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Editorial Board

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Technology Adoption and Disruption -- Organizational Implications for the Future of Work

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Abstract

Effective use of various technologies in organizations is key to success in this age of rapid technological innovation. In particular, during the last 20-30 years we have seen that the pace of technical innovation has significantly increased. Many of these technologies have created substantial and positive disruptions in organizational processes and operations. Some organizations have been struggling with this rapid technological disruption. Managers are uncertain about when and under what conditions they should adopt a new technology. A Technology Acceptance Model was developed by Fred Davis in 1985 as his Ph. D. dissertation submitted to the Sloan School of Management at M. I. T. Since then, other researchers have developed and applied various versions of this model and similar models for adopting new technologies in organizations. In this commentary, we briefly review the history of technology adoption models and discuss disruptions created by these technologies. We summarize organizational implications and describe the technology adoption curve. During a Global health crisis and pandemic, it is timely to think about the impact of technology adoption and the implications for the future of work.

Keywords: Technology adoption, disruptive technologies, technology adoption models, technology adoption curve

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1. Introduction

Effective adoption and use of various technologies along with modern business processes in private, public, and not-for-profit organizations are essential for them to become and remain successful enterprises. Rapid and significant technological changes and newer business models and processes often make it difficult for managers to determine what new technologies to use and under what circumstances it is appropriate to adopt them. The technology acceptance model (TAM) is the most widely applied theoretical Information Systems model. It was originally developed by Fred Davis (Davis, 1985; Davis, 1989) to facilitate information technology adoption decisions. Other versions of TAM such as TAM2 (Venkatesh & Davis, 2000) and TAM3 (Venkatesh and Bala, 2008) have been developed as well.

TAM (Davis, 1985; Davis, 1989) was developed to examine end-user acceptance of information systems based on characteristics of such systems. Venkatesh & Davis (2000) developed an extension to the original TAM that is referred to as TAM2 by including characteristics such as "perceived usefulness" and "perceived ease of use" (p. 186). Venkatesh & Bala (2008) expanded the model further by including the concept of intervention by managers regarding technology acceptance. Dishaw and Strong (1999) extended TAM by including the task-technology fit constructs in their model.

TAM and its different versions have been applied to different technologies over the years such as Internet banking and user behavior (Chan & Lu, 2004); e-learning (Cheung & Vogel, 2013); e-mail usage (Gefen & Straub, 1997); ERP use (Gumussoy, Calisir, and Bayram (2007); and telemedicine technology acceptance by physicians (Hu, Chau, Sheng, & Tam,1999) to name a few technology areas.

The effectiveness of TAM as a predictive model has been studied by a number of researchers. Lee, Kozar, and Larsen (2003) examined accomplishments and limitations of TAM by reviewing 101 articles published from 1986 until 2003. The authors divided their study period of eighteen years into four stages of "introduction, validation, extension, and elaboration." A major finding of this study is that TAM has evolved over the years. During its introduction, TAM received significant attention. This was followed by a period of validation of the model, in particular, validation of the TAM instruments that were used. This period was followed by an extension phase when researchers focused on external variables including individuals, organizations, and tasks characteristics. As stated above, many researchers extended the model during the elaboration period resulting in models such as TAM2 (Venkatesh & Davis, 2000) and TAM3 (Venkatesh & Bala, 2008).

Other researchers have used alternative concepts to those used in various versions of TAM to discuss technology acceptance and adoption. For example, Sun, Fang, and Zou (2013) suggested the importance of mindfulness when adopting a technology. They proposed that technology adopter's mindfulness is a critical factor that determines how a particular technology fits specific tasks. The authors focused their efforts on the concept of mindfulness of technology adoption (MTA) along with the task-technology-fit (TTF) model and suggest an MTA-TTF framework. Elaboration of TAM continues.

The technology acceptance and adoption literature are very mature after more than four decades of important research about this topic. As a result, some researchers have tried to look at technology and adoption using a different lens. Pauleen, Dalal, Rooney, Intezati, and Wang (2014) suggest that the IS community needs to look at various aspects of the individual, organization, and society to understand the interface and interaction between organizations and technology.

One way to look at the above concepts in more depth and to assess the wisdom of technology acceptance and adoption models is to delve into the underlying ideas behind the technology adoption curve phenomenon.

2. The Technology Adoption Curve

The technology adoption curve (TAC) explains how individuals, managers, and organizations behave in implementing innovative technologies. A quick examination of the framework shows some similarities to the product life cycle curve discussed in business marketing courses. The theory is however more sophisticated than a life cycle or a diffusion model. The underlying model of technology adoption identifies five types of adopters of technology with very different interests and buying characteristics. The companies and individuals that are first to adopt a new technology are called innovators. The second type is known as the early adopters. The third type is called early majority, then the late majority adopters and, finally, the laggards (Roger, 1995).

In general, technology refers to products including software that are based on scientific knowledge. As scientific discoveries are made innovators often apply the new scientific findings to create useful products. Adoption of new innovative technologies seems to occur following a pattern. The technology adoption curve pattern is presented as a traditional bell-shaped curve with exponential growth in the beginning phase of adoption and a slowdown in adoptions occurring during the late adoption phase. When a new technology is introduced, it is usually hard to find, expensive, and imperfect (even flawed). Over time, the new technology's availability increases, cost decreases, and features improve to the point where many organizations and individuals can benefit from adopting the technology. The technology diffuses and spreads to general use and application.

Adoption occurs in phases and adopters in each phase have similar characteristics. In the initial phase innovators are technically oriented users and "visionary." In the final phase, laggards are practical and conservative. The early adopters are seeking a competitive advantage. Productivity issues and conformity influence the early and late majority adopters. Some technology innovations reach a "dead end" early in the adoption cycle. These immature or premature innovations "flame out." The technologies that change industries and even society are the "killer applications" like the VisiCalc spreadsheet.

Innovators are enthusiasts who adopt a new technology for its own sake, with no clear purpose in mind. Early Adopters have the vision to adopt an emerging technology and apply it to an opportunity that is important to them. Early Majority adopters are pragmatists who do not like to take the risks of pioneering, but are ready to see the advantages of tested technologies. They are the beginning of a mass market for the new technology. Late Majority adopters are also pragmatists and this group represents about one-third of available customers. This group dislikes "discontinuous innovations" and believes in tradition rather than progress. The late majority buy high-technology products reluctantly and do not expect to like them. Traditionalists (or laggards) don't really like technology. This group performs a "reality testing" service for the rest of us by pointing out the discrepancies between the day-to-day reality of a technology product and the often-exaggerated claims made for it.

The Technology Adoption Curve (TAC) model is relevant to understanding the adoption of various information and decision support technologies. For example, model-driven DSS are probably at the late majority stage, but Web technologies have reinvigorated that type of decision support and changed its adoption curve. Data warehousing and analytics are probably still in the hands of the early majority. Customer Relationship Management (CRM) may be at the late majority stage. Communications-driven DSS have been adopted quickly. Knowledge-driven DSS and Artificial Intelligence are probably still in the early adoption stage. Document-driven DSS are evolving with the Web technologies. Analytics are extending and expanding the statistical and quantitative technologies used for decision support. Some decision support technologies like virtual reality have however been dead ends and disappointments. Don Norman is often credited with first explaining the technology adoption curve model. Gordon Moore, co-founder of Intel, also helped popularize the technology adoption curve.

3. Disruption, Organizational Implications – Future of Work

There is no doubt that adoption of technological innovations over the years has had a positive impact on the personal and professional life of individuals and on organizations. Technology innovation will continue to do so. An obvious example that is cited often is process automation. Technical innovation not only has affected organizations and how we work but also has created a boundaryless environment between professional and personal life. Chen and Karahanna (2014) articulate the notion that technology disruption has impacted our work and personal life on two fronts – "work-to-nonwork" and "nonwork-to-work" (p. 16). One finding of their study is the negative impact of technology interruptions on our daily personal lives (p. 30). The authors suggest that to minimize the number of messages we should combine messages as much as possible to reduce the number of interruptions. They also propose the idea of using "intelligent interruption management" (p. 31). Their study classifies interruptions caused by communication technologies as negative. The study also articulates the impact of technology on flextime and teleworking. Although this study was published back in 2014, it is particularly relevant in the current pandemic period where a very large segment of knowledge workers is teleworking from home. One wonders if this study were repeated during the current pandemic would similar negative implications of technology be among the findings.

Long-term implications of the COVID-19 pandemic, especially the rapid and widespread adoption of technology to do telework are difficult to predict. There is however little doubt that the ongoing and continuous use of telework technologies by organizations would be transformative. If technology companies, in particular, follow steps taken by Twitter which recently announced some employees will be allowed to permanently work from home, the implications of such decisions are very significant. For example, if people telework regularly from their homes this has impacts for commercial real estate prices, and potentially long-term positive sustainability implications.

In a recent presentation, a Gartner (Gartner Inc., 2020) analyst highlighted long-term implications of pandemics such as COVID-19 for the human resources units in various organizations. Among their major recommendations is the need for rebuilding business models. This recommendation obviously has broad and impactful consequences for not only the organizations, but also for business partners. Gartner estimates that teleworking will increase significantly, reaching about 48% of employees compared to about 30% prior to COVID-19. This telework phenomenon, they predict, will result in expanded data collection due to monitoring of remote workers. Also, as remote work increases, employees need a new skill set to be able to digitally collaborate.

Two major consequences of technology innovations are the organizational impact and the implications for the future of work, and in particular, impacts on employment. A common technology example that is often cited is the automation of the regular voice phone system which was originally a manual system. Phone company employees were doing phone line switching manually at a central office location. When the phone line switching was automated, serious concerns were raised that these individuals were losing their jobs and their livelihood. Imagine how many telephone operators we would need today if line switching was still manual. Some technology changes are inherently necessary.

As we continue to experience the implications of the digital revolution and the use of newer technologies such as the Internet of Things (IoT) (Ashton, 2009), Artificial Intelligence (AI), Fifth Generation (5G) mobile technology, Blockchain technology, and advances in big data analytics techniques, we also hear some concerns about future employment opportunities – the same concerns expressed before about the automation of telephone line switching. Innovative technologies impact the future of work for individuals and they create other more impactful and disruptive consequences. For example, the integration of AI and Blockchain technologies makes it possible to replace the existing disjointed supply chains with smart supply chain networks.

As French and Shim (2016) point out, the Internet of Things (IoT), in particular, has had and continues to have an impact on many products and services including design of home appliances and security, human health, and clothing. Smart security systems, smart lighting, and remote door locks are increasing in adoption. Similarly, smart appliances such as TVs, refrigerators, dishwashers, stoves, and air-conditioning are already in common use. Examples of innovative technology adoption in healthcare include automated blood pressure and cholesterol monitoring systems. Physicians are able to monitor and adjust medical devices that have been surgically installed in the body of a patient remotely. Examples of innovative clothing and accessories include smart watches and glasses, and socks with sensors.

Casual observation of younger or so called "digital natives" with their parents verifies the significant impact of technology adoption. The work and life habits of these two generations are different in many ways. The baby boomer generation tried to separate their work and home life and their means of communication was primarily face-to-face. The "digital natives" generation behavior is quite the opposite. For "digital natives", work and home life are very much integrated. The primary means of communication is not face-to-face rather it is often by means of chat, email, social media, video calls or other digital means. It is not surprising that the technology adoption curve for innovative technologies by the digital generation is more exponential.

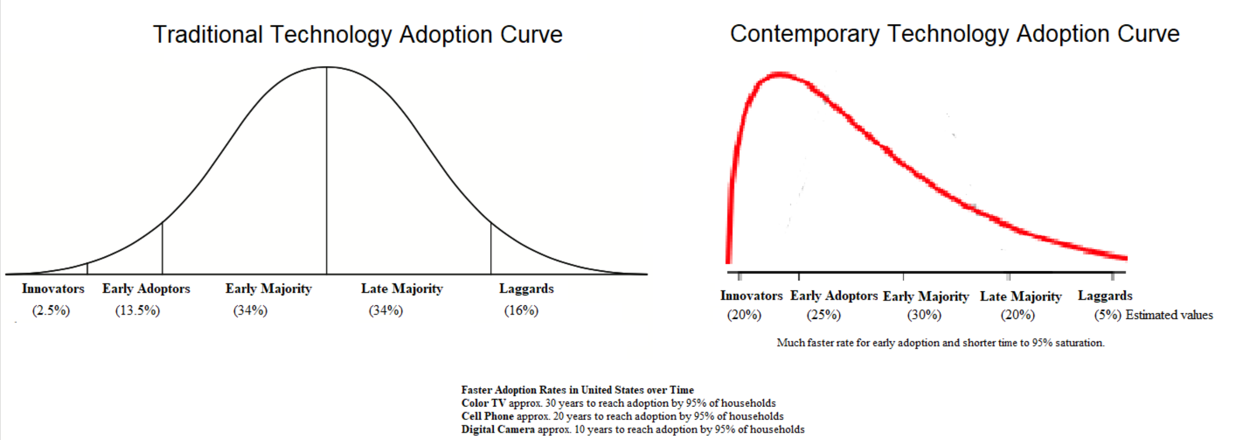

Figure 1. Changes in Adoption Rate and Skew

As Figure 1 depicts, we are asserting the technology adoption rate is now much faster and that the technology adoption curve has changed from an approximately normal curve to a skewed curve with more people adopting new technology quickly. The health crisis has encouraged and promoted faster adoption of innovative technologies.

4. Overview of the contents of this issue

This issue of the journal includes a traditional research article, a research note, and a historical article about the creation of the Midwest Association for Information Systems and the *Journal of the Midwest Association for Information Systems.*

Yi Maggie Guo and Barbara Klein in their interesting and unique article describe Chin's adoption and implementation of the Internet as an economic engine. They further describe how the Chinese central government has controlled access to information over the years. Their study examines users' perception of information quality in China during the decade of 2007 to 2017.

Neetu Singh, Apoorva Kanthwal, Prashant Bidhuri, and Anusha Vijaykumar Munnolli in their informative research note use a data set from SMART BRFSS to predict the chances that individuals will pursue a health checkup and identify which factors potentially play a role that leads to deciding to pursue a health checkup.

In the detailed historical article, Chinju Paul, Bryan Hosack, and Kevin Scheibe describe the creation of the Midwest Association for Information Systems (MWAIS), its journal (JMWAIS), and provide a summary of the annual conferences.

We appreciate and wish to acknowledge the contributions of reviewers for this issue of the journal, including Queen Booker, (Metropolitan State University), Omar El-Gayar (Dakota State University), Joey George (Iowa State University), Yi "Maggie" Guo (University of Michigan, Dearborn), Bryan Hosack (Penske Logistics), Barbara Klein (University of Michigan, Dearborn), Jeffrey Merhout (Miami University), Kevin Scheibe (Iowa State University), and Troy Strader (Drake University). Thank you.

