplay as well as competition between owners and users of digital platforms.
4. Blockchain as a new infrastructure and platform – how blockchain can be successfully implemented or utilized within organizations and what are the various challenges and barriers.
5. Online labour platforms – how online labour platforms will impact pricing, hiring, and training within organizations.

In studying these systems, it is recognized that evolution includes both social and technical aspects (Vaast & Walsham, 2009). While the technology itself evolves through its usage, so does the way that the various users of the system interact with one another. Workflows, processes, and procedures can eventually evolve with the interactions with the infrastructure.

Digital Innovation

Digitization has been at the forefront of IS scholarship for the past 40 years (Nambisan et al., 2017). Nambisan et al. provide a historical timeline for this scholarship: first focusing on the impact of digitization on internal organizational processes, then understanding the unique aspects of digitization by industry, domain or product families, and eventually focusing on both the challenges digitization brings to innovation and its role in the innovation process. This digitization, therefore, transitions the existing academic understanding of innovation (Benner & Tushman, 2015).

The combination of digitization and innovation leads to a phenomenon known as digital innovation. Nambisan et al. (2017) define digital innovation as the usage of digital technology to enable innovation. It is thereby "the creation of (and subsequent change in) market offerings, business processes or models that result from the use of digital technology" (p. 224). This type of innovation includes a wide range of tools and infrastructures; however, it is highly dependent on digitization (Yoo et al., 2010). Its outcomes can include products, platforms, services, customer experiences, and new value pathways. These innovation outcomes can then be diffused, assimilated, or adapted to specific use cases. Due to the conditions of digital infrastructures – the separation of data from the products – there is a high potential for innovation, particularly in vertically integrated industries (Kallinikos et al., 2013) like the Canadian media industry.

Digital innovation challenges the traditional assumptions of innovation (Yoo et al., 2012, 2010). First, due to the malleability and editability of digital objects, the resulting outcomes of digital innovation can continue to evolve (Lyytinen, Yoo, & Boland Jr., 2016). Secondly, digital innovation also results in many actors – with many different goals and motivations – being involved in the process (Nambisan et al., 2017), resulting in a distributed innovation. Finally, digital innovation, unlike traditional innovation, places equal weight on both process and outcomes (Nambisan et al., 2017).

At the same time, the rise in digitization – and subsequently, the reprogrammability of devices and homogenization of data – has resulted in layered modular architectures for digital infrastructures (Yoo et al., 2010). This architecture can be seen as a hybrid between layered and modular architectures. Yoo et al. described a layered architecture as one which has four distinct layers: (a) the content layer containing all forms of data; (b) the service layer which consists of the user interfaces; (c) the network layer consisting of both physical and logical transmission of the data; and (d) the device layer consisting of physical hardware as well as the required operating systems. A modular architecture, on the other hand, is one which is an assembly of standardized components (Mikkola & Gassmann, 2003).

Any shift in product architecture has an impact on the structure, processes, and responsibilities of organizations; thereby changing the innovation processes

(Yoo et al., 2010). The ability to disaggregate components in a modular architecture reduces overall design complexity (Baldwin & Clark, 2000). This lack of complexity thereby opens up new flexibility and opportunities for innovation and development. Yoo et al. point out how innovation may now be carried out by a collection of organizations rather than being dependent on a single organization – as is the case with integral architectures. By moving towards a layered modular architecture, components become product agnostic, with each layer carrying a different design hierarchy (Clark, 1985). This results in an infrastructure that offers generativity and is both fluid and open, allowing for the product to be continuously redesigned, and its boundaries changed (Yoo et al., 2010).In order to address the differences and challenges with digital innovation, Nambisan et al. (2017) present four new logics for innovation within a digital context:

- Dynamic problem-solution design pairing.
- Socio-cognitive sensemaking.
- Technology affordances and constraints.
- Orchestration.

Each of these logics is now reviewed.

Dynamic problem-solution design pairing. A problem-solution pair is a solution to a problem that was not conceived a priori (von Hippel & von Krogh,

2016). An example of such, provided by von Hippel and von Krogh, would be Sadow's invention of the rolling suitcase. It was only through experiencing the issue of carrying his heavy suitcases in the airport that the solution of attaching roller wheels became apparent. In the case of digital infrastructures and innovation, Nambisan et al. (2017) suggest that solutions consider digital artifacts and the associated socio-technical context. The evolution, or innovation and the identification of these solutions is through an ongoing evolution of matching of uses and potential uses of the infrastructure.

Nambisan et al. (2017) provide two key benefits of focusing on problem-solution pairing in the study of digital innovation. Through using these design pairs, the fluidity of innovation within a digital context is recognized – appropriate given the high degree of flexibility which digital infrastructures offer. Additionally, it allows for the recognition of the degree of collaboration within this space and therefore recognizes that agency can be distributed.

Socio-cognitive sensemaking. Nambisan et al. (2017) define socio-cognitive sensemaking as technology "being made sense of simultaneously in an individual innovator's cognition and the innovator's social system of collectives or organizations and individuals" (p. 228). They further explain that this particular facet of sensemaking is central to digital innovation. This facet is due to the complexity of digital infrastructures – which makes them difficult to understand by a single actor and their particular frame of reference. It is by multiple actors

collaboratively sharing their frames, that new ideas and uses can be developed, resulting in digital innovation.

Technology affordances and constraints. Nambisan et al. (2017) suggest the use of affordances and constraints as a means to gain an understanding of the role of digital tools, products, and services in the digital innovation process. Affordances can become a tool allowing for an understanding of how the technology can be used and repurposed in very different ways by different actors providing insights into how innovation can progress and therefore produce very different outcomes and results. Affordances also allow, due to their specificity, to develop more accurate theories on innovation. This ability is due to their direct matching of product features to the perceived benefits of the users. It is very much these exact reasons that affordances can be viewed as a methodological tool, or means, to understand innovation processes (e.g., Bygstad et al., 2016). See Chapter 5 for more details on affordances.

Orchestration. Orchestration is the process in which one or more entities becomes responsible for the coordination of innovation processes (Nambisan & Sawhney, 2007). Nambisan et al. (2017) present this as the fourth logic for understanding digital innovation. The idea of orchestration coupled with problem solution pairing, has given rise to what Afuah and Tucci (2012) refer to as problem-solving organizations – organizations whose role is to match solutions or capabilities to identified problems. A group of actors typically activates the

solution within the organization that Nambisan et al. call contributors. These contributors are mobilized often using digital technologies or directly. Therefore, Nambisan et al. suggest "problem-solution matching as a micro-foundation of (digital) innovation orchestration" (p. 231). It is through this perspective that they suggest an understanding of distributed agency and the role that technology plays in digital innovation.

Digital Infrastructures, Innovation, and the Research

This chapter has provided an overview of digital infrastructures and digital innovation. These two constructs are tightly coupled as it is the rapid rise of digital infrastructures that has led to digital innovation – blurring the understanding of how innovation works. Digital innovation manifests in a different way than traditional innovation and is continually developing and changing as the digitization of the world continues. This form of innovation, therefore, requires new logics in order to understand digital innovation. The chapter reviews both those of Yoo et al. (2010) and Nambisan et al. (2017). It is through Nambisan et al.'s logics that we see a link to the metatheory supporting (reviewed in Chapter 5) that of technology affordances and constraints. As identified by Nambisan et al. as well as Bygstad et al. (2016), affordances provide a unique opportunity to understand the digital innovation process.

Chapter 5. Metatheory Guiding Research Design and Analysis

At the heart of any research project is the underlying metatheory. The framework guides the ontology – what is knowledge – and the epistemology – how knowledge is obtained – for the project. These theoretical foundations drive the research methods and ultimately assist the researcher in answering the research questions of interest. The goal of this research project was to understand the mechanisms allowing for digital innovation within the Canadian Television Industry. The research sought to understand how the evolution of AISs with big data came to be. The search for understanding how a phenomenon occurs differs from other types of research – such as prediction, hypothesis testing, or other types of questions – and therefore requires a metatheory that aligns and supports these types of questions. Critical realism (CR) is a useful paradigm for this type of research.

The dominant research paradigms in management information systems (MIS) continue to be positivism and interpretivism (Mingers, 2004c). Despite this – due to its unique differences between the two – there has been a growing interest in the ideas of CR within the MIS field (Mingers, Mutch, & Willcocks, 2013). While CR shares some ideas with each of the dominant paradigms, it is quite distinct. These distinctions – a strong realist ontology, an acceptance of epistemic relativity, and the acknowledgement of the acceptance of different kinds of objects (Mingers et al., 2013) – make it an ideal and appropriate underlying

meta-theory for this study. This chapter thoroughly reviews the aspects of CR and its alignment with the research questions. The chapter reviews the fundamental principles of CR in terms of: (a) its ontology; (b) its epistemology; and (c) its methodology. The review provides the necessary understanding of the paradigm and its philosophical views that underlie this research project as well as exploring and addressing some relevant criticisms of the CR paradigm. The chapter then concludes with a review of two additional theories used in the research method; affordances as a particular type of mechanism, and a typology for social mechanisms.

Critical Realism

A review of the paradigm will allow for an understanding of why CR was chosen to provide the underlying metatheory of the research study. CR is associated with the work of British philosopher Roy Bhaskar (2008a/1975) and is often considered to be a combination of transcendental realism and critical naturalism as it describes the interface between natural and social worlds (Mingers, 2004c). Transcendental realism (Bhaskar, 2008/1975) builds from Kant's transcendental procedure but diverges in a less restrictive manner suggesting social activities can be considered historically transient and also dependent on the power of actors as causal agents (Bhaskar & Lawson, 1998). It was in this work that Bhaskar introduced an ontology consisting of three nested domains – the real, the actual, the empirical – and provided a critique of the epistemic fallacy, arguing that ontology is not distinct from epistemology. At the

same time, that pure and natural sciences are distinct, each requiring independent explanations. Critical naturalism (Bhaskar, 2014/1979) recognized a distinction between natural and social reality and at the same time that society was an open system (Archer, 1998). It was the combination of these two philosophies that resulted in what other authors referred to as CR.

The foundational work of Bhaskar was later applied to the social sciences through the work of Archer and Sayer (Mingers et al., 2013). Archer (1998) and Sayer (2000) expanded upon the work of Bhaskar by demonstrating the application of CR specifically to the social sciences. Archer argued that structure and agency are independent yet analytically intertwined, operating and interacting on different time scales through a morphogenetic sequence – an important distinction for the social sciences and distinct from Giddens' (1984) view of structuration. Sayer's work provided methodological guidance for the use of CR within the social sciences. Gibson's affordance theory was later applied to CR by Volkoff and Strong (2013) by considering an affordance as a particular type of generative mechanism thereby expanding the use of CR within an information systems (IS) context.

CR can be positioned as an alternative to positivism and interpretivism, particularly within the IS field (Bygstad et al., 2016; Mingers et al., 2013; M. L. Smith, 2006) due to its epistemology. The approach allows a researcher to access knowledge previously only understood under a positivist or interpretivist

approach. Like interpretivist approaches, CR acknowledges the role of subjective knowledge of actors. At the same time, CR recognizes the existence of an independent world that can constrain or enable actions – similar to the positivist approach. However, the goal of CR differs from those of positivist or interpretivist approaches. It does not seek to predict future events or the understanding of cultural meanings of events. It instead seeks to explain the actual mechanisms which have generated an event by considering a broad, and stratified world, which contains not just strictly empirically observed or measured events, but also those that can be relative and subjective to the perspective of the researcher (Mingers et al., 2013). It is the stratified ontology – explored in full later in the chapter – of the CR world that separates it from strong positivism and interpretivism.

Many examples of the application of CR and the identification of generative mechanisms are found in the MIS literature (e.g., Aaltonen & Tempini, 2014; Bygstad, 2010; Chandwani, De, & Dwivedi, 2018; Henfridsson & Bygstad, 2013; Jetzek, Avital, & Bjorn-Andersen, 2014). In their study of audience manufacturing, Aaltonen and Tempini sought to understand "what mechanisms allow the company to manufacture an advertising audience from the mobile network data?" (p. 97). They identified three generative mechanisms that allowed the organization to shape their audience data-pool: (a) semantic closure; (b) pattern-finding; and (c) framing. By using CR, Aaltonen and Tempini were able

to recognize that the data tokens had both syntactic and semantic properties, which in combination, allowed for the creation of the audience product.

CR is particularly useful in IS research because it addresses the two major domains of IS; namely, the social and the natural worlds (Mingers, 2004c). Mingers (2004a, 2004b) points out how CR successfully addresses some of the significant issues in IS philosophy, specifically: "an impoverished view of causality and explanation within empiricism/positivism; the major critiques of observer- and theory-independence from an interpretive stance; the dislocation between natural and social science; and the radical anti-realist positions adopted by constructivist and post-modernists" (2004a, p. 145). Several characteristics of the CR metatheory support this argument. Unlike empiricism/positivism, CR does not ontologically rely on observation and allows for both inductive reasoning in addition to deduction; at the same time, CR allows for the co-existence of both a natural, independent world as well as an observer dependent world. This manifests through the transitive and intransitive domains of knowledge (Bhaskar, 2008/1975). The former is that which consists of transitive objects, those that are not independent of human activity, and the latter consisting of intransitive objects, those that exist independent of human activity. CR allows the natural and social aspects of IT to be treated differently and, contrary to constructivist or post-modernist views, accepts objective and subjective knowledge within both the natural and social domains.

CR has already become quite influential in many other disciplines (Mingers, 2004b). It has gained acceptance in the MIS field and has appeared in a variety of types of papers in the literature (Table 4). Entire issues of top-tier MIS journals have focused on this research approach (e.g., Information and Organization 14(2), MIS Quarterly 37(3)). The fluid nature of the audience product also makes CR entirely appropriate for studying AISs (e.g., Aaltonen & Tempini, 2014; Aaltonen, 2011).

Table 4

Examples of CR in the MIS literature

Type of Paper	Examples
Calls for studies	Dobson, 2001; Mingers, 2004b; Mingers et al., 2013; Smith, 2006
Empirical studies	Mutch, 2010; Volkoff, Strong, & Elmes, 2007; Williams & Karahanna, 2013
Methodological papers	Bygstad et al., 2016; Easton, 2010; Wynn & Williams, 2012; Zachariadis, Scott, & Barrett, 2013

Ontology of Critical Realism

Ontology relates to the particular view, within a philosophical paradigm, of what constitutes the world. It applies to both society and actors, as well as physical structure and entities with attention paid to how they interact with one another (Eriksson & Kovalainen, 2008). Bhaskar developed CR as an alternative to empiricism and positivism, arguing that science was more than simply

recording observations, but understanding the various components of reality and how they interact and generate phenomena (Mingers et al., 2013).

Ontologically CR specifies an independent stratified and layered domain, consisting of various components which function as an open system (Bygstad & Munkvold, 2011; Mingers et al., 2013; Wynn & Williams, 2012). The stratification and layering support a reality that is both independent (i.e., the domain of the real) and subjective (i.e., the domain of the empirical). Within this framework, understanding occurs even though not all components of reality are directly observable or measurable. Therefore, Bhaskar (2008a/1975) argues that it is necessary that there exists an intransitive domain consisting of components which, despite being independent of humankind, can exist within our body of knowledge. The existence of this independent world is evident through the fallibility of our knowledge (Sayer, 2000), whereby the existence of the world is necessarily independent of knowledge. Reality is, therefore, viewed as either intransitive, in the sense of particular entities which do not depend on awareness, or transitive, in the sense of social constructions such as our knowledge and beliefs (Aaltonen & Tempini, 2014). Therefore, thought-objects (e.g., theories) are independent of fixed entities; and can, therefore, be revised, redefined, or reinterpreted.

Bhaskar's (2008a/1975) reality consists of three nested domains: the real, the actual, and the empirical. Mingers et al. (2013) describe the real as the "whole

of reality" (p. 796), the actual as the events that occur and the potential events that could have occurred, and the empirical as the subset of the events which can be observed or experienced. Within these three domains, there are four ontological components: structures, mechanisms, events, and experiences (Wynn & Williams, 2012). Each of these components can exist in one or more domains (Table 5). The multiple domains, therefore, results in a layered ontology (Bygstad & Munkvold, 2011) where the structures give rise to one, or more, mechanisms, which then cause one, or more, events which may, or may not, be observed (Figure 5). Different structures and mechanisms emerging from them may even give rise to a very similar event. This creates a challenge for empirical investigation since the researcher needs to be able to identify the various structures and mechanisms that could have possibly led to the phenomenon of interest.

Table 5

Stratified ontology of CR (Bhaskar, 2008/1975, p. 2)

Component	Domain of Real	Domain of Actual	Domain of Empirical
Mechanisms	X		
Events	X	X	
Experiences	X	X	X

Note. Adapted from *A Realist Theory of Science*, by R. Bhaskar, 2008/1975, New York, NY: Routledge. Copyright 2008 by Routledge.

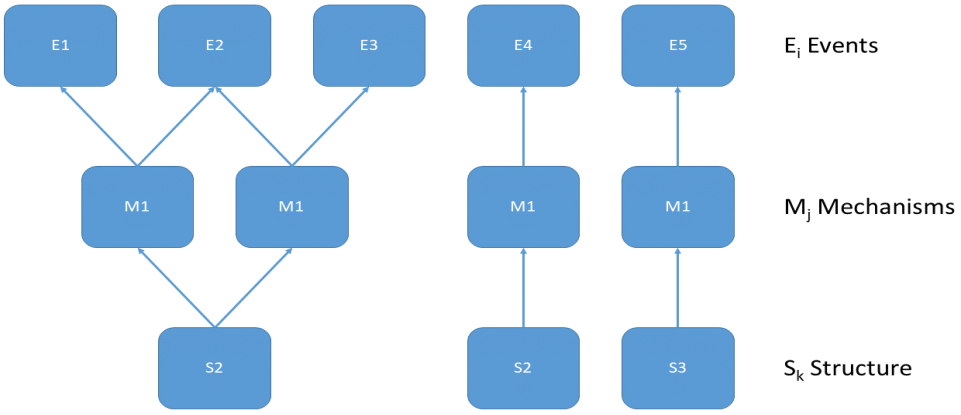

Figure 5. The relationship between structures, mechanisms, and events. Adapted from "In Search of Mechanisms: Conducting a Critical Realist Data Analysis," by B. Bygstad and B. Munkvold, 2011, *ICIS 2011 Proceedings,* p. 3. Copyright 2011 by the Association for Information Systems.

Bhaskar (2008a/1975) views reality as an open system which cannot be fully controlled. Therefore, the boundaries of reality – or the system – are fluid and permeable. Not only are the various causal powers, or mechanisms, always changing; but the structure itself may also be constantly evolving. It is therefore not possible to have experimental controls within an open system, thereby removing the ability to control possible mechanisms. Due to their dependence on structures and mechanisms, events that occur have no guarantee to repeat in the future. For this reason, epistemologically, CR prefers to seek explanation rather than prediction (Mingers, 2004c; Wynn & Williams, 2012).

Due to their importance to the ontology of CR, the remainder of this section provides an exploration of each of the four components of the stratified ontology in detail.

Structures. A structure is a system of objects or practices which is of interest to a researcher (Sayer, 2003). One or more generative mechanisms emerge from the structure – producing the phenomenon of interest. Structures can be social (e.g., an organization, a market) or physical (e.g., information systems). Quite often, and in particular within IS contexts, structures consist of both a social and physical, and even discursive, entities (Wynn & Williams, 2012). The structure itself is defined by the entirety of the contained entities and the way they interact together. Wynn and Williams (2012) present the practical example of water, where despite being made of both hydrogen and oxygen, the characteristics of water cannot "be readily attributed to those of the elements themselves" (p. 791). Instead, the combination of the ways the entities act together results in the emergent properties – of being more than the sum of the parts of the structure.

Social and physical structures may be entirely different. While physical structures can exist independently, within the intransitive domain, social structures necessarily are dependent of the actors within the structure, albeit recognizing that the knowledge of the actors may not be perfect. These social structures can, therefore, constrain and enable social activities and can be further transformed by these activities (Archer, 1995; Bhaskar, 2014/1979; Wynn & Williams, 2012). Due to the open system of CR, these structures can change, or even cease to exist, over time. Since structures are temporal they cannot simultaneously enable and be changed by action (Orlikowski & Yates, 2002).

Mechanisms. Mechanisms, or generative mechanisms, are the processes that give way to the phenomena of interest. Bhaskar (2008a/1975) defines mechanisms as the way things may act. Mechanisms are only the capacity or tendency of action, and should not be viewed as deterministic since they do not always yield the events to which they are capable of producing (Volkoff & Strong, 2013). It is also entirely possible that the actualization of the capacity or tendency can trigger another mechanism in which the resulting interaction results in different, modified, or nullified effects. While a mechanism is considered to exist independently and unobservable within the domain of the real, social mechanisms often bear their generative properties through the thoughts and beliefs of the actors within the structures. It is the beliefs or thoughts of the actors that can give rise to the tendency of particular ways of being (Bhaskar, 2014/1979).

Events. Events are the direct outcome of a mechanism enacted within a particular context. Not all events are directly observable or measurable, and as such, access to them is restricted. Often, it is only through abstraction of their observable subset that a researcher can achieve the knowledge of particular events. Multiple events may counteract one another resulting in no changes, or even, a single event may amplify the effects of another event. Therefore, even when a particular mechanism has regularly generated an event, this should be viewed merely as a particular case rather than causation (Runde, 1998). Events

reside within the domain of the actual, and therefore, also within the domain of the real.

Experiences. Experiences are the events that are observed – either directly or through the use of tools. Therefore, experiences are a subset of all of the events generated in a particular setting. It is entirely reasonable to assume that the subset of experiences may be smaller than the set of events. Ontologically, experiences reside in the domain of the empirical, and due to the stratification of reality reside within the domains of the real and actual.

Epistemology of Critical Realism

Epistemology relates to the particular view, within a philosophical paradigm, of what constitutes knowledge, how knowledge is obtained, and how knowledge can be justified. CR accepts that knowledge can either be transitive (i.e., social constructions) or intransitive (i.e., independent of awareness) (Bhaskar, 2008a/1975). Despite it being beyond the senses of experiences of researchers, it is the intransitive knowledge that researchers seek. In order to accomplish this, a researcher needs to, through research, develop transitive knowledge. The researcher seeks to understand the intransitive world through theories and hypotheses developed from transitive knowledge.

Mechanisms reside in the domain of the real, and as such, are neither observable nor measurable. Thus, the identification of mechanisms can only occur via causal criteria (observation of its effects). According to Wynn and Williams

(2012), mechanisms need to have their existence inferred based on the observations which are believed to be their result. Since CR research attempts to answer the question, "what must reality be like in order for this event to have occurred?" (Wynn & Williams, 2012, p. 794), the research attempts to hypothetically identify the mechanisms that emerge from both physical and social structures (Sayer, 2003), which might have resulted in the observed events. The research seeks to understand the enabling, stimulus, and releasing conditions that allow for both the enacted mechanism and the impact on any structural factors.

Since there can be multiple possible explanations as to the mechanism(s) at play, these multiple explanations, therefore, need to be evaluated and compared. The researcher, given the existing knowledge, then selects the explanation that is most likely the accurate representation of the world, recognizing the open system perspective of CR. There are far too many possible interactions between all of the mechanisms, entities, and factors to always lead to the same outcome (Mingers, 2004c; Wynn & Williams, 2012). Therefore, the goal of CR is not to predict, but rather, to explain the mechanisms that resulted in the generation of a specific event or set of events.

Methodological Approaches of Critical Realism

While there are no methods specific to CR, there is a large degree of guidance surrounding which methods can be used. Several methodological approaches have been presented for CR research (e.g., Bygstad & Munkvold,

2011; Easton, 2010; Mingers et al., 2013; Wynn & Williams, 2012). Central to each approach there are three common themes: (a) an iterative methodology that seeks to explain events, structures, mechanisms, and context; (b) the principle of retroduction; and (c) the use of multiple methods. This section explores each of these components in turn. It is important to note that CR based empirical research seeks to find the specific mechanisms, that can explain a specific event rather than broad types or kinds.

An iterative methodology to explain events, structures, mechanisms, and context. The CR researcher aims to understand what event, or events, constitutes a particular phenomenon of interest (Wynn & Williams, 2012). This aim, therefore, presents a challenge given that the researcher cannot directly observe events since they lie within the domain of the actual (Bhaskar, 2008a/1975). Therefore, instead of directly observing events, the researcher must abstract based on empirically observed experiences, perceived by either the researcher or the participants of the research, as well as empirically identified and measured outcomes (Mingers et al., 2013; Wynn & Williams, 2012). Thorough and successful abstraction requires a thick description of the observed experience and outcome (Wynn & Williams, 2012); therefore research methods need to be able to capture details of the key actions and outcomes (i.e., inputs and outputs) as well as the structural components. By viewing the sequence that the events occurred, the researcher can then begin to develop theories regarding the mechanisms and how they enacted the events from the associated structures.

In order to fully understand the mechanisms, the CR researcher should identify the social and physical components of the structures as well as the contextual environment and the relationships among them (Bygstad & Munkvold, 2011). The researcher must, therefore, identify the various potentially activated mechanisms or actualized affordances that led to the phenomenon of interest. Structures are not always directly observable and can take various physical or social forms (Wynn & Williams, 2012). In these cases, experiences, values, and existing theory inform knowledge of the structure; therefore, the knowledge can only reside within the transitive dimension of CR. Once the constituent parts are identified, analysis can then allow for the understanding of the potential linkages. Given that many different theoretical interpretations may exist, the researcher should rely on the principles of parsimony, focusing only on the most relevant parts and continuously consider the purpose or context of the research.

The methodology of CR can produce many competing hypotheses about an unobservable domain. Therefore, for each hypothesized causal mechanism, the CR researcher must seek evidence to ensure that the mechanism does have the required causal powers. Evidence helps determine which hypothesis is stronger, and as such, more likely to describe the causal mechanisms responsible for the observed phenomenon. The process is not linear, but rather, an iterative process in which many steps may occur in parallel. Wynn and Williams (2012) illustrate this methodology through their five iterative methodological principles: (a)

explication of events; (b) explication of structures; (c) retroduction; (d) empirical corroboration; and (e) triangulation/multi-methods (Figure 6).

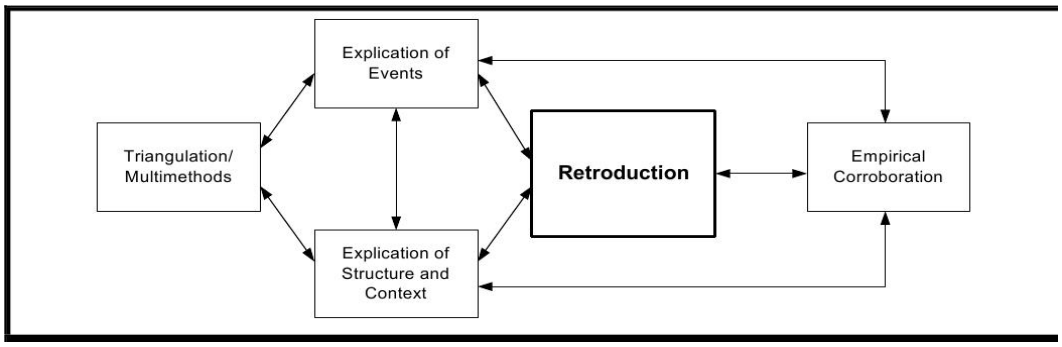

Figure 6. The methodological principles of CR and their relationship. Reprinted from "Principles for Conducting Critical Realist Case Study Research in Information Systems," by D. Wynn, Jr. and C. Williams, 2012, *MIS Quarterly, 36*(3), p. 797. Copyright 2012 by MIS Quarterly. Reprinted with permission.

Recognizing that systems are open and the powers of mechanisms are emergent, it is easy to understand why empirical corroboration cannot depend on the regularity of certain events (Aaltonen & Tempini, 2014; Runde, 1998). Instead, empirical corroboration needs to occur through processes such as Yin's (2014) process of pattern matching or Lee and Hubona's (2009) concept of summative validity.

The principle of retroduction. Bhaskar (2014/1979) argued that the primary function of philosophy is to allow the researcher to answer *what must be true* in order for the observed phenomena to have happened, or be possible. These questions can be answered through the process of retroduction (Dobson, 2001). Retroduction – like induction or deduction – is a form of logical inference where

the most likely hypothesis relating to why a particular event may have occurred is postulated. Unlike deduction which produces a single conclusion, retroduction results in the most likely of a set of possible conclusions. Mingers et al. (2013) suggest that this form of inference is essentially the same as abduction. By employing retroduction, the researcher moves from observed or described events in the domain of the empirical to hypothesize the causal mechanisms in the unobservable domain of the real that produced the observed phenomena. Knowledge is created through research designed within the transitive domain in order to better understand the intransitive domain (Zachariadis et al., 2013) (Figure 7).

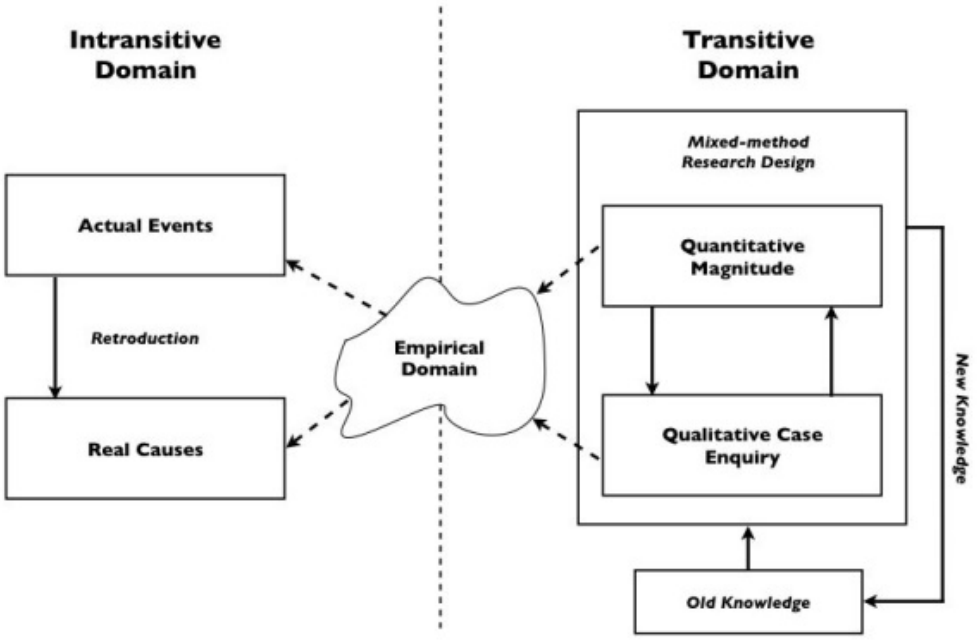

Figure 7. The retroductive approach of critical realism for knowledge creation. Reprinted from "Methodological Implications of Critical Realism for Mixed-methods Research," by M. Zachariadis, S. Scott and M. Barrett, 2013, *MIS Quarterly, 37*(3), p. 859. Copyright 2013 by MIS Quarterly. Reprinted with permission.

Using retroduction, the researcher starts with observations and then mentally reconstructs the mechanisms that would need to exist in order to explain the event (Aaltonen & Tempini, 2014). This process is largely creative (Wynn & Williams, 2012) and can be viewed or compared to Weick's thought trials. Thought trials are a highly variable theorizing process that produces a wide array of possible conjectures (Weick, 1989). The more extensive the range of conjectures, the better, especially when crossing more than one theoretical paradigm.

Use of multiple methods. The use of multiple methods and triangulation is often used to control for various influences, perceptual limitations, and biases, which may impact research findings (Yin, 2014). The need for multiple methods and triangulation is further impacted by the recognition within CR that structures can take many forms (e.g., social, physical) and as such, required different tools to develop knowledge about them and their respective properties (Mingers et al., 2013; Wynn & Williams, 2012). When combining quantitative and qualitative methods, it should be noted that quantitative methods play a different role in the critical realist perspective than in other perspectives (e.g., positivism) (Mingers, 2004c). Many of the underlying assumptions and principles of statistical analysis would seem incompatible or unlikely within a CR perspective. Statistical analysis assumes a closed system, makes distributional assumptions for the data and often assumes independence; all concepts which do not fit with CR's assumption of the world being an open system. However, this does not reject the use of quantitative

analysis, but rather as per Mingers, requires a "re-thinking of the purpose of such analysis" (p. 98). Instead, statistical analysis is an exploratory technique for data detection, suggesting possible structures, or even corroborating possible explanations.

Criticisms of Critical Realism

Since the introduction of CR as a research philosophy for the social sciences, it has garnered attention in fields such as economics (e.g., Lawson, 1997, 2003) and more recently, MIS (e.g., Mingers, 2004b; Smith, 2006). Both Mingers and Smith see CR as an opportunity to leverage the strength of each of the dominant paradigms (i.e., positivism, interpretivism) while overcoming their respective challenges. At the same time, there have also been relatively few critiques of CR. Mingers (2004c) suggests that the low number of critiques is likely due to Bhaskar's "disengagement from the philosophical establishment" (p. 388). Despite this, it is important to address some of the key criticisms that exist. It is worthwhile to note that despite their criticisms of CR, many of the critics do see value in CR as an underlying philosophy for organizational studies (e.g., Chalmers, 1988; Klein, 2004).

Criticisms with the ontology of CR. Two main criticisms with the ontology of CR exist, the dislocation between the natural and social sciences and the limited ontological differences between CR and interpretivism. An exploration of each ontological criticism now follows.

The dislocation between the natural and social sciences. Bhaskar initially developed CR in relation to the natural sciences (Collier, 1994) yet suggested that it could also be applied to the social sciences, as a sort of "critical naturalism in social science" (Mingers, 2004b, p. 91). This statement suggests to many that there are similarities in the ways one would research the natural and social worlds and as such, one single universal method could be applied to both worlds (Graca Moura & Martins, 2008; Mingers, 2004b; Monod, 2004). A statement such as this can be problematic for one of two reasons: either it is just as "extreme" as positivism (Monod, 2004) ignoring the differences between the social and natural worlds, or, it ignores the fact that the differences between the natural and social world are far too significant for a single approach to be appropriate (Mingers, 2004b).

CR recognizes that there are significant differences between the natural and social worlds directly through its stratified ontology. This stratified domain allows for the recognition of both an unknown independent world and a socially constructed observed world. This stratified ontology is what separates CR's general approach from an argument of a "methodological universalism" (Monod, 2004, p. 115) versus a claim of ontological dualism. This is further exemplified through CR's endorsement of methodological pluralism, recognizing that different tools (e.g., hermeneutic, interpretive, quantitative) are equally important and should be used when appropriate.

The ontological differences between CR and interpretivism. Some scholars have questioned whether ontologically there is any difference between critical realism and interpretivism (Klein, 2004). In the absence of any ontological difference, these scholars question the value of CR, suggesting that it can never be as rich or reflective in theory building as traditional interpretivism. Klein argues that while both interpretivism and CR recognize that the actors' world is always a subset of the entire world, CR is deficient in this means by relying on imperfect presuppositions. Klein makes the comparison of CR's contextual and theoretical pre-understandings to Klein and Myers (1999) principles of contextualization, which requires critical reflection of the research setting, and abstraction and generalization, which requires relating idiographic details to theoretical concepts. It is felt that CR ignores both contextual and theoretical pre-understandings. Further, Klein questions CR's ability to fully recognize how the interaction between the researcher and subjects and influence the data.

Interestingly, Klein evaluates CR against a set of principles developed for conducting and evaluating interpretivist fieldwork. The ontology and epistemology of a particular paradigm are what typically guides the development of a set of methodological principles. Therefore, they are specific to that paradigm and inappropriate to use to evaluate the ontology or epistemology of another competing perspective. The lack of fit with one perspective to the principles of another perspective is not evidence of superior ontologies, but rather, different ontologies. Additionally, while Klein and Myers (1999) have provided a handy

and thought out set of principles for conducting interpretivist researcher, there is no guarantee that all research in this paradigm is conducted with these principles in mind. Therefore, they cannot be evidence of a richer, or superior, ontology.

While there are many similarities between CR and interpretivism, there are some significant differences, especially within the ontological realm. Some versions of interpretivism[6] maintain that the social world is entirely comprised of individual consciousness (Mingers, 2004a). This is a significantly different view than CR, which recognizes the reality of an independent world that exists separate from the consciousness of actors (i.e., the real). Within Bhaskar's stratified ontology, all components (i.e., mechanisms, events, experiences) can exist within the domain of the real, independent of the actor's observed domain of the empirical. This again highlights that despite the similarities, interpretivism and CR have entirely different ontologies.

Criticisms with the epistemology of CR. There are few critical critiques of the epistemology of CR worth exploring: (a) the issue of observer dependence or objectivity; (b) CR's position on prediction, or event regularities; (c) the transcendentalist argument of CR; (d) the lack of guidance in CR on dealing with the double hermeneutic; and (e) the nature of truth in CR. Each of these epistemological criticisms is now explored.

Objectivity. CR claims that there is a natural world that is independent of human knowledge (i.e., the domain of the real). At the same time, CR

acknowledges observer and subject dependence in the gathering of knowledge. This duality may strike some, e.g., Monod (2004), as a contradiction as it implies that CR is both objective and subjective – two incompatible ideas. This type of argument, or criticism, would be what Bhaskar (2008a/1975) referred to as the epistemic fallacy. This is a product of using epistemological statements (e.g., acknowledgement of the subjectivity of knowledge) to analyze ontological statements (e.g., the existence of a stratified domain). These critiques fail to differentiate between CR's ontology and epistemology, which in combination allow for the existence of both a transitive and intransitive domain.

Prediction. CR views the world as an open system (Bygstad & Munkvold, 2011; Mingers et al., 2013; Wynn & Williams, 2012) with permeable boundaries. Even when a mechanism has previously produced an event, there is no guarantee that the same event will occur again. Tendencies may even trigger another mechanism which results in an interaction with the primary mechanism resulting in a completely different event (Volkoff & Strong, 2013). It is for these reasons that CR seeks explanation rather than prediction (Mingers, 2004c; Wynn & Williams, 2012). Many scholars question the value of a paradigm that recognizes that, at least on the surface, prediction is not entirely possible (Backhouse, 1998; Blaug, 2003).

While the concept of causation in a Humean or Kantian sense may be absent in CR, it does accept the existence of demi-regularities. The existence of a

strict event regularity is extremely rare (Graca Moura & Martins, 2008) which leads to question if postulating such statements is even of any use to science. Instead, focusing on demi-regularities allows for much more thorough hypotheses about causal factors and underlying tendencies that lead to phenomena of interest. It is through these concepts that CR is a useful tool at developing middle-range theory (Dobson, Jackson, & Gengartharen, 2013; Henfridsson & Bygstad, 2013; Williams & Karahanna, 2013) which can be considered a form of generalization, or more specifically, a prediction.

The transcendentalist argument. A transcendentalist argument is described as an argument which asks 'what must be true in order for a phenomenon to have occurred?' where the phenomenon is usually an agreed social occurrence (Collier, 1994; Mingers, 2004b). These types of arguments have been used by many philosophers such as Kant and Sartre (Collier, 1994), and it is generally accepted that Kant coined the term in his work "Critique of Pure Reason". Kant asked how a priori synthetic judgements are possible (Kant, 1899). Bhaskar also uses a transcendentalist argument to claim an independent and stratified ontological domain.

While there are some connections between Kant and CR, in particular, the transcendentalist argument, Bhaskar does not use the term in the same manner as Kant (Collier, 1994; Mingers, 2004a). Kant takes it for granted that we experience the world in the same way and therefore, states that there is a fixed set of a priori

categories to make this possible. This fails to recognize individual thinking. Bhaskar, on the other hand, focuses on experiences which are generally accepted and seeks the necessary conditions to make them possible, resulting in a much broader question or transcendentalist argument (Archer, 1998; Mingers, 2004a). Collier (1994) further notes three additional differences between Kant and Bhaskar's arguments: (a) while Kant's arguments are focused on science (i.e., the science of the time), Bhaskar does not view science as the only form of knowledge; (b) Kant focuses on the mind of the actor imposing structure on the world whereas Bhaskar seeks to understand what the world must be; and (c) Kant presupposes a timeliness on his theory of the world, that is absent in Bhaskar's arguments.

The double hermeneutic. The double hermeneutic is an integral part of social sciences. Coined by Anthony Giddens (1987), the double hermeneutic recognizes the two-way relationship between actors and their environment. Unlike in the natural sciences, social science researchers interpret a world that has already been interpreted by its inhabitants. Therefore, the empirical domain can only be understood by also recognizing the meanings and interpretations of the actors within the empirical domain (Klein, 2004). While this is easy to accomplish with an interpretivist lens, it is less clear how to deal with it within a CR lens.

While guidance on how to deal with the double hermeneutic may be weak, Bhaskar fully accepts that a hermeneutic phase of inquiry is necessary for any form of research:

> *I want to argue that a hermeneutical circle (C1) is a condition of any act of enquiry, whether in natural or social science and that another (C2) is a condition of any dialogue or intersubjective communication at all. In these senses hermeneutics is indeed, as for example Gadamer has claimed, universal.* (Bhaskar, 2014/1979, p. 153)

The acceptance of the double hermeneutic is evident and manifested through Wynn and Williams (2012) methodological principle of triangulation and multi-method approach. This principle recognizes that different views of the world require different tools, perspectives, and techniques to understand.

The nature of truth. Within CR research, truth becomes of the utmost importance since findings can be neither proven nor unproven. Bhaskar (2010a/1994) recognized four different dimensions of truth: (a) normative-fiduciary - truth from what is believed to be a trustworthy source; (b) adequating - truth based on evidence and justification; (c) referential-expressive - truth which is adequate to an intransitive object of knowledge; and (d) ontological/alethic - the truth of things unto themselves. This can result in some questioning as to which truth should be used for judging between competing explanations (Mingers, 2004b).

It is through the principles of abstraction and retroduction that the researcher develops their truth. The explanatory power guides the choice of the

explanatory mechanism. The chosen explanatory mechanism is, therefore, recognized as being the best explanation under the current understanding of the world (Wynn & Williams, 2012). At the same time, due to the open system perspective, while thought-objects are ontologically real, they are distinct from the entities and as such, always subject to revision or reinterpretation.

Other criticisms. Concerns exist about CR's claim of being "critical" and as such, claiming to bring about change in society (Mingers, 2004b). These concerns are exemplified through Klein's (2004) critique of the ambivalence with CR towards social norms and values. Recognizing that Bhaskar (2010/1989) wrote about freedom and emancipation, Klein notes that the presentation of CR by academics such as Mingers, or Ackroyd and Fleetwood is devoid of the mention of consideration of either norms or values. This perhaps indicated a lack of concern within the overall philosophy for these values and that perhaps CR lacks the humanness of social research. Klein further notes that CR fails to distinguish between cultural and political values and is absent from the consideration of norms.

While it is recognized that the earlier works of CR were absent of these considerations, CR has since evolved and now recognize their role through the explanatory critique, one of the "central planks of CR" (Mingers, 2004a, p. 151). Bhaskar introduced the explanatory critique through his account of fact-value

relations (2014/1979) as well as his account of how theory can affect practice (2009/1987).

In essence, the explanatory critique occurs when a social researcher discovers a reason for a phenomenon that does not match the popular societal view. By being at odds with the beliefs of society, the researcher is effectively criticizing society. At the same time, the new information brought to light by the research, emancipates society from the previously held incorrect assumptions and beliefs. Collier (1994) exemplifies the explanatory critique through the example of unemployment in Britain during the 1980s. At the time, the popular belief was that high unemployment was a product of "the fecklessness of the unemployed" (p. 171). This belief was at odds with the real reasons (e.g., world markets, government policies) and as such, the real reasons were at odds with the popular belief. This necessarily dictates that social research criticized the subjects of its research (i.e., society). It is through the explanation of the real reasons that the popular societal belief will naturally evolve. Given that "it is better to believe in what is true than what is false" (Collier, 1994, p. 172), the explanatory critique is emancipatory. This naturally suggests and exemplifies a concern for human values through research.

While the recent interest in CR as an underpinning philosophy for MIS studies has not led to many studies with a critical focus, or focus on emancipation, this does not preclude future studies from using the explanatory critique. Nor is

this evidence of the lack of CR's ability to bring about change. Klein's (2004) arguments should be viewed as criticisms of the research conducted to date rather than of the philosophy itself.

The Alignment of CR to the Research

The underlying meta-theory for a research project should be aligned to the underlying research questions and goals of the research. For example, if the purpose of the research were to test a hypothesis in order to generalize or predict future behaviour, a positivist approach would be most appropriate. In this case, the goal of the research was not to predict, but rather to understand how certain events have come to be. The research also deals with an interaction between physical IT artifacts (e.g., data, AISs) and social constructs (e.g., pre-established trading currencies, the audience marketplace). The underlying metatheory must, therefore, allow for understanding while at the same time recognizing the existence of both the physical and social world. These are all possible within the framework of CR.

CR offers an alternative to other paradigms (e.g., positivism, interpretivism) and provides both an ontology and epistemology well suited to address the research questions. CR allows for IS research to be realist, applied, and flexible enough to address both the social and natural aspects of the field (Mingers, 2004c). Its realist view allows for the existence of an independent world while at the same time recognizing the importance and validity of the

perception of the various actors (Mingers et al., 2013) – an important feature to support the research. The audience marketplace consists of many interactions between actors and organizations. It is based upon a social system which has determined a sophisticated measurement system and currency. Within the marketplace, subjectivity, forecasting, and perception all play a role. At the same time, the audience product is a complex construct that exists independently of the market and therefore, the world of the actors. Napoli's (2003) typology of the audience product clearly illustrates this stratification between an independent and perceived reality – the actual audience existing in the domain of the real and the measured audience existing in the domain of the empirical.

Two Additional Theories to Guide the Methodological Approach

While CR sets the underlying metatheory that guided the research, two additional theories were used to help guide the overall research method, namely Volkoff and Strong's (2013) approach of viewing affordances as a special type of mechanism and Hedstom and Swedberg's (1998) typology of social mechanisms. These are now reviewed in turn.

Affordance theory and affordances as a special type of mechanisms. An affordance is the possible opportunity furnished by an object to an actor. Gibson (2015/1979) defined an affordance as what is offered to an actor (animal or person) by the environment be it positive or negative. An affordance can, therefore, be seen as an opportunity. These opportunities are a property of the

relationship between the object and the actor rather than a distinct property of the object (Gibson, 2015/1979; Norman, 1988; Volkoff & Strong, 2013). A single object may, therefore, provide very different and distinct affordances to different actors. For example, a log in a forest may provide an opportunity for a burrow to a small animal, but the opportunity to sit and rest to a hiker.

Norman (1988) adapted the concept of an affordance to the interactions that occur between actors and technology. Within this framework, the affordance fills the role of one of the three dimensions of how an actor understands how to operate a technological device. Norman (1999) later recognized that there are two distinct types of affordances within this context – real affordances and perceived affordances. The real affordances are those physically enabled to the actor; however, they are of little value if the actor does not perceive them. For example, while Google Scholar may allow an individual to refine search topics to academic literature unless the actor leading to its use perceives them, it will provide little value. Therefore, it is perceived affordances that lead to how an actor will interact with a technological artifact. It is important to note that these (perceived) affordances are not always actualized, therefore can be viewed as "entities with the potential for behaviours associated with achieving an immediate concrete outcome and arising from the relation between an object (e.g., an IT artifact) and a goal-oriented actor or actors" (Volkoff & Strong, 2013, p. 823). Since Norman's articles, the role of affordances within the context of technology continues to be a topic of interest within the literature (e.g., Kane, Bijan, Majchrzak, & Faraj, 2001;

Markus & Silver, 2008; Zammuto, Griffith, Majchrzak, Dougherty, & Faraj, 2007).

Due to similarities between affordances and mechanisms, the concept of an affordance offers benefits to the CR researcher (Volkoff & Strong, 2013). Volkoff and Strong identify the immediate similarity between an affordance and a mechanism through Hedstrom and Ylikoski's (2010) first characteristic of a mechanism where a mechanism is a means of generating an outcome and is therefore identified by the potential outcome. Like mechanisms, affordances exist independently of whether or not they are exercised. There are, however, slight differences where an affordance arises between a structure and a goal-oriented actor, but a mechanism can arise from a structure alone. The affordance requires the actor to be triggered, whereas this is not the case with all mechanisms. Volkoff and Strong, therefore, view an affordance as a special type, or subset, or mechanisms.

What makes the subset of affordances different than other types of mechanisms is the required structure-actor relationship (Volkoff & Strong, 2013). An affordance requires both a structure and a goal-oriented actor seeking to actualize the affordance. This means that a structure may provide different affordances to different actors, thereby yielding multiple affordances. In the case of these special mechanisms, an actor may be a single individual or a group of actors (e.g., an organization, a department). By viewing affordances and

mechanisms within this framework and focusing research on affordances allows a much deeper understanding of structure-actor relationships since "both the associated goal and the act of actualizing an affordance are tied to an actor, [and therefore] a resulting event or outcome in the *actual* domain is necessarily specific to the actor" (p. 822). This view of mechanisms is particularly useful for studying AISs and RPD since it recognizes the interaction between the systems or data (i.e., structure) and the end-user of the AIS (i.e., actor).

The macro-micro-macro typology of social mechanisms. Due to the complexity of mechanisms and the way that they interact, Hedstrom and Swedberg (1998) developed a typology of social mechanism building upon the work of Coleman (1986). This typology recognizes that social mechanisms are interactions between the actors within a microenvironment and their interaction with the macroenvironment. Three types of mechanisms are presented (Figure 8): (a) situational mechanisms; (b) action-formation mechanisms; and (c) transformational mechanisms.

This typology recognizes that, while the macro environment influences the actors within the microenvironment, the actors can then, in turn, modify the macroenvironment (Hedstrom & Swedberg, 1998). The first stage is what Hedstrom and Swedberg refer to as situational mechanisms. In these mechanisms, and actor or actors are exposed to a specific situation from the macroenvironment, thereby influencing their behaviour. The authors provide the example of belief-

formation, opportunity-generation, and preference-formation mechanisms as prototypical examples of these Type 1 mechanisms. The influence then works within the microenvironment, resulting in a specific form of action due to the new desires, beliefs, or opportunity of the actors. This second stage is referred to as the action-formation mechanism. In the final stage, the collective action of many actors ultimately influences and transforms the macroenvironment. The examples of tipping models and standard game-theoretic models are provided.

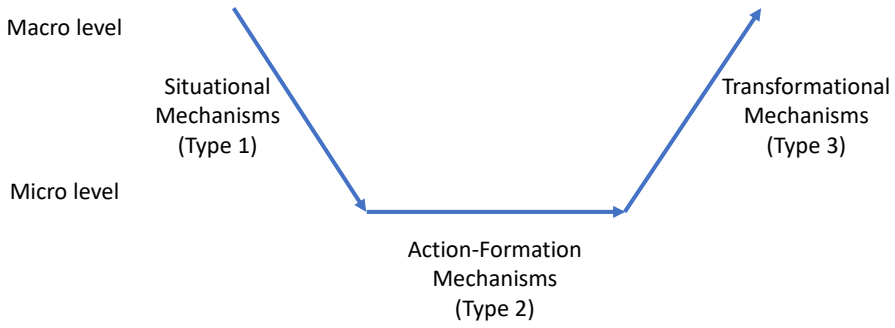

Figure 8. Hedstom and Swedberg's (1998) typology of social mechanisms. Adapted from Social Mechanisms: An Introductory Essay by P. Hedstrom and R. Swedberg, in P. Hedstrom and R. Swedberg (Eds.), *Social Mechanisms: An Analytical Approach to Social Theory* (p. 22), 1998, Cambridge, UK: Cambridge University Press. Copyright 1998 by Cambridge University Press.

Within the audience marketplace, there is a complex interaction between the macroenvironment and microenvironment. The macroenvironment consists of the industry as a whole where particular practices and processes can impact the microenvironment consisting of the various marketplace organizations. These organizations can, therefore, experience influences from the marketplace resulting in new actions. These actions can then subsequently transform the industry. This typology can also be used within the organization, merely by placing the

organization at the macro level and its employees at the micro level. This typology can, therefore, provide a useful means of classifying the various mechanisms at play within the research project.

Chapter 6. The Canadian Television Industry

The purpose of this research project was to study the innovation of audience information systems (AISs) occurring in the Canadian television broadcast and distribution industry – a $16 billion annual industry (CRTC, 2017). This chapter describes the industry allowing for an understanding of the studied organizations and the environment in which they operate. The high-level overview serves two key reasons. Firstly, due to the number of organizations within the industry, a more traditional review of the research sites would compromise the confidentiality of the studied organizations. Secondly, many other factors within the industry impact the way that television broadcasters conduct business and make decisions. These factors include the large broadcast distribution undertakings (BDU) which operate in the industry as well as Canadian government regulators such as the Canadian Radio-Television Telecommunications Commission (CTRC).

This chapter consists of four sections. The first section is an overview of the Canadian broadcast industry – the industry in which television broadcasters operate. Due to the geographical proximity and overlap in media consumption, this will also include a brief comparison between the Canadian and United States of America (US) industries. The second section focuses on the Big Five – the five largest broadcast organizations in Canada. A review of the measurement

arrangement for television in Canada then follows. The final section then provides an overview of the CTRC and the role it plays within the industry.

The Canadian Broadcast Industry

The CRTC, a regulatory agency of the Government of Canada, regulates the Canadian audience marketplace setting and enforcing rules. The media organizations within the Canadian media landscape also contain a national public radio and television broadcaster, the Canadian Broadcasting Corporation (CBC), as well as some provincial public television (e.g., TVOntario, Télé-Québec) and radio (e.g., CKUA, Knowledge) broadcasters.

In recent years, the Canadian media industry has experienced a great deal of consolidation, both in terms of media broadcasters merging or consolidating (e.g., Bell Media's 2013 acquisition of Astral Media, Corus Entertainment's 2016 acquisition of Shaw Media) and in terms of BDUs purchasing Media Broadcasters (e.g., Shaw Communications' purchase of Canwest Global in 2010). Today, despite there being 76 ownership groups operating television services, the top five groups account for 81% of the total Canadian broadcasting revenue (CRTC, 2018c). As of April 2019, these five groups consisted of Bell Canada Enterprises Inc. (BCE), Shaw Communications Inc. (Shaw), Rogers Communications Inc. (Rogers), CBC, and Quebecor Inc. (Quebecor). While another large company exists, Corus Entertainment Inc. (Corus), due to its ownership and control structures[7], the CRTC considers Corus to be part of Shaw. On January 13th, 2016,

Shaw sold the Shaw Media unit to Corus (Bradshaw, 2016), effectively removing any television or radio ownership from Shaw and consolidating all media assets under Corus.

The Big Five

In 2017, the top 5 media ownership groups in Canada – BCE, Shaw, CBC, Rogers, and Quebecor – represented 81% ($14.0 billion) of the total broadcasting revenue (CRTC, 2018c). This distribution suggests a significant concentration of revenues in a limited number of organizations. The CRTC defines four sectors that comprise the Canadian broadcasting industry: (a) radio; (b) conventional television; (c) discretionary and on-demand television; and (d) BDUs, which include cable, direct-to-home satellite (DTH) and internet protocol television (IPTV) providers. All of the big five operate in several sectors – three of which operate in all four sectors. These three organizations represent 65% of the total broadcasting revenue. By comparison, the 173 ownership groups that operate in only one of the four sectors represent 5% of the total broadcasting revenue.

As of April 2019, all of the big five owned a mix of broadcast operations, with Bell, Shaw, and Rogers operating in all four sectors and Quebecor and CBC operating in three sectors (Table 6). These organizations also own eight of Canada's 12 conventional television networks (Table 7). Of those big five with BDU operation, Quebecor acquired its first television operations before its BDU

operations, whereas Bell, Shaw, and Corus were operating in the BDU sector before acquiring television assets. CBC does not have any BDU assets.

Table 6

Broadcast sectors in which the big five operate

Organization	Radio	Conventional television	Discretionary and on-demand television	BDU
Bell	✓	✓	✓	✓
Shaw / Corus	✓	✓	✓	✓
Rogers	✓	✓	✓	✓
CBC	✓	✓	✓	
Quebecor		✓	✓	✓

Table 7

Canadian conventional television networks owned by the big five

Bell	Corus	Rogers	CBC	Quebecor
CTV	Global	City	CBC Television	TVA
CTV Two		Omni Television	Ici Radio-Canada Télé	

In 2017 Canadian BDU operations earned $8.0 billion in revenue whereas television, excluding internet-based video services, earned $6.9 billion in revenue (Canadian Radio-television and Telecommunications Commission [CRTC], 2018d, 2018b). The top six groups accounted for 94% ($7.5 billion) of revenues, with 96% of BDU subscribers subscribing to the services of the top five groups (CRTC, 2018b). Similarly, in the television sector, the top five groups represented 89% ($6.1 billion) of the total television revenues (CRTC, 2018d).

More detailed information was published by the CRTC (2017) for 2016 showing that the “big five” represented 89% ($6.5 billion) of television revenues

and 83% of BDU subscribers. Of the five, BCE has the largest share of television revenues (32% of total) and the largest share of BDU subscribers (26% of total). Assuming that the share of subscribers approximates the share of total revenues, BDU operations for the big five represent 11% more revenue than their respective media operations. This revenue structure could have implications for the decision-making processes within these organizations.

The source of television service revenues has been changing over time. Despite total revenues being relatively stable, the proportion of revenues coming from advertising has been decreasing while the proportion of revenues coming from subscriptions has been increasing (Table 8). Advertising used to be the primary means of television revenue; subscription, or distribution, is now becoming equally as important. This shift could have implications in this sector and may result in new business models or organizational priorities and strategies.

Lastly, it is important to note that due to the high degree of consolidation and vertical integration in Canada, many broadcasters are also content producers (Quail, 2015b). This consolidation presents a unique environment where an organization – like BCE or Rogers – produces, broadcasts, and delivers media content.

Table 8

Breakdown of television service revenues

Year	Revenue ($ millions)			Proportion of Total Revenue	
	Total[8]	Advertising	Subscriber	Advertising	Subscriber
2013	5,652	2,927	2,725	51.8%	48.2%
2014	5,675	2,768	2,907	48.8%	51.2%
2015	5,703	2,743	2,960	48.1%	51.9%
2016	5,762	2,787	2,975	48.4%	51.6%
2017	5,649	2,709	2,940	48.0%	52.0%

Note. Sourced from *Communications Monitoring Report: Television Sector*, by CRTC, 2018d, Ottawa, ON: CRTC.

The Canadian Television Measurement Arrangement

Unlike some countries, like the US, where a private company such as Nielsen Media, Kantar Media or GfK conducts audience measurement activities, a Joint Industry Council (JIC), known as Numeris, conducts radio and television audience measurement in Canada. Numeris operates as a not-for-profit, member-owned tripartite industry organization – owned by radio and television broadcasters, agencies and advertisers – and produces the media currency for both the Canadian television and radio industries. The Canadian Association of Broadcasters, the Association of Canadian Advertisers, and the Canadian Association of Advertising Agencies formed Numeris – then known as the Bureau of Broadcast Measurement – on May 11th, 1944. Initially, the role of Numeris was to provide unbiased audience measurement of radio in Canada (Canadian Communications Foundation [CCF], n.d.). Numeris began measuring television audiences in 1952.

The sole source of audience estimates were initially cross-sectional diary surveys until 1998 when the Bureau of Broadcast Measurement launched its first electronic measurement panel in Vancouver using picture-matching technology (PMT) licensed from Taylor Nelson Sofres plc. (Pellegrini & Purdye, 2002). The PMT service was a giant step forward for television audience measurement since audience data was now available daily, more accurately reflecting the ongoing content preferences of the Canadian population. This system competed alongside another electronic audience measurement system run by Nielsen Media Canada.

Following participation in initial technical tests of an electronic passive measurement device, the personal people meter (PPM), licensed from The Arbitron Company (now Nielsen Audio), Numeris – then operating as BBM Canada – began to install a PPM panel in the Quebec Franco market in 2003 (Pellegrini & Purdye, 2004). This new measurement system was considered advantageous for many reasons including lower panelist fatigue, the ability to measure both radio and television audiences as well as much more cost-effective audience measurement.

After competing in electronic television audience measurement, Nielsen Media Canada, and BBM Canada (Numeris) announced a joint venture (JV) in 2004 (Nielsen Media Research, 2004). This new service dismantled the remaining PMT system in favour of the Nielsen Mark II people meter in Toronto, Vancouver, Calgary, Ontario Regional and National but continued to use the PPM

panel in Quebec Franco. This arrangement did not last long as the Nielsen people meters were approaching their end of life, and as such, in 2009 BBM Canada (Numeris) launched the PPM system nationally as a national television and radio electronic measurement solution (BBM Canada, 2009). This system continues to be the primary source for Canadian audience estimates and AISs. Since that time, additional measurement panels have been built in Edmonton and Anglophone Montreal. In 2014, BBM Canada rebranded as Numeris.

The CRTC

The CRTC is an administrative tribunal that regulates the Canadian broadcasting and telecommunications industry operating under a mandate of the Parliament of Canada and administered through the Minister of Canadian Heritage (Canadian Radio-television Telecommunications Commission [CRTC], 2018a). The primary activities of the CRTC include licensing, promotion compliance with regulations, making ownership decisions, approving tariffs, encouraging competition, and providing information. In many ways, the CRTC is similar to the US Federal Communications Commission except it lacks some of the powers the FCC has which instead fall under the purview of the Canadian Department of Industry (e.g., assigning frequencies and call signs).

Many of the CRTC's policies and regulations have a profound effect on both programming and purchasing decisions made by Canadian broadcasters (e.g., Canadian content rules) or the flow of advertising revenue within the audience

marketplace (e.g., simultaneous substitution rules). The CRTC's policies are not stagnant and do change (Quail, 2015a). The most recent reviews were Let's Talk TV: A Conversation with Canadians (Canadian Radio-television Telecommunications Commission [CRTC], 2018f) and Harnessing Change: The Future of Programming Distribution in Canada (Canadian Radio-television and Telecommunications Commission [CRTC], 2018e). While Harnessing Change did not set out to prescribe policy, Let's Talk TV had many impacts on licensing and distribution policy in Canada.

Canadian content rules. In order to protect Canadian programming against often more popular American programming, the CRTC has issued Canadian content rules, often referred to as CanCon rules (Quail, 2015a). The original rules required that 60% of annual programming and 50% of primetime programming must be Canadian (Edwardson, 2009), however, the amount of required Canadian programming was lowered to 55% annually in 2011 (Canadian Radio-television and Telecommunications Commission [CRTC], 2011a). According to Quail, a program is considered to be Canadian based on an evaluation of its financing, production, producer, talent and crew, among other items. Successful evaluation on these criteria satisfy the CRTC's rules and may also yield certain tax incentives. The CRTC continues to review and rewrite the Canadian content rules (Bradshaw, 2015).

Rules like the Canadian content rules have a profound impact on programming decisions. By broadcasters taking advantage of loopholes in the policy, the Canadian content rules have partially led to the proliferation of formatted programming in Canada (Quail, 2015a). Quail (2015b) defines formats "program concepts, created by a production team for the purpose of licensing internationally to national production firms – are standardized television shows with multiple international iterations" (p. 186). Examples of format programming are the So You Think You Can Dance format, with So You Think You Can Dance Canada, and the America's Got Talent format, with Canada's Got Talent. The usage of these types of program to meet Canadian content rules is ironic since Quail argues that while these rules are set to support local production, format programming often disproportionately benefit the larger international format and its foreign holders. At the same time, Quail suggests that this type of programming can also bring about "problematic cultural discourses" (2015a, p. 473).

Simultaneous substitution rules. The CRTC has implemented simultaneous substitution rules to: (a) protect the rights of Canadian broadcasters, who have paid for broadcasting rights of particular programs; (b) promote local broadcasting, by increasing the available revenue for local broadcasters; and (c) to keep advertising dollars in Canada (Canadian Radio-television Telecommunications Commission [CTRC], 2015b). Simultaneous substitution rules state that when a program is being aired within the same market by two

different stations, one being local and the other being non-local, BDUs are required to replace the entire signal of the non-local channel with that of the local channel. Typically, the non-local station is a US station; however, on occasion, it can be a Canadian signal from another market (i.e., distant signal). An example would be a program airing at the same time on a US station and a Canadian station. The BDU would replace the US feed with the Canadian feed meaning that the Canadian commercials will over-ride the US commercials.

This rule has a significant impact on how Canadian broadcasters program their stations. When scheduling programming purchased from American networks, Canadian broadcasters need to decide whether to run the program at the same or different time as when the program airs on the American broadcast station. If the program airs at the same time – due to the simultaneous substitution rule – the Canadian broadcaster can increase advertising revenue by containing all of the audiences regardless of dial position. This decision, however, comes at the expense of flexibility in scheduling or programs and can – in the case when purchased programs are airing at the same in the US – result in less than optimal program scheduling. These complications were one of the reasons that led to BCE creating the CTV Two network in 2011 – to allow for more flexibility in the scheduling by eliminating the need to run one program out of simulcast when two purchased programs were scheduled simulaneously.

Let's Talk TV report. The CTRC is currently undergoing another review of their policy framework. A key component of this review was the Let's Talk TV proceeding that the CRTC held in 2014. This report led to major broadcast policy changes, thereby resulting in significant impacts or future impacts, to the Canadian audience marketplace. Some of the critical decisions included: (a) a significant reduction of the overall Canadian content quotas for broadcast television; (b) the prohibition of simultaneous substitution for the Super Bowl; (c) the requirement for BDUs to offer an affordable entry-level television; and (d) the requirement that BDUs offer more Canadian, rather than non-Canadian, channels in their program line-ups.

The Let's Talk TV proceedings also resulted in the formation of an industry working group focused on the development of a new audience measurement system using set-top box data. The introduction of such a system could have a profound impact on the measurement organizations within the Canadian audience marketplace. At this time, it is unknown if this new system will replace existing currency systems or not. Taneja (2013) has studied the impact of multiple audience information systems co-existing within the same marketplace. His findings were that unless the 'second' system can differentiate itself enough from the existing system, market pressures will typically return the audience marketplace to a monopoly situation for audience measurement. However, when the 'second' system is distinct enough, it can co-exist alongside a currency system by addressing other needs.

Chapter 7. Research Methods

The aim of the research project was to develop an understanding of how television broadcasters are successfully innovating their AISs with big data. This understanding is accomplished by answering the following questions:

RQ1: How has big data led to successful innovation of AISs and the television audience product?

RQ2: What is the sequence of events or causal mechanisms leading to the digital innovation occurring in the Canadian television industry?

These questions allow for an understanding of what the resources are – as well as the constraints – that allow for this action of digital innovation to occur. More simply put, it will help to answer *how does innovation with big data occur*?

Critical realism (CR) is compatible with a wide range of research methods (Easton, 2010). The choice of research method, therefore, is considerably related to the phenomenon of interest and the research question (Sayer, 2000). Despite the compatibility with many different methods, some argue that case studies are the primary design for realist based research (Ackroyd & Karlsson, 2014). The ability of case study research to illustrate causal sequences and the context in which they occur aligns with one of the critical epistemological goals of CR and therefore makes it suitable for this type of research. While generative mechanisms reside in the domain of the real, the effects of the mechanisms are accessible in

the domain of the empirical. A case study approach allows for the identification of the events and outcomes, which exist in the domain of the empirical. These can then be used as evidence of higher-level mechanisms which operate in the domain of the real allowing for the development of the sought knowledge. The suitability of case study research is demonstrated through the methodological papers by Bygstad (2010), Bygstad and Munkvold (2011), Henfridsson and Bygstad (2013), and Bygstad et al. (2016). Case studies have also been demonstrated as a useful tool in the specific study of audience information systems (AISs) within a CR lens by Aaltonen (2011) as well as Aaltonen and Tempini (2014).

Ackroyd and Karlsson (2014) identify eight research designs relevant to realist-informed, such as critical realist, research (Table 9). The research strategy and procedure should guide the choice of design. Two of the eight key research designs are case study methods: case study designs – what Yin (2014) defines as single case designs – and comparative case analysis – what Yin defines as multiple case designs. The research strategy – a continuum between intensive and extensive – aids in the selection of the most appropriate approach. Studies which take the context as a given should use case studies, whereas studies which wish to explore the interaction between the mechanisms and their context lead to comparative case analysis.

Table 9

Eight research designs relevant to realist-informed research

	Distinctive Research Strategies			
	Intensive ←→ Extensive			
	What is the mechanism?	How do context and mechanism:		What is the context?
		typically interact?	historically intersect?	
Research Procedures:				
Detached study	Case studies	Comparative case analysis	Generative institutional analysis	Research surveys and census data
Engaged study	Action research	Intensive realist evaluation	Barefoot historical research	Extensive realist evaluation

Note: Adapted from "Critical Realism, Research Techniques, and Research Designs," by S. Ackroyd and J. Karlsson, in P. Edwards, J. O'Mahoney and S. Vincent (Eds.), *Studying Organizations Using Critical Realism: A Practical Guide* (p. 27), 2014, Oxford, UK: Oxford University Press. Copyright 2014 by Oxford University Press.

Case Studies vs. Comparative Case Analysis

Within (critical-) realist informed research, case research can take two specific forms: single-case studies or comparative (i.e., multiple) case studies (Ackroyd & Karlsson, 2014). The choice between the two depends on the goals and strategies of the research. The researcher's view of the importance of mechanisms and their context guides the decision. A single case study takes the context as given and seeks to understand the generative mechanisms at play, whereas a comparative case study is an appropriate tool to understand the interactions between context and mechanism.

The various broadcast organizations in Canada own very different broadcast assets – each which target a different audience. Due to the difference in their audience products, these organizations have very different goals and may perceive different affordances through similar innovation with big data. This environment suggests that a multiple case study approach was thought to be the most appropriate as should differences exist, it would allow for the further exploration of the interaction between context and mechanism (Ackroyd & Karlsson, 2014).

This choice in method is further supported by Yin's (2014), albeit positivist, call for multiple-case study designs in the absence (which the proposed research lacks) of the following five single-case rationales: (a) a critical case; (b) an unusual case; (c) a common case; (d) a revelatory case; or (e) a longitudinal case.

Based on the above guidance, the initial research design was a comparative case-study. The underlying goal was to understand the interaction between context and mechanisms, or more simply put, to understand the differences and similarities between the organizations. Through the analysis, it was discovered that the organizations were all behaving very similarly. They were undertaking the same innovation processes and evolving their AISs and the resultant audience product in very similar ways. While there were slight differences in the underlying data between organizations, the cases displayed

significant similarity and very little in the way of difference. This finding resulted in the research focus shifting from seeking the interaction between context and mechanism to taking the context as given and seeking to understand the mechanisms. Therefore, while the study was designed as a comparative case study, the analysis used the data as a whole. This change, therefore, led to the analysis being conducted as a single case study as per Yin's (2014) fourth rationale for a single case design – a common case.

Holistic vs. embedded designs. A case study, whether it be a single or multiple case design, can either be based on a single (i.e., holistic) or multiple (i.e., embedded) unit(s) of analysis (Yin, 2014). A holistic design would yield a general understanding of the audience manufacturing process, whereas an embedded design would serve to understand how the manufacturing process, and thereby, mechanisms, differ within the organization. Since audience manufacturing and the resultant business strategies do not vary by department or location, a general approach to the research was initially deemed more appropriate. Therefore, the original case design was set to be holistic.

As described above, however, the case design shifted to a single case study during the analysis when little difference was seen between organizations. This change also made an embedded case study more appropriate. The initial units of analysis – the organizations – became the sub-units of analysis. By considering the design in this way, the data could be analyzed within the sub-units

independently, between the sub-units, or across the sub-units (Baxter & Jack, 2008). In this case, by analyzing the data across the sub-units, the data could provide a revelatory study better describing the digital innovation process of AISs with big data.

Case Selection

The phenomenon of interest is the innovation of audience information systems using big data that includes return path data (RPD). At the time of research, there was no central organization in Canada collecting or aggregating RPD from the various broadcast distribution undertakings (BDUs). Therefore, each BDU has unique access to their proprietary RPD data, and access to other organizations is limited. Some of these organizations are large vertically integrated (VI) media organizations where a BDU owns a television broadcaster. In these cases, the flow of proprietary data between the BDU and the broadcaster should be more straightforward. In other cases, BDUs have agreements in place with television broadcasters allowing for the sharing of data. The sharing of this data necessarily must follow the legislated frameworks for privacy and competition. More information on the industry is available in Chapter 6.

As described, the organizations with access to RPD are limited to either VI broadcasters that are subsidiaries of BDUs or broadcasters with a partnership or relationship with a BDU. While VI organizations are easy to identify, it is far more challenging due to confidentiality, to identify those non-VI broadcasters

with partnerships or relationships with BDUs. Therefore, there is a limited subset of the Canadian television broadcast industry available for study.

While many broadcasters have relationships in place with BDUs, currently, there are four VI organizations in Canada which have both broadcasting and BDU operations, specifically: Bell Canada Enterprises Inc., Cogeco Inc., Quebecor Inc., and Rogers Communications Inc. (Bradshaw, 2016; Canadian Radio-television and Telecommunications Commission [CRTC], 2014). A fifth broadcast organization has a very public relationship with a BDU; while Shaw Communications Inc. (Shaw) and Corus are separate publicly traded companies (SJR and CJR), they are both controlled by the Shaw family, and Shaw owns 39% of Corus (Bradshaw & Dobby, 2016). Before the acquisition, the now-defunct Shaw Media Inc. was heavily involved in the usage of RPD acquired through the BDU division of Shaw even having run an advertiser-sponsored initiative (Shaw Media Inc., 2014).

This research project studied three organizations that were either Vis or had a relationship with a BDU. The specific selection of the organizations was to ensure a broad range of broadcasting assets and therefore a variety of target audiences – allowing for the broadest range of possible affordances to understand the full set of mechanisms that allow for successful innovation of the audience product. There is no disclosure of the identity of specific organizations or individuals in this dissertation for confidentiality reasons. Executive level

individuals within each organization granted organizational access and approval for the research. Fieldwork occurred between March and November 2017.

Data Collection Instruments

While it is understood that in order to achieve the broadest understanding of the phenomenon possible, as well as accommodating noted limitations of individual data collection techniques (Gallivan, 1997; Yin, 2014), a variety of data collection techniques should be used. A range of data collection techniques also supports Wynn and Williams' (2012) principle of triangulation and multimethod. However, due to the highly confidential and strategic nature of the phenomenon of interest, only a limited number of data sources were available, but those available were used (Table 10). Using multiple sources of evidence also allowed for converging lines of inquiry and a broader range of issues to be addressed (Yin, 2014). All collected data were stored securely under lock and key and was password protected.

Interviews. Semi-structured interviews formed the primary means of data collection. Yin (2014) considers interviews to be "one of the most important sources of case study evidence" (p. 110). Interviews can take many forms, including prolonged case study interviews, shorter case study interviews, or survey interviews. Unlike in positivist research where it is argued that interviews need to be tightly controlled consisting of standard questions in order to minimize bias in the interviewing process, CR interviews are geared to understand context,

constraints, and resources while appreciating the interpretation of the actors (C. Smith & Elger, 2014).

Table 10

Data sources used as evidence

Source of Evidence	Description	Number of records by organization		
		A	B	C
Interviews	Primary source of data. 827.25 minutes of interview time over 19 interviews	7	6	5
Direct observation	Casual and informal observation of the 19 interactions with the study participants, captured daily in field notes	7	6	5
Press releases	Eight press releases issued by studied organizations related to data enhanced audience products	0	6	2
Chain of evidence	Case study database consisting of both the data and evidence as well as the research report	1	1	1

The development of CR interviewing methods are credited to Pawson (1996), and Pawson and Tiley (1997); however, it was the practical guidance of Smith and Elger (2014) which guided the interviewing process for the research. This form of interviewing, known as theory-driven interviewing, recognizes "the active roles of both the interviewer and the informant in addressing a range of aspects of experience and subjectivity, but draw on their 'mechanisms, contexts, and outcomes' formula to offer a stronger specification of their respective roles"

(Smith & Elger, 2014, p. 116). Interviews, therefore, focus on the theoretical framework identified by the researcher rather than the experience of the participant. The participant, therefore, is a means of confirming, refuting, or refining the theoretical framework. This process also aligns with the methodological guidance for conducting qualitative CR research provided by Fletcher (2016).

While theory-driven interviewing shifts power to the interviewer, it is essential to recognize that the interviewee still does play an active role in the interviewing process (C. Smith & Elger, 2014). The interview takes the form of a negotiation of sorts and is highly participatory. Smith and Elger recommend viewing the interview process as a "teaching-learning process" (p. 117) since this shows the interviewee how to provide the needed information. This procedure requires paying attention to explanatory passages, sectional and linking narratives, flow paths, and answer sequences, as well as repeated and checking questions (Pawson, 1996). Through the interviewing process, the researcher offers different accounts and looks for the interviewee to accept, reject, or better refine. In a sense, this becomes theory refinement as respondents are "offered a formal description of the parameters of [the researcher's] thinking followed by an opportunity to explain and clarify the thinking" (Pawson, 1996, p. 306).

There are two distinct types of interviewees: (a) practitioners – those with specific expertise and expert knowledge of policies, influences to outcomes, as

well as challenges and opportunities; and (b) subjects - those with more narrow expertise and those who policies are generally created to motivate (Pawson & Tiley, 1997). Both types of interviewees are vital as they can each bring unique aspects to the data. While practitioners can give expert insight, their expertise is usually limited to specific contexts or situations. Smith and Elger (2014) also warn that managers, as well as senior managers, should not always be assumed to be practitioners.

Through preliminary discussions with Senior Management in each of the organizations, it became apparent that the innovation and enhancement of the AISs were being managed through small cross-functional teams. There was, therefore, a small number of individuals working with these systems with respect to integrating big data. In order to maximize the depth of the research data, all of these individuals working with the data and involved in the audience manufacturing processes were invited to participate in the research. The list of potential interviewees was developed through preliminary interviews with the respective project leads. One additional interview occurred with a senior member of the innovation lab of a Canadian audience measurement organization who was familiar with the innovation occurring in the industry.

There were 22 individuals invited to participate in the research (Appendix A). Of these, five declined to participate – one was wrongly identified as a potential participant, another had recently left their organization, and a third, due

to the specific nature of their role (i.e., regulatory), did not feel that their participation could contribute to the research. The remaining two did not provide a reason for their unwillingness to participate.

Identified participants participated in a semi-structured interview guided by an interview protocol (Appendix C). The protocol was created with consideration to the various interview themes suggested by Volkoff and Strong (2013) that focus on the outcomes and affordances offered to the participants or their organizations eventually allowing for the identification of mechanisms – the underlying goal of the research.

The interview guide consisted of three sections. The first section consisted of the core questions asked to all participants. Necessary demographic information including name, role, and responsibilities within the organization, as well as the amount of experience within the media industry was captured. These questions allowed the researcher an understanding of how the participant participated in the organization and how their role might be related to the digital innovation of interest. The second section consisted of basic data questions. These questions were asked as needed or where appropriate and served as introductions to the theory-driven discussions with participants. These questions allowed for discussions around specific themes such as experiences using AISs and RPD, and what the data from these systems have enabled the team to do. In many cases,

these subsequent discussions would be expanded beyond RPD and include all of the other forms of data that were leveraged in the digital innovation process.

The final section consisted of audience manufacturing questions and was administered to those participants directly involved in that process. These questions focused on areas related to the raw level data and how it was processed into a usable form for usage within the organization. An understanding of how the end products were used, what they enabled, and how they were presented and disseminated was captured.

Themes and theories identified in earlier interviews guided subsequent interviews. For example, initial interviews suggested the innovation of interest was not enabled by RPD alone; instead, the entire big data eco-system consisting of data from various sources enabled innovation. This guided subsequent interviews to explore the affordances presented by all forms of data used in the enhancement of the existing audience information systems (AISs).

There was a total of 827 minutes of interview time conducted over 19 separate interviews (Table B1, Appendix B). Interviews were recorded and subsequently transcribed. A copy of the interview transcript was provided to each participant allowing for the correction of any errors or redaction of any portion of the transcript.