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User Perceptions of Information Quality in China: The Boomerang Decade

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Abstract

China has adopted and implemented the Internet as a vehicle for economic development during the past several decades. As this has occurred, the Chinese national government has sought to control access to information in various ways over time. As political philosophies have changed over time, so has control over the ways in which users are able to publish and access information through the Internet in China. This study examines user perceptions of information quality in China over the decade beginning in 2007 and ending in 2017. Data were collected three times at five-year intervals. The results show that user perceptions have changed in a way that is consistent with changes in control over use of the Internet in China during this ten-year period. Specifically, user perceptions of information quality along a number of dimensions are similar at the beginning and end of this decade and either significantly higher or lower in the middle of the decade in ways that are consistent with Chinese control of the Internet in the middle of this decade. Our research shows that users are sensitive to information quality issues in that the changes in Chinese Internet users' perceptions have shifted in parallel with public events and governmental practices. China is a prototypical case of tight government control of the Internet. The findings of this study shed light on user perceptions in one society of this type. In the long run, information providers should strive to provide high quality information as a strategy for mitigating the effects of fake news.

Keywords: *information quality, user perceptions, China, Internet, longitudinal research; social and technical change*

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1. Introduction

Throughout history, social changes have accompanied technological advances. The wheel changed the way that people lived and worked. The development of paper and printing brought changes to education and entertainment. Similarly, the development of the Internet has brought changes to the way people work, learn, and communicate (Leiner, et al., 1997; World Wide Web Foundation, 2020). These changes have had broad effects and have occurred relatively quickly. Although the Internet technological standards were developed primarily in the United States, the technological infrastructure of the Internet has spread around the world and has influenced societies as they have built the infrastructure needed to adopt and connect to the Internet. This is true in China as elsewhere.

As countries have implemented the technological infrastructure needed to connect their citizens to the Internet, governments have made decisions about the way in which the Internet is used and controlled within the country. In some countries, approaches to the control and use of the Internet have also shifted over time in response to factors and governmental philosophies within the country. The Internet, as it was developed in the United States and Europe, has an underlying philosophy of open-access to information and an essentially democratic nature (Berners-Lee, 2013). This is arguably inconsistent with the basic philosophy of information governance at a national level in China. The Chinese government has, therefore, had to develop a governance approach to the Internet that is somewhat different than the technical architecture of the Internet. At the national level, the adoption and use of the Internet in China has been deployed as a tool of economic development. Although this has led to improvements in the standard of living in China, Chinese citizens have faced limitations to their access to information available elsewhere through the Internet (Shao et al., 2016).

While government regulations have limited access to information available through the Internet in China, the nature of these restrictions has varied over time (Dong, 2012; Wang and Mark, 2015). The technology of the Internet makes it relatively easy for governmental authorities to quickly implement changes related to what citizens are allowed to see and communicate through the Internet. There have been periods of relatively open and freer access to information as well as periods of tighter control. Generally speaking, controls related to the Internet in China became looser during a period ending in 2012 and have become more restrictive in the years since. These changes have affected what and how information is available to users in China. Users are aware of issues related to information quality, and these changes are likely to be reflected in shifts in Chinese users' perceptions of the information available through the Internet over time.

China is an ever-important player in the world economy and international affairs. With its largest population and number of online users, we, as researchers, have a responsibility to study its users. This study examines changes in Chinese user perceptions of the information quality of Internet-based information. Yang (2014) notes that Internet use in China is inherently complex and dynamic; and the present study continues a tradition that seeks to understand the relationship between the Internet and user perceptions and behaviors in China (Kluver and Yang, 2005; Li and Kirkup, 2007; G. Yang, 2007). We believe the changing environment with its unique cultural, social, and political characteristics will affect and be affected by user behaviors and attitudes toward the Internet and the information available from it.

In this study, we look at information quality from the perspective of information consumers. Data were collected three times over ten years: first in 2007, then in 2012, and finally in 2017. In each time period, similar groups of respondents were surveyed using the same survey instrument. The central question examined in this study is whether user perceptions of the information quality of Internet-based sources of information have shifted over time as policies and control of Internet content have changed in China. China is a prototypical case of tight government control of the media. These findings of study shed light on user perceptions in one society of this type.

2. Literature Review

In order to address the question of the extent to which user perceptions of the information quality of Internet-based information have changed over time, a very brief history of the use of the Internet in China is offered. The framework of information quality used in the study is then introduced and applied to an examination of events in China during the period of the study.

2.1 A Brief History of the Internet in China

As in other parts of the world, Internet use in China began with the use of email and other forms of communication primarily to facilitate research initiatives supported by the central government and universities (Lu et al., 2002; CERNET, 2001). Over time, use of the Internet grew to include a much more diverse set of users who were drawn to the Internet to conduct business, find information, engage in entertainment, and socialize. As elsewhere, use of the Internet grew rapidly in the late 1990s and twenty-first century (CNNIC, 1997; CNNIC, 2012; CNNIC, 2017b).

The Internet was originally designed to facilitate open communication and open access to information. As China adopted the Internet, the issue of fit between policies and priorities of the country and the architecture of the Internet became apparent. While the central Chinese government has embraced the Internet at times in order to facilitate the economic development of the country (CNNIC, 2016; Ferdinand, 2016), it has also struggled to control the publication and online discussion of information on topics that are viewed as sensitive or forbidden by the government. Efforts to block posts and users are among the tactics developed to limit the online publication of information on the Internet (Bamman, et al., 2012).

2.2 Information Quality in the Context of the Internet

In the early days of Internet use, practitioners, scholars, and teachers expressed alarm about the ease with which imperfect information could be published and distributed through the Internet. (Clausen, 1996; Keltner, 1998; Saha et al., 2012). There was wide-spread concern that Internet users, and especially students, were ill-prepared to deal with the information quality issues posed by the Internet and would accept everything they read on the Internet as being accurate, complete, unbiased, and so forth. Similar concerns are sometimes voiced today, in part, because of developments such as big data (Ge and Dohnal, 2018) and fake news (Handley, 2018).

In stark contrast to this view, empirical evidence suggests that users are aware of information quality issues associated with the Internet and recognize relative strengths and weaknesses of information published on the Internet (Klein, 2001; Klein and Callahan, 2007; Klein et al., 2011a, 2011b; Rieh and Belkin, 1998). Much of this evidence is based on Internet users in the United States, although some international efforts have been carried out in Mexico and China (Klein, 2001; Klein et al., 2011a, 2011b).

Numerous frameworks organizing the dimensions of information quality have been proposed and used in the field (e.g., Arazy and Kopak, 2011; Fox et al., 1993; Helfert and Foley, 2009; Huh et al., 1990; Naumann, 2002; Wang and Strong, 1996), and a variety of instruments for measuring information quality have been developed (Lee et al., 2002; Michnik and Lo, 2007; Wang and Strong, 1996). Because the study described in this paper is part of a long-standing research program in which data have been collected in several countries for several different purposes over a relatively long period of time, the framework developed by Wang and Strong (1996) is used in this paper to theorize about and measure information quality. Wang and Strong (1996) proposed a framework and measures from the perspective of information consumers. In this conceptualization of the dimensions of information quality, data quality attributes are grouped into four categories: intrinsic data quality, contextual data quality, representational data quality, and accessibility data quality. There are fifty items measuring the fifteen dimensions of information quality. The majority of the dimensions are measured by multiple items. The dimensions cover various aspects of information quality from accuracy to completeness, from style to accessibility, from timeliness to scope, and more. These dimensions as a whole express the idea that high quality data and information are of intrinsic high quality, appropriate to the task context, and clearly represented and accessible to the user.

The Wang and Strong (1996) framework are one of the most comprehensive and carefully developed frameworks in the field of information quality research. The framework has been applied in a large number of studies (e.g., Baskarada, 2010; Huang et al., 1999; Katerattanakul and Siau, 2008; Klein, 2001; Klein and Callahan, 2007; Klein et al., 2011a, 2011b, 2014; Lee et al., 2002; Michnik and Lo, 2007; Pipino et al., 2002; Strong et al., 1997). It has also been available and in use over a long period of time which has facilitated data collection for a decade in the present study and even longer in the research program in which this study is embedded.

Table 1 shows the fifteen dimensions of information quality used in the Wang and Strong (1996) framework grouped into the four categories of information quality. The last column shows the data attributes of the fifteen dimensions of information quality.

2.2.1 Intrinsic Data Quality and Perceptions of Internet-Based Information in China

The intrinsic data quality category in the Wang and Strong (1996) information quality framework includes the dimensions of believability, accuracy, objectivity, and reputation. User perceptions of believability, accuracy, objectivity, and reputation of Internet-based information in China are likely to have shifted over time as the government

Table 1. Information Quality Categories and Dimensions of Information Quality from Wang and Strong (1996)

Information Quality Category	Dimension of Information Quality	Data Attributes
Intrinsic Data Quality	Believability	Believable
	Accuracy	Data are certified error-free, Error free, Accurate, Correct, Flawless, Reliable, Errors can be easily identified, The integrity of the data, Precise
	Objectivity	Unbiased, Objective
	Reputation	The reputation of the data source, The reputation of the data
Contextual Data Quality	Value-added	Data give you a competitive edge, Data add value to your operations
	Relevancy	Applicable, Relevant, Interesting, Usable
	Timeliness	Age of data
	Completeness	The breadth of information, The depth of information, The scope of information
	Appropriate amount of data	The amount of data
Representational Data Quality	Interpretability	Interpretable
	Ease of understanding	Easily understood, Clear, Readable
	Representational consistency	Data are continuously presented in same format, consistently represented, consistently formatted, Data are compatible with previous data
	Concise representation	Well-presented, Concise, compactly represented, Well-organized, aesthetically pleasing, Form of presentation, Well-formatted, Format of the data
Accessibility Data Quality	Accessibility	Accessible, Retrievable, Speed of access, Available; Up-to-date
	Access security	Data cannot be accessed by competitors, Data are of a proprietary nature; Access to data can be restricted; Secure

has changed the extent and nature of its control over Internet-based information in the country. During periods of relatively restrictive government policy with respect to the Internet, users are likely to more strongly distrust Internet-based information and their views of the believability, accuracy, objectivity, and reputation of this information are likely to be lower than during times of more openness and weaker control.

During the period of time in which the Chinese Communist Party has controlled the government in China, the government has generally exercised media control and used the media for ideological purposes. The introduction of the Internet in China with its philosophy of open access to information and potential to publish user generated content was viewed by some as being likely to transform the way in which the government controls the media in China (G. Yang, 2007; Wu, 2012). While this has proven to be the case in some ways (e.g., the publication of information during the outbreak of SARS in 2002), government control over information published and disseminated through the Internet has followed traditional practices of limiting access to information in other ways (Shao et al., 2016).

The Chinese government has engaged in media control and censorship of Internet-based information throughout the history of Internet use in China, but the extent and nature of this control has varied over time in response to political objectives and concerns (MacKinnon, 2008). In some ways, the government has used the Internet to encourage openness and reform (Balla, 2014); while in other ways, technical measures and systems have been implemented to limit access to data and information, silence critical views and voices, and discourage collective and public expressions and actions (Feng and Guo, 2013; King et al., 2013, 2014).

Chinese government regulation of Internet-based information dictates that online sources of news are controlled at either the national or local level of government (Chu, 2017). Free speech is limited with respect to statements criticizing the government or national policies and practices (Shao et al., 2016). The nuances of the specific practices, enforcement, and penalties associated with these regulations vary over time in response to government concerns. Because penalties can be severe, knowledge of these nuances spreads widely among the user population in China; and Internet users tend to understand how to conform to these regulations and how to avoid incurring penalties for violating the regulations. This awareness of shifts in government regulations suggests that user perceptions of the intrinsic data quality of Internet-based information are likely to also vary in response to user knowledge and reactions to these changes over time in government regulation of Internet-based information.

At times, heightened awareness of issues associated with intrinsic data quality emerges among the user population in China. For example, a national protest centered on the issue of the accuracy of Internet-based information occurred following the death of a Chinese college student in 2016 who was believed to have died, at least in part, because of inaccurate information disseminated through the Internet on appropriate medical treatments for his condition (Li, 2016). Internet users are likely to have been aware of this event, and their perceptions of the intrinsic data quality of Internet-based information generally are likely to have shifted because of this awareness.

Evidence of Chinese Internet users' sensitivity to issues associated with intrinsic data quality are also found in surveys of Internet users who report that they trust media sources in the west more than they trust Chinese sources of information (Weber and Fan, 2016) and trust news published by official news agencies more than they trust commercial news sites (Xie and Zhao, 2014).

As detailed later in the manuscript, we expect changes in government regulation and control of Internet-based information over time to affect Chinese users' perceptions of intrinsic data quality. We expect these changes to be particularly evident among urban, college students in China who are frequent and well-educated users of the Internet. Specifically, we expect perceptions of the believability, accuracy, objectivity, and reputation of Internet-based sources of information to shift during the decade beginning in 2007.

2.2.2 Contextual Data Quality and Perceptions of Internet-Based Information in China

The contextual data quality category in the Wang and Strong (1996) information quality framework includes the dimensions of value-added, relevancy, timeliness, completeness, and appropriate amount of data.

Chinese governmental control of the publication and dissemination of Internet based data may affect user perceptions of the dimensions of data quality associated with contextual data quality. Users understand that censorship is blocking their access to information on certain topics and on information related to points of view opposed by the government. This leaves users with an understanding that the information they access for any particular task may be incomplete for that task. They also may realize that relevant information is missing and that issues of timeliness affect the data they can access in the sense that the most up-to-date information may be blocked. Finally, users' assessments of the appropriate amount of data may be affected by their awareness that some data may be blocked when they search for information on a topic or information they need for a task.

User perceptions of value-added, relevancy, timeliness, completeness, and appropriate amount of data may have been affected in the time period following President Xi's 2015 call for tightened control over the media and heightened monitoring of social media in China (Creemers, 2015; The Washington Post, 2016; Wong, 2016a, 2016b). Following this call, a law was implemented in 2017 imposing additional Internet restrictions including expanded authority of a department charged with monitoring and controlling the Internet.

Chinese government regulation and censorship of Internet-based information is well documented and well understood by Chinese users of the Internet. This regulation and censorship affect user perceptions of the value-added, relevancy, timeliness, completeness, and appropriate amount of data because people are aware of these controls. Since users know that some information is blocked, they understand that information is incomplete and lacking in some ways with respect to the value-added, timeliness, and appropriate amount of data dimensions of data quality. As regulations and the extent and nature of censorship change over time, user perceptions of these dimensions of data quality will also shift over time. A key element of regulation and censorship of the Internet is that policies and practices are not kept secret from Internet users. Rather, the policies work, at least in part, because they are well understood and users are quite knowledgeable about what is and is not allowed on the Internet. As changes occur in Internet regulation, users are informed and communicate with one another about these changes.

Consequently, user perceptions will reflect this and will shift as the nature and extent of regulations and censorship shift over time.