Direct observation. Direct observation can take many forms ranging from formal to casual, or even, participant-observation. The research project also relied on casual and informal observation of the interaction of the study participants throughout their interviews. In order to ensure the observation remained casual, field notes were created following each interview. These notes captured observations surrounding the interaction with the participant, notes regarding any illustrations, data, or reports shared with the researchers, and general thoughts and hypotheses that came from the dialogue. These observations allowed for more profound theoretical thought and helped guide the hypothesizing of the affordances and mechanisms of interest.

Press Releases. Press releases related to the enhancement of the audience products were obtained through the corporate communications departments or the media- or investor-relations websites of the studied organizations. There was a total of eight press releases issued by two of the three studied organizations. These press releases helped yield insight into the perceived affordances for both the broadcaster and their clients of the various audience product innovations. While press releases are public record, in order to protect the identity of the studied organizations, they were treated with the same level of care and confidentiality as other data collection instruments. Like any other form of internal documentation, it was recognized that there could be a degree of reporting bias in which the documents could be biased by the author (Yin, 2014).

Chain of evidence. Maintaining a chain of evidence allows the researcher to increase the reliability of their research by providing a means for external researchers to follow the same path by which the conclusions were reached (Yin, 2014). While the concepts of reliability and replication are often associated with the positivism, CR is fully compatible with these concepts (Tsang & Kwan, 1999). Tsang and Kwan identify six forms of replication (Table 11). The first dimension represents measurement and analysis: using the same measurement and analysis or using different measurement and/or analysis. The second dimension represents the source of the data: the same data set, a new dataset from the same population, or a dataset from a different population. Replication can bring significant credibility to the findings of the study. For the proposed research, the dimension of concern is replication based on the same data set: checking of analysis, or reanalysis of data. Reviewing the chain of evidence throughout the analysis process ensured that the same findings, or proposed mechanisms, were identified.

Table 11

Types of replication

	Same measurement and analysis	Different measurement and/or analysis
Same dataset	Checking of analysis	Reanalysis of data
Same population	Exact replication	Conceptual extension
Different population	Empirical generalization	Generalization and extension

Note. Adapted from "Replication and Theory Development in Organizational Science: A Critical Realist Perspective," by E. Tsang and K. Kwan, 1999, *Academy of Management Review,* 24(4), p. 766. Copyright 1999 by Academy of Management.

Case study database. Throughout the research process, a case study database was maintained. This database separated the case study data and evidence from the case study report. It contained field notes, interview recordings and transcriptions, press releases, and narratives. This database is considered a critical piece of the research chain of evidence.

Analysis

The research was conducted under the five methodological principles for CR studies proposed by Wynn and Williams (2012). While these principles provided an understanding of the process to conduct research, they fail to provide practical guidance (Bygstad et al., 2016); in particular, the process to identify mechanisms and how to understand their role in technology. Therefore, the analysis of data followed the method developed by Bygstad et al. (2016). Building upon Wynn and Williams' methodological principles, this analysis method uses the work of Bygstad and Munkvold (2011), and Volkoff and Strong (2013) to provide practical guidance for the identification of generative mechanisms through affordances.

CR data analysis is an intuitive process which starts through the thick description and abstraction of events (Wynn & Williams, 2012). It is through these events that the researcher can begin to identify the structures, relationships, and contexts within the case. The researcher needs to understand how the structures may change and what sort of properties may emerge using retroduction.

Retroduction is, therefore, the critical methodological principle and the primary means of analysis. Conceptualization of causal mechanisms occurs through retroduction. This means of analysis differs from the usual modes of inference used in case study research, specifically induction and deduction. Sayer (1992) defines retroduction as a "mode of inference in which events are explained by postulating (and identifying) mechanisms which are capable of producing them" (p. 107). In this process, data is used in order to attempt to hypothesize causal mechanisms; eliminating some of the competing hypotheses while supporting others. One or more mechanisms may be identified in this process.

The analysis method of Bygstad et al. (2016) connects the previous five-step process of Bygstad and Munkvold (2011) with the work of Volkoff and Strong (2013) where the concept of an affordance as a particular type of mechanism is provided as a tool to identify generative mechanisms. This guidance provides a comprehensive analysis plan that builds on Wynn and Williams (2012), Mingers et al. (2013), and Bygstad and Munkvold (2011) and conveniently aligns with the research questions that the proposed research seeks to address. Therefore, this stepwise framework served as the primary method of analysis.

Attention was given to Aaltonen and Tempini's (2014) guidance to steer retroduction reasoning when studying AISs: focusing the analysis on events that are essential for organizational survival, and assuming that the importance of

audience measurement does not vanish despite the rapid industry changes. Bygstad et al. (2016) provide a stepwise analysis framework which consists of six steps (Table 12). These steps are subsequently reviewed in detail.

Table 12

Stepwise analysis framework (Bygstad et al., 2016)

Step	Sub-step	Description
1.		Description of events and issues.
2.		Identification of key entities
3.		Theoretical re-description (abduction)
4.		Retroduction: identification of candidate affordances
	i.	Identification of immediate concrete outcomes
	ii.	Analysis of the interplay of human and technical entities
	iii.	Identification of candidate affordances
	iv.	Identification of stimulating and releasing conditions
5.		Analysis of the set of affordances and associated mechanisms
6.		Assessment of explanatory power

Note. Adapted from "Identifying Generative Mechanisms Through Affordances: A Framework for Critical Realist Data Analysis," by B. Bygstad, B. Munkvold and O. Volkoff, 2016, *Journal of Information Technology, 31*(1), p. 89. Copyright 2016 by Springer.

Given the natural break in the process, the first three steps are reviewed in Chapter 8 and the following three steps in Chapter 9. A review of these steps and the methods employed now follow.

Description of events and issues. The phenomenon of interest should be recognized not as a single event, but rather, a cluster of observations (Bygstad et

al., 2016). Once identified, these observations are explained with a level of depth of explanation driven by the phenomenon of interest. This recognizes that some observations may require a deeper explanation to understand than others. Through coding, analysis of the data and abduction, the researcher was able to identify key events that were likely precursors to the phenomena of interest. These key events were environmental situations, which either allowed or encouraged the innovation of AISs with big data. Analysis of the common themes of the events allowed for the classification of three distinct types (Table 13). Chapter 8 presents an in-depth exploration of these events.

Table 13

Typology of identified events

Type	Description
1.	Events related to the existence of electronic audience measurement
2.	Events related to the growth of the digital advertising product
3.	Events related to vertical integration within the television broadcast industry

Identification of key entities. The actors, groups of actors, and technological artifacts of the case constitute the structures with causal powers. Therefore Bygstad et al. (2016) suggest the second step of CR analysis should be the identification of the objects for each event or issue previously identified. This step can be through either a grounded approach or using existing theoretical frameworks. In the case of this research project, the underlying framework of audience economics guided this process by focusing on the audience marketplace

and the measured audience as a product. This framework allowed for a view of the events as a part of a broader economic eco-system and allowed for a focus on the interaction between the broadcasters and their clients, advertisers, and their agencies.

Theoretical re-description. Through the process of abduction, a single narrative allowing for a view of the entire case is developed (Bygstad et al., 2016). In this narrative, different theoretical perspectives and explanations are hypothesized and explored. The exploration is developed in conjunction with the underlying theoretical framework focusing on how the enhancement of the AIS was ultimately influencing the audience product and its marketplace. Careful thought is given to the impact on both the broadcasting organization and their client – the advertisers and their agencies. It is through this process that a more holistic view of the marketplace can be obtained; ultimately leading to an understanding of higher-level mechanisms that generate outcomes affecting the industry as a whole.

Retroduction: Identification of candidate affordances. In order to identify candidate affordances – with the ultimate goal of yielding insight into the causal mechanisms at play – this analysis step is broken into four sub-steps. These sub-steps align with the structure of an affordance provided by Bygstad et al. (2016) (Figure 9). This structure allows for an easier recognition of affordances by breaking the affordance into easily identifiable components (e.g., concrete

outcomes, enabling, stimulating, and releasing conditions). This process recognizes retroduction as the primary means of analysis within CR based research and aligns with the methodological principles of Wynn and Williams (2012) and builds upon the work of Volkoff and Strong (2013).

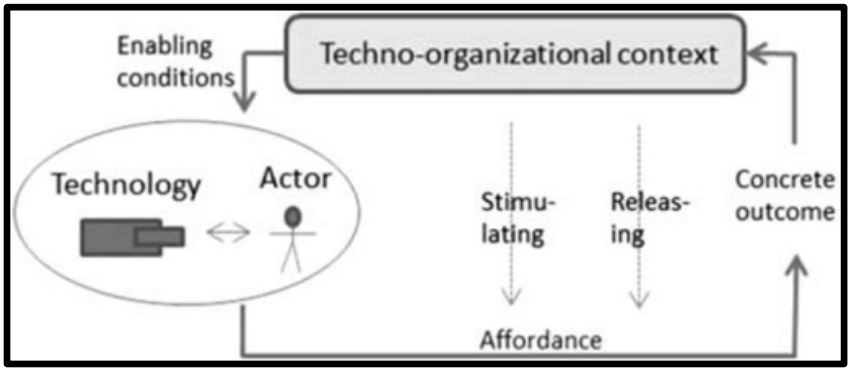

Figure 9. The structure of an affordance. Reprinted from "Identifying Generative Mechanisms Through Affordances: A Framework for Critical Realist Data Analysis," by B. Bygstad, B. Munkvold and O. Volkoff, 2016, *Journal of Information Technology, 31*(1), p. 87. Copyright 2016 by Springer. Reprinted with permission.

The four sub-steps are: (a) identification of immediate concrete outcomes; (b) analysis of the interplay of human and technical entities; (c) identification of candidate affordances; and (d) identification of stimulating and releasing conditions. This process proceeded in a stepwise fashion and began with the coding of immediate concrete outcomes. A concrete outcome is defined as the goals that are or can be, accomplished through the usage of the technology of interest. In this research project, the technologies are the big data enhanced AIS of the studied organizations, and a focus is on goals related to the organizational usage of these systems.

Data collected from transcriptions of the semi-structured interviews (see Appendix C for interview protocol), as well as the press releases, was analyzed using NVivo software (NVivo 12 Mac, Version 12.4.0). It was quickly determined that the press releases revealed little in addition to the interviews, and most of the information provided was promotional rather than informative. As such, these data were not further used in this process.

Identification of concrete outcomes was made through multiple rounds of coding. Concrete outcomes were those events, using Volkoff and Strong's (2013) definition of an affordance, which occurred through the interaction of the actor with the technology in pursuit of a goal. Any occurrence of such an event, as reported in the data, was coded as an outcome. The identification of outcomes was aided through the direct observations that occurred of data, diagrams, and other artifacts shared by the participants captured in the field notes. Many of these cases directly suggested an outcome as there was a physical artifact shown to the researcher at the time of the interview.

All of the identified outcomes were then reviewed, identifying those which were the same to ensure that there was no duplication. This process resulted in a total of 86 concrete outcomes identified. In the second round of coding, these outcomes were refined and grouped into larger hierarchal groupings. These groupings relied heavily on the various theoretical perspectives underlying the research, such as the audience marketplace as well as digital innovation and the

value of data as well as affordance theory. Groupings were based upon themes that were within the aforementioned bodies of literature, and the researcher's personal experience, which could represent various constructs of interest and importance. These groupings continued to be considered within the project's accepted theoretical definition of an affordance – focusing on the interaction between an actor and technology, as well as the actor's goal. For example, some outcomes were related to directly adding features to the existing audience product in the desire to make the product more competitive. These outcomes could then be grouped by the specific underlying feature (e.g., addressability) resulting in groupings of new products.

This second stage of coding resulted in 17 outcomes that could be classified into four broad categories. The categories were those related to: (a) advanced advertising products; (b) increased granularity; (c) organizational change; and (d) increasing value. Once the concrete outcomes were identified, using affordance theory and Volkoff and Strong's (2013) structure of an affordance, the data were analyzed with reference to each outcome in order to identify the potential components of an affordance. This process was first accomplished through identifying the techno-organizational contexts, followed by the enabling, stimulating, and releasing conditions.

In order to identify the techno-organizational context, an analysis of the interplay of the human and technical entities was conducted recognizing the

inherent complexity of each. Focusing on the interplay between the technology and the actors allows for insight and information of the candidate affordances (Bygstad et al., 2016; Volkoff & Strong, 2013). For example, the interplay between a cross-functional team and the data management platform (DMP) allowed for the advanced advertising product outcome. These products were dependent on the DMP, bringing all of the data together, but at the same time, required the broad range of knowledge provided by a cross-functional team. All of this exists due to the existence of the audience data eco-system and the organization's infrastructure, forming the techno-organizational context.

This context now allows for the identification of the candidate affordances. An affordance can be defined as "the possibilities for goal-oriented action afforded to specified user groups by technical objects" (Markus & Silver, 2008, p. 622). This affordance can either be real (e.g., the keyboard allows for interaction with a computer) or perceived, as in the case with most digital systems (Norman, 1999). Whether or not realized, the affordance can continue to exist as long as the actors and technology exist (Bygstad et al., 2016). Affordances are typically either actualized through stimulating conditions, making it easier to act, or releasing conditions, which are usually a decision. For example, a stimulating condition may be more information; yielding a strong sale strategy or the decision to base programming decisions for niche stations on the RPD rather than the currency AIS. A set of affordances and stimulating and releasing conditions are

hypothesized, using this framework, for each of the identified outcomes. The identified affordances are presented in detail in Chapter 9.

Analysis of the set of affordances and associated mechanisms. Once the affordances are identified, an analysis of the set allows for the identification of the associated mechanisms. Bygstad et al. (2016) suggest four analysis methods for this stage, with the appropriate choice depending on the research questions.

- "Analysing the dependencies between affordances;
- Grouping the affordances;
- Identifying focal affordances; or
- Abstracting the affordances into higher level mechanisms." (p. 92)

By viewing affordances as a subset of mechanisms (Volkoff & Strong, 2013), and mechanisms as a means of enabling, constraining, or stimulating affordances (Bygstad et al., 2016), it makes sense to group affordances in an effort to identify the mechanisms – one of four analysis techniques in Bygstad et al.'s method. Quantitative methods can be useful for the identification of groups within data. These methods are appropriate within a CR framework when they are used to provide a "quantitative measure of the number of objects belonging to

some class or a statement about certain common properties of objects" (Sayer, 1992, p. 100).

Cluster analysis was used in this study to group affordances as a means to recognize patterns and similarities between affordances allowing for their grouping. Cluster analysis is a well-developed quantitative method that facilitates the classification of similar groups within the data. This method typically measures similarity through distance measures applied to numeric measures of the observations; however, techniques have been developed that can measure a distance between categorical data. K-modes clustering is one such approach (Huang, 1997, 1998). Applying this technique to the set of identified affordances, allows groups to be identified through the similarity of their context, outcome, stimulating, enabling and releasing conditions, and their macro-micro-macro form.

Abstraction allows for the identification of the underlying generative mechanisms each identified affordance group represents. This process is accomplished through the analysis of the set, paying particular attention to the interactions and dependencies between them. These dependencies can take three distinct forms: (a) temporal dependencies; (b) structural dependencies; or (c) complementary dependencies (Bygstad et al., 2016; DeLanda, 2006). Each dependency suggests a different form of the higher-level generative mechanism and provides insight into the activation of the mechanism.

Assessment of the explanatory power. While many mechanisms may be abstracted, the final set of mechanisms should be those with the strongest explanatory power (Bygstad, 2010; Wynn & Williams, 2012). All proposed mechanisms were therefore viewed only as candidates until it could be determined which likely had the strongest explanatory power. Explanatory power is guided using the three evaluation criteria offered by Runde and de Rond (2010). Attention is given to whether the identified mechanisms could pre-exist the outcomes, could be causally effective and could be supported and explained through existing theory and the epistemology of the underlying metatheory.

The findings from these final two analysis steps follow in detail in Chapter 10.

Research Quality

Wynn and Williams (2012) provide a clear set of principles to not only conduct but also evaluate CR based explanatory case study research. While particular attention has been paid to Bygstad et al. (2016) for guidance on the analysis of the case study data, attention was also paid to Wynn and Williams by guiding the research, and concurrently evaluating the research, to ensure that research quality was achieved. By using the evaluation criteria for each principle, this was achieved in the research process.

Wynn and Williams (2012) recommend multiple investigators in order to achieve the principle of triangulation. However, a single researcher conducted this

research project. Therefore, this principle was achieved through replication of the same dataset (Tsang & Kwan, 1999) and peer (i.e., supervisor) debriefing which occurred with the assistance of the researcher's supervisory committee as well as independent academics within the researchers' place of employment. This step minimized researcher bias in the interpretations (Denzin, 1978; Wynn & Williams, 2012).

Table 14

Evaluating causal explanations (derived from Runde (1998))

Causal Test Question	Implications
Are the causal factors of the phenomenon actually manifest in the context?	• Confirm that a cited causal factor was in fact part of the context of the phenomenon. • Confirm that explanatory information from generalization (e.g., reference theory) applies to the specific context. • Ensure causal factors are not idealizations; the causal factor may potentially exist in the realm of the real and not just as an impossible theoretical entity.
If the causal factors were part of the context, were those factors causally effective?	• Assess the proposed causal factor to determine if it is a cause of the phenomenon and not an accidental or irrelevant feature of a genuine cause. • Determine if the proposed causal factor was in fact preceded by another causal factor of the event.
Do the causal factors provide satisfactory explanation to the intended audience?	• Ensure the causal explanation is not too remote (unspecified links in causal chain or adequate knowledge of links cannot be assumed). • Ensure the causal explanation is not too small such that it is just one of a composite of causes producing the observed event.
Does the proposed mechanism provide causal depth?	• Assess *depth of necessity* such that the observed event would have occurred in the absence of the proposed causal factor due to the presence of an alternative causal factor. • Assess *depth of priority* to determine if the proposed causal factor is closely preceded by another causal factor significant in explaining the event.

Note. Adapted from "Principles for Conducting Critical Realist Case Study Research in Information Systems," by D. Wynn, Jr. and C. Williams, 2012, *MIS Quarterly, 36*(3), p. 802.

Testing of the causal explanations obtained through the analysis was conducted using the four causal test questions which Wynn and Williams (2012) derived from Runde (1998) (Table 14).

The Researcher's Role in the Industry

In order to be genuinely reflexive of the research process, it is essential to address the researcher's role in the Canadian television industry and how that may have guided and framed the theory, data collection, analysis, and subsequent contributions of the research project. The researcher was employed in a senior role within the Research department of Numeris – the television measurement organization for Canada – for almost fifteen years, ten of which preceded the research project. Being in this role allowed for an advantage in both contacting the organizations and securing organizational approvals for the research. However, there were several other ways in which it assisted in the project and its analysis.

The central role within the industry, particularly concerning AISs and the audience marketplace, allowed for the researcher to be familiar with some of the work – albeit in a limited fashion – that was being undertaken by the organizations, thereby prompting the original curiosity and research questions. It also allowed the researcher to have a familiarity with the key players at each of the organizations working in the areas of the innovation of the audience product

and subsequent systems. The familiarity allowed the researcher to be confident that the list of identified potential participants was broad and comprehensive.

The research relied heavily on the literature and theory related to the audience marketplace, its systems, and the audience marketplace. These were all very familiar constructs and processes to the researcher. By adding the subsequent theory to the process, a deep understanding of the economic conditions, marketplace, and its processes could be established. Through this, combined with a strong quantitative understanding of the audience product and its representation within AISs, the researcher was able to better pull together the broader theories aiding in the interviewing process, subsequent analyses, and conclusions. The interviewing process was aided by the researcher being able to draw upon experience and industry knowledge to guide the theory-driven interviewing process. Analysis, abduction, and retroduction were also aided similarly through the ability to theorize and make sense of the data more effectively. Finally, in drawing conclusions, understandings, and contribution, the knowledge of the industry allowed for an understanding of how the findings might be important and where there were currently knowledge gaps in which practical contributions could be made.

Ethical Consideration

There were many ethical considerations for the research project. Media organizations are in constant competition with one another to obtain audiences

and effectively sell their audience product to advertisers. Therefore, any competitive advantage an organization may feel that they have is of utmost importance and highly confidential. There is no prescribed or standardized method of forecasting predicted audiences, scheduling or buying programming, or packaging programming for sales. Each organization uses its proprietary methods. The research allowed the researcher to gain potentially proprietary and strategic information. Therefore, all information collected and observed was considered confidential and therefore treated appropriately with the appropriate safeguards. The researcher was always cognizant of the need for anonymity of individuals and organizations and well as the confidentiality of internal processes and mechanisms.

At the time of the research, Numeris employed the researcher in a senior management function; therefore, the researcher also needed to be cognizant of his role within the industry. Organizations and participants were assured that the research was strictly being conducted for academic reasons and was outside of the scope of the researcher's place of employment, Numeris. Primary data was not shared with Numeris, nor did information reside on any Numeris server. The overall research concept was also shared with the corporate counsel of Numeris to ensure that there was no conflict of interest. It was also ensured that the role of the researcher within the industry did not cause any pressure to cooperate with the research in fear of any retaliation in future audience estimates by clearly outlining

all facts, considerations, rights, and safeguards in the letter of initial contact, informed consent form, and the confidentiality agreement.

The conducting of research needs to be transparent and follow ethical standards. Before commencing the fieldwork, a thorough research proposal was submitted to the Research Ethics Board of Athabasca University, following the university's policies (Athabasca University, 2009a) and procedures (Athabasca University, 2009b) for the ethical conduct for research involving humans. The Research Ethics Boards of Athabasca University and the Athabasca University Faculty of Business approved the research project on October 3, 2016, for one year less a day, with a further extension of one year being granted on September 18, 2017 (Appendix D).

Chapter 8. Events, Entities, and Reconceptualization

The next three chapters present a narrative outlining the key findings and results from the application of methods reviewed in Chapter 7. The narrative presents the results in a stepwise manner closely following the proposed steps presented by Bygstad et al. (2016). This chapter begins with the first three steps of the method: (a) a description of the events and issues of the case; (b) the identification of the key entities within the case; and (c) a theoretical re-description of the case. Subsequent chapters cover the results from the remainder of the analysis, specifically the identification of the affordances (Chapter 9) and the mechanisms (Chapter 10).

There are two primary reasons for the narrative to flow in this fashion. First, each section builds on the previous; therefore, providing insight and evidence into the identification of the generative mechanisms, the end goal of the research. This flow also allows for a secondary goal of the research by providing an example of the application of Bygstad et al.'s (2016) method.

The first section in this chapter begins by providing an overview of the critical events and issues that constituted the phenomenon of interest as well as the associated entities of each event. In the case of this research project, the phenomenon of interest was the innovation occurring through the enhancement of audience information systems (AISs) with big data. The chapter then concludes by re-describing the case in conjunction with the theoretical framework.

Three Key Events and Their Associated Entities

In order to develop an understanding of the innovation of the AISs, it is necessary to identify the social and technical structures that lead up to it. The identification of these events was done in part by the participants' interviews, but also, by the researcher through interconnecting recurring themes with the theoretical framework of the research project. It is the combination of an event and its associated entities that constitute a structure (Danermark, Ekstrom, Jakobsen, & Karlsson, 2002); therefore, the identification coincides with an exploration of the associated entities – both actors and objects.

These steps form the foundation of the analysis and lead to the subsequent narratives in this, and further, chapters. Three broad event categories emerge from the identified events (Table E1): (a) the advent of electronic audience measurement in Canada; (b) the creation and growth of the digital audience product; and (c) vertical integration within the Canadian media industry.

Electronic measurement in Canada. Since 1998, the vast majority of the television audience product in Canada was measured through electronic audience measurement panels (Table 15) operated by Numeris – a not-for-profit, member-owned tripartite industry organization – and produced through the portable people meter (PPM). These data provide daily estimates of Canadian video audiences across approximately 500 television stations/networks and their multiple content delivery platforms (e.g., traditional broadcast television, video-

on-demand services) with rich demographic data, supporting the Canadian audience marketplace as a transactional currency. These data formed the basis of the expanded digital infrastructures. At the same time, many participants described these data as playing a particular role in the observed observation by being: (a) a 'source of truth'; (b) a means of calibration; (c) a broader unbiased picture; or (d) an underlying currency that can serve to provide a value to more data-driven audiences.

Table 15

Breakdown of the measured television audience by the source of measurement in Canada

Category	Region	Average Minute Audience (AMA) (000)	% of Total AMA	Source of Measurement
Conventional	Six PPM Markets[2]	1118.2	22.0	PPM (electronic)
	Other Markets	943.7	18.6	Diary
Specialty	Total Canada	2206.2	43.4	PPM (electronic)
Digital	Total Canada	641.6	12.6	PPM (electronic)
Other	varies	173.2	3.4	Varies

Note. Sourced from Numeris, Total Canada, Ind. 2+, Mo-Su 2a-2a, Broadcast Year 2016-17.

Compared to many countries that use people meter technology, television audience measurement in Canada is somewhat unique. Minute by minute audience data – a combination of qualitative (e.g., age-sex information, product consumption information) and tuning data – is measured through the passive electronic PPM panel and program line up (PROL) data. This data is captured and processed by Numeris Electronic, a jointly owned subsidiary company of Nielsen (acting as the silent partner) and Numeris (acting as the controlling partner)

(Figure 10). Numeris Electronic then sends the collected and processed data to third-party processors (TPP) to sell various software packages or application programming interfaces (APIs) that allow the Canadian television industry to access and analyze the data. Both Numeris and Nielsen also have a subsidiary TPP, capturing the majority of the television AIS market. Additional TPPs, with a licensing agreement with the Numeris-Nielsen JV, also compete with specialized AIS products. Due to the unique organizational structure of Numeris, and the tight control over the Numeris data, in order to purchase the software and corresponding data from any TPP, the buyer must have a membership to Numeris.

Television broadcasters have a variety of options for software and data in which to base their internal AISs. Three products dominate the industry: (a) Nielsen Media Research's Borealis – a software as a service solution (SaaS); (b) NLogic's InfoSys – a legacy software solution; and (c) NLogic's connexAPI – an API allowing for the combination of audience data with other data sources. This variety of options allows for various means of downstream data fusion and integration, resulting in complex digital infrastructures, or data management platforms (DMPs).

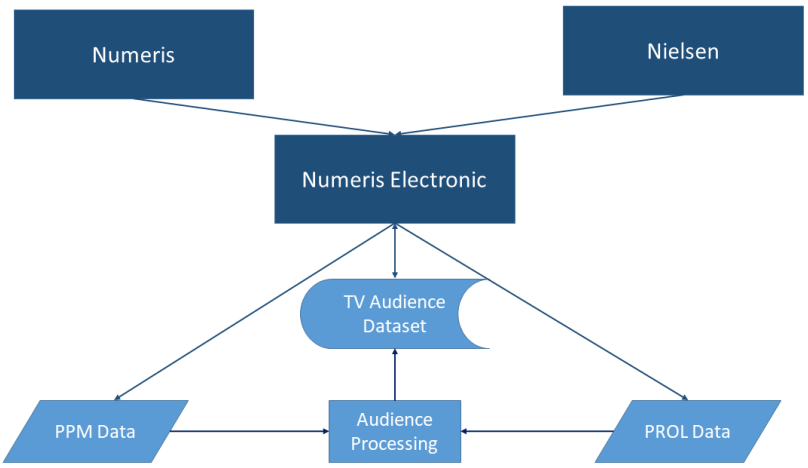

Figure 10. Numeris Electronic and the television measured audience dataset.

Another essential feature of the Canadian arrangement is the ownership and organizational structure of Numeris (Figure 11). As previously described, Numeris is a not-for-profit, member-owned industry organization that is governed externally by its Board of Directors consisting of representatives of the three constituent member groups: broadcasters (radio and television), advertising agencies, and advertisers (Numeris, n.d.-a). Within the realm of television audience measurement, the board of director has a sub-committee, the Television Executive Committee (TVEC) who is responsible for making policy and recommendations related to television measurement with guidance from the Television Research Committee (TVRC).

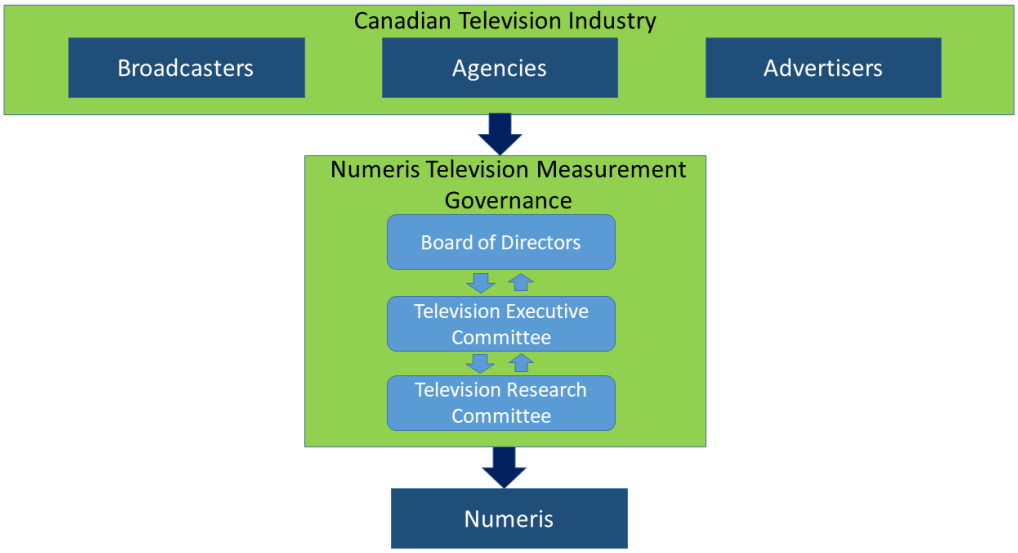

Figure 11. Numeris governance.

This ownership and governance structure of Numeris allows the television audience measurement service to behave and evolve differently than if a for-profit measurement organization produced it. Rather than being responsible for generating profit, acquiring new customers, and maximizing equity for shareholders or owners, like other audience measurement organizations (e.g., Nielsen, Kantar Media), Numeris' mandate is to serve its members by providing the most accurate audience estimates at the lowest possible cost. This ownership has allowed Numeris to be an early adopter of new and emerging measurement technologies through partnerships with other providers. For example, Numeris was the first in the world to move away from people meters in favour of passive electronic measurement for television audience measurement. Given many Canadian media broadcasters own both television and radio assets, Numeris was

also the first in the world to develop radio and television cross-measurement. This environment results in an audience marketplace that is used to a high degree of innovation in audience measurement, allowing for more openness towards additional incremental and radical innovation.

The growth of the digital advertising product. Throughout the last millennium, the audience products within the Canadian audience marketplace consisted primarily of television, radio, print, and outdoor, each with an arrangement with an audience measurement organization (Table 16). With the advent of the Internet, a new form of advertising, or audience product, began to develop, later termed Digital Marketing (Monnappa, 2017). The first clickable web-ad appeared in 1993 – an ad sold by the Global News Navigator to a Silicon Valley law firm (T. O'Reilly, 2001). These types of clickable ads would become known as banner ads, and comScore would eventually fill the role of measurement within the respective marketplace measuring web traffic, click rates, and impressions.

While several digital marketing, advertising, and data companies have since launched (e.g., Yahoo in 1994, MSN in 1998), there have been two major digital organizations entering the audience marketplace – namely Google, which launched in 1998 (Google, n.d.), and Facebook which launched in 2004 (Carlson, 2010). Both organizations – known as the 'Digital Duopoly' – control 60% of the world's digital advertising industry (Bond, 2017; L. O'Reilly, 2017) and have

continued to expand as providers of audiences, drawing advertising dollars away from established mediums such as television and radio.

Table 16

Established media products in Canada and their measurement organization

Established Media Type	Measurement Organization
Television	Numeris
Radio	Numeris
Print – Magazine	Vividata (formerly PMB)
Print – Newspaper	Vividata (formerly NadBank)
Outdoor	COMB

The digital audience product can take many forms (Table 17), some of which directly compete with the television audience product and others indirectly compete by fighting for the same advertising budgets. The digital audience product often yields a similar reach to the television audience product (Gleeson, 2012) but brings additional benefits for often a lower price. The digital audience product is seen as easier to target with, more interactive, more data-driven and personalized, and provides stronger analytics.

eMarketer (2016) predicted that by 2017, US digital advertisement spending would surpass that of television by $5.4 billion. This growth would place television, the long-standing leader, to 35.8% of total US media advertising spending, slightly behind digital with 38.4%. Further, eMarketer predicted that TV share of spending would drop below 1/3rd of total spending by 2020. The growing share of advertising spending going towards digital advertising results in

a competitive landscape for television broadcasters that now includes digital advertising organizations in addition to one another. Facebook and Google represent the dominant competition since they were responsible for over 77% of the US online ad spending growth in 2016.

Table 17

Examples of types of digital audience products

Type	Examples	Competition for the television audience product?
Digital video	Pre-video ads, post-video ads, in-stream video ads	Directly competes - similar product and sometimes similar or identical content
Display advertising	Banner advertising, pop-ups, news feed ads	Directly competes – display advertising can take video form to television advertising
Email	Targeted emails – solicited or unsolicited (i.e., SPAM)	Indirectly competes – can compete for the same advertising budget
Mobile advertising	Advertisement delivered through smartphones, SMS/MMS ads, adver-games, mobile video ads	Directly and indirectly – can take many forms including digital video
Search engine marketing (SEM)	Search engine optimization (SEO), sponsored search results	Indirectly competes – can compete for the same advertising budget
Social media marketing	Facebook pages, tweets, influencer programs	Indirectly competes – can compete for the same advertising budget

The increased pressure from digital advertising resulted in television broadcasters looking for ways to innovate in order to keep their audience product relevant and competitive. Participant 21 related how this pressure, relayed through one of their clients, resulted in looking at return-path data (RPD) as a means to innovate their product. By enhancing their AIS with this additional data, they expected that the targeting ability of television would increase; thereby directly challenging one of the value propositions of the digital audience product. This

project resulted in a simple proof of concept using a relatively small sample of set-top boxes (STBs). Today, this dataset is almost 4,500% larger than the original proof of concept demonstrating the overall success of the innovation project.

Participant 21: *It started with a conversation between our head of sales and the head of one of the agencies. The head of one of the agencies said, "You guys are getting killed by digital, you have to do something." And our head of sales thought about it and looked around and decided that better targeting was an opportunity using set-top box data.*

(Interview with Participant 21, Organization C on July 7th, 2017)

Organization B felt similar pressures from the digital audience product, as described by Participant 9. The organization felt that Google and Facebook posed a more significant threat than other television broadcasters did. Their product offered a very different value proposition by being more data-driven. Therefore, this audience product would absorb the majority of new money coming into the audience marketplace, thereby eroding the organization's share of advertising revenue. These changes to the marketplace resulted in a call to action for the organization, and the need to innovate their audience product to remain competitive.

Participant 9: *…it is happening in a very dynamic media environment where we face asymmetric competition from Google and Facebook, who present themselves, probably mostly rightly, as data-driven companies that can deliver this kind of segmentation work, and they're taking, as you know, 85 cents out of every new dollar, or whatever the actual true figure is. That is the figure that is reported. So it is not like our competitive marketplace is remaining static. It is a very*

> *dynamic market. Kind of we have to do it, would be one part of the answer to that, because standing still in the broadcast business is not an option because we face competition for audiences.*

(Interview with Participant 9, Organization B on May 5th, 2017)

Through the Internet, the primary form of delivery for digital advertising, Organization A was identifying an increasing degree of media fragmentation. This fragmentation is taking the form of what Napoli (2003) describes as inter-media fragmentation, where new means of delivery for media are appearing (i.e., Internet), and intra-media fragmentation, where media content is increasingly becoming disaggregated as the number of available channels to potential audiences increases. Media fragmentation has been a significant challenge for the media industry (Napoli, 2011) in particular for audience measurement and the corresponding AISs (Napoli, 2012). This increasing fragmentation was a catalyst for the organization to look for new ways to better understand audiences falling in the tail of the consumption distribution.

Participant 3: *And in the digital space, and as things shift to digital, in fact, just in general media there's sort of fragmentation of content, there used to be two channels, then three channels, then four channels, 100 channels, 500 channels, and the internet is essentially infinite, for all intents and purposes, an infinite number of channels. So increasingly, the thing you care about is in what might have been called the 'long-tail'.*

(Interview with Participant 3, Organization A on March 10th, 2017)

The timeliness that data is available with the digital advertising product also created additional pressure for organizations to start exploring new ways of understanding audiences. Unlike the digital advertising product, the television audience product does not become the "currency" for the marketplace until after seven days have passed[9]. While this is for excellent technical reasons (i.e., to allow for playback of a program through time-shifting or recording to be captured in the measured audience), it does create an illusion of a lag compared to other competing audience products. Television advertisers were, therefore, seeking a way to deliver audience estimates, to reconcile advertising spends, in a similar amount of time as digital media. This led Organization C to start looking at ways to enhance their current AISs in order to address this competition.

Participant 18: *When we get into the actual campaigns, and you've got advertisers wanting to look at their seven-day campaign, or their three week campaign and they want to know the day after so that they can optimize, because that is what they do on digital and that's what they do with Facebook, and that's what they do with Google. And we need to be able; we just absolutely need to be able to do that. So enhancing the currency with much bigger samples, I think allows us to be able to address some of those things.*

(Interview with Participant 18, Organization C on June 29th, 2017)

The introduction of digital media has resulted in an expansion of the audience marketplace (see Chapter 3). Digital, being an emerging media, has entered the marketplace, essentially providing a new audience product for consumption by advertisers and their agencies (Figure 12). Due to the high reach of established media[10], the digital audience product competes with the established

media product for roughly the same pool of consumers. With fixed advertising budgets, as well as the high degree of overlap between digital and other established media channels, it is clear that the additional product is not complementary, but rather, competitive.

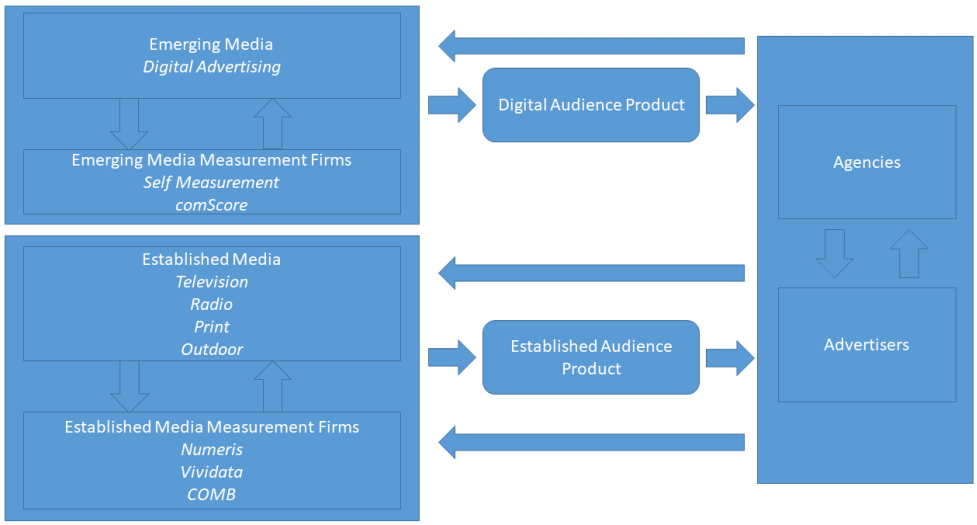

Figure 12. The "new" Canadian audience marketplace.

Through advancements in technology, as well as the evolution of the digital advertising product to include video content, the line distinguishing the television and digital audience products has become blurred (Interactive Advertising Bureau, 2017a). This evolution has resulted in direct competition with digital media organizations since it brings a high degree of overlap and blur between their video and display[11] audience products – particularly apparent in IP-based distribution mechanisms and through viewing devices/platforms (e.g., mobile, desktop, OTT[12]/connected TV, social). As a result, the various actors

within the audience marketplace have begun to rethink the definitions of the television audience product; a phenomenon coined the "TV-video-shift" (Interactive Advertising Bureau, 2017b). The resulting video audience product (Table 18) becomes a more encompassing and accessible for advertisers but places television broadcasters in direct competition with digital advertising organizations through similar content types, distribution mechanisms, viewing platforms, and ad units.