2.2.3 Representational Data Quality and Perceptions of Internet-Based Information in China

The representational data quality category in the Wang and Strong (1996) information quality framework includes the dimensions of interpretability, ease of understanding, representational consistency, and concise representation.

Chinese regulation and censorship of the Internet is concerned with information content rather than with the presentation or format of information. If content is allowed, it can be published and disseminated in any format with any degree of interpretability and ease of understanding. These are simply not concerning of Chinese government policy or practice. Because of an absence of regulation related to representational data quality, we do not expect to see shifts in user perceptions of interpretability, ease of understanding, representational consistency, and concise representation.

2.2.4 Accessibility Data Quality and Perceptions of Internet-Based Information in China

The accessibility data quality category in the Wang and Strong (1996) information quality framework includes the dimensions of accessibility and access security.

A key aim of censorship is the limiting of access to information and ideas. As regulations and censorship strategies have changed over time in China, access to information has changed and user perceptions of accessibility and access security have in turn shifted.

Accessibility issues related to the Internet in China are twofold. First, the Great Fire Wall of China (Zhong et al., 2017) blocks access to a wide array of websites by Chinese users. The exact websites blocked vary over time, and users are well aware of these changes. The existence of the fire wall is known by Chinese users of the Internet and the ways in which it operates are understood. Users employ tactics such as Virtual Private Networks to thwart censorship but face a dynamic environment as these tactics are themselves shut down over time (Yang and Liu, 2014). Second, in order to avoid governmental sanctions, commercial websites engage in regulation and censorship of their own. Posts and texts related to sensitive topics and those containing a government-issued list of forbidden words and topics are simply not published. User awareness of these restrictions is evidenced by the use of text manipulation tactics designed to avoid the detection of forbidden words (Kou et al., 2017). Search engines available in China do not return results related to forbidden topics. These practices have become a normal part of Internet use for Chinese users; and, in general, users are knowledgeable about these restrictions.

Knowledge of these practices affect users' perception of data accessibility and security. As practices related to censorship change over time, users' perceptions of accessibility and access security are also expected to shift. Since an understanding of what is and is not permitted on the Internet is vital to avoiding sanctions in China, we expect that user perceptions of these two dimensions of data quality will be especially responsive to changes in governmental policy.

3. Research Questions and Hypotheses

This study addresses the question of whether users' perceptions of the information quality of Internet-based information have changed over time in China.

The set of fifteen hypotheses given below are tested to answer the research question using data collected in 2007, 2012 and 2017. The fifteen hypotheses are organized according to the four categories of data quality in the Wang and Strong framework (1996).

3. 1 Shifting Patterns in Intrinsic Data Quality

Intrinsic data quality includes the innate attributes of information, such as accuracy, objectivity, believability, and reputation. The truthfulness of information is the focus. In the past decade, online content has experienced explosive growth in volume. Compared to the traditionally controlled state media, online content has enjoyed a period of openness. We propose that user perceptions are influenced by these changes so user perceptions of intrinsic data quality will also change, which is embodied in its believability, accuracy, objectivity, and resulting reputation.

Hypothesis H1:	A shifting pattern will be observed in perceptions of the **believability** of Internet-based sources of information in 2007, 2012, and 2017 among urban, Chinese college students.
Hypothesis H2:	A shifting pattern will be observed in perceptions of the **accuracy** of Internet-based sources of information in 2007, 2012, and 2017 among urban, Chinese college students.
Hypothesis H3:	A shifting pattern will be observed in perceptions of the **objectivity** of Internet-based sources of information in 2007, 2012, and 2017 among urban, Chinese college students.
Hypothesis H4:	A shifting pattern will be observed in perceptions of the **reputation** of Internet-based sources of information in 2007, 2012, and 2017 among urban, Chinese college students.

3. 2 Shifting Patterns in Contextual Data Quality

Contextual category of data quality examines the characteristics related to external use of data and information. Chinese Internet users, both data consumers and content providers, understand the constraints within which they are operating. Biased information may present an incomplete picture since it does not present arguments from all sides, although the absolute amount of information available has increased. Thus, we posit there are changes in user perceptions in contextual data quality dimensions.

Hypothesis H5:	A shifting pattern will be observed in perceptions of the **value-added** of Internet-based sources of information in 2007, 2012, and 2017 among urban, Chinese college students.
Hypothesis H6:	A shifting pattern will be observed in perceptions of the **relevancy** of Internet-based sources of information in 2007, 2012, and 2017 among urban, Chinese college students.
Hypothesis H7:	A shifting pattern will be observed in perceptions of the **timeliness** of Internet-based sources of information in 2007, 2012, and 2017 among urban, Chinese college students.
Hypothesis H8:	A shifting pattern will be observed in perceptions of the **completeness** of Internet-based sources of information in 2007, 2012, and 2017 among urban, Chinese college students.
Hypothesis H9:	A shifting pattern will be observed in perceptions of the **appropriate amount of data** of Internet-based sources of information in 2007, 2012, and 2017 among urban, Chinese college students.

3. 3 No Shifting Patterns in Representational Data Quality

Although presentation of information plays a role in understanding information and the interface of Web has evolved, in essence it is still text-based and linked pages with images and videos. Overall the design of information presentation has not change significantly. More critically, in China, the presentation of the information is not the concern of censorship and access restriction. Therefore, we posit that there are no changes in user perceptions in the dimensions of interpretability, ease of understanding, representational consistency, and concise representation.

Hypothesis H10:	No shifting pattern will be observed in perceptions of the **interpretability** of Internet-based sources of information in 2007, 2012, and 2017 among urban, Chinese college students.
Hypothesis H11:	No shifting pattern will be observed in perceptions of the **ease of understanding** of Internet-based sources of information in 2007, 2012, and 2017 among urban, Chinese college students.
Hypothesis H12:	No shifting pattern will be observed in perceptions of the **representational consistency** of Internet-based sources of information in 2007, 2012, and 2017 among urban, Chinese college students.
Hypothesis H13:	No shifting pattern will be observed in perceptions of the **concise**

representation of Internet-based sources of information in 2007, 2012, and 2017 among urban, Chinese college students.

3. 4 Shifting Patterns in Accessibility Data Quality

In the Wang and Strong (1996) framework, accessibility data quality includes both accessibility and access security. Data consumers using computers to access information view accessibility data quality as an important dimension of data quality (Wang and Strong, 1996). This study examines whether Chinese users' perception of accessibility and security have changed over time. Restriction to access of information is fundamentally at the heart of the control over the Internet by the Chinese government. At times, the Chinese government has loosened its control of the Internet, and we posit that user perceptions have been affected by these shifts.

Hypothesis H14: A shifting pattern will be observed in perceptions of the **accessibility** of Internet-based sources of information in 2007, 2012, and 2017 among urban, Chinese college students.

Hypothesis H15: A shifting pattern will be observed in perceptions of the **access security** of Internet-based sources of information in 2007, 2012, and 2017 among urban, Chinese college students.

4. Methodology

The purpose of the current study is to examine user perceptions of information quality in China from 2007 to 2017. Survey data were collected three times: first in 2007, then in 2012, and finally in 2017. The same survey was used in a similar research setting in all three rounds of data collection. Data were collected from undergraduate students in a major, national university in Beijing, China. The student population of the university has been stable over the years in terms of educational and socioeconomic background and therefore provides a good setting for the examination of changes in perceptions over time.

The information quality framework developed by Wang and Strong (1996) provides the foundation of the survey used in the current study. The survey has been used in prior studies of information quality (e.g., Klein, 2001; Klein and Callahan, 2007; Klein et al., 2011a, 2011b). The survey used in the current study includes a set of fifty questions that measure users' perceptions of the information quality of Internet-based information along fifteen dimensions (Wang and Strong, 1996). The questions in the survey were written in both Chinese and English as shown in Appendix A.

Characteristics of the survey respondents are summarized in Table 2. The respondent profiles are similar across the three time periods. However, the 2007 cohort had fewer years of experience with computers and the Internet because young children did not start using computers and the Internet as early in this cohort compared to later cohorts. Male students made up more than half of the survey respondents due to the nature of their course enrollments, and consistent with the finding that there are more male Internet users than female users in China (CNNIC, 2017b). For ease of reference, we will refer to the data sets from 2007, 2012, and 2017 as T1, T2, and T3 respectively.

5. Empirical Results

The results of the data analysis are reported here, first for the reliability of the measures and then for tests of the research hypotheses.

5.1 Reliability of the Measures

The measures used in data collection for the study have been previously validated and used in past studies (e.g., Klein, 2001; Klein and Callahan, 2007; Klein et al., 2011a, 2011b). The survey includes questions measuring the fifteen dimensions of information quality. We first examined the reliability of the dimensions that are measured with more than one item. Table 3 presents Cronbach's alpha for these dimensions for the three rounds of data collection. The objectivity dimension has poor reliability and was therefore excluded from the remaining analysis.

Table 2. Respondent Profile of 2007, 2012, 2017 Surveys			
	2007 (T1)	2012 (T2)	2017 (T3)
Number of valid responses	253	200	265
Average age	21	21	20
Gender	Male: 185 Female: 68	Male: 112 Female: 88	Male: 187 Female: 63
Most common level	Junior	Junior: 144 Freshman: 16	Junior: 157 Freshman: 79
Most common major	Telecommunications	Telecommunications: 116 Computer: 32	Signal and control: 140 Telecommunications: 65
Years of computer experience	5.7	8.1	6.8
Years of Internet experience	4.8	6.9	6.7

Table 3. Cronbach's alpha for the Dimensions of Information Quality			
	Cronbach's Alpha		
Dimension of Information Quality	2007 (T1)	2012 (T2)	2017 (T3)
Accuracy	.861	.902	.868
Objectivity	.539	.636	.580
Completeness	.771	.742	.726
Reputation	.754	.728	.766
Value-added	.762	.705	.724
Relevancy	.691	.796	.707
Ease of Understanding	.738	.756	.755
Representational Consistency	.563	.753	.663
Concise Representation	.805	.822	.873
Accessibility	.808	.853	.828
Access Security	.729	.776	.714

5.2 User Perceptions of Information Quality of Internet-Based Sources

Next, we conducted mean comparisons of the fifteen dimensions across the three time periods included in the study. For dimensions in intrinsic data quality (H1, H2, and H4, H3 is dropped because of the low reliability of objectivity dimension), contextual data quality (H5-H9), and accessibility data quality (H14 and H15), we hypothesized shifts over time. Thus, a supported hypothesis means a significant shift was detected. The results show one dimension of intrinsic data quality (accuracy), two dimensions of contextual data quality (completeness and appropriate amount), and both dimensions of accessibility data quality supported with a statistically significant difference. For the representational data quality category, we hypothesized no shift in user perceptions of information quality. Thus, a hypothesis is supported when no significant difference is found. The results show no differences. Thus, all four hypotheses for the representational data quality category are supported.

Tests were conducted to determine whether gender has an effect on respondents' perceptions of information quality. Gender was not significant for 2007 and 2017. In the 2012 data, females rated believability, objectivity, timeliness, representational consistency, and concise representation significantly higher than male participants. There is no statistically significant difference in the other dimensions of information quality.

Tests were conducted to determine whether experience with computers has an effect on respondents' perceptions of information quality. The number of years of computer use is not statistically significant for 2007, 2012, and 2017.

Tests were conducted to determine whether experience with the Internet has an effect on respondents' perceptions of information quality. The number of years of Internet use is not statistically significant for 2007, 2012, and 2017.

Table 4. Perceptions of Internet-Based Sources in 2007, 2012, and 2017						
Dimension of Information Quality	**2007 (T1)**	**2012 (T2)**	**2017 (T3)**	**Mean comparison p-value**	**Hypothesis**	**Supported?**
Intrinsic Data Quality						
Believability	3.57	3.67	3.63	.777	H1	Not supported
Accuracy	3.46	3.72	3.43	.015	H2	Supported
Reputation	3.60	3.65	3.53	.653	H4	Not Supported
Contextual Data Quality						
Value-added	4.25	4.04	4.18	.280	H5	Not supported
Relevancy	4.27	4.24	4.25	.942	H6	Not supported
Timeliness	4.48	4.43	4.49	.914	H7	Not supported
Completeness	4.57	4.18	4.41	.007	H8	Supported
Appropriate Amount	5.02	4.54	5.01	.003	H9	Supported
Representational Data Quality						
Interpretability	4.07	4.00	4.15	.524	H10	Supported
Ease of Understanding	4.41	4.17	4.28	.128	H11	Supported
Representational Consistency	3.72	3.83	3.64	.158	H12	Supported
Concise Representation	3.81	3.85	3.85	.823	H13	Supported
Accessibility Data Quality						
Accessibility	4.64	4.28	4.66	.003	H14	Supported
Access Security	3.40	3.77	3.25	.000	H15	Supported

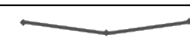
The first category of dimensions deals with the intrinsic information quality. Among the three remaining dimensions, only the accuracy dimension had a significant change in user perception over time. With 2012 data as the highest, it shows that users perceived the accuracy of information online better than that in 2007 and 2017. Although no significant changes are observed in believability and objectivity they were rated consistently low compared to other dimensions of data.

If the first category of information quality is the internal, the second category addresses external aspects. Among the five dimensions, only two dimensions of user perceptions have changed significantly over time. They are completeness and appropriate amount. The low points occurred in 2012. As hypothesized, there were no shifts in user perception of dimensions of representational data quality. These dimensions of information quality are the interpretability, ease of understanding, representational consistency, and concise representation of information. Compared to dimensions in other categories that related to the content of the information, these dimensions measure the presentational aspects of information display. If the content of and access to information is the core motive and focus of governmental control, presentational aspects have not experienced the same changes in regulation and practices. This is reflected in the stability of user perceptions of these dimensions of information quality. Both dimensions in accessibility category show change over time. The pattern of change shows that accessibility is similar to completeness and appropriate amount.

Table 5 presents the results of a post hoc analysis using Tukey tests to determine which time periods are significantly different for each dimension of information quality. For comparisons with statistically significant differences, the homogeneous subsets are given. The sparklines in the last column trace the mean values of a dimension over the three time periods, visually showing the trends and changes. For dimensions that are not different, the sparklines look like a straight line with little slope. For those dimensions that are different over the time, sparklines show a change of direction. The patterns are either Boomerang or the reverse. This observation is a way of visualizing change over time.

In summary, among the dimensions, there were significant changes in user perceptions of five dimensions. These dimensions are related to the availability of information, such as completeness, appropriate amount, accessibility, and accessibility security.

Table 5. Perceptions of Internet-based Sources 2007, 2012, and 2017 – Tukey Tests

Dimension of Information Quality	2007 (T1)	2012 (T2)	2017 (T3)	different ?	Tukey Tests	Homogenous Subsets	Sparkline
Believability	3.57	3.67	3.63	No		(T1, T2, T3)	
Accuracy	3.46	3.72	3.43	Yes	T1 vs. T2 (p=.040) T2 vs. T3 (p=.019)	(T1, T3) (T2)	
Reputation	3.6	3.65	3.53	No		(T1, T2, T3)	
Value-added	4.25	4.04	4.18	No		(T1, T2, T3)	
Relevancy	4.27	4.24	4.25	No		(T1, T2, T3)	
Timeliness	4.48	4.43	4.49	No		(T1, T2, T3)	
Completeness	4.57	4.18	4.41	Yes	T1 vs. T2 (p=.005)	(T1, T3) (T2, T3)	
Appropriate Amount	5.02	4.54	5.01	Yes	T1 vs. T2 (p=.008) T2 vs. T3 (p=.009)	(T1, T3) (T2)	
Interpretability	4.07	4	4.15	No		(T1, T2, T3)	
Ease of Understanding	4.41	4.17	4.28	No		(T1, T2, T3)	
Representational Consistency	3.72	3.83	3.64	No		(T1, T2, T3)	
Concise Representation	3.81	3.85	3.85	No		(T1, T2, T3)	
Accessibility	4.64	4.28	4.66	Yes	T1 vs. T2. (p=.011) T2 vs. T3 (p=.006)	(T1, T3) (T2)	
Access Security	3.4	3.77	3.25	Yes	T1 vs. T2 (p=.006) T2 vs. T3 (p=.000)	(T1, T3) (T2)	

6. Discussion, Implications, and Future Research

The decade from 2007 to 2017 was characterized by a pattern of continuing but slowed economic growth in China (Trading Economics, 2018). However, the general public continued to have little access to most western social media and news organization websites. After a short period of openness, in recent years, more regulation and "self-regulation" of free speech were put into place (Wong, 2016a; The Washington Post, 2016). The most striking observations of our findings reflect the changes that occurred in the larger societal and political environment in that changes in user perceptions of information quality displayed a boomerang pattern over this time period.

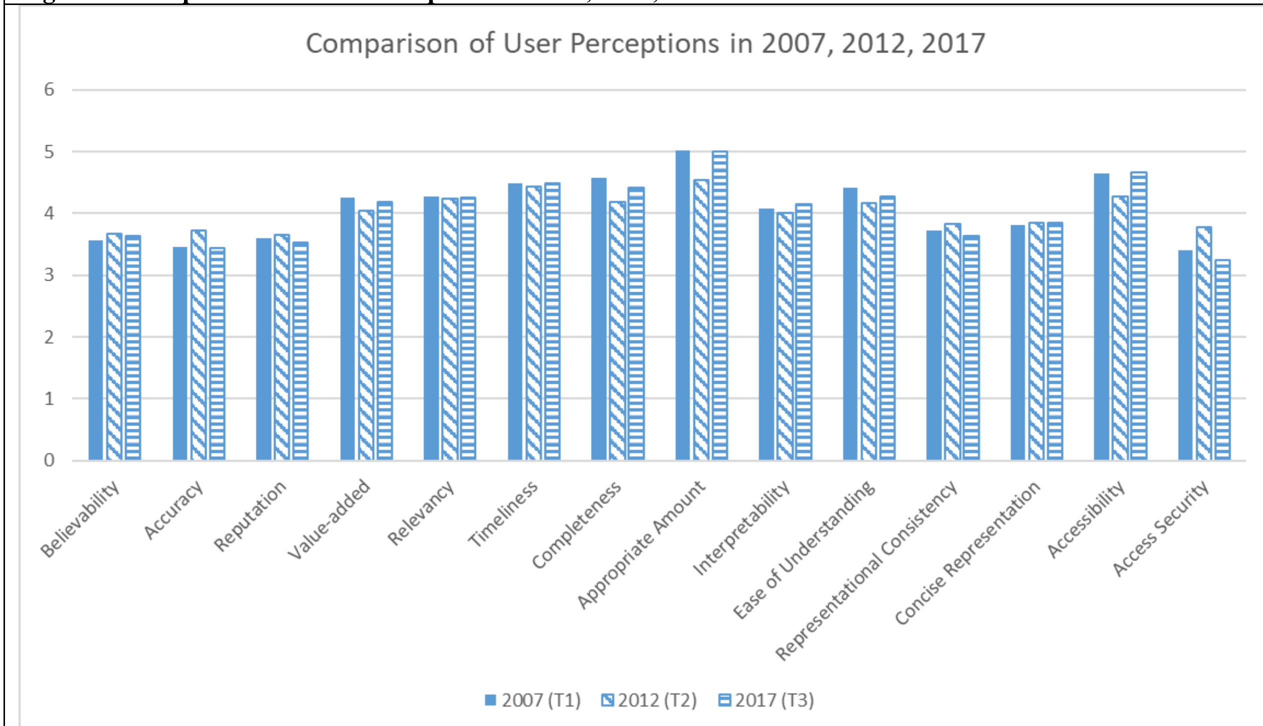
6.1 User Perceptions of Information Quality from 2007 to 2017

In this section, we examine changes in user perceptions of information quality of Internet-based information from 2007 to 2017. We explore this issue from two angles: (1) whether there were significant changes and (2) whether there is a salient pattern of change.

6.1.1 Trends

Significant differences were found in mean values of user perceptions of four dimensions (i. e., completeness, appropriate amount, accessibility, access security) at .01 level and another (accuracy) at .05 level over the three time points. Figure 1 shows a column chart with all of the dimensions of information quality with the three time periods next to each other. As shown in the figure, the greatest changes occur in appropriate amount, access security, accessibility and completeness.

Figure 1. Comparison of User Perceptions in 2007, 2012, and 2017



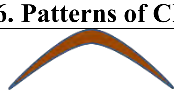
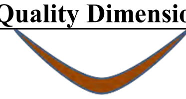
6.1.2 Return to the Past

Compared to the significance of the differences, the pattern of changes may be more telling. In 2017, all of the dimensions return toward the level of 2007, which is very evidently shown in Figure 1 by the sparklines. This can be visualized in the shape of a boomerang. Table 6 shows a summary of these patterns. The dimensions with significant differences at a level of .01 are indicated with two asterisks, while the dimension with a significant difference at a level of .05 is indicated with one asterisk.

All of the dimensions with statistically significant differences in the mean comparisons display a boomerang pattern. Access security and accuracy show this pattern with mean values in 2012 the highest among the three giving a boomerang shape when the pattern is visualized. Completeness, appropriate amount, and accessibility decreased in the 2012 data set and increased in 2017, showing the opposite pattern which can be visualized as a reserved boomerang. A return to the ratings of 2007 in 2017 is a salient pattern in the user perceptions of Internet-based data. For example, for the accuracy dimension, paired comparison Tukey tests show that the mean ratings from 2007 and 2012 are different and that the mean ratings of 2012 and 2017 are different. User perceptions of accuracy reach their peak in 2012 and then return to the level seen in 2007 in 2017.

As shown in Table 6, in addition to the completeness, appropriate amount, and accessibility dimensions which have statistically significant differences for mean comparisons, another five dimensions display a dip in the ratings for 2012.

Table 6. Patterns of Changes in Information Quality Dimensions

 **Boomerang**	 **Reversed Boomerang**
Access security **	Completeness**
Accuracy *	Appropriate amount**
Believability	Accessibility**
Reputation	Value-added
Representational consistency	Relevancy
	Timeliness
	Interpretability
	Ease of understanding

** significant at .01 level * significant at .05 level

This turning point in 2012 coincides with the scandals of low-quality commercial information and the changes in leadership and government policies in China. This supports the idea that users are sensitive to changes that affect information quality. Access security has been a concern among users in China throughout the years. The dip in ratings after improvement may be the effect of online surveillance, public opinion control projects, and big data initiatives that made users feel vulnerable. When Google left China in 2010, a great loss was felt since it was a sharp reminder of how much information was out of reach for typical Internet users in China. This is consistent with the dip in ratings of accessibility, completeness, and appropriate amount in 2012. Homegrown Internet services in China such as Baidu and Sina Weibo quickly occupied the space left by Western search engines and social media. Subsequently, ratings of these dimensions improved with perceptions of the accuracy of Internet-based sources showing a peak in 2012. Arguably, after several public crises and promising results, public confidence improved in the years leading up 2012. Subsequently, ratings of these dimensions dropped in an environment characterized by lower quality commercial information and increased censorship and propaganda.

6.2 Contributions and Implications

6.2.1 Contributions

The contributions of this research are threefold. First, the study uses a research method involving a cross-sectional approach with observations over time to study a phenomenon in the MIS field. With three data collections using an identical survey instrument and targeting similar respondents, the research revealed chronological changes in Chinese users' perceptions of Internet-based sources from 2007 to 2017. These findings reflect changes in the larger technical and political environment in which Chinese users operate. We are able to see how technologies and society intertwine and affect one another. One observation of interest is the boomerang shape in most changes, in which user ratings in 2007 and 2017 were closer to each other than to ratings in 2012. Without data from 2012, we would not have seen this pattern. Figure 1 shows that there is not much difference in ratings if we only look at 2007 and 2017. This provides evidence of the power of this type of research design to discern changes over time and strong support for more research in IS research with this approach, especially if we want to discover how information systems and users interact over time. Many effects develop over relatively long periods of time which motivates the need for studies that reexamine phenomena over time.

With the strength of the research in mind, we do realize many challenges it presents. In addition to the difficulty of finding suitable data collection sites, determining the appropriate repeating cycle is difficult. Although the results show a boomerang pattern, we do not know if this is a hiccup on a long term upward or downward trend or a normal fluctuation in data. To find out, we plan to continue data collection in the future. Another question would be whether a five-year cycle is too long. It is possible that changes have been missed even within the five-year time span between the administrations of the survey in this study.

A second contribution of the study is the use of a validated and previously used instrument for data collection. The same survey instrument has been used in prior research to measure user perceptions of information quality in a variety of settings (Klein, 2001; Klein and Callahan, 2007; Klein et al., 2011b). The instrument performs at an acceptable level of reliability and is sensitive enough to reflect differences in various contexts. Results from the present study contribute to this cumulative body of research. We believe that continuing this research tradition in both time and scope will be beneficial to information quality research in particular and information systems research at large.

Third, China is an important player in the world economy and international affairs. With its large population and number of online users, we, as researchers, have a responsibility to study its users whose perceptions of information quality are a critical aspect of understanding how information technologies affect people, unfortunately, this is an area that rarely receives sufficient research attention. The uniqueness of Chinese society provides a rich environment for such studies. The insights gained will be valuable for understanding the interplay of technologies, societies, and people.

6.2.2 Implications

Our research shows that users are sensitive to information quality issues in that changes in Chinese users' perceptions shifted along with public events and governmental practices. The dimensions to which end users paid special attention are those related to integrity and validity, that is intrinsic data quality. The lesson here is that, in the long run, information providers should strive to provide high quality information. To deal with the challenges presented by widespread fake news, the best strategy may be to continue providing high quality information that are free of bias and objective.

In this study, all of the respondents are college students. For educators, the results of the study provide valuable insights into college students' skills in judging information quality. In contrast to the long-held belief that young people are gullible and lacking in the skills needed to distinguish valid and reliable information sources from less valid information sources, the results suggest that college students in China are experienced Internet users who can critically evaluate information. Encouragingly, the results suggest that at least some college students are sophisticated information consumers whose perceptions are affected by changes in the environment in which information is produced, disseminated, and consumed.

As with many technological innovations, societies have experienced both benefits and drawbacks as they have adapted to the Internet. For example, in 2000 one reporter noted that "in this Internet-driven Information Age, with markets moving on rumors (or the mere whiff of one), code names have gotten more common and creative and become the stuff of street lore." (Tan, 2000; Lazer et al, 2018). With the prevalence of fake news in the past several years, the issue of information quality continues to be a serious concern. Our study builds on research addressing user perceptions of information quality and has the potential to inform the development of skills needed to access Internet-based information.

6.2.3 Future Research

This study was designed to observe changes in user perceptions of information quality over time in a dynamic and sometimes turbulent society. Chinese society has experienced significant political, economic, and social changes in the recent past. As has been the case throughout the history of modern China, these changes have occurred in a global context in which innovations have been shared with and adopted from the rest of the world and in which the degree to which China has been open to and influenced by the rest of the world has varied over time. The most recent period of change has been characterized by the introduction and development of the Internet which has transformed how users access and understand information. These technological advances have been coupled with and affected by shifts in the political climate in China, and the findings of this study demonstrate that user perceptions of information quality reflect these political shifts. In the future, Chinese users' perceptions of information quality are likely to continue to evolve with the political, economic, and social environment. Future research initiatives are planned to extend the documentation and insight into these changes through additional periodic administration of the survey used in this study.

Another area for future study is to build on previous information quality studies by examining user perceptions in different societies. One society of particular interest is Taiwan. While Mainland China and Taiwan share a cultural heritage and language tradition, they have developed different political and economic systems during the past seven decades. As part of this, the two societies have implemented different types of Internet regulations (K. Yang, 2007). Because Taiwan and Mainland China were separated for forty years and then experienced increasing levels of commercial and cultural exchange, a comparison of user perceptions of information quality in these two societies is likely to be both interesting and of significant importance in understanding how societies evolve in the context of technological change and political separation.

In the current research, the targeted user group is college students who have been the major body of Internet users in China. However, recently there has been an increase in the number of older Internet users in China (CNNIC, 2017a, 2017b). These users experienced state media control and events during the pre-Internet era and grew up in a very different socioeconomic environment. In addition, users in rural areas and users with less education in China have been studied less than urban users in China. The views they possess may be different from those of users with access to higher education in urban environments. Research involving more diverse user groups will broaden and test the generalizability of the findings of the current study.

This study focuses on the information quality of Internet-based sources of information. Although the publication of purely traditional sources of information such as print newspapers and magazines has decreased recently, many media outlets have adopted an Internet-based publication platform. Future research addressing the distinction between Internet-based information and traditional sources of information may increase our understanding of this potentially blurry line and the related user perceptions.

7. Conclusion

In the last several decades, Chinese society has experienced a great deal of economic, political, social, and cultural change. The introduction of the Internet has affected all aspects of public and private life. The population of Chinese Internet users grew into the largest in the world in 2008 and is currently larger than the population of Europe (CNNIC, 2017b). Meanwhile, the Chinese government has extended its control of media and the press into the realm of the Internet. The power struggle between state regulations and Internet-emboldened Chinese users has been the focus of many research studies. We took the perspective of Internet users as information consumers and studied changes in user perceptions of information quality from 2007 to 2017.

Changes in key information quality dimensions reflect users' points of concern in the surrounding political and socioeconomic environment. The boomerang pattern in our data shows that users are sensitive to changes in the political and social environment. A research approach with a decade-long time span was necessary to observe shifts over time. Future extensions will extend this project in order to further our understanding of changes in user perception of information quality over time.

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Appendix A:

Your age (年龄): _________

If younger than 18, please stop. Thank. 如果你小于 18 岁，请停止。谢谢。

Internet Sources of Data. You may have used the Internet for school assignments, work assignments, or personal projects. The following is a list of questions about data from Internet sources (e.g., World Wide Web) that you may have used. Please note that the terms data and information are used interchangeably in this survey.