Table 18

The video audience product

Video Type	Distribution Mechanism	Viewing Device / Platform	Ad Unit
Long-form video*	Over the air / Broadcast*	Desktop*	In-stream*
Short-form video*	Cable*	Mobile*	Out-stream*
Original digital video	Satellite*	Gaming console*	Overlay
User-generated content	IP-based*	OTT / Connected TV*	
Vertical video		Social	
360-degree video		Messaging app	
Virtual reality		Digital OOH	
Live video			

*directly competes with the television audience product

Note. Adapted from *The Digital Video Advertising* Landscape, by Interactive Advertising Bureau, 2017, retrieved April 10th, 2019, https://video-guide.iab.com/digital-video-advertising-landscape. Copyright 2017 by Interactive Advertising Bureau.

Since measurement, and the measured audience, plays such a vital role in the audience marketplace, it is also worthwhile to note that the digital advertising product can have a very different measurement arrangement than established

media. Many digital advertising organizations have a measurement arrangement with comScore – closely mirroring the measurement arrangements that exist for established media organizations – however, a large amount of the digital advertising product is self-measured. Both Google and Facebook utilize proprietary self-measurement algorithms for their audience product and are free of an independent third-party measurement arrangement – something of note given the sheer size of their role in the industry (Bond, 2017). This situation creates an interesting environment for the television broadcasters where they can use the independence of their existing measurement arrangement as a strength of their product, but at the same time, suggests that since the industry allows for self-measurement in the digital advertising marketplace, independent measurement is no longer a requirement. This conundrum has potential implications for existing audience products as well as future product development and innovation that previously could be difficult for measurement organizations to capture.

Through their proprietary measurement and metrics, Google and Facebook were able to position themselves as a significant data-driven alternative with a superior return on investment (ROI) to traditional television. ROI on investment is of crucial importance to many advertisers, naturally making the digital audience product an attractive alternative to the television audience product. Participant 18, recounting the discussion surrounding Pepsi's consumer journey at the TV Advertising conference in London in December 2016, describes this:

Participant 18: *But what they were really talking about were short-term sales lift, measurable ROI. And when they said measurable ROI, it is what Google and Facebook can give them.*

(Interview with Participant 18, Organization C on June 29th, 2017)

Vertical and horizontal integration in the Canadian media industry. Vertical and horizontal integration are phenomena relating to the merger or acquisition of organizations (Hindle, 2008). Vertical integration occurs when the merger or acquisition allows the organization to control its distribution (i.e., forward integration) or supply chain (i.e., backward integration). Horizontal integration, on the other hand, occurs when the merger or acquisition is between organizations engaged in the same line of business. These strategies can help organizations expand their market, strengthen their supply chain, and ultimately increasing control and dominance within a market or industry.

Over the past decades, Canada has experienced both vertical and horizontal integration in the media industry (Figure 13). Horizontal integration has occurred at both the distribution (i.e., BDU) and content creation (i.e., broadcasters) level. Many BDUs are now horizontally integrated organizations that own other telecommunications and distribution assets such as telecommunication (telco) companies – both household and cellular phone services – and internet service provider (ISP) companies. By including mobile and ISP operations, these BDUs have effectively increased their distribution abilities since these delivery methods can also deliver video content. This type of integration has also occurred for the content producers through media companies

merging or acquiring others to form large media organizations that own various forms of media assets – television, radio, print, outdoor. Vertical integration has occurred through BDUs purchasing media organizations (e.g., BCE purchasing Astral Media in 2013), thereby creating and distributing media content (i.e., backward vertical integration). These phenomena have resulted in a Canadian industry consisting of large media organizations that operate in multiple broadcast sectors – radio, conventional television, discretionary and on-demand television, and BDUs – who control the majority of the broadcast revenues (In 2011, there were as many as four vertically integrated (VI) media companies (Winseck, 2011). These VI companies consist of television broadcasting, BDU operations, telco services, and ISP units (Table 20). The broadcasting divisions of these organizations also significant in which they consist of conventional television networks – allowing for participation in both the national network and local television audience marketplaces – and television assets spanning station groups/types yielding a broad range of television audience products (Table 21). These organizations can deliver television content through traditional linear platforms – over-the-air (OTA) or a BDU – or through non-linear platforms such as video-on-demand (VOD), mobile applications, or online streaming. These VIs can also own other media types such as radio stations, print (i.e., magazines) or outdoor advertising operations.

Table *19*).

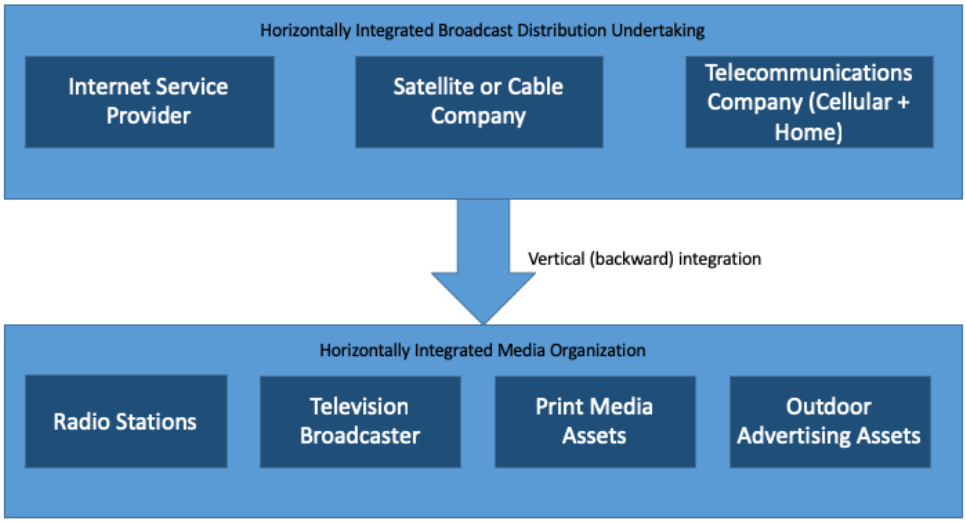

Figure 13. Vertical and horizontal integration in the Canadian media industry.

In 2011, there were as many as four vertically integrated (VI) media companies (Winseck, 2011). These VI companies consist of television broadcasting, BDU operations, telco services, and ISP units (Table 20). The broadcasting divisions of these organizations also significant in which they consist of conventional television networks – allowing for participation in both the national network and local television audience marketplaces – and television assets spanning station groups/types yielding a broad range of television audience products (Table 21). These organizations can deliver television content through traditional linear platforms – over-the-air (OTA) or a BDU – or through non-linear platforms such as video-on-demand (VOD), mobile applications, or online streaming. These VIs can also own other media types such as radio stations, print (i.e., magazines) or outdoor advertising operations.

Table 19

Percentage of broadcast revenue generated by companies operating in multiple sectors

Number of sectors in which companies offer service	Percentage of broadcast revenues generated in these sectors		
	2014	2015	2016
4	63	64	64
3	22	21	21
2	8	10	10
1	6	6	5

Note. Adapted from *Communications Monitoring Report 2017: Broadcasting Sector* Overview, by CRTC, 2017, retrieved on April 4th, 2018, https://crtc.gc.ca/eng/publications/reports/policymonitoring/2017/cmr4.htm#s42. Copyright 2017 by CRTC.

Shaw Communication sold the Shaw Media unit to Corus Entertainment in 2016. While these are separately traded organizations on the Toronto Stock Exchange, they share very similar ownership. Before the trade, the Shaw family owned 85% of the voting shares for Corus Entertainment and 78% of the voting shares for Shaw Communications (Dobby, 2017). As part of the acquisition of the media unit, Shaw Communications now owns approximately 39% of the equity of Corus Entertainment. This ownership results in a blurred line between the two organizations. So much that in the Communications Monitoring Report, the CRTC often considers them one single entity (CRTC, 2017).

Table 20

Vertically integrated media organizations in Canada (2011)

Parent Organization	Television Broadcasting Organization	Other Media Assets	BDU Unit	Telco Unit	ISP Unit
BCE Inc.	Bell Media Inc.	✓	✓	✓	✓

Quebecor Inc.	Quebecor Media Inc.	✓	✓	✓	✓
Rogers Communications Inc.	Rogers Media Inc.	✓	✓	✓	✓
Shaw Communications Inc.	Shaw Media Inc.		✓	✓	✓

Table 21

Examples of broadcast assets by type for the four VI television broadcasting organizations (2011)

Broadcast Organization	National Network	Regional System	Examples of Specialty or Digital Channels
Bell Media Inc.	CTV	CTV Two	CP24, TSN, HBO Canada, Canal D
Quebecor Media Inc.	TVA		addikTV, Canal Indigo, TVA Sports
Rogers Media Inc.	City	Omni	Sportsnet, CPAC, FX, TSC
Shaw Media Inc.[13]	Global		Slice, HGTV, Food Network Canada

Many of the participants spoke to ways that these corporate integrations can bring several advantages to the organization that can simplify innovation and product development. Due to the vertical integration, television-broadcasting units exist as subsidiaries of a larger organization that collects and maintains various sorts of data in support of the extensive range of other products. This structure, therefore, allows the broadcast subsidiary, at least in principle, access to broader ranges of data and information that can either inform decisions or assist with innovation and product development. No longer do various sources of data reside in various databases, across various locations, servers, or technologies. By centralizing the data in central digital infrastructures, the data is now unified, allowing for more holistic views and understanding of audience behaviour. A

central technology also allows for broader dissemination of data since it is no longer bound to particular infrastructures that might have limited access. This technology now makes it easier for individuals to share ideas and identify value in various data sources, as explained by Participants 19 and 14. Achieving this value would be more challenging – but not impossible – for organizations that did not have the same immediate access or insight into the data.

Researcher: *One thing I am curious about is that what you are doing at [Organization C] is not really something that… sorry, it is something that really anybody else could be doing. And I am wondering why is it that [Organization C] is doing this but say [Competing Organization] is not?...*

Participant 19: *Yeah, I think it is a combination of a few factors. Obviously, as a vertically integrated, the conversation happens a lot easier…*

(Interview with Participant 19, Organization C on June 29th, 2017)

Participant 14: *…the other two major players that have media companies and distribution. We have seen them spin up their own programs. And that is I think has a lot to do with the fact that it's easier to share data with inside your own organization. So once you start to look at the other broadcaster-only companies, those challenges get pretty significant.*

(Interview with Participant 14, Organization C on June 14th, 2017)

Having a wide range of data types from various sources also builds a natural curiosity within the organization of how to leverage these datasets to build a competitive advantage. In many cases, this curiosity even leads to repurposing data. For example, RPD data was not originally designed to build an audience

product; instead, it was designed to allow for quality control of the various STBs deployed by the organization. However, this data can be potentially repurposed to serve other needs of the organization– something only possible through digital innovation.

Participant 13: *The other part that I think is that as a part of a vertically integrated operator, I think there is just a rising awareness of the data that comes out of this – out of the telco side – and the interest towards finding ways in order to leverage and monetize it.*

(Interview with Participant 13, Organization B on April 24th, 2017)

Lastly, by combining, integrating, or fusing these datasets within a single AIS, the organizations have a level of demographic detail not previously available through the central industry AISs using data from the central measurement organization. These data can allow the organization to focus on particular demographic attributes and ultimately understand how they move across and consume the various television assets of the broadcaster. This ability to micro-target is a powerful asset that can be leveraged to make the television audience product more attractive to potential advertisers (Participant 19). This ability allowed for audience product innovations such as a cross-media audience product (e.g., a combined radio and television audience product) or linear optimization.

Participant 19: *Okay. Tell us what attributes your target audience is and we will run [an audience matching these attributes] and then we can look at what channels and programs where you are over-indexed against that group and make your buy better.*

(Interview with Participant 19, Organization C on June 29th, 2017)

A significant driver of these innovations was the data management platforms (DMPs) created to centralize, store, and integrate the vast variety and types of data. These systems existed in all of the studied organizations. While the various types of data integrated into the DMP varied by the organization, all of the infrastructures had a linkage to an RPD dataset – either sourced internally or through a partnership with another organization. In addition to third-party data, proprietary data sets – only available due to the vertical and horizontal integrations – are contained with the DMPs (Figure 14).

In all three organizations, the principal users of the DMPs – or data contained in the DMP – were cross-functional teams. These teams were quite similar across each organization consisting of actors from various departments – thereby bringing different skill sets as well as different needs. The structure of the team in organizations A & B consisted of actors from insights/research and sales departments; whereas the team at Organization C was far more complex and included actors from a far broader range of departments interacting with a central data-driven advertising team (Figure 15).

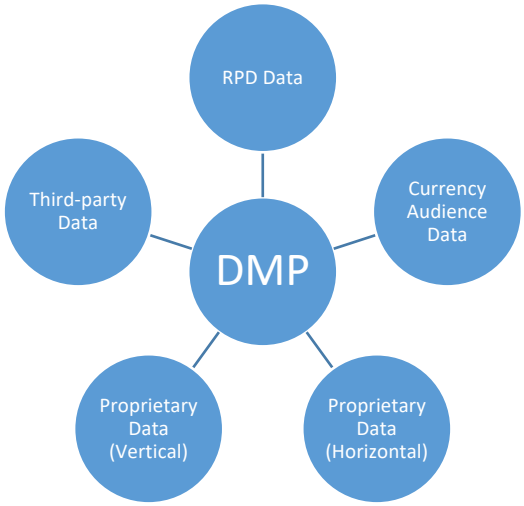

Figure 14. Example of central data management platform and data sources.

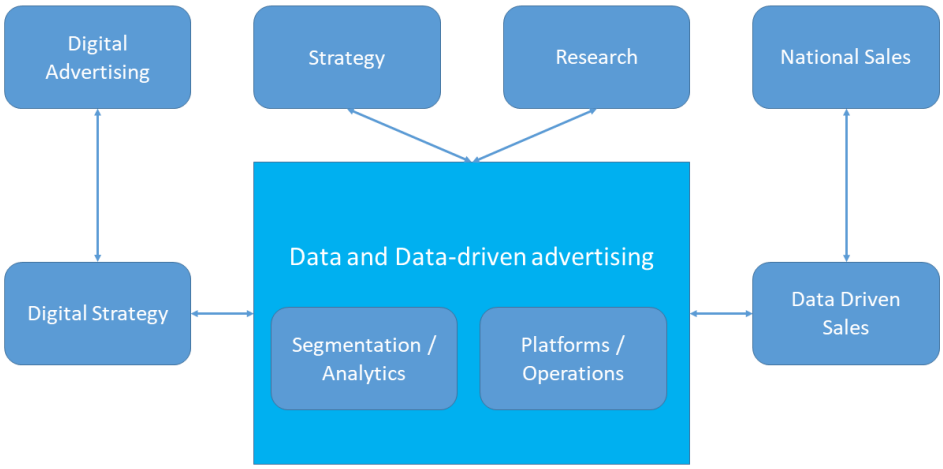

Figure 15. Organization C's cross-functional team structure.

There were also some differences in the ways that these teams extracted and processed the data from their DMP differed slightly between organizations (Figure 16). Organizations A and B interacted with the DMP through an intermediary team via an order-taking process resulting in customized data reports

or dashboards. Organization C, on the other hand, had direct access to the data and the ability to build their reports and dashboards directly. This difference appeared to be strictly organizational, and no evidence was found to suggest it was an important difference.

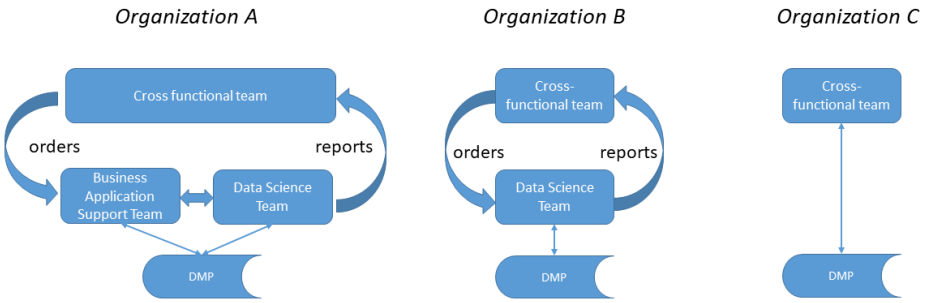

Figure 16. Organizational interactions with the DMPs.

Reconceptualization of the Case

Having identified key events that drove the phenomenon of interest – as well as the entities, objects, and relationships that comprised them – the next step is to reconceptualise the case (Bygstad et al., 2016). This process allows the guiding theory to help view the data more abstractly with the end goal of yielding a better understanding of the phenomenon of interest. These three constructs interact through various social practices (Figure 17). Therefore, a critical

realist/realism (CR) reconceptualization of the case should focus on the interplay of these fundamental entities.

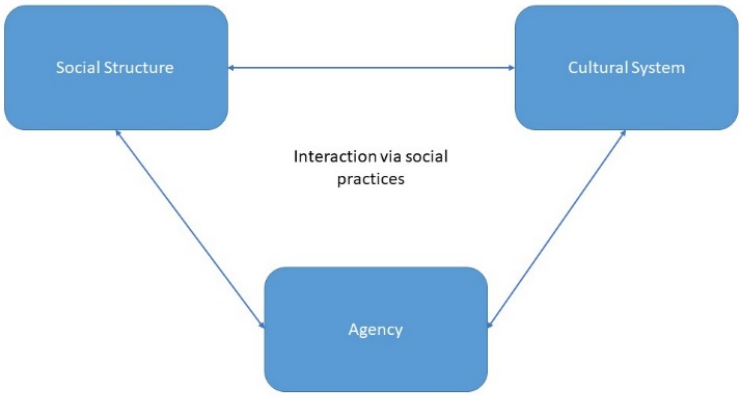

Figure 17. The interaction of structure, agency, and cultural systems. Adapted from "Using Critical Realism to Explain Strategic Information Systems Planning," by P. Morton, 2006, *Journal of Information Technology Theory and Application (JITTA), 8*(1), p. 5. Copyright 2006 by the Association for Information Systems.

Before identifying the various entities, it is essential to consider how they fit within a CR framework. Bhaskar (2014/1979) defines a social structure as that which constrains or enables social activity. This fit becomes dependent on the existence of relationships between the various comprised social objects (Sayer, 2003). A cultural system conditions the social structure while constraining and enabling agency (Parker, Mars, Ransome, & Stanworth, 2003) – the causal powers of the various actors (Sayer, 2003). The cultural system can, therefore, consist of objects, practices, theories, ideas, and any other belief systems that can explain the action of individuals.

In this framework, the big data innovation is a reactionary intervention in the open social system of the Canadian television industry and its audience marketplace, triggered by the emergence and threat of the digital audience product. The industry and the audience marketplace consist of several social structures, such as the measurement arrangement between broadcasters and measurement organizations. These social structures and the established economic system of the audience marketplace allows the audience product to exist. This product is not a tangible product – but rather an abstract representation of possible consumers of the advertiser's products enabled through a theoretical object and a trading practice – the audience marketplace is not merely an economic system but also a cultural system. By reconceptualising the case in this format, a framework is created to allow for the further steps outlined by Bygstad et al. (2016) that follow in Chapter 9.

Social Structures. The audience marketplace consists of several social structures, as outlined by Napoli (2003). Those of interest to this research are the television broadcasters and their measurement arrangements, and on the other side, the advertisers and their agencies. Within each social structure are hierarchies, departments, resources, and business strategies and rules. The broadcasters exist to produce an audience product that maximizes revenue through various departments drawing upon structural powers – both formal and informal – to accomplish this task and influence advertisers and their agencies as required. The agencies, on the other hand, seek to maximize their value to their

client advertisers by maximizing the volume of audiences at the lowest price point, while meeting critical strategic goals of the advertiser. This maximization is accomplished through media buying departments who draw upon the conventions of the cultural system of the audience marketplace and other informal structures allowing for influence over the audience purchase and reconciliation (i.e., posting) negotiations.

Through vertical and horizontal integration, Canadian television broadcasters have become part of larger media conglomerates. These new, large, multi-faceted organizations have resulted in new flows of data and communication. As such, new departments and responsibilities have emerged in order to manage the new information and ultimately drive digital innovation. These new teams or roles have resulted in new social structures within the organizations. These new social structures are responsible for pushing innovation through the audience marketplace and thereby may ultimately influence or disrupt the definition of the audience product.

At the perimeter of the case are the social structures of the various digital audience organizations that have entered the established audience marketplace with a new and competitive audience product. These organizations are identified as relevant social structures due to their product, which unlike other established forms of media (i.e., radio, print, outdoor), is not complementary to the television audience product, but rather, competitive. Their product has many of the same

features that distinguish the television audience product from other established media.

Agency. The agents within the marketplace are the various departments within the television broadcasters, the media-buying units of the agencies, and the advertisers. The agents within the advertisers and agencies can influence the television broadcasters and their associated efforts to produce the audience product through their purchasing decisions. Influence can also exist in other forms such as negotiations occurring at the time of advertisement purchase as well as the time of reconciliation (i.e., posting). This influence often manifests through pressures and demands coming from their clients, the advertisers. Within the broadcasters, the agents seek to maximize revenue by influencing the audience manufacturing process and the form of the final audience product.

The Cultural System. The audience marketplace is a social construct based on a cultural system that allows for the purchasing and selling of the audience product, an intangible product with three distinct forms: the predicted, the actual, and the measured audience (Napoli, 2003). The value of the audience product is created through social norms and conventions in which the audience watches advertisement as payment for the entertainment received from television programming (Jhally & Livant, 1986). The media communication which produces these audiences, therefore, becomes the capital of the system (Nixon, 2014).

Each organization has its cultural system with the various departments, each with its own power and interest. These cultural systems may inhibit or allow for various degrees of innovation and different reactions to market pressures and influences. Typically, the departments are encouraged to optimize the audience product through various efforts. Programming departments seek to develop programming and schedules to maximize audiences. Research and revenue management departments seek to maximize the accuracy of the predicted audience relative to the measured audiences. Moreover, sales departments seek to negotiate the sale of the audience product to the favour of the organization.

Summary

The initial steps of Bygstad et al.'s (2016) stepwise framework of CR data analysis are to develop an understanding of the events, issues, and objects that lead to the phenomenon of interest. These events and issues are deemed to be clusters of valuable information, and in the case of CR data analysis allow for the identification of the various objects of the case. Bygstad et al. suggest that the objects of the case not only take the form of individuals, organizational units, technological artifacts, but also the relationships between them. These objects are what constitute the structures residing in the domain of the real.

In the Canadian broadcast television industry, the emergence of electronic measurement, the growth of the digital advertising product, and vertical and horizontal integration were revealed by participants as significant outcomes that

allowed for the digital innovation of interest. Through understanding these critical events in more depth, it was found that the particular granularity of the audience data available to the television broadcasters, coupled by the not-for-profit industry-owned structure of Numeris – allowing for the measurement organization to focus on innovation and accuracy, rather than profits – resulted in an environment ripe for digital innovation. At the same time, the emergence of the digital advertising product increased competition for television broadcasters, requiring them to look at how they could evolve their audience product in order to remain relevant to their clients, the advertisers. This evolution was enabled through the vertical and horizontal integration that the Canadian media industry underwent. What once were independent television broadcasting organizations were not part of massive media giants. These new organizations had access to many different sets of data as well as a vast array of broadcast assets, technologies, and budgets.

In order to better understand the role that the various events and structures of the case played in the digital innovation identification of the entities involved is critical. This stage is accomplished through a focus on social structure, agency, and culture. This process allows for a deeper understanding of the structures which allow for the mechanisms of interest. The social structures for this research were the television broadcasters and their measurement arrangements as well as advertisers and their agencies. The agents within this study were the various departments within the television broadcasters, the media-buying units of the

agencies, and the advertisers. Finally, the cultural system is identified as the system which allows for the purchasing and selling of the audience product with the value of the product being determined by social norms and conventions. It was also recognized that each organization had its cultural system within each of the department – each inhibiting or promoting innovation in different ways.

By understanding the environment in this way, the researcher can better understand the interplay between structure and mechanism. This interplay allows for better identification and abstraction of the various affordances that have been realized and how they may group into higher-level mechanisms. The focus of the results now shifts from the environment to the identified affordances.

Chapter 9. The Affordances

The underlying goal of a critical realist/realism (CR) research project is to understand the various generative mechanisms that reside in the domain of the real in order to explain observed events that lie in the domain of the empirical. Using the analytical approach presented by Bygstad et al. (2016), evidence of affordances – a particular type of generative mechanism – are presented through both concrete and perceived outcomes (i.e., events of interest). Volkoff and Strong (2013) describe an outcome as "the consequence associated with actualizing the affordance" (p. 823). Given that these outcomes reside in the domain of the empirical, they are accessible through a review of the interview transcripts and various press release. These outcomes form the basis for the understanding of the affordances and generative mechanisms at play within the research project.

There were 122 outcomes identified in the data. These outcomes are classified into four distinct categories, those related to: (a) advanced advertising products; (b) increased granularity; (c) organizational change; or (d) increasing value. Each category contained one or more outcomes or sub-category of outcomes (Table 22). Included in the table is a sum of the unique references to each outcome belonging to that group. These categories and sub-categories serve as a useful framework for the analysis of the affordances.

Table 22

Categories and sub-categories of outcomes identified in the data

CATID		Category	References	% of Total
1		*Advanced advertising products*	*18*	*14.8%*
	a	Addressable advertising	6	4.9%
	b	Cross-platform targeting	4	3.3%
	c	Dynamic ad insertion	2	1.6%
	d	Media optimization	4	3.3%
	e	Programmatic television	2	1.6%
2		*Increased granularity*	*54*	*44.3%*
	a	Granularity of audiences	26	21.3%
	b	Granularity of behaviour	12	9.8%
	c	New forms of data	16	13.1%
3		*Organizational Change*	*38*	*31.1%*
	a	Better decision-making	7	5.7%
	b	Better programming	2	1.6%
	c	Increased data stewardship	1	0.8%
	d	More effective use of time	1	0.8%
	e	New sales processes	24	19.7%
	f	New ways of thinking	1	0.8%
	g	Process improvements	2	1.6%
4		*Increasing value*	*12*	*9.8%*
	a	Strengthening the value of television	8	6.6%
	b	Increasing the effectiveness of advertisement	4	3.3%

Examples of the evidence used to identify each outcome derived from the data are presented in Tables 23 through 26.

Table 23

Evidence examples for outcomes related to advanced advertising products

Outcome	Example of evidence
Addressable advertising	"As soon as you get too tiny audiences, I think the theory says, "Well, we have to all get to addressable TV." And so addressable TV is really just monetizing … Saying I know specifically what you're watching, '… he's X and Y, I'm going to serve him this specific ad'"
Cross-platform targeting	"where we're no longer selling television, selling radio independently, and selling digital and selling our apps. On 2554, we're going to want to say here's a really interesting behavioral segment that we've identified through our audience intelligence platform. And we want to be able to take that audience and we want to sell that audience across the whole platform, all of our platforms"
Dynamic ad insertion	"So, … was dealing with a company called … to do dynamic ad insertion on VOD. They came to us to test it as opposed to …, which I thought was interesting. And so, everyone's doing it now, …, …, and us are all selling that …-based VOD dynamic ad insertion"
Media optimization	"You go, you upload your CRM data, and you're given information about where you should place your advertising based upon the goals of a campaign. So really that's what we're doing in a lot of ways. We're leveraging our first-party data across TV and mobile and web platforms in accordance with our privacy policies, and operationalizing around the creation of audience segments that then are passed to our ad-serving systems"
Programmatic television	"Essentially, what we're doing is, we're just building segments to build schedules that index higher against a target audience, that's informed by new data. So it outputs a schedule, at that point, that schedule literally gets inputted into our existing sales platform, which is called ... So that we can get put into the existing infrastructure and architecture, which books the spots"

Table 24

Evidence examples for outcomes related to increased granularity

Outcome	Example of evidence
Granularity of audiences	"That being said, seeing what's possible with set-top box collection in that we can see second by second viewing, we can see that viewing to traditional sort of zero level viewing channels can be corrected"
Granularity of behaviour	"Our relationship with … is a public one. We use the … data to understand the attributes of viewers. Things like education level, propensity for product usage, pet ownership is a really common example though not immediately actionable. Understanding what a household makeup based on the … data and a postal code says and how they're viewing trends and they're viewing habits interact well with our content and then being able to have a conversation with an advertiser and say to them, 'If you're looking for a type of person, we can help you find them within our programming'"
New forms of data	"This, to me, is more interesting. This is …, this is the first episode of .... This is a heat map of downtown ...That actually shows where it's viewed. Okay? So that's kind of quite interesting. Why is it... Obviously, we can overlay that with population density. Why is it... It's kind of clear why it's resonating round here, …, but why is it doing better in central west end than in the central east end? What is it about … that makes that, that?"

Table 25

Evidence examples for outcomes related to organizational change

Outcome	Example of evidence
Better decision-making	"So …, I'll give you a good example, we ran into a dispute with … And they were not the most expensive channel, the checks out the door were a lot, but they weren't excessive … But they were offered the worst value per money, by far, on the lineup. They were very little viewed and when you look at how much the dollars going out of the door, how much that equalled, you would just go, "Well, that's terrible value." Then they said, "Well, we'd like to triple it." Because they weren't getting viewers and because they weren't getting advertising, so they had to make it back on the subscription fees…So we would use set top box data and the money to show, "Hey, the higher that bar is, the worse your value is."
Better programming	"But the programming teams have looked at viewing trends over time to try to understand what kinds of people are engaging with which content. Obviously, … focus is …, … and …, but being able to break that down further and look at particular attributes of our viewership, where they're going, where they're coming from within the … universe is something that they've taken advantage of. It has in some way altered the way that we look at cross-promoting of programming"
Increased data stewardship	"So, to be able to project an audience on those much narrower windows, to be able to look at what happened yesterday and augment the campaign, so it's campaign stewardship because we want to be accountable for the audiences that we sell, our auditors demand that we deliver on the audiences that we sell"
More effective use of time	"It lets them concentrate on high value selling, solving problems as opposed to doing data entry"
New sales processes	"So Dave and Bob are, they're an advertiser on …. I really want to get deeper in understanding your business needs and how I can solve these business needs but instead of talking to you, sometimes I'm talking to an agent of you, who covers 30 of you. They don't really know, nor do they really care, to be honest. They should care but they don't really. And so where we found a lot, a lot of traction is actually with the direct advertiser because again, you've got a direct need and we can work this out, or we can figure out together"
New ways of thinking	"I think it's changing … as an organization. The way the [team] built out the … portfolio, and the way they rolled it out and marketed it internally and externally, there is a level of comfort with data driven advertising among the sales force that is quite amazing. Now, while they don't need to know the ins and outs and all the detail behind it"
Process improvements	"Because at the end of the day, part of programmatic TV is using your own proprietary data, but part of it just making it a much easier process, being able to go to an online portal and saying, 'I want to buy auto-intenders. This is how many GRPs I want, fire away'"

Table 26

Evidence examples for outcomes related to increasing value

Outcome	Example of evidence
Strengthening the value of television	"So, for example, we're interested in working with auto dealers. We can find out who has and hasn't received TV commercials per … data. If we can then match that back with who has and hasn't bought autos, we can do all kinds of interesting things about... There's obviously many a thing to figure out how many times people need to be exposed and all the rest of it... But if it's possible for us to link those two things together, then right there out of the box you've got amazing... And it works. We've proven TV advertising works, then out the box we've got an amazing ROI study"
Increasing the effectiveness of advertisement	"Because there's so much you can say, 'Yes, you got 10% more audience but so what?' So, when you are able to sell more to convert more, that's what's important right now. So again, we strongly believe that we'll be able to do this with traditional media as well. So, we think it's a game changer. And again, if a client can improve its effectiveness by 10%, it's a huge value for their business"

This chapter starts with a review of the various affordances by outcome category and concludes with a review of the interaction between the identified affordances and the mechanisms to which they are associated.

Advanced Advertising Products

One of the key outcomes related to the process of enhancing the existing audience information systems (AISs) with big data was the ability to develop advanced forms of advertising products: (a) addressable advertising; (b) cross-platform targeting; (c) dynamic ad insertion; (d) media optimization; and (e) programmatic television. The Coalition for Innovative Media Measurement (CIMM) (Wiesler, 2016) defines advanced advertising as:

> *A range of advertising solutions designed to leverage the interactive nature of digital Set-Top Boxes and enhance the value of TV by offering, for example, request for information, polling and trivia, Telescoping, Ad-Versioning Dynamic Advertising and T-commerce applications via the television through the use of the Remote Control. (p. 21).*

A connection can be made between these five new advertising products and the stimulating event of digital advertising since these products are audience products which are more similar to the digital audience product than that of traditional television. This phenomenon of evolution is an example of institutional theory, whereby the television industry is undergoing – as described by DiMaggio and Powell (1983) – coercive isomorphic change in order to remain relevant to advertisers. This type of isomorphic change occurs through the need of an organization to stay relevant – in this case to advertisers – and, therefore, adjusting to political influence, by trying to adapt to the changing needs of audience products within the audience marketplace.

All five of these audience products have a certain degree of interrelation but do have distinct advantages to advertisers. Table 27 provides a summary of the associated definitions provided by the CIMM (Wiesler, 2016).

The digital audience product allows for behavioural targeting, thereby targeting (i.e., addressable) delivery of ads in an optimized (i.e., media optimization) and dynamic (i.e., dynamic ad insertion) way. This type of advertising approach is highly effective (Summers, Smith, & Reczek, 2016); combined with the other advantages of digital advertising, digital ad spending is forecasted to surpass that of television ad spending (“Digital ad spending to surpass TV next year,” 2016).

Table 27

CIMM definitions for the advanced advertising products in this research study

Audience Product	Definition
Addressable Advertising	Advertising that is directed to specific geographies or audiences to increase its relevance (p. 11)
Cross-Platform Targeting	Identifying and matching audiences across devices (p. 135)
Dynamic Ad Insertion	The ability of advertisers to upload and insert targeted ads into video content quickly and frequently (p. 180)
Media Optimization	Media optimization involves the use of models that require the input of media audience and cost data for all qualified measured media vehicles, and the input of the brand's requirements in terms of budget, target audience, reach/frequency, and other factors. The models typically involve a complex set of equations which considers all of this input and outputs one or more "best schedules" within the pre-determined budget and timing constraints (p. 293)
Programmatic television	TV inventory planned, bought and sold on impressions using system automation with the use of advanced audience data, facilitating value and operational efficiency for both the buy and sell side (p. 374)

Note. Adapted from *CIMM Lexicon 3.0: Terms and Definitions. A Common Language for Media Measurement: RPD, Cross Platform, Connected TV, iTV, DAI, ACR, Internet, Digital, Programmatic, Neuroscience, Virtual Reality*, by C. Wiesler, 2016, retrieved from http://cimm-us.org/wp-content/uploads/2016/08/CIMM-LEXICON-3.0_July-2016.pdf. Copyright 2016 by the Coalition for Innovative Media Measurement.

In all of the organizations, these new television advertising products have moved to beta type testing, where the products are being refined and further developed in cooperation with a few select advertisers before full production launches. The goal of these products is to allow television to compete directly with the digital advertising product by offering features within the television audience product that were only possible before through digital advertising. The creation of these new products is enabled not only by technology and data but

through the existence of cross-functional teams within the organization and strong partnerships with advertising clients and technological partners.

At the core of each of these products are the various data management platforms (DMP), which synthesize the various forms of data in the organization. The various types of data varied slightly between organizations, but at the core of each DMP was return-path data (RPD), allowing for a census-like view of a subset of Canadian households. Cross-functional teams, consisting of individuals from various areas of the business (e.g., sales, product management, research & insights), leverage these DMPs. Each of these individuals had different internal or external clients, leading to an awareness of different product needs. These cross-functional teams also allowed for more rapid innovation and product development approaches, and at the same time, expanded the net of potential partners for testing, technology, or data.

While all five products (i.e., outcomes) have similar stimulating and releasing conditions and share similar techno-organizational contexts, the enabling conditions differed. Table 28 lists the enabling condition for each of the five products. These outcomes are an opportunity for the broadcaster to develop an audience product that can more effectively target potential consumers for advertisers. This targeting starts with media optimization. Media optimization provides the ability to build smaller, more niche and targeted audiences – compared to the traditional large reach audiences (e.g., Adults 25 to 54 years old).

At the same time, optimization also allows for more precise locating of these targets within the programming inventory. Therefore, through this audience product a deeper understanding of audiences can be gained. Participant 2 speaks of the process of using the data to understand advertising placement based on a data-driven audience.

Participant 2: *You go, you upload your CRM data, and you are given information about where you should place your advertising based upon the goals of a campaign. So really, that is what we are doing in a lot of ways. We are leveraging our first-party data across TV and mobile and web platforms in accordance with our privacy policies, and operationalizing around the creation of audience segments that then are passed to our ad-serving systems. And obviously, at that point, we are delivering advertising against those segments and learning from that, improving the segment, possibly optimizing the ad campaigns, etcetera.*

(Interview with Participant 2, Organization A on March 10th, 2017)

Table 28

Enabling condition – affordance pairs for the remaining four outcomes

Outcome	Enabling Condition
Addressable advertising	Partnership with BDU
Cross-platform targeting	Ability to link audiences across platforms
Dynamic ad insertion	Technological partners
Media optimization	Census-like data
Programmatic	Automation software

The optimized audience is reached more effectively by specifically targeting households with six-digit postal codes (FSA LDUs) which have been identified to be highly likely to contain the targeted audience. Through this targeting, specific advertisements sent to these households is possible through the

addressable advertising product. This product allows for the television audience product to move away from the traditional business model of a high reach, broad, and diverse audience, to a more targeted and specific audience. Allowing an advertisement to run across multiple platforms can, therefore, increase the reach and frequency of the optimized targeting campaign, and the dynamic ad insertion can allow for the timely delivery of the advertisement message. These four outcomes form the "more effective audience targeting" affordance (Figure 18).

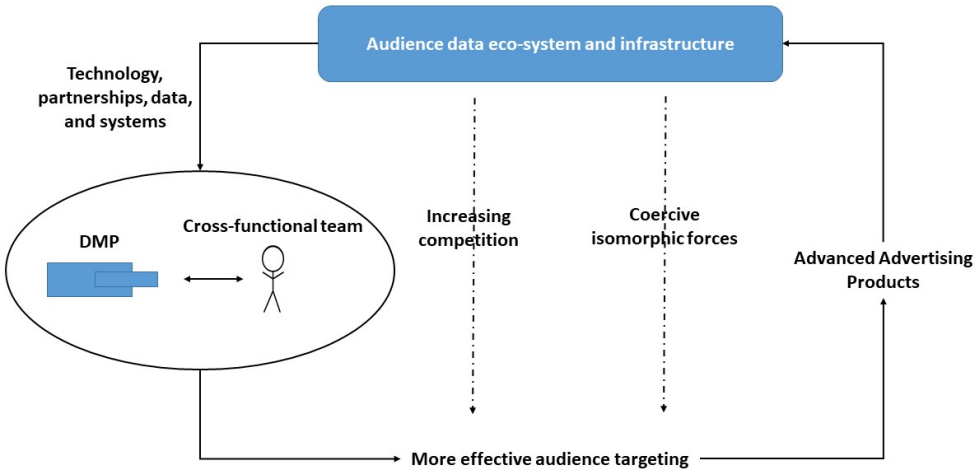

Figure 18. The more effective advertising affordance.

The programmatic outcome allows for a very different opportunity for the participants of the audience marketplace. Unrelated to increasing the ability to more precisely target, programmatic television gives the ability to automate a portion of the sales process for the broadcaster and the buying process for the advertisers and their agencies. Programmatic advertising has been a feature of the

digital audience product for some time and has allowed for the ability to target and scale that was previously not possible. The implementation of programmatic advertising has resulted in a more effective and smooth transaction of the targeted audience product (Figure 19).