互联网数据

你也许在完成学校作业，工作任务，或个人项目中使用过互联网。以下是一系列有关互联网和万维网数据和信息的问题。在这份问卷调查中，“信息”和“数据”可以交替使用。

Although the questions may seem repetitive, your response to each question is critical to the success of the study. Please answer each question to the best of your ability.

即使有些问题看上去有重复，请对每个问题一一作答。回答时，圈中你的第一反应，并尽量使用全部刻度。请尽你所能回答问题。

	Strongly Disagree 非常不同意			Neutral 中立			Strongly Agree 非常同意
Data from Internet sources are accurate. 互联网数据是准确的。	1	2	3	4	5	6	7
Data from Internet sources are believable. 互联网数据是可信的。	1	2	3	4	5	6	7
Data from Internet sources are concise. 互联网数据是简明的。	1	2	3	4	5	6	7
Data from Internet sources are objective. 互联网数据是客观的。	1	2	3	4	5	6	7
Data from Internet sources are well-presented. 互联网数据表达得好。	1	2	3	4	5	6	7
Data from Internet sources are up-to-date. 互联网数据是最新的。	1	2	3	4	5	6	7
Data from Internet sources are aesthetically pleasing. 互联网数据赏心悦目。	1	2	3	4	5	6	7
Data from Internet sources are accessible. 互联网数据是可获得的。	1	2	3	4	5	6	7
Data from Internet sources are compactly represented. 互联网数据表达紧凑。	1	2	3	4	5	6	7
Data from Internet sources are consistently formatted. 互联网数据格式一致。	1	2	3	4	5	6	7
Data from Internet sources are retrievable. 互联网数据是可获取的。	1	2	3	4	5	6	7
Data from Internet sources are usable. 互联网数据是可以使用的。	1	2	3	4	5	6	7
Data from Internet sources are well-organized. 互联网数据组织得好。	1	2	3	4	5	6	7
Data from Internet sources are correct. 互联网数据是正确的。	1	2	3	4	5	6	7
Data from Internet sources are relevant. 互联网数据是有关的。	1	2	3	4	5	6	7
Data from Internet sources are flawless. 互联网数据是无误的。	1	2	3	4	5	6	7
Data from Internet sources are consistently represented. 互联网数据是表达一致的。	1	2	3	4	5	6	7
Data from Internet sources are interesting. 互联网数据是有趣的。	1	2	3	4	5	6	7
Data from Internet sources are unbiased. 互联网数据是无偏见的。	1	2	3	4	5	6	7

Data from Internet sources are interpretable. 互联网数据是可解释的。	1	2	3	4	5	6	7
Data from Internet sources are applicable. 互联网数据是适用的。	1	2	3	4	5	6	7
Data from Internet sources are available. 互联网数据是可用到的。	1	2	3	4	5	6	7
Data from Internet sources are error-free. 互联网数据是没有错误的。	1	2	3	4	5	6	7
Data from Internet sources are well-formatted. 互联网数据格式设计得好。	1	2	3	4	5	6	7
Data from Internet sources were reliable. 互联网数据是可靠的。	1	2	3	4	5	6	7
Data from Internet sources are clear. 互联网数据是清楚的。	1	2	3	4	5	6	7
Data from Internet sources are precise. 互联网数据是精确的。	1	2	3	4	5	6	7
Data from Internet sources are readable. 互联网数据是可读的。	1	2	3	4	5	6	7
Data from Internet sources are easily understood. 互联网数据是容易被理解的。	1	2	3	4	5	6	7
Data from Internet sources are certified error-free. 互联网数据被鉴定没有错误。	1	2	3	4	5	6	7
Data from Internet sources give you competitive edge. 互联网数据给你竞争优势。	1	2	3	4	5	6	7
Data from Internet sources cannot be accessed by competitors. 竞争对手无法获得互联网数据。	1	2	3	4	5	6	7
Data from Internet sources are compatible with previous data. 互联网数据和以前的数据兼容。	1	2	3	4	5	6	7
Data from Internet sources add value to your assignments. 互联网数据让你的作业更有价值。	1	2	3	4	5	6	7
Data from Internet sources are of a proprietary nature. 互联网数据是私有（非公开）性质。	1	2	3	4	5	6	7
Data from Internet sources are continuously presented in the same format. 互联网数据连续使用同种格式。	1	2	3	4	5	6	7
Data from Internet sources are secure. 互联网数据是安全（不易被破坏）的。	1	2	3	4	5	6	7
Errors in data from Internet sources can be easily identified. 互联网数据的错误很容易被发现。	1	2	3	4	5	6	7
The form of presentation of data from Internet sources is adequate. 互联网数据的表达形式适当。	1	2	3	4	5	6	7
The scope of information from Internet sources is adequate. 互联网信息有足够的范围。	1	2	3	4	5	6	7
The format of the data from Internet sources is adequate. 互联网数据的格式适当。	1	2	3	4	5	6	7
The depth of information from Internet sources is adequate. 互联网信息有足够的深度。	1	2	3	4	5	6	7
The reputation of the source of data from Internet sources is adequate. 互联网数据源有足够的信誉。	1	2	3	4	5	6	7
The breadth of information from Internet sources is adequate. 互联网信息有足够的广度。	1	2	3	4	5	6	7
The age of the data from Internet sources is adequate. . 互联网信息有足够的数据的年限。	1	2	3	4	5	6	7
The reputation of the data from Internet sources is adequate. 互联网数据有足够的可信度。	1	2	3	4	5	6	7

The amount of data available from Internet sources is adequate. 互联网数据有足够的数量。	1 2 3 4 5 6 7
The speed of access to data from Internet sources is adequate. 获取互联网数据的速度足够快。	1 2 3 4 5 6 7
The integrity of the data from Internet sources is adequate. 互联网数据有足够的完整性。	1 2 3 4 5 6 7
Access to data from Internet sources can be restricted. 可以限制对互联网数据的获取。	1 2 3 4 5 6 7

Background Questions. Please answer the following questions about your background.
个人背景

I. Work Experience 工作经历

1. How many years of full-time work experience have you had?
   有几年全职工作经历？
2. How many years of part-time work experience have you had?
   有几年兼职/半职工作经历？

II. Computer and Internet Experience 计算机和互联网使用经验

1. How many years of experience using computers have you had?
   有几年使用计算机的经验？
2. How many years of experience using the Internet have you had?
   有几年使用互联网的经验？
3. Which of the following best characterizes your experience with the Internet?
   以下哪一项最切合你的互联网使用经验？
   ____ Very experienced 非常有经验
   ____ Experienced 有经验
   ____ Somewhat experienced 有一点儿经验
   ____ inexperienced 没经验
   ____ Very inexperienced 非常没经验

III. Demographic Information 个人信息

1. What is your age? 年龄
2. What is your gender? 性别 ______Female 女 _____ Male 男
3. Which grade you are? 年级
   ______ Freshman 大 一
   ______ Sophomore 大 二
   ______ Junior 大 三
   ______ Senior 大 四
   ______ Graduate 研究生
   ______ other, 其它 please identify 请指明 ____________

Your Major 专业: _____________________

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Research Note

Using Individual Decision, Economic, and Health Status Data to Predict Health Checkup Behavior

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Abstract

Annually, the Behavioral Risk Factor Surveillance System (BRFSS) survey is administered by the Centers for Disease Control and Prevention (CDC). This article uses 2016 SMART BRFSS data to predict the likelihood a person will get a health checkup and it identifies which factor(s) influence the decision to obtain a checkup. Patterns of individual decision making were analyzed using various supervised data mining techniques. The best predictive model, with a predictive accuracy of 80%, can improve future BRFSS surveys by better understanding the responses and provide insight into the factors affecting decisions. The model was scored on new data to verify its accuracy. These findings supplement ongoing research to identify how behavior leads to better decision making related to medical checkups. The model can help identify poor decision-makers in high-risk groups. This research can also be used by healthcare professionals to improve clinical prevention services. Potentially, the research can be extended by combining the BRFSS data with ICD-10 and CPT codes. Better knowledge of diagnosis (ICD-10) and the cost associated with diagnosis (CPT) will help to understand a person's health behavior. In the United States, expenditures on healthcare are rising significantly every year. Health decisions of individuals determine the overall health of a nation. Therefore, the U.S. Government should initiate health programs that encourage individuals to make better health decisions.

Keywords: Health behavior, high-risk behavior, decision making, public health, data mining

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1. Introduction

Expenditures on healthcare in the United States are rising every year. For example, U.S. health care spending grew 4.6 percent in 2018, reaching $3.6 trillion or $11,172 per person, cf., https://www.cms.gov/. It is important to understand the drivers of the cost of healthcare and how advanced technologies can be used to help people make better healthcare decisions. A study using Behavioral Risk Factor Surveillance System (BRFSS) data suggests that morbidity and mortality from chronic disease and injury are related to high-risk behaviors (e.g., physical inactivity, cigarette smoking, and drinking and driving) and lack of preventive health care, e.g., health plans (Holtzman et al., 2000).

Organizations try to influence positive health behavior among their employees through wellness programs. However, these efforts may be in vain because it is often observed that the healthier and less stressed employees have higher attendance while the more stressed and less healthy employees show less participation. Behavioral risk factors contribute to a high percentage of diseases in most of the developed countries (WHO, 2002). The health condition of individuals is primarily a direct consequence of behavior (Schwarzer, 2008). Critical factors such as morbidity and mortality rates are directly affected by the decisions that people make about their health (Sheeran et al., 2017). People recognize their health needs, are aware of them, but fail to act upon those needs (Rothman et al., 2015). Fear of terminal illnesses has often proven to lead to poor health behaviors (McErlean & Fekete, 2017). Prior research raises the question of what is the right approach to influence people's attitudes towards positive health behavior? Prior studies of health behavior have lacked predictive models based on data that is available.

The Centers for Disease Control and Prevention (CDC) administers a Behavioral Risk Factor Surveillance System (BRFSS) survey annually intending to gauge people's health behaviors in the United States. The BRFSS survey is used for the Selected Metropolitan/Micropolitan Area Risk Trends (SMART) to "provide prevalence rates for selected conditions and behaviors" (*SMART*, 2017). Surveys such as BRFSS offer a new direction for research on health behavior and the decisions impacting a person's health. Data-driven decisions have become more sophisticated with advances in technology (Power, 2008). This study aims to predict the likelihood of obtaining a checkup based upon behavioral factors, especially decision, economic, and health status data, and identify which factor(s) affect the decision to obtain a checkup. More specifically, the research objective of this study is to explore and identify the factors that influence the decision making of individuals to go for a routine medical checkup. The research question addressed in this study is: What factors predict an individual's decision to go for a medical checkup? To answer this research question, we developed a predictive model using a data mining approach using the 2016 SMART BRFSS survey data.

This article is organized as follows. In the next section, we examine existing studies in the field of health behavior, obtaining a medical checkup, and decision making. The literature review is followed by an explanation of the data mining approach used to develop our predictive model. Next, we discuss the results of our analysis including the scoring of the model using new data. We conclude the article by discussing the contributions, limitations and future research needs.

2. Literature Review

Decisions individuals make about health issues plays a vital role in determining their health outcomes. Health awareness in patients and the steps taken by them to take better care of their health is also one of the main factors that affect their decision making (Coulter et al., 2008). Individuals who are aware of their health condition, actively take part in making informed decisions about their health (Levinson et al., 2005). Existing studies have suggested that behavioral intervention should be used as it can not only prevent disease but can also help improve disease management. Also, the link between behavior and health is very high (Fisher et al., 2011).

Kasl and Cobb (1966), define health behavior as “any activity undertaken by a person who believes himself to be healthy for preventing disease or detecting disease in an asymptomatic stage”. Gochman (2013) defined health behavior as patterns or actions taken by people that may have a good or bad effect on maintenance or health improvement. Often, individuals make decisions based on some risk assessment. A cognitive psychology study explains that informing individuals about long-term consequences would compel them to consider reflective information processing rather than making impulsive decisions (Mueller et al., 2017). Mueller et. al (2017) describes this as a feedback processing to enable better decision making in individuals. One of these decisions is to go for a routine medical checkup.

Several research studies have used the BRFSS data to identify the patterns of use of clinical prevention services. Also, routine medical checkups had been the outcome variable in several studies (Culica, Rohrer, Ward, Hilsenrath, and Pomrehn, 2002). In addition, Culica et al. (2002) noted that several studies have identified the association of health insurance coverage and health risk factors such as smoking, physical inactivity, drinking, and the presence of chronic disease with access to medical checkups. However, Culica et al. (2002) and some of the existing literature emphasize a moderating impact of a specific geographic location. So, the focus of this research is to determine the most important health behavior factors that help in predicting the likelihood of obtaining a medical checkup in the United States.

According to the 2010 Annual Status Report of the National Prevention, Health Promotion, and Public Health Council, the underlying risk factors that lead to poor health and death were physical inactivity, poor nutrition, tobacco use, and excessive alcohol use (Fisher et al., 2011). Education is considered as an important factor that determines an individual’s behavior (Nordahl et al., 2014). It has been found that adults with higher education tend to make better choices concerning their health (Skalamera & Hummer, 2016). Higher education experiences seem to lead to more informed and intelligent decisions about improving one’s health (Cutler & Lleras-Muney, 2006).

Better health literacy results in greater awareness and it improves an individual’s health conscious. This awareness has led to numerous people making use of the dozens of smart devices and accessing their health information in real-time using health apps and mobile health devices (Bhavnani et al., 2016). Fitness trackers, wearables equipped with full-fledged electrocardiogram (ECG) capabilities are enabling individuals to make better decisions regarding their health (Manganello et al., 2017). With the advent of the Internet, there has been a tremendous growth of information sharing over social media and health applications, regarding health-related issues, by individuals anonymous or identified.

While concepts of health have often been related to the study of illness and its management and care aspects (Millstein & Irwin, 1987), few studies have focused on the decision making of individuals about their health conditions. Most health-related problems seem to arise from poor behavior such as indulging in bad drinking habits, smoking, physical inactivity, and substance use (Jensen et al., 2011; Kahn et al., 2002; Prochaska & Velicer, 1997; Schwarzer, 2008).

The growing effect of social media activities such as Facebook likes has been studied using SMART BRFSS data to predict county wise mortality, diseases, or lifestyle habits in the United States (Gittelman et al., 2015). This data has also been used to study whether variation in local health led to health disparities depending on demographics or ethnicity (Shah et al., 2006). Several similar studies have established a cause-effect relation between health conditions and health behavior (Chunara et al., 2013; McGuire et al., 2007; Pucher et al., 2010).

The BRFSS survey data has been used in prior literature to study health behaviors (Aaron et al., 2001; Denny et al., 2003; Leslie et al., 2012; Meyer et al., 2017; Nandi et al., 2013; Wang et al., 2018). The BRFSS survey data has also been checked for its reliability and validity (Pierannunzi et al., 2013). As per the statistics from 1984 to 2012 about 1,387 articles have used the BRFSS survey data for research. Out of these, 84.2% of the articles were published during 2002-2012 (Khalil & Gotway Crawford, 2015). Further, several behavioral studies have been conducted using BRFSS data (Khalil & Gotway Crawford, 2015). However, most of the models that have been developed have only considered a single condition or a category of responses (Dwyer-Lindgren et al., 2015; Frazier et al., 2011; Michimi & Wimberly, 2015).

3. Methodology

The Centers for Disease Control and Prevention (CDC) sponsor BRFSS phone survey to better understand current health conditions and general habits of the population. The goal is to guide a specific health programs to deliver better care. The BRFSS has over 250 variables, some are primary variables including the response of the individuals being surveyed and others are derived variables. In our study, we consider variables that are representative of high-risk behaviors while also providing considerable support for understanding human decision making when aware of current medical health conditions (Fisher et al., 2011). In past research done using BRFSS data, the key behavioral factors used were health status, tobacco use, physical activity, and alcohol use (Fisher et al., 2011; Meyer et al., 2017). The questionnaire in CDC's survey has been framed in terms of frequency of these factors and subsequent studies have then examined their influence on health.

We developed several predictive models to understand the implications of decision making in predicting health behavior using the SMART BRFSS survey dataset for the year 2016 (*SMART*, 2017). We sought to understand an individual's decision making by determining the most important factors influencing their decision to obtain a routine medical checkup. Data mining was performed using the SEMMA (Sample, Explore, Modify, Model, Assess) approach of SAS® Enterprise Miner (Shmueli et al., 2017). Multiple supervised learning techniques such as Logistic Regression, Decision Tree, and Neural Network were used to develop the best predictive model with the highest accuracy to identify whether a patient went for medical checkup in prior year. The data set was coded using conditional functions referring to the codebook of BRFSS data (*LLCP 2016 Codebook Report*, 2017) to create subsets and transform important information for analysis.

We explored the various factors influencing an individual's decision making towards their health, including tobacco use, alcohol consumption, cigarette smoking, physical inactivity, and income (Aaron et al., 2001; Liu et al., 2018; Nandi et al., 2013; Pate et al., 2019). In our research, poor health, mental health, and physical health are part of healthy days/health-related quality of life. Additionally, the research considers variables such as asthma and smoking habits of the general population to capture event variables for events such as a person being aware of a medical condition and his/her subsequent decision of controlling high-risk behaviors. One event variable could be a person having a medical condition such as asthma and while its associated decision-making event variable could be his/her smoking habit.

A study on asthma assessment suggests that asthma severity was highly prevalent among adults who were current smokers (Zahran et al., 2014). The first step in treating such asthma severity patients would be to change the course of habits worsening the medical condition. The routine medical checkup variable CHECKUP2, also considered as the dependent variable in the analysis, has been considered as a reliable source that an individual with some medical condition and health insurance is able to seek authorized medical advice (Culica et al., 2002; Oboler et al., 2002). Good health insurance makes it easier to afford a routine medical checkup which increases the propensity of an individual obtaining a medical checkup (Culica et al., 2002; Oboler et al., 2002; Pate et al., 2019). Our research assumes the event of going for a medical checkup is a high priority decision making point for individuals with a medical condition.

Our research adopts a feature engineering technique that focuses on responsive variables (determined by feature importance analysis, discussed below) such as physical health of an individual, general health, conditions determining mental health, poor health, medical cost for checkups, education level of individual, income, asthma, whether an individual exercise or not, health plan, smoking habits, dependency on e-cigarette, and alcohol days. All the predictor variables used in the study are described in Table 1.

Predictor Variables	Description
ALCDAY5	Alcohol consumption in last 30 days. (1=Yes, 2=No)
ASTHNOW	Asthma during past 12 month. 1=Yes, 2=No
ECIGARET	Ever used E-Cigarette. 1=Yes, 2=No
EXERANY2	Physical activity in last 30 days. 1=Yes, 2=No
HLTHPLN1	Healthcare coverage for individual between age 18-64. 1=Yes, 2=No
MEDCOST	Could not see doctor because of cost. 1=Yes, 2=No
POOR14D	Not poor health (Healthy person). 1= For Zero days, 2=1-13 days, 3=14+ days
EDUCAG	Education completed. 1=Not Graduated High School, 2=Graduated High School, 3=Attended College or Technical School, 4=Graduated from College or Technical School
INCOMG	Income categories. 1= Less than $15,000, 2= $15,000 to less than $25,000, 3= $25,000 to less than $35,000, 4= $35,000 to less than $50,000, 5= $50,000 or more, 9= Don't know/Not sure
MENT14D	Not good mental health. 1= For Zero days, 2=1-13 days, 3=14+ days
PHYS14D	Not good physical health. 1= For Zero days, 2=1-13 days, 3=14+ days
RFHLTH	Adults with good or bad health. 1=Good, 2=Bad
RFSMOK3	Current smoker. 1=Yes, 2=No

Table 1. Predictor Variables and Description

The target variable medical checkup (CHECKUP2) has two categories (1, 2) where "1" represents whether an individual had a medical checkup within the past year and "2" represents no medical checkup in the past year. The model comparison including the evaluation criteria of misclassification rate, Average Squared Error, ROC Index, and Gini Index is shown in Table 2. There was no overfitting of data as represented by the cumulative lift chart in Figure 1. QuickProp (QProp) Neural Network (Swastika, 2017; Xie et al., 2018) with three hidden units was chosen by SAS® Enterprise Miner as the best overall model with misclassification rate 18.80% and an accuracy of 81.20% (Table 2).

Selected Model	Model Node	Model Description	Train: Misclassification Rate	Average Squared Error	Train: ROC Index	Train: Gini Coefficient
Y	Neural7	QuickProp Neural Net with 3 Hidden Units	0.18801	0.14358	0.695	0.390
	Tree	Decision Tree (B2D6)	0.18989	0.14839	0.603	0.205
	Reg5	Interaction Logistic Regression	0.18998	0.14433	0.691	0.383

Table 2. Model Comparison

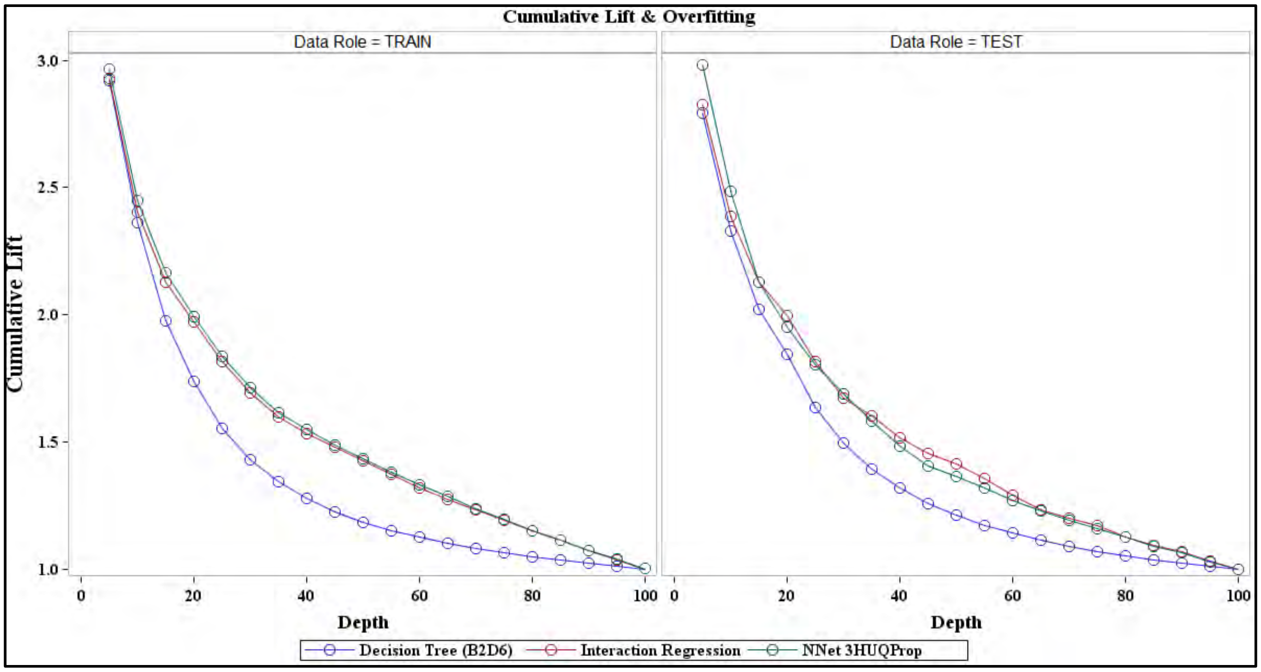

Figure 1. Cumulative Lift for Best Model

To identify the best model and evaluate model performance for a classification predictive model, the receiver operating characteristic (ROC) curve, and confusion matrix were used (Shmueli et al., 2017). The ROC curve shown in Figure 2 represents a Neural Net with three hidden units and using the QProp algorithm has the highest sensitivity both for training and test data. The confusion matrix was also analyzed for a detailed analysis of classifications by the best model (Table 3). Model performance was also analyzed by comparing the misclassification rate (18.80%) of the best model (QProp Neural Net) with a baseline misclassification rate (19.77%). To ensure that there is no overfitting misclassification rate was checked for training and test data. The same was also checked by analyzing the cumulative lift for training and test data for each model as shown above in Figure 1. The model was further scored to ensure the accuracy of the model on score data. The scoring of the developed model on new data is discussed later in this section.

False Negative	True Negative	False Positive	True Positive
1865	8426	143	246

Table 3. Confusion Matrix for Best Model (QProp Neural Net)

The analysis of results helps us to identify that the Neural Network model has an accuracy of 80% to identify if an individual had a medical checkup in the past year. The Neural Network is one of the supervised data mining techniques which provides the highest predictive accuracy (Shmueli et al., 2017). In this study, we used the multi-layer perceptron (MLP) architecture of the Neural Network. Several types of MLPs were used to identify the most accurate Neural Network where a perceptron is used as a classifier to map a predictor variable to the target variable as a function of predictors. Neural Networks do not have a specific model or equation to represent the outcome of the model.

In addition, the model is not summarized in a specific model as in the case of regression or decision trees (Cerrito, 2009). The accuracy of the Neural Networks model is examined the same way as other predictive models using ROC curves (Area under the curve), including the misclassification rate, the AIC (Akaike's Information Criterion), and the average error. The accuracy of the developed models was visualized using ROC which plots the sensitivity of the predictive model versus 1- specificity (Figure 2). The curve for a Neural Network with 3 hidden units is the highest, making it the most accurate model to predict the target variable medical checkup (CHECKUP2). After examining the overfitting of the models, we have observed that the Neural Network has the minimum overfitting with the highest accuracy. The appropriate method to identify the best model should be the one that can equally distinguish all classes (Cerrito, 2009).

The best model identified was a Neural Network with 3 hidden units. It had the highest overall accuracy. The result of scoring the best Neural Network model on the score data resulted in an accuracy of 80%. This means the Neural Network model accurately classifies 80% of the patients for whether they have regular health visits to the doctor. (Shmueli et al., 2017).

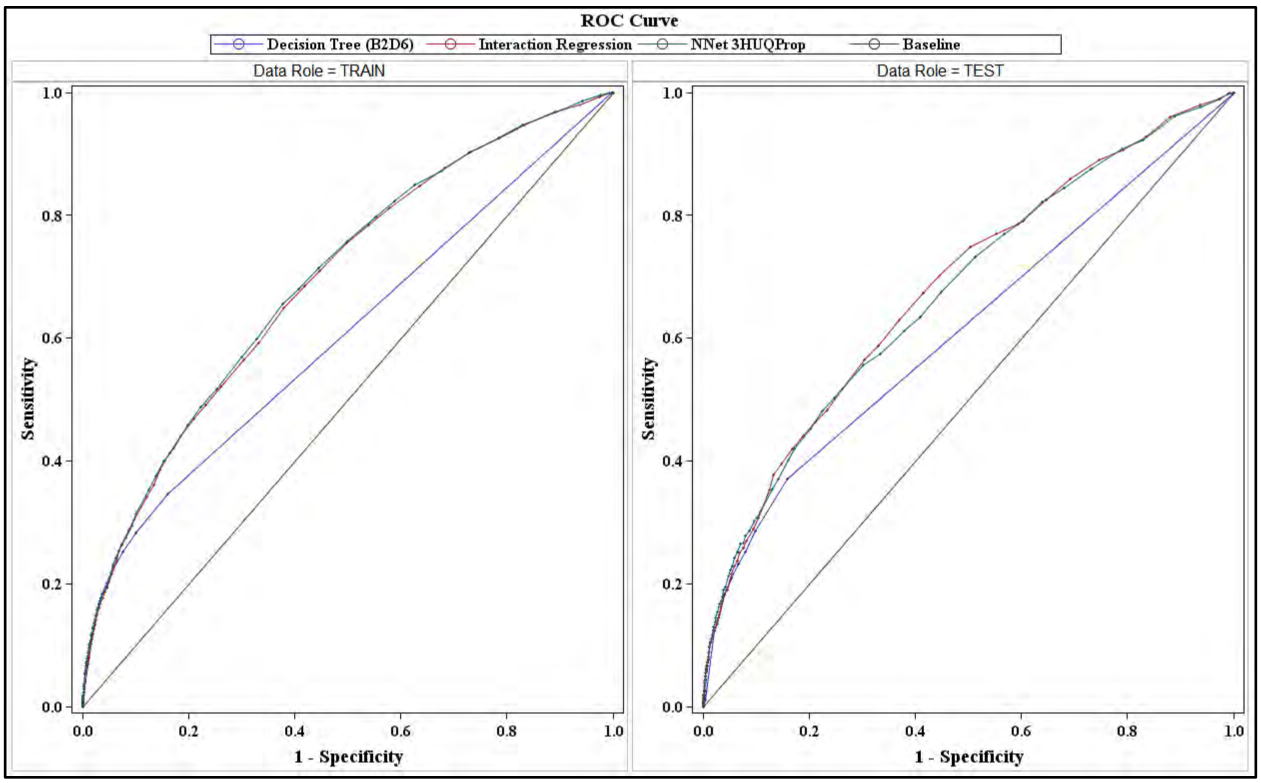

Figure 2. Receiver Operating Characteristic (ROC) Curve

We acknowledge the limitation that the Neural Network is a black box that does not help us to identify the factors which help the individual to make the decisions for a regular health checkup. So, after further detailed analysis of the developed models, we identified a Decision Tree that is the second-best model with a misclassification rate of 18.989%. This misclassification rate for the Decision Tree is slightly higher than Neural Net model but less than the misclassification rate of Interactive Logistic Regression (Table 2). Also, the cumulative lift chart of Figure 2 ensures there is minimum overfitting. In addition, it was observed that the input variables asthma, health plan, external (leisure) exercise, medical cost, poor health, physical health, and smoking (e-cigarette) habits were significant as shown in Figure 3.