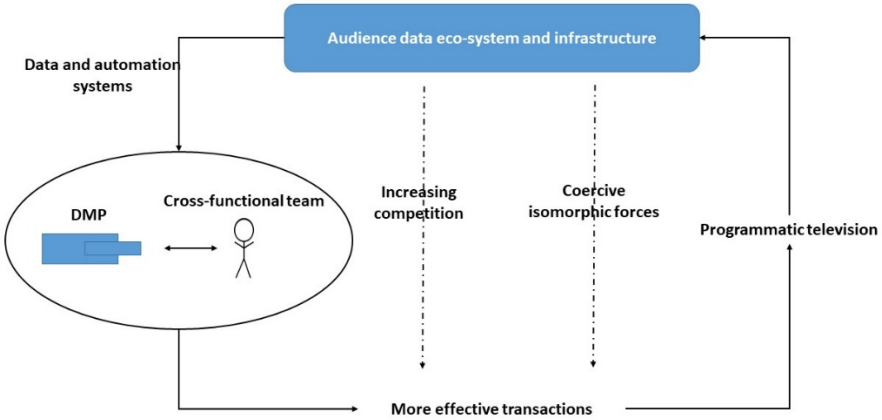

Figure 19. The more effective transaction affordance.

Increased Granularity

One of the key outcomes of the enhanced AISs was better granularity into audiences for the broadcaster. The increased granularity came in many forms but allowed for a more in-depth and better understanding of audience behaviour and video consumption. The increased granularity manifests in three forms, those related to: (a) increased granularity into audiences – being able to measure audiences more effectively; (b) increased granularity into behaviour – being able

to understand behaviour more effectively; and (c) new forms of data – resulting in a different view into the data.

Increased granularity into audiences. The increased granularity into audiences brings many clear outcomes or advantages. Media fragmentation has resulted in a high degree of audience fragmentation (Napoli, 2011), where audience measurement for many stations becomes less accurate and reliable (Napoli, 2003, 2012). Having access to a dataset with a considerable number of households has resulted in a census-like view of consumption of all stations. The currency AIS uses samples and, therefore, does not provide the same level of precision in the measurement of niche stations as for large reach stations; whereas, the enhanced AIS does not have the same sample size limitations. This massive dataset results in not only an increased precision in the predicted audience but also the ability to audit the measured audience and defend possible negative discrepancies at the time of posting. The organizations can also now more effectively program for these stations, through larger tuned measured audiences, with the hope of increasing overall audiences and, therefore, the value of the audience product.

The currency for the Canadian television audience product is program ratings. The measured audience is, therefore, the Average Minute Audience (AMA), or Rating, of the program. This form of television currency is entirely different from the US, where the currency is commercial ratings instead.

Commercial ratings measure the average audience against the commercial pods within a program rather than the program itself. Television ratings have been shown to drop during commercial breaks (Danaher, 1995). Since the commercial breaks are what the advertisers are effectively paying for, the measured audience using program ratings overstates the actual audience of value. Theoretically, the pricing of the audience product would compensate for this phenomenon, but this possible discrepancy does occasionally bring concern with advertisers. With the increased granularity of the RPD data, measuring viewing by the second rather than by the minute (like the currency AIS), as well as the sizeable census-like dataset, it is possible to estimate commercial ratings. At the same time, being able to view the data by the second allows for the ability to understanding viewing trends in a way not previously possible. It is therefore much easier to understand how viewing shifts between stations or networks.

This data is also real-time, so there is timely feedback on audience performance. The currency database delivers 'overnight' ratings (i.e., live + same day viewing) by 11 am the following day, but feedback on program performance can now be obtained in some cases as quickly as fifteen minutes (Participant 3, Organization A, March 10th, 2017). The quicker turnaround on audience information, as well as the increased granularity in audience information, allows the broadcaster to augment campaigns and ultimately be more accountable to the advertisers, as explained by participant 18.

Participant 18: *So, to be able to project an audience on those much narrower windows, to be able to look at what happened yesterday and augment the campaign, so it's campaign stewardship because we want to be accountable for the audiences that we sell, our auditors demand that we deliver on the audiences that we sell. We have revenue recognition where we cannot actually count our revenue until we have been able to prove that we have delivered on all the impressions that we sold.*

(Participant 18, Organization C, June 29th, 2017)

The data not only increases accountability to clients but also increases trust in the insights and estimates developed by the cross-functional team within the organization. This increase in trust occurs – despite the many biases and limitations with these data sets – because the data is real-time and census-like, and not based on a sample of the population. These data can then be used in conjunction with the currency audience, allowing for an audit of the accuracy of currency audience estimates. Participant 3 suggested that the increased trust in the enhanced data also comes from the lack of experience with panels, and statistical projections, by many of the end users of the insights and reports. They are, therefore, cautious towards statistical estimates and favour more robust census-like options.

The currency AIS relies on inaudible signals (i.e., watermarks), encoded into the audio stream of a program, in order to be measured. Due to a limited number of codes, and technical encoding challenges with some types of platforms, programs running on multiple platforms might be grouped as a single audience estimate or may be missed entirely in the measured audience. This grouping of

channels is a challenge for broadcasters as they now have an incomplete picture of the delivered audience and lack the insight on how the audience behaves by the platform. Content on digital platforms (e.g., non-live content on a broadcaster's website) often goes unmeasured; while the attribution of live-streamed content is grouped with the equivalent live program broadcast on a linear television station.

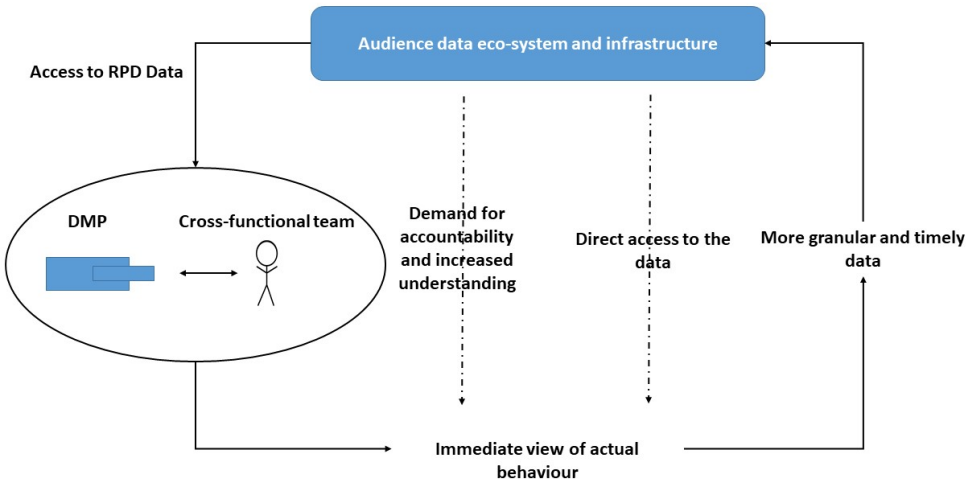

Figure 20. The immediate view of actual behaviour affordance.

These outcomes result in two separate affordances: an ability to yield an immediate view of actual behaviour (Figure 20) and a perceived ability to view the actual audience (Figure 21).

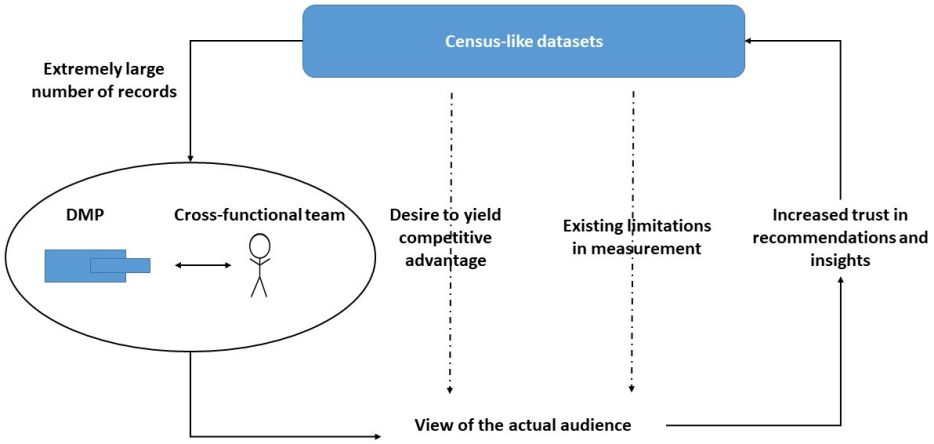

Figure 21. The view of the actual audience affordance.

These new systems also allow the broadcasters to measure audiences that were outside of the current measurement eco-system, resulting in several 'new' types of measurement available to these organizations. The currency AIS uses the Portable People Meter (PPM) system, which relies on the detection of hidden audio tones or watermarks in order to measure a station. This technological approach means that a station with the volume muted will go unmeasured. The lack of measurement is a common phenomenon with some stations; for example, CP24, due to its format that includes news tickers, is frequently muted in both homes and at out-of-home locations (e.g., offices, elevators, gyms). The RPD data allows the organization to effectively now measure these previously unmeasured audiences.

Canadian simultaneous substitution (simsub) laws can mask stations from the current measurement eco-system. When a local or regional broadcaster is broadcasting the same content as a foreign or non-local broadcaster at the same time (e.g., Survivor airing on both CBS and Global), BDUs are required by the Canadian Radio-television and Telecommunications Commission (CRTC) to simulcast the local station over the non-local station. This simulcast essentially creates a gap in the measurement of the non-local station since it is the local station's watermark that gets detected. Again, the RPD data fills in these gaps, which are quite useful for competitive intelligence reasons.

A third example of this lies with playback of recorded programs – a phenomenon that has existed since the introduction of VCRs. The current audience measurement currency in Canada is Live + 7. This definition means that the program's ratings include any playback that occurs within seven days of the initial airing of the program. Therefore, any playback occurring beyond that point is not included and, therefore, not visible to the broadcaster. Using the RPD data allows the broadcasting organization an understanding of their programs occurring outside of the traditional 7-day window. The ability to measure these previously unmeasured audiences (i.e., muted stations, simsub, 8-day+ playback) results in the expansion of measurement affordance (Figure 22).

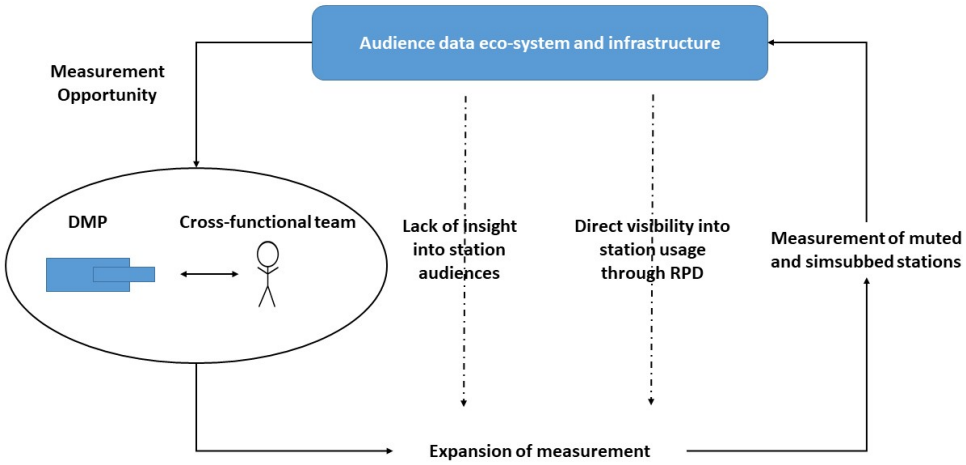

Figure 22. The expansion of measurement affordance.

Increased granularity into behaviour. Similar to how the census-like data allowing for a deeper understanding of audiences, many participants also reported a better understanding of the television viewer. The enhanced AIS allowed for a holistic view of consumer behaviour, new perspectives, and new insights. While the census-like data helped lead to these understandings; it was the fusion of behavioural datasets (e.g., geodemographic) to the RPD data that enabled this phenomenon. Participant 10 describes the process and how having these different perspectives may lead to more effective advertising.

Participant 10: *And there is also the possibility to work with multi-dimensional relationships. I think that you should take a look at the audience, it is uni-dimensional, you know how many of them and what are their profile. What we are trying to do here is to connect the dots. So, it is, we have a number but the most interesting thing is not the number, but you know it is the connection of this number to something else.*

> *Something else that took place before or will take place after mobility searches, visits to websites, and eventually maybe purchase decisions. So we are trying to build the pathway for effectiveness of advertising. So this is a different and interesting perspective. So when we started to do cross-tabulation with let's say Numeris information, it was nice. But here I feel that the potential is through 3D cross-tabulation with other consumer behavior as I mentioned, you know, the searches and the visits.*

(Participant 10, Organization B, May 11th, 2017)

From this data, a more granular or holistic understanding of the audience or consumer can be conceptualized (Figure 23). By asking for evidence as to the effectiveness of the television audience product, advertisers seek to understand whether their advertising budgets are being effectively spent. With the existing AISs only providing a uni-dimensional view of audience behaviour, the organizations seek ways to richen and deepen the understanding; this is possible through the fusion of the RPD data.

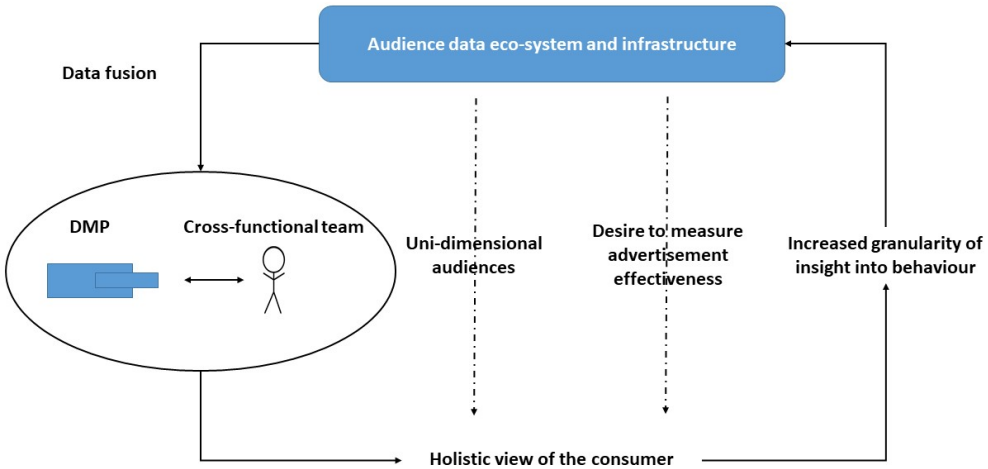

Figure 23. The more holistic understanding of the consumer affordance.

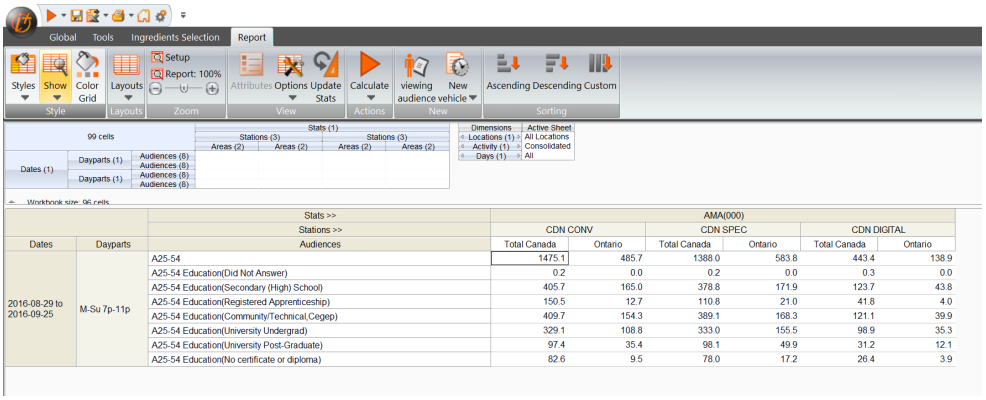

Figure 24. Existing view of the measured audience through InfoSys+TV. Reprinted from InfoSys+ [Computer software], by Nlogic. Copyright by Numeris. Reprinted with permission.

New forms of data. The previous AISs were typically third-party software such as Nielsen's Borealis or Nlogic's InfoSys+. These respondent level datasets only allow for summarized cross-tabulations of the underlying respondent level data (Figure 24). While these software packages are quite powerful for data

analysis, there was an underlying desire to yield different ways of analyzing the data and, therefore, to develop new forms of data and data analysis or visualization. Through other market offerings like Nlogic's ConexAPI, broadcasters could link existing currency audience information into their DMPs and build custom views of the data.

Organizations could now analyze or visualize the data through tools such as Tableau. At the same time, using the geographic data (e.g., latitude and latitude coordinates) within proprietary datasets allowed for spatial and location analysis. This data visualization could allow for a deeper understanding and, therefore, opened up new ways of looking at and thinking about programming and subsequent audiences. Participant 9 describes how spatial analysis can be used in conjunction with audience information to glean more in-depth insight, and new questions, on audiences specific to a program.

Participant 9: *This, to me, is more interesting. This is [program name], this is the first episode of [program name]. This is a heat map of downtown Toronto… So that is kind of quite interesting. Why is it... Obviously, we can overlay that with population density. Why is it... It is kind of clear why it is resonating round here, and I am too much of a new person to Toronto to know what to call these areas, but why is it doing better in central west end than in the central east end? What is it about [program name] that makes that, that?*

(Participant 9, Organization B, May 5th, 2017)

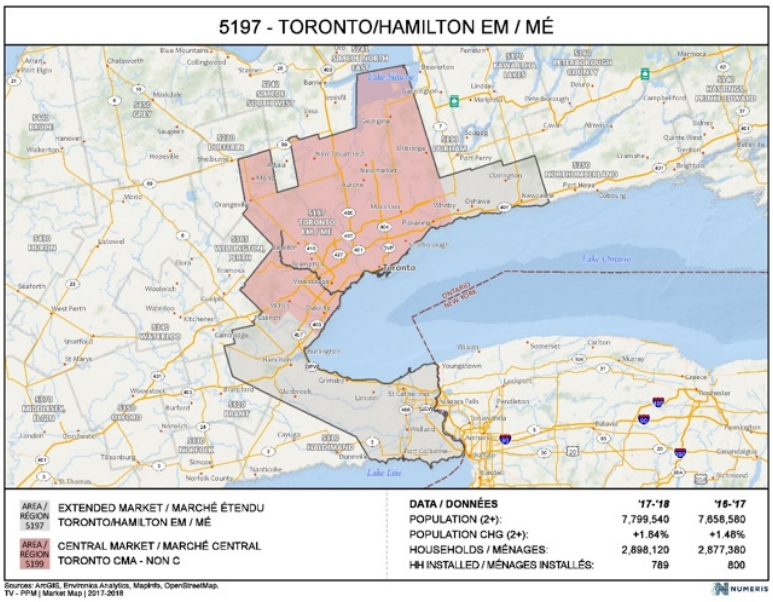

Figure 25. The Toronto / Hamilton EM. Reprinted from Geographical Reference Guide, by Numeris, 2018, Toronto, ON: Numeris. Copyright 2018 by Numeris. Reprinted with permission.

This view of the data also allowed organizations to understand audiences at lower levels than those available in the currency AISs. For example, the currency trading geography for the Toronto area is the Toronto / Hamilton Extended Market (EM) (Figure 25). This sizeable geographic region includes four separate Census Metropolitan Areas (CMAs): Oshawa CMA, Toronto CMA, Hamilton CMA, and St Catherines - Niagara CMA; and has approximately 7.8 million residents. This region contains a large and very heterogeneous population. The currency AIS provides a limited ability to drill down into the EM with only the Toronto CMA and Hamilton / Niagara Region available for analysis. This limitation requires the broadcast organizations to generalize audience insights across a large, diverse population.

Using the enhanced AISs, organizations can now yield an understanding of audiences for smaller geographies. This ability is particularly vital for programming decisions, as well as understanding niche audiences spatially clustered within the larger currency EM. Participant 1 explains how this granularity is useful for news programming.

Participant 1: *"Look, we know a ton of things about the demographics of people who watch different programs through the Numeris dataset, but there are gaps in that knowledge." There are specific things, affinities, that we cannot necessarily draw between. And I think they have started to realize that and that is fundamentally why they are sort of turning to that within some of the sales executions that they are starting to go with. But where I do not actually necessarily see them using it as much as they should is what I was talking about earlier, and really understanding where... Let's use [morning news program] again as an example. So [morning news program] we know is designed to be a very urban-appealing show, much like [news station], very focused on the city of Toronto, the inner happenings of the city, of interest to people who live in the city.*

But how interesting is it to people in the East end versus the West end? In the North end versus the South end? And I know we cannot necessarily draw the comparisons to [news station], at least not in a way that on the media side we can leverage, but I think it could actually help them with the content creation of the show to understand how many... Even as simple as, how many people live in the beaches versus how many people live in Scarborough? How many people live in Etobicoke, because they can actually tailor their stories and the events that they focus on dependent on that data.

(Participant 1, Organization A, March 10th, 2017)

This results in a more granular view of the audience (Figure 26) stimulated through the need for a more granular understanding of the audiences and released through the postal code information in the additional datasets.

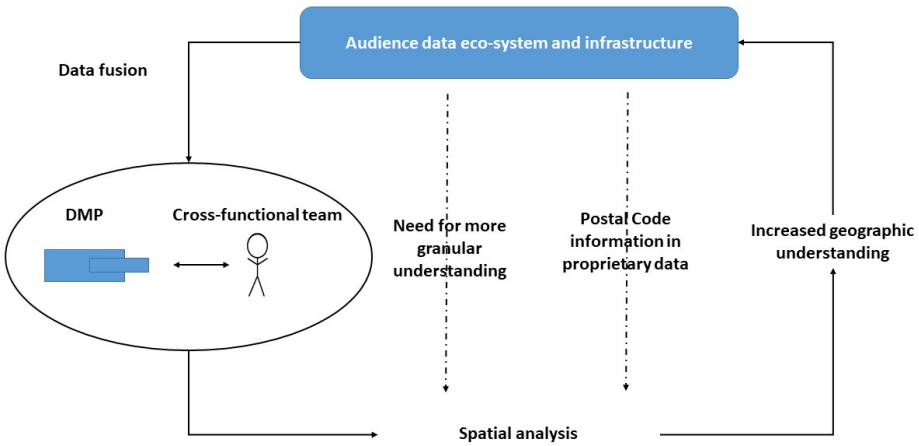

Figure 26. The more granular view of the audience affordance.

Organizational Change

Many participants described some form of organizational change as an outcome of the innovation process related to enhancing the AISs with the big data. The data had 38 total references related to seven distinct organizational changes: (a) better decision-making; (b) better programming; (c) increased data stewardship; (d) more effective usage of time; (e) new sales processes; (f) new ways of thinking; and (g) process improvements. New sales processes were the most commonly referred to, followed by better decision-making. Due to the

diversity and number of references to the new sales processes, this organizational change is reviewed independently from the rest.

New sales processes. The big data enhanced AISs resulted in changes to the existing sales processes in the organizations. These changes took four forms: (a) changes to the customer experience; (b) better inventory management; (c) new pricing models; and (d) new types of advertisement. The majority of references concerned the changing customer experience, and at least one participant for all three organizations identified this outcome.

Most of the identified changes to the customer experience were positive; however, there was one mention of an adverse outcome. Participant 5 from Organization A shared a concern that these new systems required proprietary algorithms[14] to create audience metrics (e.g., AMA – the standard metric for measuring television audiences[15]), there was no standard model amongst competing broadcasters and therefore no consistency in the audit of the audience product. While this was deemed to be an interesting observation and consideration, it is considered outside of the scope of the research project.

Many of the positive changes to the customer experience were related to the ability of the new systems to allow for better conversations between the broadcaster and the advertiser. Since the broadcaster could better target and understand audiences (see increased granularity and advanced audience products), the sales conversations could be more specific to the advertiser's needs.

Participant 2 described how having access to the RPD data can effectively begin to change the conversation with advertisers; allowing the advertiser to understand their target consumers' video consumption behaviour better. Sales discussions can now be more specific and tailored to the advertiser and can also allow the advertiser more insight and a better understanding of what is achievable through purchasing the audience product.

Participant 2: *So, instead of trying to re-architect, end-to-end broadcast TV, and as we rolled out programmatic, what we have done is, we are changing the conversation around audience and data. New ways to think about the audiences that are watching and viewing our shows through our set-top boxes to build these new segments. But it really is, at this stage, it is about changing that conversation. And marketers are looking for this. They are like, "Tell me more about viewers, and behavior." And so, then, when you start to get to adjustability, I think was the other point you made, is that is where other platforms connect. So when you have an audience segment that is connected to universal set-top boxes, because of who we are, we are able to connect that set-top box to potentially mobile devices that are in the household, as well.*

(Interview with Participant 2, Organization A on March 10th, 2017)

The new sales process also unloads some of the traditional work which the advertiser's agencies would be required to do (e.g., platform allocation, segmentation) onto the broadcaster, allowing for the agency to have more time to work closely with their client, the advertiser, to better understand the needs and best represent them in the audience marketplace. Participant 21 explains how the agency can spend less time focusing on advertising proposals, and instead, can allocate that time to understand the advertiser's need better.

Participant 21: *Instead of saying, "I have got to spend two hours putting this proposal together," it is like, "Okay, so, you are selling this model of car, let us talk about what kind of segment is going to work best for you." And if we can orches... They talk about it in the US now, 'orchestrated campaigns' which means, you see part one on VOD and then you see part two on broadcast. And then we know you saw that, so part three is going to be when you are on your web, your app.*

(Interview with Participant 21, Organization C on July 7th, 2017)

These systems now allow broadcasters to differentiate themselves from other media companies, both television and other forms of media. The depth of the insights they can now provide to their clients becomes a major differentiating factor. Participant 9 describes this process:

Participant 9: *It is definitely opening new doors, so we are able to have conversations. If we are just seen as vendors of TV, digital out of home, and radio, then we are in a vendor relationship with agencies. If we are seen as people that can provide really interesting and actionable insights about client's and advertiser's audiences, then that changes the tone of our conversations. And that means we can have deeper conversations about people's long-term business objectives. And that is just a very different kind of relationship than if we are just looking at media channels. So yes, I do think it opens up new possibilities, and it opens up new ways of talking, and proper reputation is very good.*

(Interview with Participant 9, Organization B on May 5th, 2017)

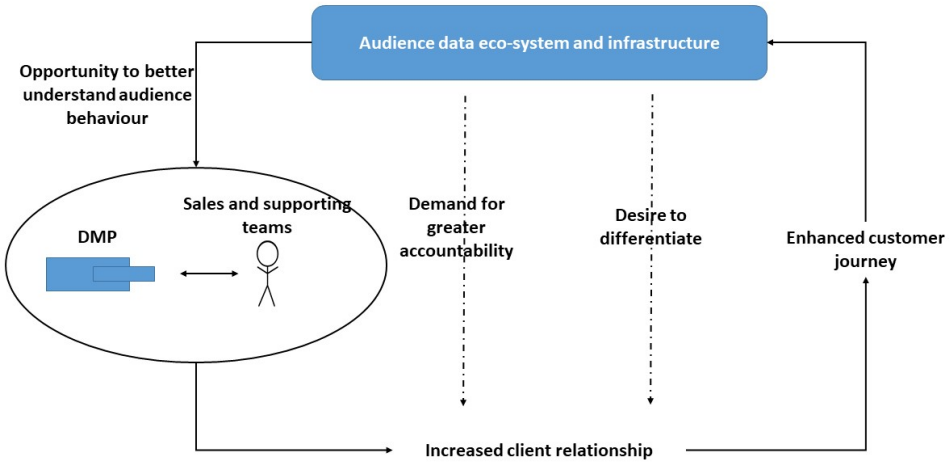

Figure 27. The increased client relationship affordance.

This process exemplifies the increased client relationship affordance (Figure 27). The affordance is realized through the demand for greater accountability on the audience product from advertisers and the desire of the broadcaster to differentiate themselves from various forms of competition. The opportunity presented by the data eco-system for the organization to better understand audience behaviour across all of their various platforms and within their television assets enables this affordance.

Other organizational changes. Other organizational changes were those related to decision-making, both overall and specific to programming, as well as those related to changes in the organization through more effective use of time within the organization, process improvements, and increased data stewardship within the organization. While these were referenced less frequently than those

related to the sales process, they were equally important and could increase the overall effectiveness and efficiency of the organization. The reference to data stewardship was quite valuable as it highlights the increased need, due to privacy concerns, for care and concern related to the data, its collection, usage, and storage. The need to be conscious of data usage, in particular, to protect the organizations from investigations from regulators (i.e., privacy commission) was a frequent topic of conversation. However, this particular reference gave an insight that the consciousness surrounding privacy was not just in theory but was indeed in practice – through data governance practices – and of overall concern to organizations.

The enhanced AISs allowed for better decision making across the organization. These systems enabled more in-depth insight into audience behaviour and video consumption across not only platforms but between stations. This insight could allow for an understanding of "viewing trends over time to try to understand what kinds of people are engaging with which content" (Participant 14, Organization C, June 14th, 2017), or even providing supporting evidence for proposed strategic directions.

Participant 12: *They will look at it and say, "Okay, does this make sense?" And they will do it if it makes sense and they are allowed to and they will not if it does not make sense.*

(Participant 12, Organization B, June 22nd, 2017)

This process describes the deeper understanding of consumption affordance (Figure 28). The work that the cross-functional team does with the enhanced AIS enables this affordance for areas of the business such as marketing, sales, or strategy. This affordance is stimulated through the unique insight, or view, of the behaviour of audiences within the subset and is released through the degree of trust by the organizations in the data and subsequent insights the data allowed. This trust existed despite concerns for possible bias within the actual teams working with the data; likely due to the ability of the cross-functional teams to model and adjust the data for bias, sell the value of the data, and perhaps due to an overall distrust in the existing currency data.

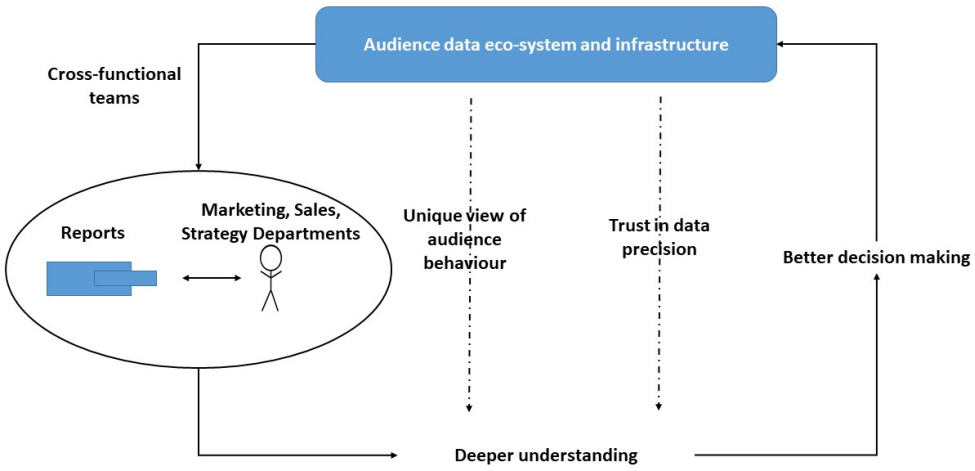

Figure 28. The deeper understanding of consumption affordance.

Through the ability to build programmatic systems and self-serve portals, organizations were also able to improve many internal processes and effectively

increase the effectiveness of their staff by reducing the time spent on tasks such as data entry. Processes were now much easier and allowed for sales staff to focus on "high-value selling, [and] solving problems" (Participant 21, Organization C, July 7th, 2017). Building a campaign for a sales pitch now became as easy as "[going] to an online portal and saying, 'I want to buy auto-intenders. This is how many GRPs[16] I want, fire away.'" (Participant 1, Organization A, March 10th, 2017).

Figure 29 illustrates the automation affordance. It is through the interaction between the programmatic tools and portals that sales staff can realize an automation affordance. This affordance is enabled through self-service and released by the organization's willingness to move to a data-enhanced sales process, effectively as a means to increase sales and remain competitive, and ultimately profitable, in a highly competitive audience marketplace.

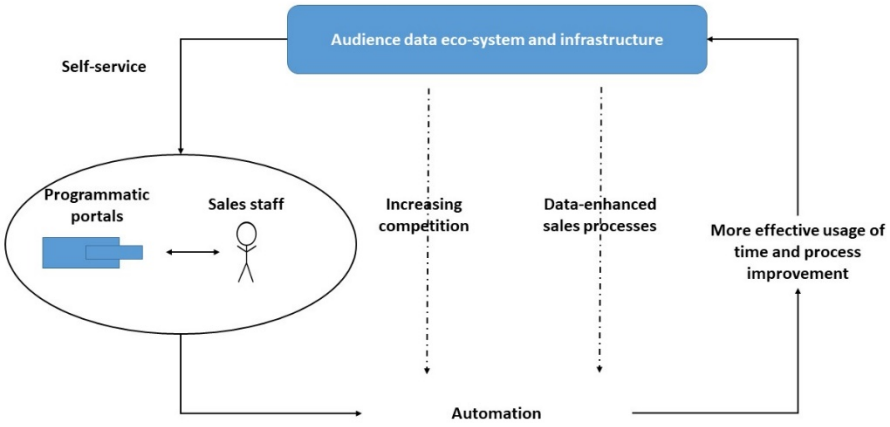

Figure 29. The process automation affordance.

Increasing Value

One of the identified events was the growing market for the digital audience product. As the market for this product grew, television advertising revenue began to decrease. Advertisers and their agencies found the emerging digital audience product as innovative and valuable. The perceived features, or affordances, which this new product offered drove this value. The digital audience product offered advertisers the ability to purchase a product that was not based on old traditional broad reach demographics (e.g., Adults 25 to 54), but rather, targeted smaller audiences. In order for the television audience product to remain competitive against the digital audience product, television broadcasters needed to increase the perceived value of their product to their clients.

An increase in the value of television was an outcome of the innovation studied in this research product. This increase occurred in two distinct ways, a strengthening of the perceived value of television and an increase in the effectiveness of the television audience product through stronger advertising. Five participants spoke of the strengthening of the value of television; while their examples differed slightly, the underlying thread was that this increase in value was directly related to the enormous data-sets and census-like data available to the organizations. This phenomenon is exemplified by participant 13 who directly attributes a more significant value proposition to television from the multiple datasets and the ability to fuse them into a single, massive dataset.

Participant 13: *Yeah, so I would say this. I think that we all look at it and be like, "Man, this is a real opportunity to drive some real differentiated value for us versus, let's just say a Facebook." So it is not to say we will be better or worse, but you look at this and you are like, "Oh man, if I can do some really good stuff with this, this is really, really important and this can really differentiate and create a value proposition. And value proposition is really really key. And when I say RPD, I think when we think through it, RPD to my definition would have been very much set-top box oriented data, which I think is really really valuable…. So from our review, what is more important than just that specifically is the fusion of data across [the organization], so meaning, if I can, over time, fuse … data and … data or in our case [RPD] Data, or any... That to us is really the bigger value prop. I want my RPD data, it is really really good that [it has] got its own level [data] set, but I think when you kinda go with the aha moments, it is the fusion. That for us is really interesting.*

(Interview with Participant 13, Organization B on April 24th, 2017)

In these cases, the census-like datasets are considered to be the techno-organizational context, which, through the stimulating and releasing conditions result in an increased value proposition affordance (Figure 30). It is through the existing strategic relationships with clients that the value proposition affordance is released.

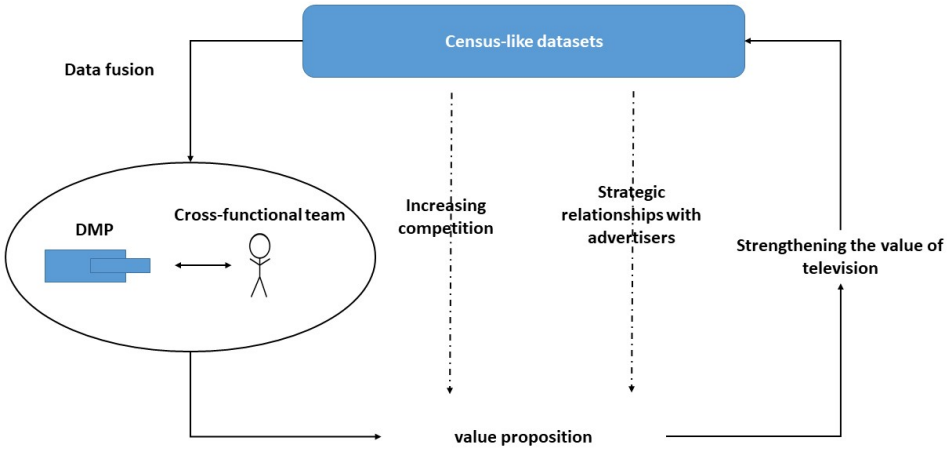

Figure 30. The increased value proposition affordance.

A similar affordance structure is apparent with the stronger advertising outcome. There was a total of four references to outcomes related to advertising effectiveness. Advertising effectiveness is a topic of interest for advertisers since these advertisers need to ensure that there is a positive return on investment for the advertisement purchase. Independent research organizations exist that assess advertising creative as well as the effectiveness of advertisements – often through brand recognition studies or focus groups – due to the inability of television broadcasters to provide empirical evidence. Through fusing the large datasets to the currency AISs, the broadcasters are hoping to get a better picture of the effectiveness of advertising through the ability to understand and create attribution models. Participant 18 explains:

Participant 18: *…taking a 12,000-person panel and appending that on to a 150,000 home seems like it is going to help us with, to deal*

> *with those challenges that we face in campaign and getting us ultimately to be able to measure what the actual commercial did…*
>
> *…You can append so much information. So much behavioral information on top of that in a privacy-compliant way. By linking the [primary key] to the [database ID], all of a sudden, your anonymous data becomes incredibly valuable. So, that was our point of view and it was really going to be an OTT driven solution until we could figure out and we were looking to the working group, we were looking to some of the work that the other VIs were doing in set-top box to think, "Okay well, we know that, at some point, we will be able to close the loop here, and we will be able to know all of this great information about our viewers, link them to a currency so that we can start to do attribution."*

(Interview with Participant 18, Organization C on June 29th, 2017)

Advertising attribution is when an organization can empirically show how multiple touchpoints with a target audience can contribute to the desired outcome – often a purchase of a particular product. Attribution models like Last-Touch Attribution or Multi-Touch Attribution have been available with the digital audience product (Barajas, Akella, Holtan, & Flores, 2016), but have not been fully available for the television audience product. Through the combination of various datasets, these organizations are now getting much closer to television advertising attribution models and therefore, the ability to provide a better understanding of advertising effectiveness to their clients. Participant 13 provides an example of leveraging internet usage in combination with RPD in order to better understand the effectiveness of an advertisement.

Participant 13: *But the hard part with RPD is, I know I have got some better usage, a better understanding of how you watch what you have done, but I do not actually have view of your action. And in some regards, if I am able to use some of my other data to say, "Oh, so I will just make this up." So Derrick was watching the Leaf game, and we know that he was watching that or it would not be just you, it would be perhaps some grander group of it. And there [were] eight ads for Tim Hortons, and we are able to understand what of that target group in this period of time. Would that change their actions through mobile data than how many times they went to Tim Hortons? And maybe if I am working with Tim Hortons, they can give me some data but even taking that I was able to track some different movements as examples. So I am able to do things, or I can go either whether you have movements or via your mobile internet or if I am able to get my other internet from my desktop or whatever it is, I can track some action.*

(Interview with Participant 13, Organization B on April 24th, 2017)

The attribution affordance directly relates to the outcome of stronger advertising and is illustrated in Figure 31. This affordance is very similar in structure to the value proposition affordance but has a different releasing condition. Whereas the existing strategic relationships with clients released the value proposition affordance, it was the granularity of the data – allowing for a highly detailed view of television audiences – that released the attribution affordance.

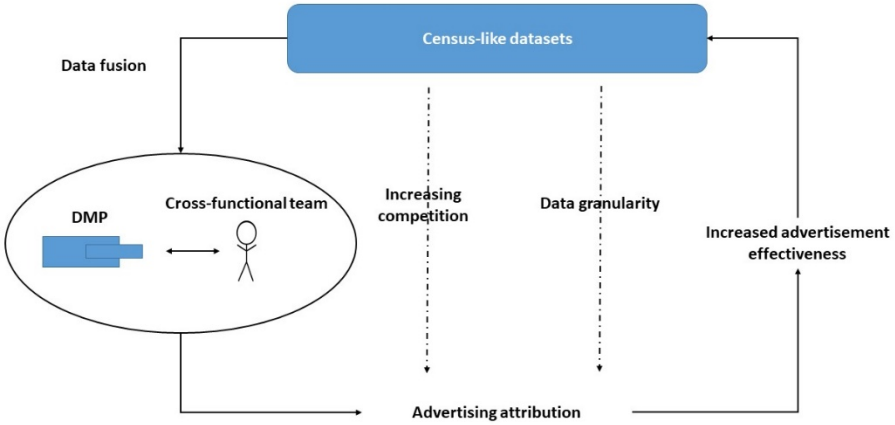

Figure 31. The advertising attribution affordance.