As shown in Figure 3, if an adult has health coverage and there is no medical cost associated with a medical checkup, there is an 83% chance that an individual will have a medical checkup (Figure 3, Node Id 7). On the other hand, if an individual does not have healthcare coverage, but there is no cost associated with doctor visit, and individual didn't have an asthma episode in past 12 months, and did not have good health for approximately 10-12 days; then there was a 79% chance the individual did not go for a medical checkup (Figure 3, Node Id 16). However, if an individual has health coverage and there is no medical cost associated with doctor's visit, then there is a 95% chance that individual will go for a medical checkup even if he/she is a healthy person, does not have asthma episode in last 12 months, and did not even have any physical activity in last 30 days (Figure 3, Node Id 36).

The key observation is that individuals with health coverage have a greater likelihood of regular medical checkups. However, due to high healthcare costs associated with any diagnosis individuals prefer not to go for a medical checkup even when they are not healthy (Figure 3, Node Id 16).

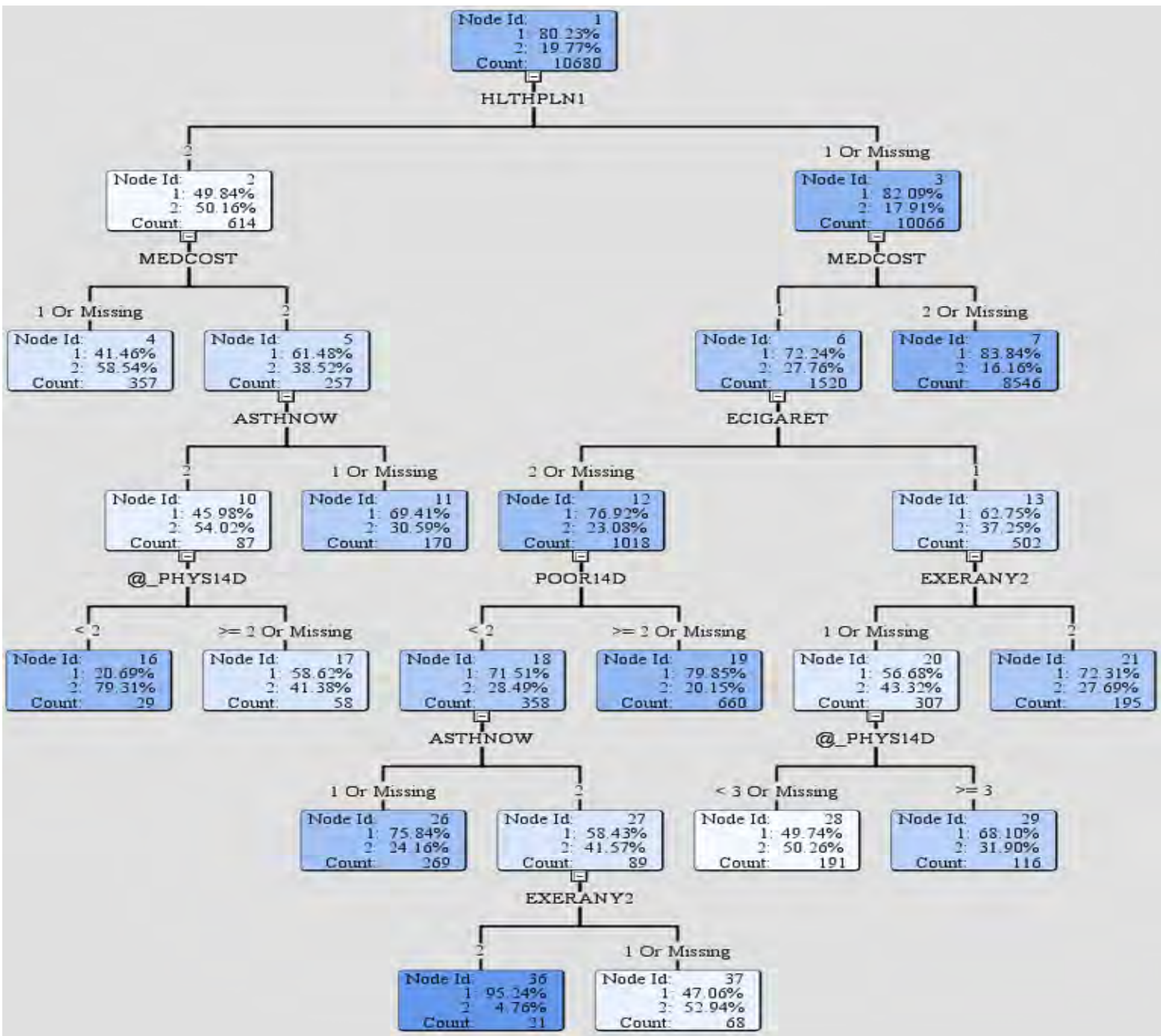

Figure 3: Factors Influencing Medical Checkup

4. Discussion and Conclusion

Primary prevention programs such as an annual medical checkup when focused on healthy behaviors can improve the quality of life and may increase the life expectancy (Brown et al., 2003; Fisher et al., 2011). We found that asthma, health plan, external (leisure) exercise, medical cost, poor health, physical health, and smoking (e-cigarette) habits are the important factors that influence the health decision of the individuals to go for a medical checkup or not. We observed that an unhealthy person who does not have healthcare coverage is less likely to go for a medical checkup even if there is no medical cost associated with it. However, a healthy person obtained a medical checkup in the prior year if he/she has health coverage and if there is no medical cost associated with the checkup.

We believe healthcare and behavioral education about preventive health interventions is needed to promote a healthy life. This research can also be used by healthcare professionals to develop a profile at the national level of persons who may not have a checkup so that prevention services could be targeted.

We used data from the BRFSS survey and performed predictive modeling in the study. Various factors related to physical, and mental health; medical cost for checkups, education level of an individual, income, asthma status, physical exercise, health plan, smoking habits, dependency on e-cigarette, and alcohol habits were analyzed using several supervised learning techniques. The results of scoring showed that 73% of people in the sample had asthma and 13% of them did not have a routine medical checkup. Furthermore, it was found that 11% of people suffering from asthma and who had health plans, did not have a routine medical checkup. Additionally, we observed 15.6% of individuals with smoking habits did not go for a health checkup and 3.6% expressed medical costs as a factor.

The analysis also suggested bad decision making for 14% of the people with poor physical health. This means even if people had poor health, they did not have a medical checkup. Based on our analysis it is evident that there is a need for encouraging better health decision making by individuals. This involves creating better health awareness programs and developing decision aids that enhance decision making. The results of this study provide a better understanding of the factors affecting health decisions.

The existing literature and the feature engineering technique helped us to identify the primary high-risk behavioral factors that can influence the decision to obtain a medical checkup, but there are other secondary variables that have not been used in this study. These secondary variables can be used to replicate and extend the research. Another key indicator is when a person responds “Don’t know” for critical health questions in health surveys (Orom et al., 2018). The SMART BRFSS data used in this study does not include such responses. “Don’t know” responses of individuals were eliminated before creation of the predictive model. Perhaps “Don’t know” responders should be provided with relevant health information.

Finally, the BRFSS data can be combined with ICD-10 (International Classification of Diseases) codes and Current Procedural Terminology (CPT) codes to better understand the diagnosis which will further lead to better healthcare decisions by the individuals (Medicare, 2018; Writers, 2018).

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A Brief History of the Midwest Association for Information Systems: 2005-2020

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Abstract

The Midwest Association for Information Systems (MWAIS), founded in 2005, was recognized as an outstanding chapter of the Association for Information Systems (AIS) for all five years of the award (2014, 2015, 2016, 2017, and 2018). MWAIS continues to grow and serve academics in the Midwest and the surrounding region through annual conferences, meetings and receptions at national and international conferences, and through its journal, Journal of the Midwest Association for Information Systems (JMWAIS). This article briefly describes the impetus and actors instrumental in the creation of the association and the current state of MWAIS, its conferences, and the journal.

Keywords: History, Founding MWAIS, Founding JMWAIS, Midwest Association for Information Systems

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1. Introduction

The Midwest Association for Information Systems (MWAIS) has been in existence for 15 years. Founded in Fall 2005, MWAIS is an organization of Information Technology academic and industry professionals that creates a regional network where they can work together to advance the region in addition to meeting the shared needs for professional development and scholarly collaboration. The goal of MWAIS is to "promote the exchange of ideas, experience, and knowledge among scholars and professionals in the Midwest region in the development, management, and use of information and communication systems and technology." The MWAIS serves Association for Information Systems (AIS) members across the Midwest region of the United States from Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, Oklahoma, South Dakota, and Wisconsin. MWAIS meetings are held yearly in the region and offer an opportunity for academic and social interactions with colleagues.

AIS has made a commitment to expanding chapters both globally and regionally. The regional conferences create affordable opportunities for academic engagement. According to Daniel Power, one of the founding members of MWAIS, the association helps regional researchers to network and work together to advance in professional development and to improve scholarly collaboration. The structure of the organization allows for continuity between events and allows MWAIS to be active throughout the year. With the addition of the *Journal of the Midwest Association for Information Systems (*JMWAIS), the organization provides another quality peer-reviewed outlet for Information Systems scholarship. Throughout the years, MWAIS has genuinely supported the goal of offering a chance to make life long professional friends!

2. A Brief History of Information Systems

It is necessary to briefly review the history of the IS field and the formation of the Association for Information Systems (AIS) to appreciate the history of MWAIS. The Information Systems (IS) field has a unique yet rich history. In its formative stages, information systems (IS) programs in business schools were part of other academic disciplines like accounting, economics, management, and operations research. Hence, many of the early IS researchers had professional affiliations in other disciplines. Over the years, there has been considerable effort expended by IS researchers to establish Information Systems as a discipline.

The first International Conference on Information Systems (ICIS) was held in Philadelphia in 1980 . This conference was created by senior IS scholars predominantly from North America. However, the conference grew, and scholars worldwide considered it as an opportunity to interact with researchers in the field.

The Association for Information Systems (AIS) was created by the efforts of many, especially William R King from the University of Pittsburgh. The initial effort by Dr. King was to conduct a study on the issues of creating a comprehensive academic association and the factors affecting the level of support for such an organization. In the process of the study, he found that many of the senior scholars were interested in the idea of creating a scholarly association. He formed an organizing committee consisting of 40 senior scholars around the world, solicited membership, created an organization having 1800 members in 6 months, and became the first President. In addition to ICIS, there are national and multi-national conferences like AMCIS, ECIS, and PACIS to cater to the regional scholarly IS community. The impact of these national conferences led to the demand for regional conference opportunities to further chances for collaboration, thus paving the way for AIS-sponsored organizations like MWAIS. More information on the history of AIS is online at https://history.aisnet.org/.

3. Beginnings of MWAIS

MWAIS was conceived in August 2005. The initial idea developed during conversations between Dan Power, University of Northern Iowa, and Troy Strader, Drake University, at the 11th annual AMCIS meeting in Omaha, Nebraska, USA, August 11-14, 2005. Based on the enjoyable AMCIS social event that year held at the Omaha Zoo, they thought it would be a good idea to have a yearly meeting at universities around the Midwest for both academic and social interactions. Ilze Zigurs, University of Nebraska-Omaha, joined them along with 23 others in submitting a proposal to found MWAIS on September 7, 2005. Ilze Zigurs helped Dan Power craft the initial by-laws to define the preliminary structure of MWAIS.

The early years focused on organizing the yearly meeting and establishing the framework for the executive committee to govern. As the process and by-laws evolved, the committee actively met monthly during the academic year and developed a website to promote the organization. Over time, additional events were added to the committee calendar, including occasional meetings or gatherings during national and international AIS conferences. In addition to the conferences, the committee has supported the offering of panels on topics relevant to research or teaching as well as highlighting topics of interest in the MWAIS newsletters.

4. The First of Many Conferences

The first MWAIS meeting was in May 2006 at Grand Valley State University. The meeting established the typical structure for subsequent events with an agenda of presentations and panels followed by a social event held that year at the Gerald Ford library and museum. On the following day, there were more presentations and a business meeting with elections of officers. In 2007, the annual meeting was in Springfield, Illinois at the University of Illinois-Springfield with a social event at a presidential museum–the Abraham Lincoln Presidential Linrary and Museum. It became a joke that the meeting could only happen in towns where there was a presidential museum! Of course, that has not been the case; the conference has met all over the Midwest (See Table 1 for the list of MWAIS conference hosts).

Year	**Conference Hosted By**
2006	Grand Valley State University
2007	University of Illinois Springfield
2008	University of Wisconsin, Eau Claire
2009	Dakota State University
2010	Minnesota State University, Moorhead
2011	University of Nebraska Omaha
2012	University of Wisconsin, Green Bay
2013	Illinois State University
2014	Iowa State University
2015	Pittsburg State University
2016	University of Wisconsin, Milwaukee
2017	University of Illinois Springfield
2018	University of Missouri, St. Louis
2019	University of Wisconsin, OshKosh
2020	Drake University

Table 1: List of MWAIS conference hosts

The annual MWAIS meeting represents a time to share budding or novel research with academic peers and has always allowed ample time to socialize between sessions and over meals. The meetings foster engagement between faculty, students, and practitioners in the context of panels, presentations, and social events. Figures 1 and 2 are from the first MWAIS conference. Professor Gordan Davis, University of Minnesota, was the keynote speaker at the Grand Valley State Conference.

Figure 1: Gordan Davis receiving an award from Simha Magal and Deepak Khazanchi

Figure 2: Dan Power and Gordon Davis engaging in conversations with conference attendees at the First Conference at Grand Valley State University

5. Milestones Of MWAIS

MWAIS has a short but meaningful legacy of 15 years. In 2020, Drake University is hosting the 15th MWAIS conference in Des Moines, Iowa. Over the last fifteen years, MWAIS has grown as an association. The following summarizes the timeline and major milestones of MWAIS. The milestones are not necessarily reflective of any particular President but rather the group as a whole.

MWAIS 2006

The first annual MWAIS conference was at Grand Valley, Michigan. The conference had 54 paid participants and 25 papers presented. Dan Power served as the interim President, and the conference was co-chaired by Simha Magal and Paul Leidig. Dan Power considers Gordon Davis' Keynote at MWAIS 2006 conference as one of the most memorable events in MWAIS history. According to Pete Tensley, the then deputy executive director of AIS, MWAIS, and SAIS (Southern AIS) were the only two chapters of AIS. The MWAIS chapter newsletter was created that year, and the MWAIS website was expanded.

MWAIS 2007

The University of Illinois-Springfield hosted the second MWAIS conference that was co-chaired by Rassule Hadidi and In Lee. Program co-chairs were Matthew Nelson and Arkalgud Ramaprasad. The academic keynote speaker was Blake Ives. The industry keynote speaker was Ronald Swift, vice president of cross-industry solutions for Teradata. Some amendments were made to the by-laws during this conference meeting. The period of office was changed from two years to one year for President, President-elect, and past-President. The term of secretary and treasurer remained at two years.

MWAIS 2008

MWAIS conference in 2008 was hosted by the University of Wisconsin – Eau Claire and was co-chaired by Matt Germonprez and Jakob Iversen. During this conference meeting, the MWAIS president Deepak Khazanchi presented the service award to Dan Power for his service to MWAIS as the founding president and past president of MWAIS.

MWAIS 2009

Simha Magal was the MWAIS president during this time. The MWAIS 2009 conference on the theme "Information Technology in service industry" was hosted by Dakota State University and was co-chaired by Omar El-Gayar and David Olson. The keynote speakers for the conference were Kevin DeWald and Hesham Ali.

MWAIS 2010

The MWAIS 2010 conference, co-chaired by Ashish Gupta and Mani Subramani, was hosted by Minnesota State University, Moorhead. MWAIS president Rassule Hadidi presented Ilze Zigurs with a service award for her service to MWAIS as the At-large director of MWAIS.

MWAIS 2011

University of Nebraska – Omaha hosted the 6th MWAIS conference and was co-chaired by Gert-Jan de Vreede and Fred Niederman. The theme of the conference was on the multi-disciplinary nature of IT research and practice. The program co-chairs were Stacie Petter and Fiona Nah. The conference included research-in-progress and full papers on pedagogy, research and services in IT/IS and the academic keynote speaker was Moez Limayem.

MWAIS 2012

Gaurav Bansal chaired the MWAIS 2012 conference hosted by the University of Wisconsin – Green Bay. The seventh MWAIS conference had an emphasis on privacy, security, sustainability, innovation, and collaboration. Alan Henver and Dov Te'eni were the academic keynote speakers.

MWAIS 2013

The 8th MWAIS conference was hosted by Illinois State University. The conference focused on the role of Big Data in organizations and was co-chaired by Bryan Hosack and Gabriel Giardano. Joey George was the academic keynote speaker for the conference, he presented his perspective on Massive Open Online Courses (MOOCs). Rob Thomas, Vice President for Big Data at IBM Software Services, and Steve Pettit, Director of Systems at State Farm Insurance, presented industry keynotes on the impact of the changing data landscape on organizations. A highlight of the conference was a tour of State Farm Insurance's three-story data center and emerging technologies lab tour.

MWAIS 2014

The award for the best chapter of AIS was introduced in 2014. MWAIS was named as the outstanding AIS chapter for the first time. Iowa State University hosted the MWAIS 2014 conference in Ames, Iowa. Joey George was the conference chair, and Zhengrui Jiang and Kevin Scheibe were program co-chairs. Dr. Munir Mandviwalla of Temple University was the academic keynote speaker. Geoff Wood, founder of Welch Avenue and COO of Startup Genome, James Eliason, Co-Founder and CEO of Goodsmiths, and John Jackovin, Founder of Bawte, all discussed startups in Iowa and the Midwest.

MWAIS 2015

In 2015, the 10th MWAIS conference was in Pittsburg, Kansas, chaired by Dr. Peter Rosen. The Kelce College of Business at Pittsburg State University hosted the meeting at Bicknell Family Center for the Arts in May 2015. This conference covered a wide array of topics and several informative sessions. There were seven tracks, including security; leadership, government, and governance; knowledge management and decision support; healthcare; adoption and use; social-media, and e-commerce. The same year, MWAIS introduced the new *Journal of the MWAIS* – JMWAIS. The inaugural volume of the journal had two issues containing ten articles. MWAIS was named as the outstanding chapter of AIS for the second time.

MWAIS 2016

The School of Information Studies at the University of Wisconsin – Milwaukee hosted the 11th MWAIS conference. The conference theme was "Bigger, Smarter, Safer: Game Changers for Information Systems" focusing on how organizations use IT to adapt, learn and respond effectively to a rapidly changing environment. The conference included 22 research and research-in-progress academic presentations.

MWAIS 2017

The 12th MWAIS conference hosted by the University of Illinois Springfield and chaired by Rassule Hadidi. . Program co-chairs were Fiona Nah and Roya Gholami. This year, a poster session and a "slam" session were introduced to the conference. Slam sessions give the opportunity to authors to give a five-minute presentation of their work in its early stages. The slam sessions gave authors early feedback on their research ideas.

MWAIS was recognized as the outstanding chapter of the AIS for the fourth time. In 2017, MWAIS rolled out a newly designed website (http://mwais.org). After soliciting feedback from the members of the organization, a new website was designed and implemented through the nonprofit program at the University of Wisconsin-Milwaukee's School of Information Studies. In addition to the new website, MWAIS maintains a presence on aisnet.org and a LinkedIn group.

MWAIS 2018

University of Missouri – St. Louis hosted the 13th conference of MWAIS. For the fifth time, MWAIS was recognized as an outstanding chapter of the AIS. During the 2017-2018 time period, the face of MWAIS was redesigned. A new logo that represents the expanded MWAIS community was created. The MWAIS newsletters were given a more professional and updated look. Figure 3 shows the previous and current logo of MWAIS.

Figure 3: The previous logo (left) and the current logo (right) of MWAIS.

As with any volunteer organization, it takes the dedicated work of the executive board to maintain the health and direction of the organization. The prior MWAIS Presidents (shown in Table 2), are only one piece of the leadership puzzle. To recognize the excellent work performed by board members, the executive board of MWAIS voted to create an outstanding officer award to recognize members of the MWAIS executive board for their exceptional leadership, dedication, and commitment to the chapter. The awards are presented during the MWAIS conference. In 2018, Ryan Schuetzler (secretary) was awarded the outstanding officer for his work and contribution to the MWAIS logo redesign.

Also, Shana Ponelis received the outstanding officer award for her dedicated work as President and the for leading the website redesign project with the help of the student team from the University of Wisconsin- Milwaukee.

Year	President
2006	Daniel Power
2007	Daniel Power
2008	Deepak Khazanchi
2009	Simha Magal
2010	Rassule Hadidi
2011	Matt Germonprez
2012	Amit Deokar
2013	Ashish Gupta
2014	Martina Greiner
2015	Gaurav Bansal
2016	Bryan Hosack
2017	Kevin Scheibe
2018	Shana Ponelis
2019	Dave Larson
2020	Ryan Schuetzler

Table 2: List of Presidents of MWAIS

MWAIS 2019

The 2019 MWAIS conference was hosted by the Univerity of Wisconsin, Ashkosh. Webinars were initiated in 2019 to improve the outreach to members of the MWAIS community. The webinars are based on interesting research done in the Midwest region. The first webinar was conducted in November 2019 by Gaurav Bansal and Noah Redfearn on their work on "Trust violation and rebuilding after a data breach: role of environmental stewardship and underlying motives."

6. Ongoing Success

In 2020, Drake University will host the 15th annual MWAIS conference in Des Moines, Iowa. Each year the annual conference has seen participants from all over the Midwest, surrounding states, and even a few from outside the US. The conference has served as an excellent way for Midwest colleagues to re-connect in a more personal setting than what is found in the larger national and international AIS conferences. Additionally, the relationships that are deepened at the regional conference make AMCIS and ICIS more enjoyable, as MWAIS members interact at the MWAIS receptions. Another benefit of the regional conference is the scholarships made available for graduate students with accepted papers. These scholarships have provided affordable opportunities for the next generation of faculty to engage with experienced scholars, present their research, and receive feedback in a friendly and relaxed environment.

To enable the success of the conferences, the MWAIS has an active executive board. Serving on the board are the President, President-elect, Immediate Past-President, Treasurer, Secretary, Membership and Publicity Director, and At-Large Director. The executive board meets monthly to discuss any relevant business and to ensure the next conference planning is moving forward smoothly. Other business discussed by the board is proposals from universities for future conferences. To help program chairs successfully plan their conference, the executive board has formalized procedures, established budget expectations, and outlined best practices. These procedures serve to provide conference planners with helpful support, and they help to minimize surprises or potential problems.

7. Journal of the MWAIS

The Journal of the Midwest Association for Information Systems (http://jmwais.org) was initially proposed in September 2013 by Rassule Hadidi, while serving as At-Large Director of MWAIS in a meeting of the MWAIS executive committee. The executive committee approved the proposal in October of that year to provide an additional research outlet for the region and beyond. Daniel Power was named the Editor-in-Chief, and Rassule Hadidi became the Managing Editor. The journal has a full panel of Senior and Associate Editors. The inaugural issue, published in January

2015, contained six articles on a variety of IT-based topics.

The editorial emphasis is on interdisciplinary research involving information systems or information technology and MIS from organizational and individual perspectives. JMWAIS strives to be unique, in both its interdisciplinary information systems focus and its commitment to authors of an expedited and constructive review process. Specifically, the editorial policy encourages authors from various disciplines to submit interesting IS/T and MIS related manuscripts. The editorial board emphasizes a balanced vision between rigor and relevance with a focus on both academic, scholarly-oriented as well as practitioner-oriented.

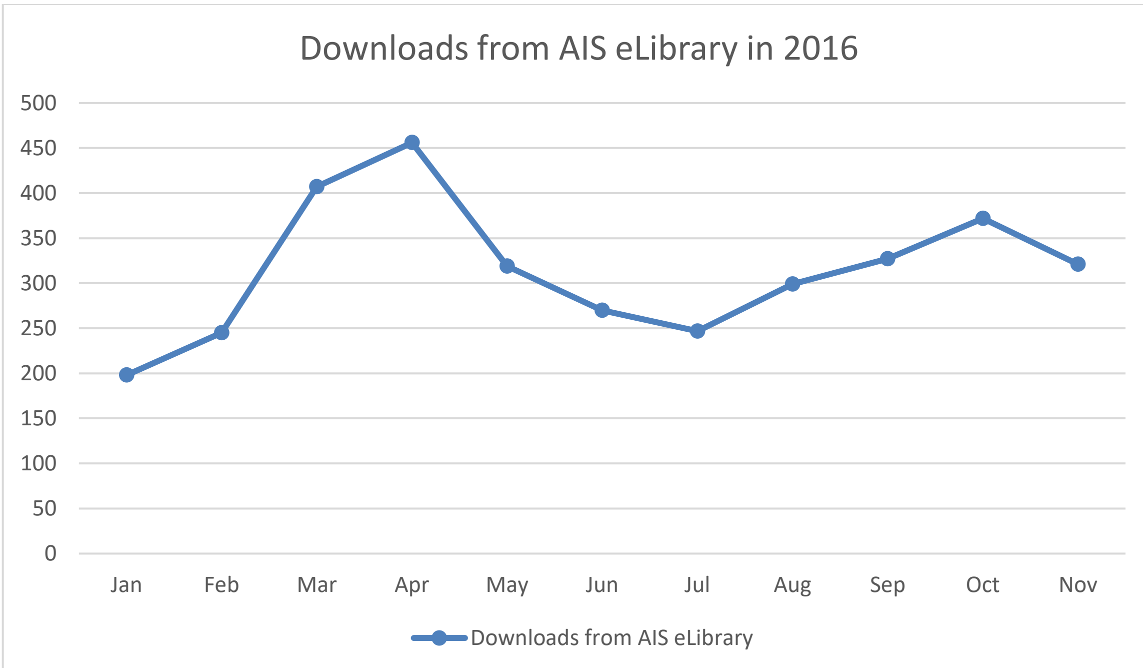

Fig 4: Monthly statistics of JMWAIS download from AIS eLibrary during the year 2016.

JMWAIS publishes bi-annually in Winter and Summer. To date, the journal has five volumes with ten issues, including one special issue on Health Information Systems. JMWAIS has published 48 rigorously peer reviewed articles over the past five years and continues to grow. The winners of the best paper award in the MWAIS conference have the opportunity to publish an expanded, reviewed version of their paper. In 2016 alone, JMWAIS had over 3,500 article downloads and averaged over 300 downloads per month. Figure 4 shows the monthly download statistics of JMWAIS articles in 2016. The journal helps to support the continuing mission of the chapter to provide a regional venue to engage colleagues in academia and industry, and as figure 5 shows, the journal has a greater reach than just the Midwest.

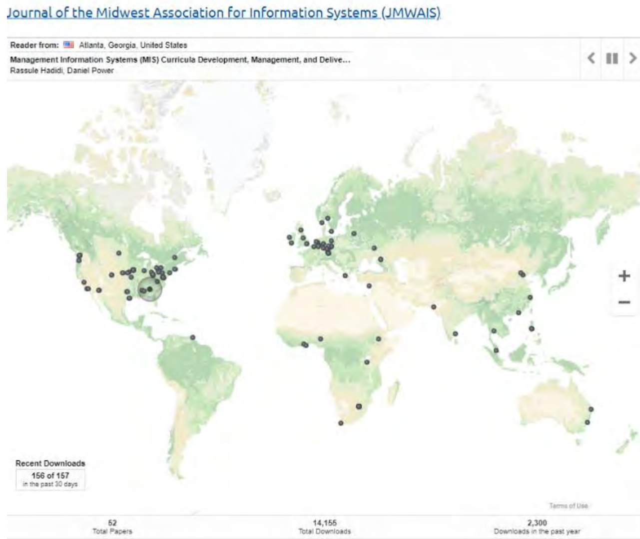

Fig 5: February 2020 snapshot of global downloads of JMWAIS papers (AIS eLibrary)

8. MWAIS Today

The current MWAIS executive board consists of seven members under the leadership of Ryan Schuetzler (President 2019-2020). Membership is robust and engaged, and the executive board is considering additional ways to engage the community, including more webinars and cooperative efforts with SIGs that are aligned with conference topics. MWAIS continues to serve a crucial role in the academic community. There are opportunities to host conferences, engage in scholarship through the conferences and the journal, and to serve in a leadership capacity on the board. As noted, the fifteenth conference of MWAIS will be held at Drake University, Des Moines, Iowa. MWAIS 2021 will be hosted by Bradley University in Peoria, Illinois.

9. Conclusion

MWAIS has grown over the last fifteen years, including the formation of its own journal - JMWAIS. According to Daniel Power, MWAIS experienced "slow, steady growth". The annual conference of MWAIS has helped scholars share their scholarship and develop new professional friendships. The excellent leadership of MWAIS has helped in its ongoing growth. To continue to grow, MWAIS has to focus more on serving Ph.D. students. Currently, MWAIS provides financial support to Ph. D. students to present paper at MWAIS conferences. Also, the association provides support for doctoral students to publish their research work in JMWAIS. However, Daniel Power believes that MWAIS "can and should do more" to serve Ph. D. students. Furthermore, MWAIS is in a position to help Information Systems faculty adapt to the challenges of learning about developments in Information Technology and producing scholarship that advances our shared understanding. Past experience suggest that MWAIS will continue to foster a stronger community of Information Technology scholars and teachers. Each year members add to the history of the Midwest Association for Information Systems.

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