Summary

This chapter outlines the various affordances identified in the date, which help to explain the various action possibilities resulting through the interaction of various actors in the organization and the big data through the digital innovation process. Affordances are identified through their various structural components (Bygstad et al., 2016). The first step is the identification of concrete outcomes. Concrete outcomes are those which are achieved through the usage of the technology. These form the basis of the affordance as they are directly tied to the goals of the actor.

Once the outcomes have been identified, it is through an understanding of the interplay between the actors and the technical artifacts as well as the various conditions – enabling, stimulating, and releasing. Due to the complexity of both

people and technical artifacts, a deep understanding of both and how they interact is necessary to fully develop an understanding of the affordance (Bygstad et al., 2016). By identifying the three conditions, an understanding of how the affordance is actualized is obtained; this, therefore, allows for a clearer picture of the mechanisms.

In the next chapter, these affordances are brought together, allowing for an understanding of the associated mechanisms. It is these affordances that form the "building blocks" (Bygstad et al., 2016, p. 92) of the explanation the research seeks to answer.

For ease of review by the reader, the following tables present the conceptualized affordances. The tables include the enabling, stimulating, and releasing conditions as well as the applicable actors. There were certain commonalities in the affordances, either through common actors realizing the affordance or through a common techno-organizational context. Therefore, the affordances are presented according to these themes, only from an organizational perspective, those related the organization's infrastructure and the data eco-system realized by the cross-function team (Table 29) and those realized by the sales, and other, teams (Table 30) as well as those derived from the census-like datasets (Table 31).

Table 29

Affordances related to cross-functional teams and the organization's infrastructure

Affordance	Conditions			Outcomes
	Enabling	Stimulating	Releasing	
More effective advertising	Technology, partnerships, data, and systems	Increasing competition	Coercive isomorphic forces	Advanced Advertising Products
More effective transactions	Data and automation systems	Increasing competition	Coercive isomorphic forces	Programmatic television
Expansion of measurement	Measurement opportunity	Lack of insight into station audiences	Direct visibility into station usage through RPD	Measurement of muted and simsubbed stations
Immediate view of actual behaviour	Access to RPD Data	Demand for accountability and increased understanding	Direct access to the data	More granular and timely data
More holistic understanding of the consumer	Data fusion	Uni-dimensional audiences	Desire to measure advertisement effectiveness	Increased granularity of insight into behaviour
More granular view of the audience	Data fusion	Need for more granular understanding	Postal code information in proprietary data	Increased geographic understanding

Table 30

Affordances related to sales or other teams and the organization's infrastructure

Affordance	Conditions			Outcomes
	Enabling	Stimulating	Releasing	
Increased client relationship	Opportunity to better understand behaviour	Demand for greater accountability	Desire to differentiate	Enhanced customer journey
Deeper understanding of consumption	Cross-functional teams	Unique view of audience behaviour	Trust in data precision and accuracy	Better decision making
Process Automation	Self-service	Increasing competition	Data-enhanced sales process	More effective usage of time and process improvement

Table 31

Affordances related to the cross-functional team and the census-like dataset

Affordance	Conditions			Outcomes
	Enabling	Stimulating	Releasing	
Increased Value proposition	Data fusion	Increasing competition	Strategic relationships with advertisers	Strengthening the value of television
Advertising attribution	Data fusion	Increasing competition	Data granularity	Increased advertisement effectiveness
View of the actual audience	Extremely large number of records	Desire to yield competitive advantage	Existing limitations in measurement	Increased trust in recommendations and insights

Chapter 10. The Underlying Mechanisms

This research project focuses on three cases within the Canadian television industry that are enhancing their existing audience information systems (AISs) with big data. These big data are digital eco-systems consisting of data from many sources obtained through either internal data collection processes or partnerships with other organizations. Underlying the datasets in all three cases are return path data (RPD) obtained from the set-top boxes (STBs) of a set of Canadian households – with a subscription to a digital cable or internet-protocol television (IPTV) service from a broadcast distribution undertaking (BDU). These datasets are extensive, often referred to as census-like, and provide data to highly specific geography (e.g., 6-digit postal code), a high level of frequency (e.g., second by second), and an exceptional level of detail. Through data fusion and other modelling techniques, cross-functional teams within the organizations can enhance the existing AISs and develop new insights, audience products, and organizational change.

Chapters 8 and 9, explored the data using the method presented in Chapter 7, based on the framework developed by Bygstad et al. (2016). There were 12 candidate affordances identified through the analysis of the collected data forming the basis for the identification of the associated mechanisms. The findings of this process are reviewed in this chapter – like the previous – using a writing-with-evidence approach. Since the goal of a critical realist/realism (CR) study is to

identify causational mechanisms, there is a focus on necessary rather than sufficient conditions (Aaltonen, 2011). A necessary condition is one that must be present for the event to happen; however, its presence alone does not guarantee the activation of the event. Instead, it is the set of sufficient conditions that result in the phenomenon (Runde, 1998). In this case, the entire digital innovation process is not the scope of interest, but rather, the mechanisms which allow for the digital innovation – the necessary condition.

Table 32

Affordances representing situational (macro-micro) mechanisms

Affordance	Description
Immediate view of actual behaviour More holistic understanding of the consumer More granular view of the audience Deeper understanding of consumption View of the actual audience	The DMP and data ecosystem allow for a very different view and understanding of the audience to the individual actors in the organization
Process automation	The DMP and data ecosystem allow for many processes conducted by the actors in the organization to be automated
Increased client relationship	By being empowered through the enhanced AIS, the actors can gain the ability to better serve their clients

Using the macro-micro-macro typology for social mechanisms (Hedstrom & Swedberg, 1998), the 12 candidate affordances (Chapter 9) were classified based on the type of mechanism to which they might belong. Mechanisms were identified as either situational (macro-micro) (Table 32) or transformational (micro-macro) (Table 33). Since the research sought to understand how a larger data eco-system (the macro environment) was being successfully innovated upon

by a small cross-function team (the micro environment), the interplay of primary interest was, therefore, the interaction between the macro and micro environments. Therefore, in line with Bygstad et al. (2016), all mechanisms were deemed to be either situational or transformational, and no focus was placed on action-formation (micro-micro) mechanisms.

Table 33

Affordances representing transformational (micro-macro) mechanisms

Affordance	Rationale
More effective advertising More effective transactions Expansion of measurement Increased value proposition Advertising attribution	Through the actions and innovation by the actors within the organization, the audience marketplace is impacted by: • Increasing the effectiveness of the audience product; • Increasing the effectiveness of transactions; • Expanding the reach of the audience product; and • Being better able to attribute the audience. This results in an increased value proposition for the audience product across the marketplace.

Since an affordance cannot be both situational and transformational, this typology aided in the identification of the underlying mechanisms. Situational mechanisms as those where the environment (i.e., macro-state) impacts individuals and transformational mechanisms are those where a group of individuals produces a collective outcome (Volkoff & Strong, 2013). Classifying, in this manner, provides a high-level understanding of the possible generative

mechanisms to aid in the abstraction process as described by Bygstad et al. (2016).

Table 34

Coding of categorical variables for cluster analysis

Categorical Variable	Category	Numerical Factor
Context	Related to the infrastructure	1
	Related to the census-like data	2
Actors	Cross-functional team	1
	Other actors	2
Enabling Conditions	Data fusion	1
	Data	2
	Measurement Opportunity	3
	Opportunity to better understand behaviour	4
	Cross-functional teams	5
	Self-service	6
Stimulating Conditions	Increasing competition	1
	Demand for accountability and understanding	2
	Lack of insight	3
	Desire for competitive advantage	4
Releasing Conditions	Coercive isomorphic forces	1
	Desire to measure ad effectiveness	2
	Access to data	3
	Desire to differentiate	4
	Strategic relationships with advertisers	5
Mechanism Type	Transformational	1
	Situational	2

A k-modes clustering analysis was conducted on the set of affordances using their context, enabling, stimulating and releasing conditions, the actors for whom the affordance applied, and the type of mechanism they likely belonged. Using the identified contexts, actors, enabling, stimulating and releasing

conditions, and the type of mechanism (see chapter 9) a coding scheme consisting of numerical factors was developed for each of the categorical variable (Table 34). This coding allowed for the creation of a data set that could then be analyzed in R using the klaR:kmodes (Weihs, Ligges, Luebke, & Raabe, 2005) procedure (data frame available in Appendix F).

Visualizing the results of this analysis (Figure 32) provides an understanding of how these affordances may group into a higher-level mechanism. Some patterns are apparent in the data, specifically the grouping of affordances 1, 2, 10, and 11 as well as affordances 7, 8, and 9.

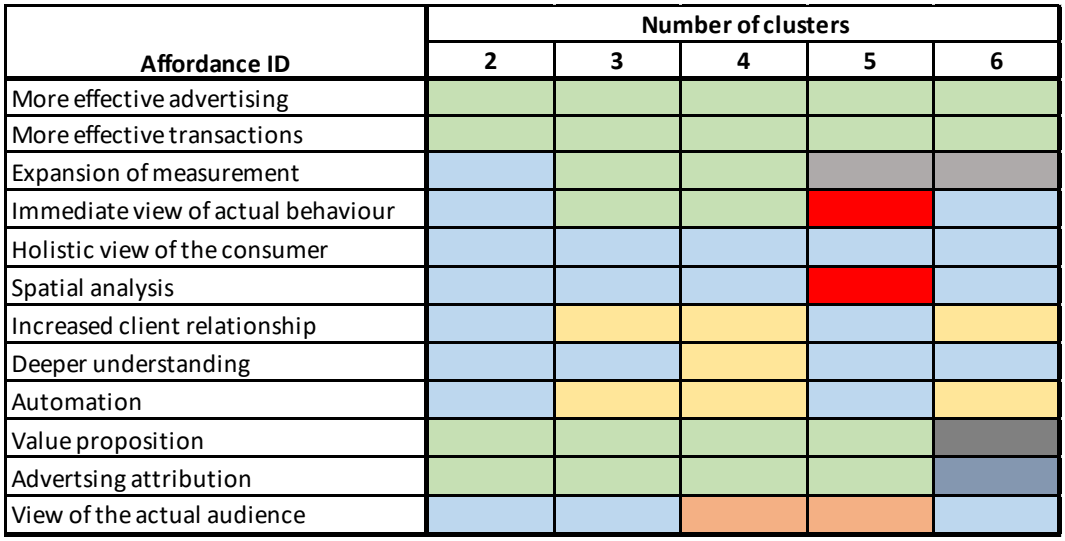

Figure 32. Visualization of k-modes cluster analysis results. Common colours represent affordances grouped into the same cluster by the procedure.

Cluster analysis, using some pre-determined measure of distance (e.g., Euclidean distance, Pearson correlation distance), creates a taxonomy of clusters

to maximize homogeneity within each cluster while maximizing heterogeneity between clusters. The k-modes procedure measures the effectiveness through the within-cluster simple-matching distance (Huang, 1998). As the number of clusters increases, the average simple matching distance decreases. This relationship, however, is not linear; therefore, the selection of the number of clusters is at the point where the gain in the simple-matching distance by adding another cluster is minimal. An analysis of the average within-cluster simple-matching distance (Figure 33) suggests that the data should break into four or five distinct clusters. Due to the significant gain in the simple-matching distance between the first and second elbow, a taxonomy consisting of five clusters of affordances forms the basis for the abstraction of the affordances into higher-level generative mechanisms.

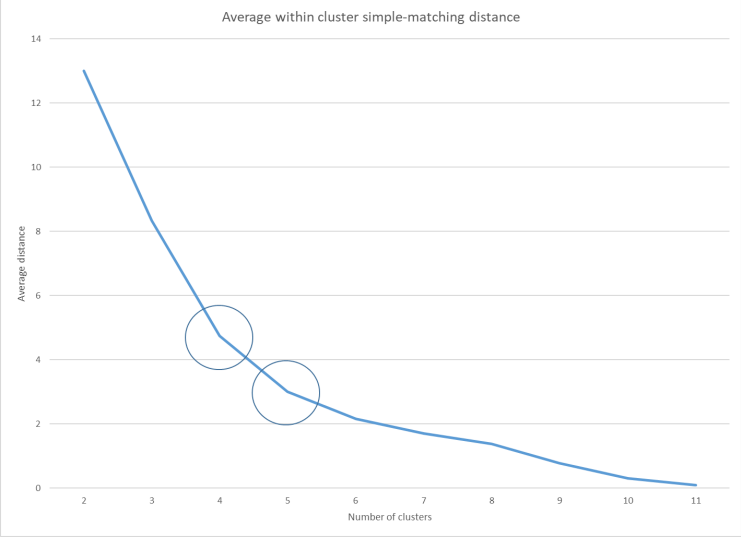

Figure 33. The average within-cluster simple-matching distance for various numbers of clusters.

In reviewing the five clusters created by the k-modes algorithm, it is essential to note that each cluster consisted of affordances associated with either a situational or a transformational mechanism. Since the clusters represent a potential grouping of affordances into a higher-level mechanism, the consistency within each cluster suggests that the five mechanisms are each either a transformational or a situational mechanism. There was a total of three situational (macro-micro) mechanisms and two transformational (micro-macro) mechanisms. An exploration of these mechanisms now follows. The mechanisms are presented in the order of Hedstrom and Swedberg's (1998) typology, commencing with the three situational (Type 1) mechanisms and followed by the two transformational (Type 3) mechanisms.

Three Situational (Macro-Micro) Mechanisms

This section reviews the three situational (macro-micro) mechanisms identified in the research project. These three mechanisms are those in which the macro-level events or conditions affect the actors or organization.

New views of the audience – the framing mechanism. By creating different views of the underlying audience through the data, two different affordances actualize for the organization and its actors. The first affordance is a product of the immediacy the enhanced AISs allow for the understanding of the audience, and the other derives from the ability to tie audiences to a more granular spatial level. The affordances are examples of the framing mechanism identified

by Aaltonen and Tempini (2014). They describe this mechanism as one where the actors in an organization combine various sources of data yielding different interpretations of the information that allows the organization to address issues and challenges strategically. This mechanism typically allows for "the production of more information by connecting the data to other data sources with respect to a broader context" (p. 105).

The framing mechanism is illustrated by the more granular view of the audience affordance. The currency AISs can only report audience estimates for a limited number of spatially large areas; this results in a challenge for local advertising sales for the conventional products (i.e., Canadian Conventional television stations) of the studied organizations. Small local businesses are a strategic target for the sales of these types of advertisement. These types of organizations typically have trade areas that are much smaller than the region in which an audience is possible to report. This lack of granularity often requires an assumption of homogeneity of audiences within the reporting area, which is often not the case. For example, the sub-region of Toronto Census Metropolitan Area (CMA)[17] contains the entire Census Subdivision (CSD)[18] of Toronto, which represents the former five cities and one borough of Metropolitan Toronto - an area with a population of 5,928,040 individuals (Statistics Canada, 2017). This area in no way could be assumed to be homogeneous. It is through the framing mechanism that the organization leverages other data sets with information at the six-digit postal code (FSA LDU) level, and through data fusion techniques,

combines the two data sets in order to increase the granularity of audience information and eventually achieve better precision in local audience product sales (Figure 34).

Participant 9 provides an example of how being able to view audiences at a more granular level than the EM can provide more profound insights and understanding. In some cases, the answer may not be obvious, but it does provide a clue of how audiences may vary by micro-region and drives not only a different understanding but new questions and areas for further exploration.

Participant 9: *…this is the first episode of [program]. This is a heat map of downtown [city]. That actually shows where [the program] is viewed. Okay? So that is kind of quite interesting. Why is it... Obviously, we can overlay that with population density. Why is it... It is kind of clear why it is resonating around here, …, but why is it doing better in central west end than in the central east end? What is it about [program] that makes that, that?*

(Interview with Participant 9, Organization B on May 5th, 2017)

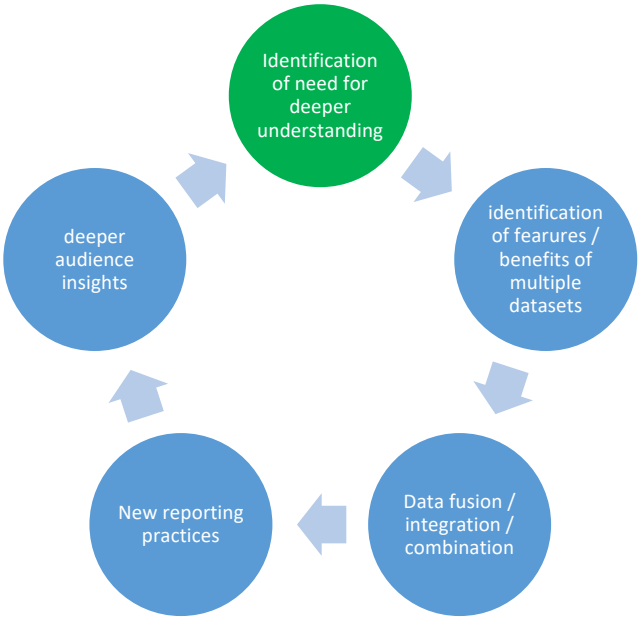

Figure 34. The framing mechanism.

Shaping the organization – the AIS adoption mechanism. The usage of big data within organizations has been shown to shape organizational design (Schildt, 2017). By answering managerial questions using the data, management can better organize resources and tasks. In this study, this occurred through the enhancement of the existing AISs with big data leading to changes in the way the broadcasters were able to conduct business. There were four affordances related to new ways of conducting business: (a) a more holistic understanding of the consumer; (b) increased client relationships; (c) deeper understanding of behaviour; and (d) process automation.

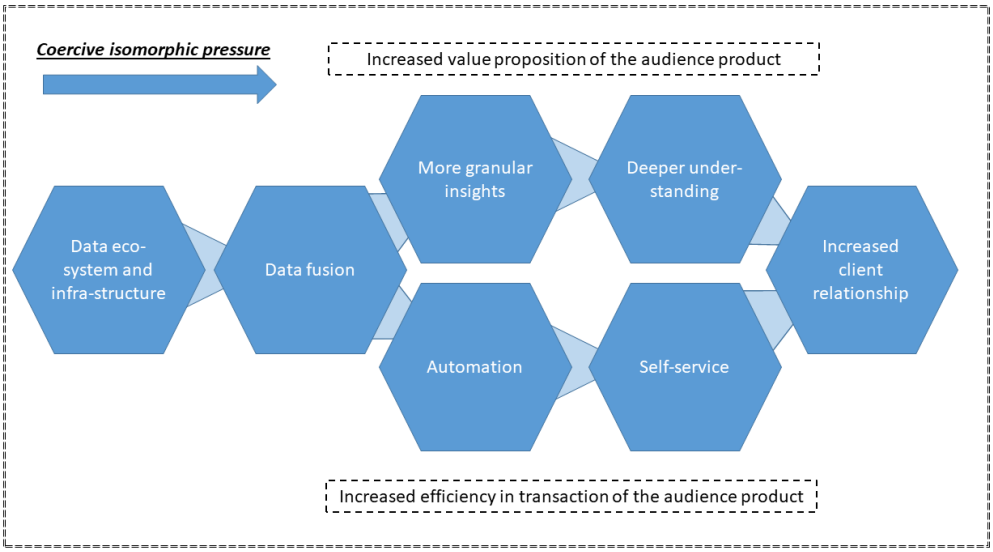

Figure 35. The AIS adoption mechanism.

Through a fusion of the various datasets in the enhanced eco-system and infrastructure, the value proposition and the ease and efficiency of the transaction of the audience product increases, eventually enhancing the relationship with the end clients (Figure 35). Two distinct phenomena enable this outcome:

- the granularity of the data – allowing for a more granular view and understanding of audience behaviour; and
- the ability to leverage technology to automate the sales process of the audience product – resulting in greater efficiency of transactions.

The path in which this takes place is very clearly explained by Participant 9. By increasing the understanding of audiences, the relationship with the client

changes significantly. The organization is no longer positioned as merely a provider of the audience product, but rather, a strategic partner for the advertisers.

Participant 9: *It is definitely opening new doors, so we are able to have conversations. If we are just seen as vendors of TV, digital out of home, and radio, then we are in a vendor relationship with agencies. If we are seen as people that can provide really interesting and actionable insights about client's and advertiser's audiences, then that changes the tone of our conversations. And that means we can have deeper conversations about people's long-term business objectives. And that is just a very different kind of relationship than if we are just looking at media channels. So yes, I do think it opens up new possibilities, and it opens up new ways of talking, and properly reputation is very good.*

(Interview with Participant 9, Organization B on May 5th, 2017)

However, ultimately, it is the adoption of the data by the various actors within the organization that results in an increased relationship with their clients (i.e., advertisers and agencies). This adoption has many similarities to the digital infrastructure adoption mechanism identified by Henfridsson and Bygstad (2013) (Figure 36) but is not tied to the investment of resources. Instead, in this case, the adoption is through coercive isomorphic pressure (see Chapter 5) as the broadcasters seek to answer calls by the advertisers to mimic features available with the digital audience product. By answering this request, the result is stronger client relationships.

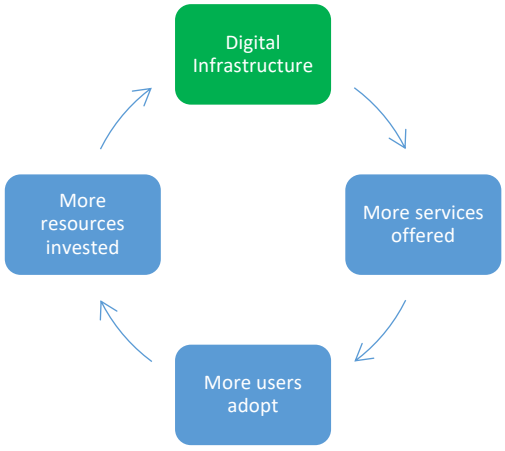

Figure 36. Henfridsson and Bygstad's (2013) digital infrastructure adoption mechanism. Adapted from "The Generative Mechanisms of Digital Infrastructure Evolution," by O. Henfridsson and B. Bygstad, 2013, *MIS Quarterly, 37*(3), p. 919. Copyright 2013 by MIS Quarterly.

Building trust in measurement – the audit mechanism. The currency AIS reports on the measured audience, a product of the measurement organization serving the audience marketplace. These measured audiences are statistical projections created through survey samples. Unfortunately, estimates obtained through survey samples are subject to many forms of error (Deming, 1944). While audience measurement organizations endeavour to reduce error as much as possible, it is impossible to eliminate (Kish, 1965). Groves (1989) provides a typology of the various forms of error which can occur through a survey. In the case of audience measurement (i.e., the measured audience), an example of coverage error is the absence of Canadian households without telephones in the Numeris sampling frame. While these households only represent 0.7% of Canadian households (Statistics Canada, 2016), these households are unreachable in telephone-based recruitment, and their absence could, therefore, result in what

Kish refers to as a frame bias. The combination of the long-tail of media consumption and the limited sample sizes used by measurement organizations makes sampling error of particular concern to broadcasting organizations since the reliability of the niche stations is challenged (Taneja & Mamoria, 2012).

The actors employed within the research departments of these broadcast organizations have backgrounds in statistical projection and survey samples. Therefore, error in measurement and the statistical methods used to create and analyze these types of data are areas of familiarity for these actors. At the same time, these concepts and methods are complicated and foreign to many of the actors in other areas of the organization (e.g., programming, sales). Due to this unfamiliarity and lack of experience, these individuals often "fear," as described by participant 3, and misunderstand what the audience estimate truly represents.

Participant 3: *I think for people who are not used to working with panels, and working with statistical projections, something that seems to be real, like a real activity as opposed to... A measurement of something that really happened as opposed to an estimate based on a sample, seems more concrete. But I actually think that that is... So if there is an idea that there is some great measurement that is out there, that has not been realized yet. But I think a lot of just comes from the misunderstanding of what value a statistical estimate is versus what is effectively a limited measurement of reality. And I did the scare quotes, but of an actual count as opposed to an estimate. Some people do not like estimates, and they are very familiar with limits of them, so they will try to do something that has not worked before and somebody said, "Well the sample is too small," or something, so they get this idea that this is an inherent problem with panel-based solutions.*

(Interview with Participant 3, Organization A on March 10th, 2017)

Enhancing the existing AIS with additional data that can confirm, or even refute the measured audience from the currency Numeris system, therefore brings trust and comfort to the data for these actors. This benchmark is essential since the measured audience is the basis of many important economic and strategic decisions within a broadcast organization. For example, the measured audience drives strategic decisions related to program development, program purchasing, and scheduling. These audiences also drive financial forecasts, sales targets, and the formation of the predicted audience used in the sales process of the audience product. It is easy to understand how an inaccurate audience estimate can have severe organizational consequences and could lead to lost revenue for the broadcaster.

The RPD datasets produce data related to the delivery of video content to a set-top box (STB) within a household. This measure is entirely different from the data from the currency AIS, which measured the exposure of video content to individuals. Through mathematical and statistical adjustments and modelling, the RPD data is transformed into a measured audience, which can then be directly compared to the currency measured audience. While this comparison is not free of its errors, it can become a sanity check for the currency measured audience. This additional insight allows for concerns with the accuracy of the measured audience to be eased and allows for the analysis conducted by the actors in the research departments to be trusted and gain organizational credibility. When the two data

sources do not match, it then flags the potential need to apply caution in the decision-making process using the currency AIS. The existence of the audit mechanism (Figure 37) enables this process and the broadcast organizations to address issues of accuracy or precision (i.e., reliability) of the data. This audit can enable stronger and more productive data-driven decision making, as described by Tambe (2014), through the usage of a variety of datasets.

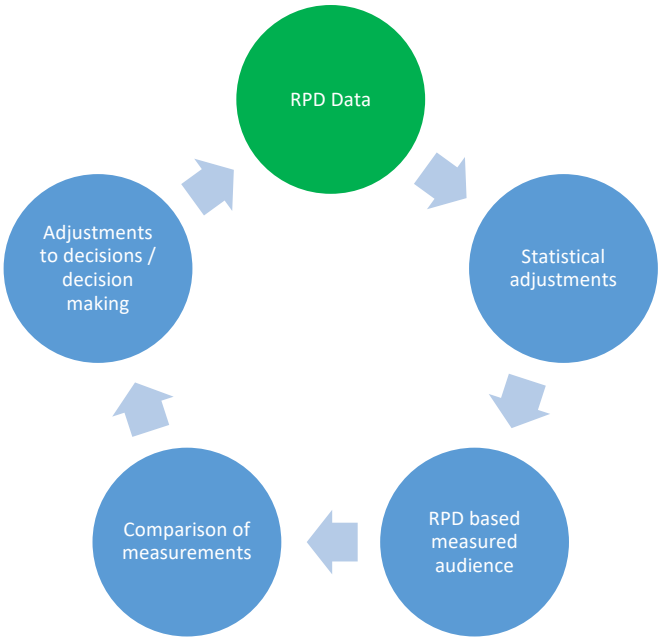

Figure 37. The audit mechanism.

Two Transformational Mechanisms

The following section now reviews the two identified transformational mechanisms (micro-macro). These two mechanisms are those in which the actors within the organization (micro-level) can affect the audience marketplace.

Innovating the audience product – the audience product innovation mechanism. The first identified group of affordances consisted of: (a) the more effective advertising affordance; (b) the more effective transactions affordance; (c) the value proposition affordance; and (d) the advertising attribution affordance. These affordances represented the flow of the creation of a new audience product (i.e., more effective advertising, more effective transactions) through to a better understanding of the path to purchase (i.e., advertising attribution) which ultimately results in increasing the value of the television audience product (i.e., value proposition). All four of these affordances shared the stimulating condition of an increasing level of competition from the digital audience product and were realised by the cross-functional teams working with the data-enhanced AISs. These were all transformational (micro-macro), an example of a small team affecting the more significant outcome – in this case, the audience marketplace. These affordances abstracted into the higher-level audience product innovation mechanism (Figure 38).

This mechanism can be compared to the innovation mechanisms identified by Henfridsson and Bygstad (2013), in their study of digital infrastructure evolution, and Bygstad et al. (2016), in their study of innovation within the digital infrastructure of an airline. Henfridsson and Bygstad defined the mechanism as "a self-reinforcing process by which new products and services are created as infrastructure malleability spawns recombination of resources" (p. 918). It is through the technical malleability of the digital infrastructure's architecture that

users were able to reconfigure elements and routines to create new services. The form of this mechanism is very similar to that identified by Bygstad et al., where three affordances form the mechanism. In this example, the space of possibilities allowed by the developing concepts affordance fed into a prototyping affordance. This prototyping allows for various components (i.e., elements) to be assembled and therefore spawns new products. These two descriptions are likely different views of the same affordance.

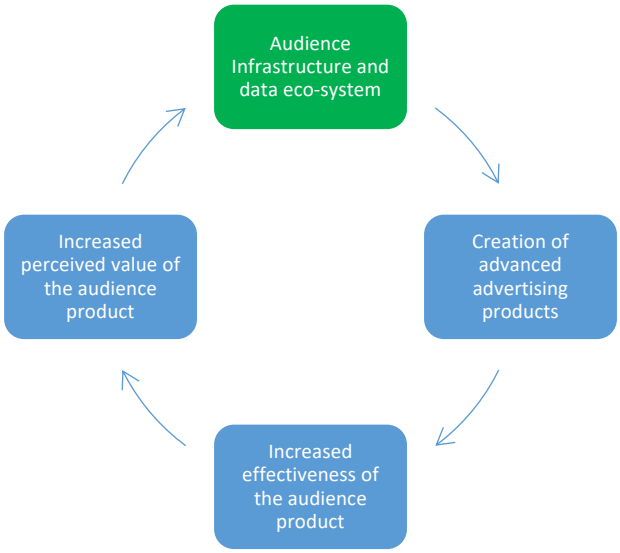

Figure 38. The audience product innovation mechanism.

The audience product innovation mechanism differs from Henfridsson and Bygstad (2013) and Bygstad et al.'s (2016) innovation mechanism. The audience product innovation mechanism expands the innovation mechanism beyond the creation of new products to the impact of the new products on the audience marketplace. In many ways, the innovation mechanism is a smaller mechanism

which feeds into the broader audience product innovation mechanism as it was through malleability of the big data enhanced AISs and reconfigurations by the cross-functional teams that resulted in the five new advanced advertising products. These products then led to the increased value of the television audience product. The audience product innovation mechanism is, therefore, an interplay between the innovation mechanism and an increasing value mechanism by expanding Figure 38 into Figure 39.

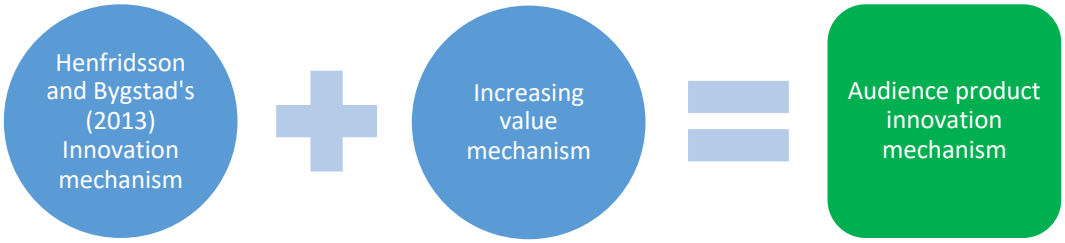

Figure 39. The reconceptualization of the audience product innovation mechanism.

Measuring the unmeasured – the expansion of measurement mechanism. There is a natural and symbiotic relationship between measurement and the audience product. Measurement organizations play a specific role within the audience marketplace and the measured audience "functions as the coin of exchange within the audience marketplace" (Napoli, 2003, p. 19). The audience product can only be institutionally effective with the presence of a measurement arrangement (Aaltonen, 2011). There are of course exceptions, niche television stations often locally transact at the spot level using custom research and

sometimes based on relationships alone, but in order to be included in large national buys, measurement is required. Any portion of the audience product unmeasured essentially becomes un-monetized; and therefore, represents 'money left on the table.'

While the current measurement arrangement for television in Canada brings many advantages over other measurement systems (e.g., out of home measurement is only available through a proxy of the viewing of visitors in panelist homes in the US), it is not perfect and does not capture all viewing. While Numeris, the national television measurement organization, is currently testing various means of expanding the breadth of its measurement universe (Lloyd, 2017), there are still many areas which are, and will likely remain, unaddressed. Examples of this include the audiences specific to US stations whose programming has been overlaid with the simulcast of the Canadian stations carrying the same content or stations whose programming is being viewed with the volume muted (e.g., CP24 in elevators or at health clubs). While the impact of these lost audiences is unknown, the simulcast issue was significant enough to be identified, concerning the Super Bowl, by the CTRC in their Let's Talk TV report (CRTC, 2018f).

Participant 9 describes how their organization was able to, through their big data enhanced AIS, to develop a unique way to monetize a particular station which otherwise would have been under-measured in the currency measurement

system. Not only did the additional data allow for an understanding that there was likely a significant difference between the actual and measured audiences, but the understanding of the cause of the difference led the organization to look at the audience product for the station in a different manner. The underlying reason for the under-measurement was the frequent consumption of the station while on mute. This situation resulted in the determination that the station's advertising product should be modified to align with its consumption patterns. The audience product for the station therefore now also includes banner type advertising, an audience product form typically found in digital advertising rather than television. This example suggests that expanding the scope of measurement not only increases the ability to monetize but can also help shape the audience product.

Participant 9: *But those news channels which are always on in offices and are on mute, [result in] a huge difference in [the measured] audience. So our reflex was to say, "Well, can we have like those displayed instead of traditional advertising?" We can have banner displays.*

(Interview with Participant 3, Organization B on May 11th, 2017)

Through complementing the existing AISs with RPD data, the organizations have found a way to understand, and potentially monetize, these uncovered audiences as exemplified through the expansion of measurement affordance (Figure 40). While the underlying mechanism shows some similarity to the framing mechanism identified by Aaltonen and Tempini (2014) – where the combination of data sources creates more information – this is conceptualized as a different mechanism: the expansion of measurement mechanism. This distinction

is because of the additional information is obtained through a single data source (i.e., RPD data) rather than through the connection of multiple data sources. The RPD data is transformed and analyzed, therefore allowing for a complementary use; juxtaposing against the currency audience and allowing for visibility into a measured audience that does not exist in the currency AIS.

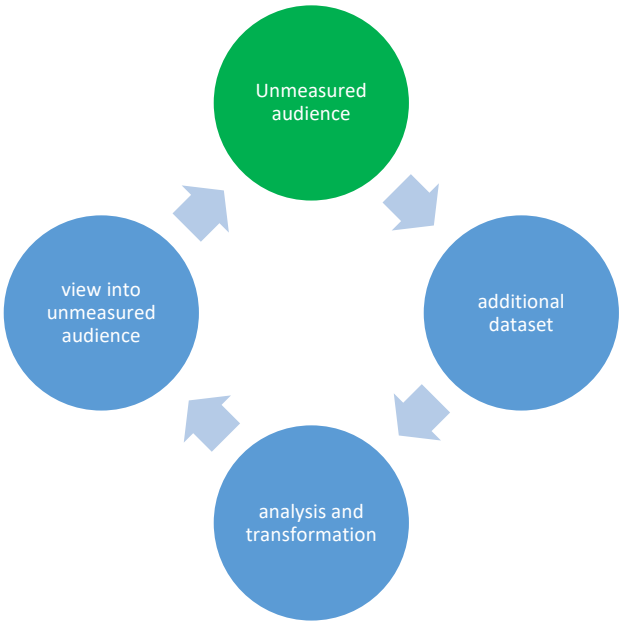

Figure 40. The expansion of measurement mechanism.

Summary

This chapter provided the results of the final steps of Bygstad et al.'s (2016) stepwise framework for CR data analysis. In these final steps, using one of four methods, the affordances from previous steps are used to understand the generative mechanisms of interest. The analysis utilized the avenue of grouping affordances to understand the associated mechanisms. This grouping was

accomplished through the novel usage of k-modes cluster analysis, classifying the affordances into groups based the context, the actors, the enabling, stimulating, and releasing conditions, as well as the type (i.e., situational, transformational). This procedure grouped the affordances into five clusters, each consisting of between one to four affordances. These clusters can then be viewed as the higher-level mechanisms of interest. Three of these mechanisms were situational, where the macro-environment impacted the micro-environment, and the remaining two were transformational, with the micro-environment impacting the macro-environment.

The situational mechanisms included the framing mechanism, the AIS adoption mechanism, and the audit mechanism. The two transformational mechanisms included the audience product innovation mechanism and the expansion of measurement mechanism. These five mechanisms are summarized in Table 35.

Table 35

Summary of the mechanisms

Mechanism	Description	Comments
Framing mechanism	The actors in an organization combine various sources of data yielding different interpretations of the information that allows the organization to address issues and challenges strategically	Previously identified by Aaltonen and Tempini (2014)
AIS adoption mechanism	Adoption of data through coercive isomorphic pressure in order to answer calls by the advertisers to mimic features available with the digital audience product thereby resulting in stronger client relationships	Similar to Henfridsson and Bygstad's (2013) digital infrastructure adoption mechanism
Audit mechanism	RPD data is transformed into a measured audience, which can then be directly compared to the currency measured audience. This additional insight allows for accuracy concerns to be eased and increases the trust and credibility in analysis	
Audience product innovation mechanism	The flow of the creation of a new audience product through to a better understanding of the path to purchase which ultimately results in increasing the value of the television audience product	An expansion of Henfridsson and Bygstad's (2013) innovation mechanism
Expansion of measurement mechanism	Through complementing the existing AISs with RPD data, organizations find a way to understand, and potentially monetize, previously unmeasured audiences	Similar to the framing mechanism identified by Aaltonen and Tempini (2014)

Chapter 11. Discussion and Practical Applications

The initial purpose of this study was to understand how television organizations were using return-path data (RPD) from digital set-top boxes (STBs). The process of reviewing various ontological and epistemological frameworks led to the discovery of critical realism (CR) – a growing philosophical framework within the field of management information systems (MIS). This journey resulted in a highly theoretical exploration of big data innovation within the Canadian television industry. However, it is theory that guides practice. Practicality comes through using theory to develop a better understanding of a business environment or, to solve or resolve problems facing business. Chapters 8 through 10 present the theoretical results of this study. This chapter now brings them together, discussing their academic contribution as well as how they practically affect organizations.

This research project allowed for an understanding of how Canadian television organizations use big data to innovate their audience information systems (AISs) successfully. Under the lens of CR, the analysis followed a stepwise process developed by Bygstad et al. (2016) – first by identifying the affordances in which the enhanced AISs brought to the organization, the marketplace and the various actors, then by abstracting the affordances into higher-level generative mechanisms (Table 36). A novel application of a classification algorithm was used to aid in the grouping the affordances – possibly

providing a methodological contribution to the literature by providing a method to group these mechanisms, an otherwise subjective and challenging process.

Table 36

The generative mechanisms allowing for successful innovation of AISs with big data

Mechanism	Type	Description
Audience product innovation mechanism	Transformational	The flow of the creation of a new audience product through to a better understanding of the path to purchase resulting in increasing the value of the television audience product
Expansion of measurement mechanism	Transformational	Understanding and potentially monetizing uncovered audiences
Framing mechanism	Situational	Obtaining different interpretations of data in order to address issues and challenges through the strategical combination of data
AIS adoption mechanism	Situational	Evolution of the television audience product due to coercive isomorphic pressure resulting in stronger client relationships
Audit mechanism	Situational	Enhancing AISs with additional data in order to build trust and comfort in the measured audience

This chapter now discusses the implications of the findings, both from a theoretical and practical point of view. The findings build upon the MIS, media studies, and CR bodies of literature by offering insights into each field. This chapter explores these contributions, in turn, followed by a discussion of the limitations of the study and concludes with overall conclusions and possible future research.

Contributions to Practice, Literature, and Methodology

Audiences as data. In his study of the audience making process using digital tokens, Aaltonen (2011) identified how the data and a computing environment allowed for the creation of an audience product: (a) comprehensiveness; (b) openness; and (c) granularity. Since it was based on data rather than content, this audience product was unlike traditional media audience products. This phenomenon is also apparent in the discussion surrounding the various affordances in Chapter 9. Similar opportunities existed within the enhanced television environment – a mix of both traditional media and big data. This situation may have implications on the understanding of the audience product as it suggests that the audience product may be far more dependent on the underlying data supporting the measured audience than the media itself. While the media may attract the audiences, the actual audience is ambiguous and subject to different interpretations (Napoli, 2003). It is the underlying data that allows for the creation of the measured audience and defines and provides and context and scope to the audience itself. Therefore, as the underlying data or the manipulation of the data changes, the audience product itself evolves.

The data supports and defines the audience product. Aaltonen (2011) suggests that the creation of the audience product is necessarily based on the existence of a specific measurement arrangement. Therefore, the audience product itself cannot exist in the absence of measurement and is highly dependent and defined by the measurement arrangement itself. It is the classification of the

measurement arrangement that generates the actual audience. This phenomenon was apparent in Aaltonen's study, whereby the organization effectively created their audience product through the measurement activities and grouping of data tokens. These data tokens then became a measurement (i.e., the measured audience) of a new product (i.e., the actual audience). This relationship and process – though less obviously – is also apparent within television, a more established and traditional medium.

This phenomenon was particularly apparent through the generative effects of the audience product innovation mechanism. Through modifying the underlying data supporting the audience information system, the audience product began to change. The observed changes were not merely the changes that occur to tangible products through re-engineering of manufacturing processes and materials, but rather, arguably the creation of entirely new audience products that had the potential to modify the existing audience marketplace. Four new audience products and a new means to transact audiences in the marketplace emerged through the enhancement of the existing measured audience. These new audience products can, therefore, be viewed as different interpretations of the same underlying audience as the original audience product. In all of these new audience products, the underlying currency measurement arrangement did not change. Instead, through the enhancement of the existing measurement arrangement with additional data, the measured audience, and therefore, the audience product, changed. This change provides additional support to the proposition that the

audience product is nothing more than the underlying data that defines the measured audience.

AISs as a digital infrastructure. AISs are a considerably understudied information system with the MIS literature. Very few scholars are working with these systems, resulting in very few published papers. While audience measurement and audience manufacturing are a studied area within the Communications discipline, this discipline does not share similar goals with the MIS discipline, which seeks to understand the interplay between actors and technology. This situation poses a challenge for both academics and practitioners seeking to understand how organizations and actors interact and co-exist with these technological systems. These systems drive the economic system for the communications and advertising industry and substantially large amounts of spending. The CTRC reports that Canadian television broadcasters earned $7.3 billion in revenue in 2016 (CRTC, 2017). This revenue is in addition to the $8.7 billion in BDU revenue, making the entire television broadcast and distribution industry revenues in excess to $16 billion annually – a significantly sized industry.

One of the strategies used in abstracting higher-level mechanisms is reviewing existing identified mechanisms that have similar outcomes and contexts that could also be responsible for the observed events and phenomenon of interest. In preparation for this process, a thorough review of CR based papers studying

digital infrastructures occurred. This literature has identified several mechanisms that allow for innovation within these infrastructures. Many of these mechanisms are also present in the research project – some in their original form, others in an expanded form.

This commonality suggests that, despite the radically different uses, there may not be many differences between AISs and other digital infrastructures – at least concerning their innovation. This similarity now opens an entire body of literature to both academics and practitioners dealing with AISs. Many of the findings, and indeed a great deal of the literature, may be transferable offering insight and understanding that was previously missing.

Digital infrastructure innovation. Many CR studies of late have focused on the generative mechanisms that allow for innovation of digital infrastructures (e.g., Bygstad, 2010; Henfridsson & Bygstad, 2013). These studies typically result in identifying a specific innovation mechanism that when activated, allows for organizations and actors to develop innovative uses for their digital infrastructures.

Bygstad (2010) identified a double set of self-reinforcing mechanisms within information infrastructures that allowed for the innovation of information and communications technology (ICT) systems. The first mechanism of the set was the innovation reinforcement mechanism whereby innovation itself opens up the space of possibilities allowing for further innovation. At the same time, the

service reinforcement mechanism, through attracting more users and partners, increases the value of the infrastructure, thereby allowing for more investment in innovation. Later work by Henfridsson and Bygstad (2013) further refines Bygstad's double set by splitting the service reinforcement mechanism into two – an adoption mechanism (related to users) and a scaling mechanism (related to partners). The innovation mechanism remains unchanged.

This research study focused on digital innovation within the context of AISs. Similar to other digital infrastructures, an innovation mechanism is present. This mechanism, however, took a slightly different form than that identified by Henfridsson and Bygstad (2013). While Henfridsson and Bygstad's innovation mechanism focuses on innovation within the organization, the audience product innovation mechanism expands the scope to include the effects of innovation on the entire audience marketplace. By reconceptualising digital innovation in this fashion, we see how innovation can impact an entire economic process for an entire industry.

This reconceptualization is a vital differentiation, and ultimately suggests the central role in which digital infrastructures can have within an industry. In this case, the organization's proprietary AISs can be just as central to the audience marketplace as those built and managed by the measurement organizations. While these systems are not currency systems, they can impact the sales process and ultimately help shape the audience product. In this case, by enhancing the existing

AISs with the big data, organizations were independently able to increase the value of the television advertising product for their advertisers by enhancing the product with additional value-added features. This process is unique because these enhancements are bounded within an existing pre-established marketplace and can co-exist and leverage the industry currency. This mechanism differs from Bygstad's (2010) service reinforcement mechanism as it is not the AIS that increases in value to the marketplace, but rather, the data-derived product. Digital innovation can, therefore, impact not only digital infrastructures but also products derived from the infrastructure and its underlying data.

Big data literature. Big data is of growing interest within the academic literature. This interest is evident through the emerging number of research agendas (e.g., Abbasi, Sarker, & Chiang, 2016; Agarwal & Dhar, 2014; Akter & Wamba, 2016). Despite these calls for research, most literature to date has been anecdotal rather than empirical (Akter & Wamba, 2016). providing a gap within the academic literature that future research could fill. Within the CR body of literature, there is an emerging interest in big data. However, this research body is limited and has focused on the role of generative mechanisms (e.g., Aaltonen & Tempini, 2015; Fox & Do, 2013; Jetzek, Avital & Bjorn-Andersen, 2013). While the underlying goal of this research was to understand the generative mechanisms allowing for the digital innovation with big data, this research was unique due to its usage of affordances as a tool to identify mechanisms. This research, therefore, provided empirical and detailed insight into the role of affordances with big data.

There is currently very little work within this frame of reference. This contribution directly aligns with Gunther et al.'s (2017) first research theme for big data – understanding the interaction between actors and big data – by developing an empirical understanding of how affordances manifest with big data.

CR methodology. Despite being a metatheory gaining popularity within the MIS field, there has been very little guidance as to how to apply CR to MIS research – a serious challenge for researchers following the philosophical approach. While methodological principles and guidance were available (e.g., Wynn & Williams, 2012), it was not until the work of Bygstad and Munkvold (2011) and Bygstad et al. (2016) that the MIS literature included an analytical method. This stepwise method of analysis consists of six steps – the fifth step is an analysis of the affordances identified in step four to identify the associated mechanisms. They present four avenues; however, little guidance as to how to accomplish each avenue is available.

One of the underlying methodological principles of CR research is retroduction (Wynn & Williams, 2012). Retroduction is a form of logical reasoning where, through empirical evidence, the best explanation is inferred. This reasoning is a mostly abstract process which lacks clear examples and description in the literature (Fletcher, 2017). In the absence of clear guidance, the development of concrete methods is of great value to the existing body of methodological literature.

In this project, the research questions dictated grouping the affordances into mechanisms. Grouping problems are quite common in organizational research. Analytical tools are available in order to group items into sub-groups, minimizing the difference within the sub-groups while simultaneously maximizing the differences between sub-groups. In the absence of a pre-determined method, cluster analysis was chosen as a means to group the affordances allowing for the abstraction of the higher-level mechanisms. Cluster analysis relies on a distance calculation in order to define the within- and between-cluster distances. Given the nature of the data (i.e., categorical), k-modes was the most appropriate distance calculation.

The k-modes cluster analysis – using the structural elements of the identified affordances as inputs – allowed for a clear, straightforward, and objective means of identifying similarities between the affordances. From these similarities, applying the underlying theoretical framework allows for the identification of the generative mechanisms – achieving the end goal of the research. This approach now provides researchers with the ability to apply a retroductive approach in a more structured and less abstract means. This approach is a methodological contribution for researchers working within the CR paradigm – one which has been acknowledged as an important, and growing paradigm for MIS researchers (Mingers, 2013).

Some Delimitations and Limitations of the Study

The following section outlines and discusses the delimitations and limitations of the conducted research. These are important to draw out, as they describe critical considerations of the research and analysis methods.

Delimitations. The delimitations of a research study are the boundaries selected by the researcher, as well as any choices made by the researcher. There were several delimitations to this research project. The primary means of data collection was through semi-structured interviews. The researcher selected this method in order to minimize the obtrusiveness and potential influence that structured interviews may yield, yet the same time to allow for guidance and steering of the interview into the vital areas of interest. The study, for pragmatic reasons, was also limited to the Canadian industry. The enhancement of AISs with other forms of data is not strictly isolated to Canada; however, the situation of the Canadian market concerning specific data sources is unique. Finally, the study was limited to a small number of broadcasters; however, these broadcasters were significantly large and did represent a significant portion of revenues and sales activity.

Potential Limitations. Limitations are influences that are beyond the control of the researcher that can place restrictions on the methodology and conclusions. These factors might influence research results. Different research approaches, such as ethnographic methods, could be argued to have produced

deeper and richer insights into the generative mechanism, however, due to the time constraints of the doctoral program, the research project opted for a case study method using semi-structured interviews and observation as the primary means of data collection. Similarly, due to the limited time on-premise/site interviewing actors of the selected organizations, certain practices may not have been observed.

Due to the confidential and competitive nature of these data enhancement projects, as well as the role that the researcher plays within the Canadian television industry, it was possible that the insights revealed to the researcher by the participants were limited. In order to combat this, every effort was made to ensure the independence of the researcher, as well as the confidentiality of the data, the participant, and the organization. However, the role of the researcher – and therefore knowledge of the research by the organizations – likely allowed for easier access and approval for the researcher, thereby, making the study possible and allowing for the collection of data for this very relevant topic.

The choice of CR as an underlying meta-theory does bring some possible limitations to the study. Rather than prediction, the goal of CR is to yield an explanation of the underlying mechanisms that resulted in an event or phenomenon. As such, the goal of the research project was understanding and explanation rather than prediction. Results of the study should not be considered as predictions, but rather, as demi-regularities. Finally, CR recognizes that there

are multiple explanations of the observed phenomenon and therefore, impossible to define the precise cause (Wynn & Williams, 2012). The choice is, therefore, the mechanism with the most significant explanatory power. This selection is based on the observed phenomenon within the domain of the empirical, which is, in reality, a subset of the domain of the actual. Therefore, it is possible that certain events that may have led to another conclusion were merely not observed. Sound research design and replicable analysis procedure can address this limitation of CR methodology.

Conclusions and Future Research

This study explored the enhancement of Canadian television AISs with big data. The goal of the study was to identify the various affordances offered to the actors and organization by these data enhancements with the ultimate goal of identifying the generative mechanisms that allowed for successful innovation of these systems. An interest in media research, big data, and digital infrastructures and how all three interacted within the Canadian marketplace prompted this study. With the end goal of understanding generative mechanisms, CR served as the primary meta-theory for the project. Reliance on the methodological guidance by Wynn and Williams (2012), Bygstad and Munkvold (2011), Smith and Elger (2014), and Bygstad et al. (2016) helped guide the data collection and subsequent analysis.

The results of this research project yielded a methodological contribution by using k-modes cluster analysis as a means to expand the analysis method proposed by Bygstad et al. (2016). This addition provides a more systematic means of the identifying mechanisms from the affordances. Through this, an additional tool is available to CR researchers seeking to understand mechanisms through the grouping of affordances.

AISs are an understudied IS system, likely a product of the general view that media research is within the realm of communication studies rather than MIS. Only a handful of academics within the MIS field (e.g., Aaltonen, 2011; Aaltonen & Tempini, 2014) have published research on these systems. Despite the low volume of existing research, these systems have significant economic importance with the Canadian broadcast industry representing approximately $16 billion in annual revenues in Canada (CRTC, 2017) and $490 billion globally (Thomson, 2018). Both practitioners, along with academics, have very little research accessible to them to aid in the understanding and development of these systems. With this research project identifying the vast similarities between these systems and other digital infrastructures, a body of literature is now available to both practitioners and academics interested in these systems.

Practical applications of research for organizations often manifest through an understanding of causality. Understanding a cause and effect process can better equip businesses to divert resources appropriately focusing on the causes linked to

desired effects. CR provides empirical statements about causality and how an event came to be, through its generative mechanisms (Wynn & Williams, 2012). By leveraging the findings from this research, media organizations can now have a different perspective on what leads to successful digital innovation using big data through understanding the connection between data and the audience product. This understanding of the connection can then be used to guide innovation practices within the organization, particularly those related to information systems and data. This is an important contribution as many organizations currently struggle to understand how digital innovation occurs and how big data can bring value (Bain Insights, 2016).

Finally, this research project also helps expand the understanding of innovation within digital infrastructures. The innovation mechanism presented by Henfridsson and Bygstad (2013) was expanded by adding an additional mechanism recognizing the resulting increase in value. This expansion of the mechanism thereby provides a deeper understanding of how innovation impacts digital infrastructures. The findings suggest that the innovation mechanism impacts not only the infrastructure but also the resulting products derived from the infrastructure on its underlying data.

Like most research, these findings call for further research and open new research questions. An obvious outcome from this project is a call for continued research and understanding of AISs. Of particular interest are the isomorphic

coercive forces that were hypothesized to have prompted the data enhancement and innovation. By further exploring this hypothesis – or even applying institutional theory within the broadcasting industry – more in-depth insight and understanding of the rapid changes and evolution currently occurring within the industry might be obtained. This industry, not dissimilar to the music industry in the 90s, is undergoing rapid changes and pressures as advertising dollars are shifting from the more established television advertising product to the digital advertising product. A better understanding of how these pressures may continue to shape and evolve, not only organizations by the audience product is beneficial.

This study also focused on one side of the audience marketplace – the broadcasters. The work could be extended, through a study of how the advertisers and their agencies adopted the audience products derived from the enhanced audience information systems. This work could yield a better understanding of the audience making process as well as the mechanisms allowing for the audience product to evolve. By extending the study this way, it could be determined if the digital innovation process differed between advertisers and broadcasters. An understanding of how adoption processes as well as levels of success could be obtained, thereby enriching the findings of this study.

The audience product is a highly abstract construct. Napoli (2013) presents three forms of this product, with the ‘actual’ being entirely unobservable. This thereby leads to difficulties in being able to fully understand and appreciate the

product as its natural intangibility, and the fact that it is bought and sold on proxies (i.e., predicted audience, measured audience). At the same time, this product is entirely central to media consumption as it is the end result of the entertainment and infotainment choices made by the public. Understanding these important drivers of media consumption are very challenging since the entire reality of the actual audience can be questioned. Therefore, in order to better understand media consumption, the research metatheory needs to closely align to the abstract and ambiguous nature of the audience product. CR provides that suitable means of understanding and studying the audience product. Napoli's (2013) typology of the audience product closely aligns with Bhaskar's (2008a/1975) nested ontology. By leveraging CR in connection with studies of the audience product, further research of the mechanisms connected to AISs and the respective audience marketplace could help yield better understanding of the product. These studies could therefore extend the understanding of audience manufacturing mechanisms to then understand the mechanisms that prompt media consumption. Through this research a better understanding of what drives choice and behaviour could be obtained.

Footnotes

1. Merriam-Webster defines mass media as a means of communication to a vast majority of a population ("Mass media," n.d.). This communication can take many forms such as television, print, radio, outdoor, or more recently, digital.
2. The top six television markets in Canada are Toronto/Hamilton Extended Market (EM), Montreal EM Franco, Vancouver/Victoria EM, Calgary EM, Edmonton EM, and Montreal Central Market (CM) Anglo.
3. The CRTC is an administrative tribunal mandated by the Parliament of Canada, administered through the Minister of Canadian Heritage, which serves to regulate and supervise broadcasting telecommunications in Canada (CRTC, 2018a).
4. Nielsen Audio is the division of Nielsen that operated as Arbitron before their purchase by Nielsen.
5. The top six Canada television markets are Montreal EM Franco, Montreal Central Market (CM) Anglo, Toronto / Hamilton EM, Calgary EM, Edmonton EM and Vancouver / Victoria EM.
6. Mingers (2004a) recognizes five forms of interpretivism: (a) phenomenology; (b) ethnomethodology; (c) hermeneutics; (d) critical, or dialectical, hermeneutics; and (e) language-games (citing Mingers (1984) and Myers (1994)).
7. Both Shaw and Corus are controlled by JR Shaw and family. Additionally, Shaw owns 39% of Corus' total equity (Dobby, 2017).

8. Total revenue includes advertising revenues, subscriber revenues, funding from the Local Programming Improvement Fund, and other revenues. The CRTC defines other revenues as those that arise from broadcasting licenses but not broadcasting activities.
9. The Canadian currency for the television audience product is Live + 7.
10. For example, in an average week, Television reaches 95.0% (Numeris, Broadcast Year 2016-17, Mo-Su 2a-2a, Total Canada, Ind. 2+, Total TV) and Radio reaches 85.8% of Canadians (Numeris, Fall 2017 Radio Diary, Mo-Su 5a-1a, Total Canada, P12+, ALL Stations).
11. The display audience product refers to audiences created through display type advertising such as banner ads on websites. This product is the digital equivalent to the established outdoor audience product created through outdoor media such as billboards.
12. OTT refers to over-the-top television that are subscription-based delivery platforms like Netflix.
13. Shaw Communications has since transferred Shaw Media to Corus Entertainment.
14. The audience data retrieved from RPD is at the household level and thus requires modelling to relate to an individual level metric. This step is necessary since the audience product is based on individuals rather than households.
15. While Rating is often used for local sales of conventional sales instead of AMA, the two metrics are related. Rating is the AMA expressed as a percentage of the total population.

$$Rtg\% = \frac{AMA(000)}{Univ(000)}$$

16. GRPs are Gross Rating Points, which are a measure of the size of a specific advertising schedule. This metric is a combination of reach and frequency and is defined as:

$$GRP\ (\%) = Reach(\%) \times Frequency(\#)$$

17. A CMA is a Statistics Canada geography representing one or more municipalities with a combined population of at least 100,000 that is centered on a core population centre consisting of at least 50,000 individuals.
18. A CSD is a Statistics Canada geography representing a municipality or municipal equivalent used for statistical reporting purposes.

References

Aaltonen, A. (2011). *Manufacturing the digital advertising audience* (Doctoral dissertation). Retrieved from LSE Theses Online.

Aaltonen, A., & Tempini, N. (2014). Everything counts in large amounts: A critical realist case study on data-based production. *Journal of Information Technology, 29*(2), 97–110. doi:10.1057/jit.2013.29

Abbasi, A., Sarker, S., & Chiang, R. H. K. (2016). Big data research in information systems: Toward an inclusive research agenda. *Journal of the Association for Information Systems, 17*(2), i–xxxii.

Ackroyd, S., & Karlsson, J. C. (2014). Critical realism, research techniques, and research designs. In P. K. Edwards, J. O'Mahoney, & S. Vincent (Eds.), *Studying organizations using critical realism: A practical guide* (pp. 21–45). Oxford, UK: Oxford University Press.

Afuah, A., & Tucci, C. L. (2012). Crowdsourcing as a solution to distant search. *Academy of Management Review, 37*(3), 355–375. doi:10.5465/amr.2010.0146

Agarwal, R., & Dhar, V. (2014). Big data, data science, and analytics: The opportunity and challenge for IS research. *Information Systems Research, 25*(3), 443–448. doi:10.1287/isre.2014.0546

Agarwal, R., & Weill, P. (2012). The benefits of combining data with empathy. *MIT Sloan Management Review, 54*, 35.

Akter, S., & Wamba, S. F. (2016). Big data analytics in e-commerce: A systematic review and agenda for future research. *Electronic Markets, 26*(2), 173–194. doi:10.1007/s12525-016-0219-0

Anderson, C. (2006). *The long tail: Why the future of business is selling less of more*. New York, NY: Hyperion.

Ang, I. (1991). *Desperately seeking the audience*. New York, NY: Routledge.

Ann Keller, S., Koonin, S. E., & Shipp, S. (2012). Big data and city living - what can it do for us? *Significance, 9*, 4–7.

Archer, M. (1995). *Realist social theory: The morphogenetic approach*. Cambridge: Cambridge University Press.

Archer, M. (1998). Introduction: Realism in the social sciences. In M. Archer, R. Bhaskar, A. Collier, T. Lawson, & A. Norrie (Eds.), *Critical realism: Essential readings* (pp. 189–205). New York, NY: Routledge.

Athabasca University. (2009a). *Ethical conduct for research involving humans policy*. Retrieved from http://ous.athabascau.ca/policy/research/ethicpolicy.pdf

Athabasca University. (2009b). *Ethical conduct for research involving humans procedures*. Retrieved from http://ous.athabascau.ca/policy/research/ethicpolicy.pdf

Attewell, P., & Rule, J. (1984). Computing and organizations: What we know and what we don't know [Special section]. *Communications of the ACM, 27*(12), 1184–1192. doi:10.1145/2135.2136

Bachman, K. (2009). Cracking the set-top box code. *Mediaweek*. Retrieved from http://www.mediaweek.com/mw/content_display/news/media-agencies-research/3i8fb28a31928f66a5484f8ea220401421

Backhouse, R. E. (1998). Review of Tony Lawson's Economics and Reality [Review of the book *Economics and Reality*, by T. Lawson]. *The European Journal of the History of Economic Though, 5*(2), 380–385. doi:10.1080/10427719800000035

Bain Insights. (2016). Most CIO's don't think their companies can handle big data. *Forbes*. Retrieved from https://www.forbes.com/sites/baininsights/2016/04/18/most-cios-dont-think-their-companies-can-handle-big-data/#57e20d54556e

Baldwin, C. Y., & Clark, K. B. (2000). *Design rules: The power of modularity*. Cambridge, MA: MIT Press.

Barajas, J., Akella, R., Holtan, M., & Flores, A. (2016). Experimental designs and estimation for online display advertising attribution in marketplaces. *Marketing Science, 35*(3), 465–483. doi:0.1287/mksc.2016.0982

Barton, D. (2012, October). Making advanced analytics work for you. *Harvard Business Review*. Retrieved from https://hbr.org/2012/10/making-advanced-analytics-work-for-you

Barua, A., Kriebel, C. H., & Mukhopadhyay, T. (1995). Information technologies and business value: An analytic and empirical investigation. *Information Systems Research, 6*(1), 3–23. doi:10.1287/isre.6.1.3

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report, 13*(4), 544-559. Retrieved from https://nsuworks.nova.edu/tqr/vol13/iss4/2

BBM Canada. (2009). *BBM Canada announces the launch of PPM TV/radio panel* [Press release]. Retrieved September 7, 2017, from http://www.newswire.ca/news-releases/bbm-canada-announces-the-launch-of-ppm-tvradio-panel-538205821.html

Benner, M. J., & Tushman, M. L. (2015). Reflections on the 2013 decade award -- "Exploitation, exploration, and process management: The productivity dilemma revisited" ten years later. *Academy of Management Review, 40*(4), 497–514. doi:10.5465/amr.2015.0042

Bhaskar, R. (2008). *A realist theory of science*. New York, NY: Routledge. (Original work published in 1975)

Bhaskar, R. (2009). *Scientific realism and human emancipation*. New York, NY: Routledge. (Original work published in 1987)

Bhaskar, R. (2010a). *Plato etc. The problems of philosophy and their resolution*. New York, NY: Routledge. (Original work published in 1994)

Bhaskar, R. (2010b). *Reclaiming reality: A critical introduction to contemporary philosophy*. New York, NY: Routledge. (Original work published in 1989)

Bhaskar, R. (2014). *The possibility of naturalism: A philosophical critique of the contemporary human sciences* (4th ed.). New York, NY: Routledge. (Original work published in 1979)

Bhaskar, R., & Lawson, T. (1998). Introduction: Basic texts and developments. In M. Archer, R. Bhaskar, A. Collier, T. Lawson, & A. Norrie (Eds.), *Critical realism: Essential readings* (pp. 3–15). London, UK: Routledge.

Biesdorf, S., Court, D., & Willmott, P. (2013). Big data: What's your plan? *McKinsey Quarterly*, (2), 40–51.

Blackwell, D. (1953). Equivalent comparison of experiments. *The Annals of Mathematical Statistics, 24*(2), 265–272.

Blaug, M. (2003). Ugly currents in modern economics. In U. Maki (Ed.), *Fact and fiction in economics* (pp. 35–56). Cambridge, UK: Cambridge University Press.

Bond, S. (2017). Google and Facebook build digital ad duopoly. *The Financial Times*. Retrieved from https://www.ft.com/content/30c81d12-08c8-11e7-97d1-5e720a26771b

Bose, R. (2009). Advanced analytics: Opportunities and challenges. *Industrial Management & Data Systems*, 109(2), 155–172. doi:10.1108/02635570910930073

Braa, J., Hanseth, O., Heywood, A., Mohammed, W., & Shaw, V. (2007). Developing health information systems in developing countries: The flexible standards strategy. *MIS Quarterly, 31*(2), 381–402. doi:10.2307/25148796

Bradshaw, J. (2015, March 12). CRTC rewrites Canadian content quotas on television. *The Globe and Mail*. Retrieved from

http://www.theglobeandmail.com/report-on-business/crtc-to-relax-canadian-content-rules-on-television/article23420352/

Bradshaw, J. (2016, January 13). Corus Entertainment acquires Shaw Media for $2.65-billion. *The Globe and Mail*. Retrieved from http://www.theglobeandmail.com/report-on-business/corus-acquires-shaw-media-for-265-billion/article28140989/

Bradshaw, J., & Dobby, C. (2016, January 13). Corus prepares for shifting TV market with Shaw deal. *The Globe and Mail*. Retrieved from http://www.theglobeandmail.com/report-on-business/corus-acquires-shaw-media-for-265-billion/article28140989/

Bresnahan, T. F., Brynjolfsson, E., & Hitt, L. M. (2002). Information technology, workplace organization, and the demand for skilled labor : Firm- level evidence. *Quarterly Journal of Economics, 117*(1), 339–376. doi:10.1162/003355302753399526

Broadbent, M., & Weill, P. (1997, Spring). Management by maxim: How business and IT managers can create IT infrastructures. *Sloan Management Review*, 77–92.

Brown, B., Chui, M., & Manyika, J. (2011). Are you ready for the era of ‘big data ’?. *McKinsey Quarterly*, (4), 1–12.

Brynjolfsson, E., & Hitt, L. M. (1996). Productivity, business profitability, and consumer surplus: Three different measures of information value. MIS Quarterly, 20(2), 121–142. doi:10.2307/249475

Brynjolfsson, E., Hitt, L. M., & Kim, H. H. (2011). Strength in numbers: How does data-driven decisionmaking affect firm performance? *SSRN Electronic Journal*. doi:10.2139/ssrn.1819486

Butsch, R. (2000). *The making of American audiences: From stage to television, 1750-1990*. New York, NY: Cambridge University Press.

Bygstad, B. (2008). Information infrastructure as organization: A critical realist view. *Proceedings of the International Conference on Information Systems, France, 29,* 774-786.

Bygstad, B. (2010). Generative mechanisms for innovation in information infrastructures. *Information and Organization, 20*(3–4), 156–168. doi:10.1016/j.infoandorg.2010.07.001

Bygstad, B., & Munkvold, B. E. (2011). In search of mechanisms: Conducting a critical realist data analysis. *Proceedings of the International Conference on Information Systems, China, 32,* 1978-1992. Retrieved from http://aisel.aisnet.org/icis2011/proceedings/researchmethods/7

Bygstad, B., Munkvold, B. E., & Volkoff, O. (2016). Identifying generative mechanisms through affordances: A framework for critical realist data analysis. *Journal of Information Technology, 31*(1), 83–96. doi:10.1057/jit.2015.13

Canadian Communications Foundation. (n.d.). *Bureau of Measurement*. Retrieved September 7, 2017, from https://www.broadcasting-history.ca/industry-government/bureau-measurement

Canadian Radio-television and Telecommunications Commission. (2011). *Admendment to the Television Broadcasting Regulations, 1987 - Broadcast of Canadian programs (2011)*. Retrieved from http://www.crtc.gc.ca/eng/archive/2011/2011-288.htm

Canadian Radio-television and Telecommunications Commission. (2011b). *General authorizations for broadcasting distributions undertakings*. Retrieved March 16, 2016, from http://www.crtc.gc.ca/eng/publications/distga.htm

Canadian Radio-television and Telecommunications Commission. (2014). *Communications Monitoring Report 2014: Broadcasting system*. Retrieved October 8, 2015, from http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2014/cmr4.htm

Canadian Radio-television and Telecommunications Commission. (2015a). *Let's talk TV: A conversation with Canadians*. Retrieved October 9, 2015, from http://www.crtc.gc.ca/eng/talktv-parlonstele.htm

Canadian Radio-television and Telecommunications Commission. (2015b). *Seeing Canadian commercials on American channels*. Retrieved October 9, 2015, from http://www.crtc.gc.ca/eng/info_sht/bdt10.htm

Canadian Radio-television and Telecommunications Commission. (2017). *Communications monitoring report 2017: Broadcasting sector overview*. Retrieved April 4, 2018, from

https://crtc.gc.ca/eng/publications/reports/policymonitoring/2017/cmr4.htm#s42

Canadian Radio-television and Telecommunications Commission. (2018a). *About Us*. Retrieved October 9, 2015, from http://www.crtc.gc.ca/eng/acrtc/acrtc.htm

Canadian Radio-television and Telecommunications Commission. (2018b). *Communications monitoring report 2018: Broadcasting distribution sector overview*. Retrieved June 12, 2019, from https://crtc.gc.ca/eng/publications/reports/policymonitoring/2018/cmr4d.htm

Canadian Radio-television and Telecommunications Commission. (2018c). *Communications monitoring report 2018: Broadcasting overview*. Retrieved April 9, 2019, from https://crtc.gc.ca/eng/publications/reports/policymonitoring/2018/cmr4a.htm

Canadian Radio-television and Telecommunications Commission. (2018d). *Communications monitoring report 2018: Television sector*. Retrieved April 9, 2019, from https://crtc.gc.ca/eng/publications/reports/policymonitoring/2018/cmr4c.htm

Canadian Radio-television and Telecommunications Commission. (2018e). *Harnessing change: The future of programming distribution in Canada*. Retrieved from https://crtc.gc.ca/eng/publications/s15/

Canadian Radio-television and Telecommunications Commission. (2018f). *Let's talk TV: A conversation with Canadians*. Retrieved June 12, 2018, from https://crtc.gc.ca/eng/talktv-parlonstele.htm

Carlson, N. (2010). At last -- The full story of how Facebook was founded. *Business Insider*. Retrieved from http://www.businessinsider.com/how-facebook-was-founded-2010-3?op=1

Chalmers, A. (1988, Summer). Is Bhaskar's realism realistic? *Radical Philosophy, 49*, 18–23.

Chandwani, R., De, R., & Dwivedi, Y. K. (2018). Telemedicine for low resource settings: Exploring the generative mechanisms. *Technological Forecasting and Social Change, 127*, 177–187. doi:10.1016/j.techfore.2017.06.014

Chen, H., Chiang, R. H. L., & Storey, V. C. (2012). Business intelligence and analytics: From big data to big impact. *MIS Quarterly, 36*(4), 1165–1188. doi:10.2307/41703503

Clark, K. B. (1985). The interaction of design hierarchies and market concepts in technological evolution. *Research Policy, 14*(5), 235–251.

Coleman, J. S. (1986). Social theory, social research, and a theory of action. *The American Journal of Sociology, 91*(6), 1309–1335. doi:10.1086/228423

Collier, A. (1994). *Critical realism: An introduction to Roy Bhaskar's philosophy*. London, UK: Verso.

Constantinides, P., Henfridsson, O., & Parker, G. G. (2018). Introduction - Platforms and infrastructures in the digital age. *Information Systems Research, 29*(2), 381–400. doi:10.1287/isre.2018.0794

Constantiou, I. D., & Kallinikos, J. (2015). New games, new rules: Big data and the changing context of strategy. *Journal of Information Technology, 30*(1), 44–57. doi:10.1057/jit.2014.17

Court, D. (2015, January). Getting big impact from big data. *McKinsey Quarterly*, (1), 48-51.

Cukier, K. (2010, February). Data, data everywhere. *The Economist*. Retrieved from http://www.economist.com/node/15557443

Danaher, P. J. (1995). What happens to television ratings during commerical breaks? *Journal of Advertising Research, 35*(1), 37–47.

Danermark, B., Ekstrom, M., Jakobsen, L., & Karlsson, J. C. (2002). *Explaining society: Critical realism in the social sciences*. London, UK: Routledge.

Davenport, T. H. (2006). Competing on analytics. *Harvard Business Review*, 84, 98–107.

Davenport, T. H. (2012). *The human side of big data and high performance analytics* (IIA Report). Retrieved from International Institute for Analytics website:

https://crtc.gc.ca/eng/publications/reports/policymonitoring/2018/cmr4d.htm

Davenport, T. H., & Harris, J. G. (2007). *Competing of analytics: The new science of winning*. Boston, MA: Harvard Business Press.

Davenport, T. H., & Kudyba, S. (2016). Designing and developing analytics-based data products. *MIT Sloan Management Review, 58*(1), 83–89.

DeLanda, M. (2006). *A new philosophy of society*. London, UK: Continuum.

Deming, W. E. (1944). On error in surveys. *American Sociological Review, 9*(4), 359–369. doi:10.2307/2085979

Denzin, N. K. (1978). *The research act: A theoretical introduction to sociological methods*. New York, NY: Praeger.

Devaraj, S., & Kohli, R. (2003). Performance impacts of information technology: Is actual usage the missing link? *Management Science, 49*(3), 273–289. doi:10.1287/mnsc.49.3.273.12736

Digital ad spending to surpass TV next year. (2016, March). *EMarketer*. Retrieved from https://www.emarketer.com/Article/Digital-Ad-Spending-Surpass-TV-Next-Year/1013671

DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and colective rationality in organizational fields. *American Sociological Review, 48*(2), 147–160. doi:10.2307/2095101

Dobby, C. (2017, January 13). Five things to know about the Corus-Shaw Media deal. *The Globe and Mail*. Retrieved from

https://www.theglobeandmail.com/report-on-business/five-things-to-know-about-the-corus-shaw-media-deal/article28143529/

Dobson, P. J. (2001). The philosophy of critical realism - An opportunity for information systems research. *Information Systems Frontiers, 3*(2), 199–210. doi:10.1023/A:1011495424958

Dobson, P. J., Jackson, P., & Gengartharen, D. (2013). Explaining broadband adoption in rural Australia: Modes of relexivity and the morphogenetic approach. *MIS Quarterly, 37*(3), 965–991.

Easton, G. (2010). Critical realism in case study research. *Industrial Marketing Management, 39*(1), 118–128. doi:10.1016/j.indmarman.2008.06.004

Edwardson, R. (2009). *Canadian content: Culture and the quest for nationhood*. Toronto, ON: University of Toronto Press.

Ekbia, H. R. (2009). Digital artifacts as quasi-objects: Qualification, mediation and materiality. *Journal of the American Society for Information Science and Technology, 60*(12), 2254–2566. doi:10.1002/asi

Eriksson, P., & Kovalainen, A. (2008). *Qualitative methods in business research*. London, UK: Sage Publications Ltd.

Ettema, J. S., & Whitney, D. C. (1994). *Audiencemaking: How the media create the audience*. Thousand Oaks, CA: Sage.

Faulkner, P., & Runde, J. (2009). On the identity of technological objects and user innovations in function. *Academy of Management Review, 34*(3), 442–462. doi:10.5465/amr.2009.40632318

Ferguson, R. B. (2012). Risky business: How data analytics and behavioral science can help. *MIT Sloan Management Review, 54*, 1–5.

Fichman, R. G., Dos Santos, B. L., & Zheng, Z. (2014). Digital innovation as a fundamental and powerful concept in information systems curriculum. *MIS Quarterly, 38*(2), 329–353.

Fletcher, A. J. (2017). Applying critical realism in qualitative research: Methodology meets method. *International Journal of Social Research Methodology, 20*(2), 181–194. doi:10.1080/13645579.2016.1144401

Francalanci, C., & Galal, H. (1998). Information technology and worker composition: Determinants of productivity in the life insurance industry. *MIS Quarterly, 22*(2), 227–241. doi:10.2307/249396

Fox, S., & Do, T. (2013). Getting real about big data: Applying critical realism to analyse big data hype. *International Journal of Managing Projects in Business, 6*(4), 739-760. doi:10.1108/jimpb-08-2012-0049

Galbraith, J. R. (1974). Organizational design: An information processing view. Interfaces, 4(3), 28–36. doi:10.1287/inte.4.3.28

Gallivan, M. J. (1997). Value in triangulation: a comparison of two approaches for combining qualitative and quantitative methods. In A. S. Lee, J. Liebenau, & J. DeGross (Eds.), *Information systems and qualitative research* (pp. 417–443). London, UK: Chapman & Hall.

Gantz, J., & Reinsel, D. (2012). *The digital universe in 2020: Big data, bigger digital shadows, and biggest growth in the far east*. Retrieved from

https://www.emc.com/leadership/digital-universe/2012iview/big-data-2020.htm

Gibson, J. J. (2015). *The ecological approach to visual perception*. New York, NY: Psychology Press. (Original work published 1979)

Giddens, A. (1984). *The constitution of society: Outline of the theory of structuration*. Cambridge: Polity Press.

Giddens, A. (1987). *Social theory and modern sociology*. Cambridge: Polity Press.

Gleeson, B. (2012, November). TV advertising vs digital advertising. *Forbes*. Retrieved from https://www.forbes.com/sites/brentgleeson/2012/11/20/tv-advertising-vs-digital-marketing/#cbe305d37f85

Gobble, M. M. (2013). Big data: The next big thing in innovation. *Research Technology Management, 56*(1), 64–67. doi:10.5437/08956308X5601005

Google. (n.d.). *About Google*. Retrieved September 11, 2017, from https://web.archive.org/web/20150623185839/http://www.google.com/about/company/

Graca Moura, M. da, & Martins, N. (2008). On some criticisms of critical realism in economics. *Cambridge Journal of Economics, 32*(2), 203–218. doi:10.1093/cje/bem038

Groves, R. M. (1989). *Survey Error and Survey Costs*. New York, NY: Wiley.

Gunther, W. A., Rezazade Mehrizi, M. H., Huysman, M., & Feldberg, F. (2017). Debating big data: A literature review on realizing value from big data. *Journal of Strategic Information Systems, 26*(3), 191–209.

Gunzerath, D. (2001). *An analysis of the proposed use of Arbitron data to define radio markets*. In Comments of the National Association of Broadcasters, Definition of Radio Markets, Attachment B (MM Docket 00-244).

Hanseth, O., & Ciborra, C. (2007). *Risk, complexity and ICT*. Northampton, MA: Edward Elgar Publishing.

Hanseth, O., & Lyytinen, K. (2010). Design theory for dynamic complexity in information infrastructures: the case of building internet. *Journal of Information Technology, 25*(1), 1–19. doi:10.1057/jit.2009.19

Hanseth, O., & Monteiro, E. (1997). Inscribing behaviour in information infrastructure standards. *Accounting, Management & Information Technology, 7*(4), 183–211.

Hedstrom, P., & Swedberg, R. (1998). Social mechanisms: An introductory essay. In P. Hedstrom & R. Swedberg (Eds.), *Social mechanisms: An analytical approach to social theory* (pp. 1–31). Cambridge, UK: Cambridge University Press.

Hedstrom, P., & Ylikoski, P. (2010). Causal mechanisms in the social sciences. *Annual Review of Sociology, 36*, 49–67. doi:10.1146/annurev.soc.012809.102632

Henfridsson, O., & Bygstad, B. (2013). The generative mechanisms of digital infrastructure evolution. *MIS Quarterly, 37*(3), 907–931.

Hibert, M. (2012). How much information is there in the "information society"? *Significance, 9*(4), 8–12. doi:10.1111/j.1740-9713.2012.00584.x

Hindle, T. (2008). *Guide to management ideas and gurus*. London, UK: Profile Books Ltd.

Horan, J. A. (2011). *The essential CIO* (The essential CIO IBM CIO C-Suite Studies Report). Retrieved from IBM website: https://www.ibm.com/downloads/cas/QBMQYMKG

Huang, Z. (1997). A fast clustering algorithm to cluster very large categorical data sets in data mining. *Proceedings of the SIGMOD Workshop on Research Issues on Data Mining and Knowledge Discover, US, 1-8*.

Huang, Z. (1998). Extensions to the k-means algorithm for clustering large data sets with categorical variables. *Data Mining and Knowledge Discovery, 2*(3), 283–304.

I-JIC. (n.d.). *About Us*. Retrieved March 21, 2016, from http://i-jic.org/about_us

Interactive Advertising Bureau. (2017a). The digital advertising landscape. In *Guide to digital video advertising: Practical advice for cross-platform video advertising* (pp. 12–21). Retrieved from https://video-guide.iab.com/sites/default/files/iab_guide_to_digital_video_advertising.pdf

Interactive Advertising Bureau. (2017b). *The digital video advertising landscape*. Retrieved April 10, 2018, from https://video-guide.iab.com/digital-video-advertising-landscape

Jetzek, T., Avital, M., & Bjorn-Andersen, N. (2013). The generative mechanisms of open government data. *ECIS 2013 Completed Research*. 156. Retrieved from https://aisel.aisnet.org/ecis2013_cr/156/

Jetzek, T., Avital, M., & Bjorn-Andersen, N. (2014). Data-driven innovation through open government data. *Journal of Theoretical and Applied Electronic Commerce Research, 9*(2), 100–120. doi:10.4067/S0718-18762014000200008

Jhally, S., & Livant, B. (1986). Watching at working: The valorization of audience consciousness. *Journal of Communication, 36*(3), 122–142.

Kallinikos, J., Aaltonen, A., & Marton, A. (2013). The ambivalent ontology of digital artifacts. *MIS Quarterly, 37*(2), 357–370.

Kane, G. C., Bijan, A., Majchrzak, A., & Faraj, S. (2001). *The paradoxical influence of social media affordances on intellectual capital creation*. Paper presented at the Academy of Management Annual Meeting. San Antonio, TX.

Kant, I. (1899). *Critique of Pure Reason* (J. M. D. Meiklejohn, Trans.). Hoboken, NJ: Wiley Books Co. Retrieved from http://0-web.a.ebscohost.com.aupac.lib.athabascau.ca/ehost/results?vid=1&sid=dd67d360-68b1-42b8-a6fc-ee1e428c3b4d%40sdc-v-

sessmgr01&bquery=JN+%22Critique+of+pure+reason.%22+AND+DT+1
8990101&bdata=JkF1dGhUeXBlPXVybCxpcCx1aWQmZGI9cHpoJnR5c
GU9MCZzaXRlPWVob3N0

Kish, L. (1965). *Survey sampling*. Hoboken, NJ: J. Wiley.

Klein, H. K. (2004). Seeking the new and the critical in critical realism: Deja vu? *Information and Organization, 14*(2), 123–144. doi:10.1016/j.infoandorg.2004.02.002

Klein, H. K., & Myers, M. D. (1999). A set of principles for conducting and evaluating interpretive field studies in information systems. *MIS Quarterly, 23*(1), 67–93. doi:10.2307/249410

Kohli, R., & Devaraj, S. (2003). Measuring information technology payoff: A meta-analysis of structural variables in firm-level empirical research. *Information Systems Research, 14*(2), 127–145.

LaValle, S., Hopkins, M. S., Lesser, E., Shockley, R., & Kruschwitz, N. (2010). *Analytics: The new path to value*. Retrieved from IBM website: https://www.ibm.com/downloads/cas/NEKMVP1M

LaValle, S., Lesser, E., Shockley, R., Hopkins, M. S., & Kruschwitz, N. (2011). Big data, analytics and the path from insights to value. *MIT Sloan Management Review, 52*, 21–32.

Lawson, T. (1997). *Economics and reality*. New York, NY: Routledge.

Lawson, T. (2003). *Reorienting economics*. New York, NY: Routledge.

Lee, A. S., & Hubona, G. S. (2009). A scientific basis for rigor in information systems research. *MIS Quarterly, 33*(2), 237–262. doi:10.2307/20650291

Lloyd, J. (2017). Numeris to test cross-platform measurement. *Media in Canada*. Retrieved February 21, 2018, from mediaincanada.com/2017/10/13/numeris-to-test-cross-platform-measurement/

Loebbecke, C., & Picot, A. (2015). Reflections on societal and business model transformation arising from digitization and big data analytics: A research agenda. *The Journal of Strategic Information Systems, 24*(3), 149–157. doi:10.1016/j.jsis.2015.08.002

Loveman, G. (2003). Diamonds in the data mine. *Harvard Business Review, 81*(5), 109–113.

Lyytinen, K., Yoo, Y., & Boland Jr., R. J. (2016). Digital product innovation within four classes of innovation networks. *Information Systems Journal, 26*(1), 47–75. doi:10.1111/isj.12093

Markus, M. L., & Silver, M. S. (2008). A foundation for the study of IT effects: A new look at DeSanctis and Poole's concepts of structural features and spirit. *Journal of the Association for Information Systems, 9*(10/11), 609–632.

Mass media. (n.d.). In *Merriam-Webster's* dictionary. Retrieved March 26, 2019, from https://www.merriam-webster.com/dictionary/mass media

McAfee, A., & Brynjolfsson, E. (2012, October). Big data: The management revolution. *Harvard Business Review*. Retrieved from https://hbr.org/2012/10/big-data-the-management-revolution

McClellan, S. (2008, May). MSOs look to capitalize on STB data. *Adweek.* Retrieved April 29, 2016, from http://www.adweek.com/news/technology/msos-look-capitalize-stb-data-108454

Melville, N., Gurbaxani, V., & Kraemer, K. (2007). The productivity impact of information technology across competitive regimes: The role of industry concentration and dynamism. *Decision Support Systems, 43*(1), 229–242. doi:10.1016/j.dss.2006.09.009

Melville, N., Kraemer, K., & Gurbaxani, V. (2004). Review: Information technology and organizational performance: An integrative model of IT business value. *MIS Quarterly, 28*(2), 283–322. doi:10.2307/25148636

Mikkola, J. H., & Gassmann, O. (2003). Managing modularity of product architectures: Toward and integrated theory. *IEEE Transactions on Engineering Management, 50*(2), 1–15.

Mingers, J. (2004a). Critical realism and information systems: Brief responses to Monod and Klein. *Information and Organization, 14*(2), 145–153. doi:10.1016/j.infoandorg.2004.02.003

Mingers, J. (2004b). Re-establishing the real: Critical realism and information systems. In J. Mingers & L. Willcocks (Eds.), *Social Theory and Philosophy for Information Systems* (pp. 372–406). Hoboken, NJ: Wiley.

Mingers, J. (2004c). Real-izing information systems: Critical realism as an underpinning philosophy for information systems. *Information and Organization, 14*(2), 87–103. doi:10.1016/j.infoandorg.2003.06.001

Mingers, J. (2013). *Realising management research: Critical realism as an underpinning philosophy*. Retrieved from https://slideplayer.com/slide/6337479/.

Mingers, J., Mutch, A., & Willcocks, L. (2013). Critical realism in information systems research. *MIS Quarterly, 37*(3), 795–802.

Monnappa, A. (2017). *History and Evolution of Digital Marketing* [infographic]. Retrieved September 11, 2017, from https://www.simplilearn.com/history-and-evolution-of-digital-marketing-article

Monod, E. (2004). Einstein, Heisenberg, Kant: Methodological distinction and conditions of possibilities. *Information and Organization, 14*(2), 105–121. doi:10.1016/j.infoandorg.2003.12.001

Morton, P. (2006). Using critical realism to explain strategic information systems planning. *Journal of Information Technology Theory and Application (JITTA), 8*(1), 1–20.

Mutch, A. (2010). Technology, organization, and structure - A morphogenetic approach. *Organization Science, 21*(2), 507–520. doi:10.1287/orsc.1090.0441

Nambisan, S., Lyytinen, K., Majchrzak, A., & Song, M. (2017). Digital innovation management: Reinventing innovation management research in a digital world. *MIS Quarterly, 41*(1), 223–238.

Nambisan, S., & Sawhney, M. (2007). *The global brain: Your roadmap for innovating faster and smarter in a networked world*. Saddle River, NJ: Wharton School Publishing.

Napoli, P. M. (2003). *Audience economics: Media institutions and the audience marketplace*. New York, NY: Columbia University Press.

Napoli, P. M. (2011). *Audience evolution: New technologies and the transformation of media audiences*. New York, NY: Columbia University Press.

Napoli, P. M. (2012). Audience evolution and the future of audience research. *International Journal on Media Management, 14*(2), 79–97. doi:10.1080/14241277.2012.675753

Nielsen Media Research. (2004). *Nielsen Media Research and BBM Canada agree to merge electronic television systems in Canada* [Press release]. Retrieved September 8, 2017, from http://www.nielsenmedia.ca/English/News_Releases/Nielsen BBM JV.pdf

Nixon, B. (2014). Toward a political economy of "audience labour" in the digital era. *Triplec (Cognition, Communication, Co-Operation): Open Access Journal for a Global Sustainable Information Society, 12*(2), 713–734.

Norman, D. (1988). *The design of everything things*. Cambridge, MA: MIT Press.

Norman, D. (1999). Affordance, conventions, and design. *ACM Interactions, 6*(3), 38–42.

Numeris. (n.d.-a). *Governance*. Retrieved March 21, 2016, from http://en.numeris.ca/about-us/governance

Numeris. (n.d.-b). *What we do*. Retrieved March 21, 2016, from http://en.numeris.ca/about-us/what-we-do

Numeris. (2016). *Numeris universe estimates 2015/2016 broadcasting year - second release: PPM television panels*. Toronto, ON: Numeris.

O'Reilly, L. (2017, June 19). The race is on to challenge Google-Facebook "duopoly" in digital advertising. *The Wall Street Journal*. Retrieved from https://www.wsj.com/articles/the-race-is-on-to-challenge-google-facebook-duopoly-in-digital-advertising-1497864602

O'Reilly, T. (2001). *SLAC Symposium on the Early Web*. Retrieved September 11, 2017, from https://web.archive.org/web/20160306145256/http://archive.oreilly.com/lpt/wlg/907

Orlikowski, W. J., & Yates, J. (2002). It's about time: Temporal structuring in organizations. *Organization Science, 13*(6), 684–700.

Parker, J., Mars, L., Ransome, P., & Stanworth, H. (2003). What does culture explain? In *Social Theory* (pp. 71–87). London, UK: Palgrave.

Pawson, R. (1996). Theorizing the interview. *The British Journal of Sociology, 47*(2), 295–314. doi:10.2307/591728

Pawson, R., & Tiley, N. (1997). *Realistic evaluation*. London, UK: Sage.

Pellegrini, P., & Purdye, K. (2002). *Pushing picture matching to the limit: Canada's four year adventure*. Paper presented at the 2002 WAM – Week of Audience Measurement Conference, Cannes, France. Abstract retrieved from https://ana-staging.dev.esomar.org/document/948?query=Ken%20Purdye&offset=0

Pellegrini, P., & Purdye, K. (2004). *Passive vs. button pushing: A comprehensive comparison from parallel TV meter panels in Quebec*. Paper presented at the 2004 WAM – Week of Audience Measurement Conference, Geneva, Switzerland. Retrieved from http://www.cb-cda.gc.ca/avis-notice/active/2012/retrans-08112012.pdf

Picard, R. (2000). Audience fragmentation and structural limits on media innovation and diversity. In J. van Cuilenburg & R. van der Wurff (Eds.), *Media and open societies: Cultural, economic and policy foundations for openness and diversity in East and West* (pp. 97–103). Amsterdam, Netherlands: Het Spinhus.

Quail, C. (2015a). Anatomy of a format: So You Think You Can Dance Canada and discourses of commercial nationalism. *Television & New Media, 16*(5), 472–489. doi:10.1177/1527476414543527

Quail, C. (2015b). Producing reality: Television formats and reality TV in the Canadian context. *Canadian Journal of Communication, 40*(2), 185–201. doi:10.22230/cjc.2015v40n2a2828

Radner, R. (1993). The organization of decentralized information processing. *Econometrica, 61*(5), 1109–1146.

Redman, T. C. (2008). *Data driven: Profitting from your most important business asset*. Boston, MA: Harvard Business Press.

Runde, J. (1998). Assessing causal economic explanations. *Oxford Economic Papers, 50*(2), 151–172. doi:10.1093/oxfordjournals.oep.a028639

Runde, J., & de Rond, M. (2010). Evaluating causal explanations of specific events. *Organization Studies, 31*(4), 431–450. doi:10.1177/0170840610361836

Sayer, A. (2000). *Realism and social science*. London, UK: Sage.

Sayer, A. (2003). *Method in social science: A realist approach* (2nd ed.). New York, NY: Routledge.

Schildt, H. (2017). Big data and organizational design - The brave new world of algorithmic management and computer augmented transparency. *Innovation: Management, Policy & Practice, 19*(1), 23–20. doi:10.1080/14479338.2016.1252043

Schroeck, M., Shockley, R., Smart, J., Romero-Morales, D., & Tufano, P. (2012). *Analytics: The real-world use of big data. How innovative organizations are extracting value from uncertain data*. Retrieved from http://www-935.ibm.com/services/us/gbs/thoughtleadership/ibv-big-data-at-work.html

Shah, S., Horne, A., & Capella, J. (2012). Good data won't guarantee good decisions. *Harvard Business Review, 90*, 23–25.

Sharma, R., Mithas, S., & Kankanhalli, A. (2014). Transforming decision-making processes: A research agenda for understanding the impact of business analytics on organisations. *European Journal of Information Systems, 23*(4), 433–441. doi:10.1057/ejis.2014.17

Shaw Media Inc. (2014). *Shaw Pinpoint*. Retrieved from http://media.shawmedia.ca/uploadedfiles/shawmedia/content/advertising/research/insideview/2014fall/insideview_fall_2014_pinpoint.pdf

Simon, H. (1957). *Models of Man*. New York, N.Y: John Wiley & Sons.

Smith, C., & Elger, T. (2014). Critical realism and interviewing subjects. In P. K. Edwards, J. O'Mahoney, & S. Vincent (Eds.), *Studying organizations using critical realism: A practical guide* (pp. 109–131). Oxford, UK: Oxford University Press.

Smith, M. L. (2006). Overcoming theory-practice inconsistencies: Critical realism and information systems research. *Information and Organization, 16*(3), 191–211. doi:10.1016/j.infoandorg.2005.10.003

Statistics Canada. (n.d.). *Focus on geography series, 2016 Census*. Retrieved February 17, 2018, from http://www12.statcan.gc.ca/census-recensement/2016/as-sa/fogs-spg/Facts-cma-eng.cfm?LANG=Eng&GK=CMA&GC=535

Statistics Canada. *Table 203-0027 - Survey of household spending (SHS), dwelling characteristics and household equipment at time of interview, Canada, regions and provinces, annual (2016),* CANSIM (database). (accessed: February 24, 2018)

Summers, C. A., Smith, R. W., & Reczek, R. W. (2016). An audience of one: Behaviorally targeted ads as implied social labels. *Journal of Consumer Research, 43*(1), 156–178. doi:10.1093/jcr/ucw012

Tambe, P. (2014). Big data investment, skills, and firm value. *Management Science, 60*(6), 1452–1469. doi:10.1287/mnsc.2014.1899

Tambe, P., Hitt, L. M., & Brynjolfsson, E. (2012). The extroverted firm: How external information practices affect productivity. *Management Science, 58*(5), 843–859. doi:10.1287/mnsc.1110.1446

Taneja, H. (2013). Audience Measurement and Media Fragmentation: Revisiting the Monopoly Question. *Journal of Media Economics, 26*(4), 203–219. doi:10.1080/08997764.2013.842919

Taneja, H., & Mamoria, U. (2012). Measuring media use across platforms: Evolving audience information systems. *International Journal on Media Management, 14*(2), 121–140. doi:10.1080/14241277.2011.648468

Tay, L. (2013). Inside eBay's 90PB data warehouse. *IT News*. Retrieved from http://www.itnews.com.au/News/342615,inside-ebay8217s-90pb-data-warehouse.aspx

Thomson, S. (2018). Global TV and video service revenue to reach $559bn in 2022. *TBI Vision*. Retrieved from https://tbivision.com/2018/08/15/global-tv-and-video-service-revenue-to-reach-559bn-in-2022/

Tilson, D., Lyytinen, K., & Sorensen, C. (2010). Research commentary - Digital infrastructures: The missing IS research agenda. *Information Systems Research, 21*(4), 748–759. doi:10.1287/isre.1100.0318

Tiwana, A., Konsynski, B., & Bush, A. A. (2010). Research commentary - Platform evolution: Coevolution of platform architecture, governance, and environmental dynamics. *Information Systems Research, 21*(4), 675–687. doi:10.1287/isre.1100.0323

TRA Global. (2011). *TV set top box data: U.S. market structure*. Retrieved from http://media.jackmyers.com/documents/TRA+Sector+White+Paper+May+2011+Final.pdf

Tsang, E. W. K., & Kwan, K.-M. (1999). Replication and theory development in organzational science: A critical realist perspective. *Academy of Management Review, 24*(4), 759–780. doi:10.5465/amr.1999.2553252

Vaast, E., & Walsham, G. (2009). Trans-situated learning: Supporting a network of practice with an information infrastructure. *Information Systems Research, 20*(4), 547–564.

Volkoff, O., & Strong, D. M. (2013). Critical realism and affordances: Theorizing IT-associated organizational change processes. *MIS Quarterly, 37*(3), 819–834.

Volkoff, O., Strong, D. M., & Elmes, M. B. (2007). Technological embeddedness and organizational change. *Organization Science, 18*(5), 832–848. doi:10.1287/orsc.1070.0288

von Hippel, E., & von Krogh, G. (2016). Identifying viable "need-solution pairs": Problem solving without problem formulation. *Organization Science, 27*(1), 207–221. doi:10.1287/orsc.2015.1023

Webster, J. G. (1998). The audience. *Journal of Broadcasting and Electronic Media, 42*(2), 190–207. doi:10.1080/08838159809364443

Webster, J. G. (2005). Beneath the veneer of fragmentation : Television audience polarization in a multichannel world. *Journal of Communication, 55*(2), 366–382. doi:10.1111/j.1460-2466.2005.tb02677.x

Weick, K. E. (1989). Theory construction as disciplined imagination. *Academy of Management Review, 14*(4), 516–531. doi:10.5465/amr.1989.4308376

Weihs, C., Ligges, U., Luebke, K., & Raabe, N. (2005). klaR Analyzing german business cycles. In D. Baier, R. Decker, & L. Schmidt-Thieme (Eds.), *Data Analysis and Decision Support* (pp. 335–343). Berlin: Springer-Verlag.

White, M. (2012). Digital workplaces vision and reality. *Business Information Review, 29*(4), 205–214. doi:10.1177/0266382112470412

Wiesler, C. (2016). *CIMM lexicon 3.0: Terms and definitions. A common language for media measurement: RPD, cross platform, connected TV, iTV, DAI, ACR, internet, digital, programmatic, neuroscience, virtual reality*. Retrieved from http://cimm-us.org/wp-content/uploads/2016/08/CIMM-LEXICON-3.0_July-2016.pdf

Williams, C. K., & Karahanna, E. (2013). Causal explanation in the coordinating process: A critical realist case study of federated IT governance structures. *MIS Quarterly, 37*(3), 933–964.

Winseck, D. (2011, September 22). Winners, losers and opportunities lost in the CRTC vertical-integration ruling. *The Globe and Mail*. Retrieved from https://beta.theglobeandmail.com/technology/digital-culture/winners-losers-and-opportunities-lost-in-the-crtc-vertical-integration-ruling/article627416/?ref=http://www.theglobeandmail.com&

Woodward, J. (1958). *Management and technology*. London, UK: Her Majesty's Stationary Office.

Wynn, D. Jr., & Williams, C. K. (2012). Principles for conducting critical realist case study research in information systems. *MIS Quarterly, 36*(3), 787–810. doi:10.2307/41703481

Yin, R. K. (2014). *Case study research: Design and methods* (5th ed.). Newbury Park, CA: Sage.

Yoo, Y., Boland Jr., R. J., Lyytinen, K., & Majchrzak, A. (2012). Organizing for innovation in the digitized world. *Organization Science, 23*(5), 1398–1408. doi:10.1287/orsc.1120.0771

Yoo, Y., Henfridsson, O., & Lyytinen, K. (2010). The new organizing logic of digital innovation: A research agenda for information systems research. *Information Systems Research, 21*(4), 724–735. doi:10.1287/isre.1100.0322

Zachariadis, M., Scott, S., & Barrett, M. (2013). Methodological implications of critical realism for mixed-methods research. *MIS Quarterly, 37*(3), 855–879.

Zammuto, R. F., Griffith, T. L., Majchrzak, A., Dougherty, D. J., & Faraj, S. (2007). Information technology and the changing fabric of organization. *Organization Science, 18*(5), 749–762. doi:10.1287/orsc.1070.0307

Zigmond, D., Dorai-Raj, S., Interian, Y., & Naverniouk, I. (2009). Measuring advertising quality on television: Deriving meaningful metrics from audience retention data. *Journal of Advertising Research, 49*(4), 419–428. doi:10.2501/S0021849909091090

Appendix A: Participant and invitee list

Table A1

Participant and Invitee List

ID	Organization	Job Level	Area of Work	Participated?
1	A	Sr. Manager	Insights	Y
2	A	Sr. Director	Sales	Y
3	A	Director	Analytics	Y
4	A	VP	Programming	Y
5	A	Sr. Manager	Applications Support	Y
6	A	Director	Data Science	Y
7	B	Sr. Director	Insights	Y
8	B	Director	Insights	Y
9	B	VP	Sales	Y
10	B	Sr. Manager	Insights	Y
11	B	Director	Data Science	N[1]
12	B	Sr. Manager	Data Science	Y
13	B	VP	Strategy	Y
14	C	Director	Product	Y
15	A	Director	Product	N[2]
16	A	Director	Regulatory	N[3]
17	C	Director	Insights	N[4]
18	C	VP	Insights	Y
19	C	Senior Director	Sales	Y
20	C	Director	Strategy	N[5]
21	C	Manager	Sales	Y
22	D	Director	Innovation	Y

Notes:

[1]Invitee declined due to lack of available time to participate. Participant 12 is a direct report and was suggested as a potential participant in lieu of.

[2]Invitee resigned from organization around the time of the invitation, therefore, declined participation.

[3]Invitee felt that there was nothing of interest that could be provided to the research due to the early stages of adoption within the organization.

[4]Invitee was wrongly identified as an eligible potential participant.

[5]Invitee declined participation. Reason was not provided.

Appendix B: Interview log

Table B1

Interview Log

Interview ID	Participant ID	Filename	Interview Date	Interview Time	Interview Length
1	1	R1I1_100317	10 Mar 17	0936hrs	0:52:06
2	2	R2I1_100317	10 Mar 17	1219hrs	0:29:51
3	3	R3I1_100317	10 Mar 17	1511hrs	0:46:44
4	4	R4I1_150317	15 Mar 17	0910hrs	1:14:32
5	5	R5I1a_310317	31 Mar 17	0800hrs	0:18:23
6	5	R5I1b_310317	31 Mar 17	0822hrs	1:09:18
7	6	R6I1_110417	11 Apr 17	1504hrs	0:50:13
8	13	R13_I1_240417	24 Apr 17	0912hrs	0:49:44
9	8	R8I1_280417	28 Apr 17	0910hrs	0:47:41
10	9	R9I1a_050517	5 May 17	1302hrs	0:06:48
11	9	R9I1b_050517	5 May 17	1310hrs	0:42:36
12	7 & 10	R7_10I1_110517	11 May 17	0945hrs	0:58:14
13	14	R14I1a_140617	14 Jun 17	0917hrs	0:46:26
14	14	R14I1b_140617	14 Jun 17	1004hrs	0:11:48
15	12	R12I1_220617	22 Jun 17	1501hrs	0:24:28
16	18	R18I1_290617	29 Jun 17	0901hrs	1:00:13
17	19	R19I1_290617	29 Jun 17	1038hrs	0:50:51
18	21	R21I1_070717	7 Jul 17	1005hrs	0:57:52
19	22	R22I1_231017	23 Oct 17	1441hrs	0:48:29

Appendix C: Semi-structured interview protocol

THE AFFORDANCES OF ENHANCING AUDIENCE INFORMATION SYSTEMS WITH RETURN PATH DATA: A CRITICAL REALIST STUDY

Interview Guide

Time and place

Date: Click here to enter a date.

Address: Click here to enter text.

Interviewee background information

Name: Click here to enter text. **Resp Code:**Click here to enter text.

Organization: **Interview No.:**Click here to enter text.

Follow-up Inteview? ☐ Yes ☐ No

Introduction

My name is Derrick Gray and I am a Doctor of Business Administration candidate at Athabasca University. As a requirement to complete my degree, I am conducting a research project about the impact and usage of return path data as a means to create and understand television audiences. I am conducting this project under the supervision of Dr. Alain May, Associate Vice President, Student and Academic Services. This interview satisfies the requirement of the Research Ethics Board of Athabasca University and its Faculty of Business

I have prepared this Informed Consent document to outline what I am asking from you and what my responsibilities are towards you, as a participant of the research. Please take the time to review and I am happy to answer any questions you might have.

I will need you to sign the consent before we start the interview. Just a reminder, while this interview will be recorded, you can drop out of the study and have the records of this interview deleted as per the timelines provided to you.

Core Questions (ask to all participants)

Basic information

1. Please state your name. Click here to enter text.
2. What is your title? Click here to enter text.
3. What got you interested in a career in media? Click here to enter text.
4. How would you describe your responsibilities? Click here to enter text.
5. How many years have you worked in the media industry? Click here to enter text.

Basic Data Questions (ask as needed/appropriate)

1. Have you ever used currency audience estimates? ☐ Yes ☐ No
2. What did you use it for? Click here to enter text.
3. Tell me about your experience using it (PROMPT: Challenges, limitations, etc.) Click here to enter text.
4. Have you ever used audience data derived from <organization's> return-path data? ☐ Yes ☐ No
5. What did you use it for? Click here to enter text.
6. Tell me about your experience using it (PROMPT: Challenges, limitations, etc.) Click here to enter text.
7. Has this data influenced the way that you or your team make business decisions? If so, how?
8. What do each form of data offer you? What offers you more? How so?
9. When would you chose to use one source of data over the other?
10. Have you ever experienced conflicting information coming from the two data sets? ☐ Yes ☐ No
11. Tell me about it: Click here to enter text.
12. How did you deal with/overcome the differences? Click here to enter text.

Manufacturing Questions (ask only to those who are involved in the Manufacturing of Audience Information/Insights/Ratings from the Raw Data (ask as needed./appropriate)

1. Who are your 'clients' with this data? Click here to enter text.

2. What does this data enable them to do? What is valuable to them?
   Click here to enter text.
3. How do you present/share/report information/insights/ratings to your customers?
   Click here to enter text.
4. How are these presentations/reports/etc. created? (ask to show if needed/appropriate)
   Click here to enter text.
5. What do these presentations/reports allow them to do?
   Click here to enter text.
6. How are these presentations/reports different/better than the existing currency audience information?
   Click here to enter text.
7. What are your challenges in creating them (prompt: limitations in RPD)?
   Click here to enter text.
8. Tell me how you overcome these limitations? (ask to demonstrate/show if needed/appropriate)
   Click here to enter text.

Closing

Thank you for taking the time to speak with me this afternoon. Please take my business card <provide card> which has my contact information should you wish to clarify any information you provided today. As indicated in my letter of introduction and the informed consent documents, I may need to arrange a follow-up interview with you to clarify today's discussion or to build upon some of the ideas we exchanged today. Should I need the second interview, I expect to contact you within 4 to 6 weeks.

Appendix D: Research ethics approval and renewal

October 03, 2016

Mr. Derrick Gray
Faculty of Business\Doctorate in Business Administration
Athabasca University

File No: 22296

Ethics Expiry Date: October 02, 2017

Dear Derrick Gray,

Thank you for your recent resubmission to the Faculty of Business Departmental Ethics Review Committee, addressing the clarifications and revisions requested for your research entitled, 'THE AFFORDANCES OF ENHANCING AUDIENCE INFORMATION SYSTEMS WITH RETURN PATH DATA: A CRITICAL REALIST STUDY'.

Your application has been **Approved** and this memorandum constitutes a ***Certification of Ethics Approval***. You may begin the proposed research.

This REB approval, dated October 03, 2016, is valid for one year less a day.

Throughout the duration of this REB approval, all requests for modifications, ethics approval renewals and serious adverse event reports must be submitted via the Research Portal.

To continue your proposed research beyond October 02, 2017, you must apply for renewal by completing and submitting an Ethics Renewal Request form. Failure to apply for **annual renewal** before the expiry date of the current certification of ethics approval may result in the discontinuation of the ethics approval and formal closure of the REB ethics file. Reactivation of the project will normally require a new Application for Ethical Approval and internal and external funding administrators in the Office of Research Services will be advised that ethical approval has expired and the REB file closed.

When your research is concluded, you must submit a Project Completion (Final) Report to close out REB approval monitoring efforts. Failure to submit the required final report may mean that a future application for ethical approval will not be reviewed by the Research Ethics Board until such time as the outstanding reporting has been submitted.

At any time, you can login to the Research Portal to monitor the workflow status of your application.

If you encounter any issues when working in the Research Portal, please contact the system administrator at research_portal@athabascau.ca.

Sincerely,

Fathi Elloumi
Chair, Faculty of Business Departmental Ethics Review Committee
Athabasca University Research Ethics Board

Mr. Derrick Gray
Faculty of Business\Doctorate in Business Administration
Athabasca University

File No: 22296

Certification of Ethics Approval Date: October 03, 2016

New Renewal Date:

Dear Derrick Gray,

Your Renewal Form has been received by the AU REB Office.

Athabasca University's Research Ethics Board (REB) has **approved** your request to renew the *certification of ethics approval* for a further year for your project entitled "THE AFFORDANCES OF ENHANCING AUDIENCE INFORMATION SYSTEMS WITH RETURN PATH DATA: A CRITICAL REALIST STUDY". Attached, please find a new Certification of Ethical Approval for your records.

As you progress with the research, all requests for changes or modifications, ethics approval renewals and serious adverse event reports must be reported to the Athabasca University Research Ethics Board via the Research Portal.

To continue your proposed research beyond September 18, 2018, you must apply for renewal by completing and submitting an Ethics Renewal Request form before expiry. Failure to apply for **annual renewal** before the expiry date of the current certification of ethics approval may result in the discontinuation of the ethics approval and formal closure of the REB ethics file. Reactivation of the project will normally require a new Application for Ethical Approval and internal and external funding administrators in the Office of Research Services will be advised that ethical approval has expired and the REB file closed.

When your research is concluded, you must submit a Project Completion (Final) Report to close out REB approval monitoring efforts. Failure to submit the required final report may mean that a future application for ethical approval will not be reviewed by the Research Ethics Board until such time as the outstanding reporting has been submitted.

If you encounter any issue with the Research Portal's online submission process, please contact the system administrator via research_portal@athabascau.ca.

If you have any questions about the REB review & approval process, please contact the AUREB Office at (780) 675-6718 or rebsec@athabascau.ca.

Sincerely,

Office of Research Ethics

Appendix E: Key events in the Canadian television industry

Table E1

Key events in the Canadian television industry relevant to innovation

Time	Event	Event Category
1944	Formation of Numeris (then known as the Bureau of Broadcast Measurement)	Electronic measurement
1952	Bureau of Broadcast Measurement commences television audience measurement coinciding with the establishment of the CBC's first two television stations	Electronic measurement
1987	Group Videotron Ltee acquires Tele-Metropole Inc.	Vertical Integration
1990	The term Digital Marketing first used	Digital Advertising
1993	First clickable web-ad	Digital Advertising
1997	Videotron acquires CF Cable TV Inc. and its subsidiaries	Vertical Integration
1998	Google Inc. incorporated	Digital Advertising
1998	Bureau of Broadcast Measurement launches picture-matching technology (PMT) for electronic television audience measurement in Vancouver.	Electronic measurement
1999	Corus Entertainment spun off from Shaw Communications	Vertical Integration
2000	Quebecor acquires Videotron	Vertical Integration
2000	Google launches AdWords, a self-service program for online ad campaigns	Digital Advertising
2001	Bureau of Broadcast Measurement rebrands as BBM Canada	Electronic measurement
2001	Transfer of control over Groupe TVA to Quebecor Media Inc. approved by the CTRC	Vertical Integration
2001	Rogers Communications Inc. acquires CTVSportsnet and rebrands as Sportsnet	Vertical Integration
2002	BBM Canada begins installing its first PPM electronic measurement panel in Quebec	Electronic measurement
2004	Google launches Gmail	Digital Advertising
2004	Facebook launches	Digital Advertising
2004	BBM Canada and Nielsen Media Research start joint venture for television measurement in English Canada	Electronic measurement
2006	Facebook launches banner ads Facebook access opens to everyone with a valid email address	Digital Advertising

Time	Event	Event Category
2006	Google acquires YouTube	Digital Advertising
2007	Rogers acquired five CITY-TV stations	Vertical Integration
2007	Facebook launches Facebook Ads	Digital Advertising
2008	Facebook launches engagement ads	Digital Advertising
2008	Google launches Google Chrome web browser	Digital Advertising
2009	Facebook launches radius-based ad targeting	Digital Advertising
	Facebook launches self-serve ads	
2009	BBM Canada launches the national PPM measurement service and shuts down the Mark II peoplemeter system	Electronic measurement
2011	Bell Canada Enterprises Inc. (BCE) purchases 100% of CTVglobemedia and renames as Bell Media	Vertical Integration
2013	BCE purchases Astral Media and merges it with Bell Media	Vertical Integration
2014	BBM Canada rebrands as Numeris	Electronic measurement
2016	Shaw Communications transfers all media assets to Corus Entertainment	Vertical Integration

Appendix F: R dataframe

Table F1

Dataframe used for the kmodes analysis in R

ID	Context	Actors	Conditions			Type
			Enabling	Stimulating	Releasing	
1	1	1	2	1	1	1
2	1	1	2	1	1	1
3	1	1	3	3	3	1
4	1	1	2	2	3	2
5	1	1	1	3	2	2
6	1	1	1	3	3	2
7	1	2	4	2	2	2
8	1	2	5	3	4	2
9	1	2	6	1	2	2
10	2	1	1	1	5	1
11	2	1	1	1	3	1
12	2	1	2	4	2	2

Appendix G: Copyright Permissions – SAGE Publishing

Dear Derrick Gray,

Thank you for your Copyright.com order to reuse Figure 2 from "Identifying generative mechanisms through affordances: a framework for critical realist data analysis" in '*Journal of Information Technology*' in your forthcoming thesis/dissertation for Athabasca University. I am pleased to report we can grant your request without a fee.

Please accept this email as permission for your request as detailed above. Permission is granted for the life of the edition on a non-exclusive basis, in the English language, throughout the world in electronic formats for two years, provided full citation is made to the original SAGE publication.

As a courtesy, we ask that you contact the author(s) to let them know the content will be republished. Please note this approval excludes any content which requires additional permission from a separate copyright holder. If the SAGE material includes anything not '© the Author' or '© SAGE', please contact the rights holder for permission to reuse those items.

As we have granted permission via this email, we will cancel your Copyright.com order. If you have any questions, or if we may be of further assistance, please let us know.

Best wishes,

Craig Myles
on behalf of **SAGE Ltd. Permissions Team**
SAGE Publishing
1 Oliver's Yard, 55 City Road
London, EC1Y 1SP
UK
www.sagepublishing.com

Appendix H: Copyright Permissions – MIS Quarterly

Confirmation Number: 11821330
Order Date: 06/06/2019

Customer Information

Customer: Derrick Gray
Account Number: 3001017240
Organization: Derrick Gray
Email: derrick_gray@fb.athabascau.ca
Phone: +1 (416) 847-2033
Payment Method: Invoice

This is not an invoice

Order Details

MANAGEMENT INFORMATION SYSTEMS QUARTERLY

Order detail ID:71917377

ISSN: 0276-7783

Publication Type: Journal

Volume:

Issue:

Start page:

Publisher: M I S RESEARCH CENTER

Author/Editor: SOCIETY FOR MANAGEMENT INFORMATION SYSTEMS (U.S.) ; UNIVERSITY OF MINNESOTA ; SOCIETY FOR INFORMATION MANAGEMENT (U.S.)

Permission Status: **Granted**

Permission type: Republish or display content

Type of use: Thesis/Dissertation

Order License Id: 4602871085671

Requestor type	Academic institution
Format	Print, Electronic
Portion	chart/graph/table/figure
Number of charts/graphs/tables/figures	1
The requesting person/organization	Derrick Gray
Title or numeric reference of the portion(s)	Figure 2, Relationships among the Methodological Principles
Title of the article or chapter the portion is from	Principles for conducting critical realist case study research in information systems
Editor of portion(s)	N/A
Author of portion(s)	Donald Wynn Jr, Clay Williams
Volume of serial or monograph	36
Issue, if republishing an article from a serial	3
Page range of portion	797
Publication date of portion	2011
Rights for	Main product
Duration of use	Life of current edition
Creation of copies for the disabled	no
With minor editing privileges	no
For distribution to	Worldwide
In the following language(s)	Original language of publication

With incidental promotional use	no
Lifetime unit quantity of new product	Up to 499
Title	Big Data Innovation Mechanisms in the Canadian Television Industry
Institution name	Athabasca University
Expected presentation date	Jun 2019

Note: This item was invoiced separately through our **RightsLink service.** More info**$ 0.00**

MANAGEMENT INFORMATION SYSTEMS QUARTERLY

Order detail ID:71917379

ISSN: 0276-7783

Publication Type: Journal

Volume:

Issue:

Start page:

Publisher: M I S RESEARCH CENTER

Author/Editor: SOCIETY FOR MANAGEMENT INFORMATION SYSTEMS (U.S.) ; UNIVERSITY OF MINNESOTA ; SOCIETY FOR INFORMATION MANAGEMENT (U.S.)

Permission Status: **Granted**

Permission type: Republish or display content

Type of use: Thesis/Dissertation

Order License Id: 4602871086860

Requestor type	Academic institution
Format	Print, Electronic
Portion	chart/graph/table/figure
Number of charts/graphs/tables/figures	1
The requesting person/organization	Derrick Gray
Title or numeric reference of the portion(s)	Figure 2. The Reproductive Approach of Critical Realism for Knowledge Creation
Title of the article or chapter the portion is from	Methodological implications of critical realism for mixed-methods research
Editor of portion(s)	N/A
Author of portion(s)	M Zachariadis, S Scott, M Barrett
Volume of serial or monograph	37
Issue, if republishing an article from a serial	3
Page range of portion	5
Publication date of portion	2013
Rights for	Main product
Duration of use	Life of current edition
Creation of copies for the disabled	no
With minor editing privileges	no
For distribution to	Worldwide
In the following language(s)	Original language of publication

With incidental promotional use	no
Lifetime unit quantity of new product	Up to 499
Title	Big Data Innovation Mechanisms in the Canadian Television Industry
Institution name	Athabasca University
Expected presentation date	Jun 2019

Note: This item was invoiced separately through our **RightsLink service.** More info**$ 0.00**