


Creating and Validating an Information Quality Scale for E-Commerce Platforms

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ABSTRACT

The rise of e-commerce technology has transformed the traditional retail industry. This study proposes and validates an information quality scale suitable for e-commerce platforms. The scale consists of four dimensions—content validity, information scope, presentation quality, and hedonic quality—and 16 questions. Data analysis results support the second-order structure of information quality. The quality of information on e-commerce platforms has a significant positive impact on consumer behavioral intentions. Thus, operators of e-commerce platforms can improve the competitiveness and sustainability of these platforms by improving the quality of information.

KEYWORDS

E-Commerce, Information Quality, Scale Development

INTRODUCTION

Nowadays, coping with too much information still presents a big challenge for information consumers (Eppler & Mengis, 2004; Flanagin et al., 2014; O'Reilly, 1980; Peter, 2019). When shopping online, a search may return tens, hundreds, if not thousands of products. When faced with a large amount of information, what kind of content enables us to fully understand the issue and quickly make a decision? From the information providers' perspective, presenting quality information in a way that is easy to understand is one of the keys for continued success.

From an information system point of view, an e-commerce platform is a medium for transferring information between enterprises and consumers. It is part of the pervasive digital information world. According to the information asymmetry theory proposed by Akerlof (1970), during the transaction process, if the information held by both parties is not equal, it may induce the party with more information to deceive the party with less information. This can easily result in an unstable market of information, including online environments. E-commerce platforms provide consumers with both

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physical and virtual services online. A main value of e-commerce lies in information transmission. Information on the platform is not only about the content, but also about data volume, form of presentation, and more. From the consumer perspective, in addition to competitive prices, high information quality leads to consumers' willingness to trust the platform and vendors (Detlor et al., 2013; Nicolaou, 2013), satisfaction (Ghasemaghahi & Hassanein, 2015; Koivumaki et al., 2008), and eventually purchase intention and loyalty (Kang & Namkung, 2019; Pearson et al., 2012). From the perspective of e-commerce platforms, high information quality helps increase consumer traffic and enhance the platform's brand image (Detlor et al., 2013; Kullada & Kurniadjie, 2020).

Many scholars have explored characteristics of information quality in different fields (Baškarada & Koronios, 2014; Eysenbach et al., 2002; Fehrenbacher, 2016; Klein, Guo, & Zhou, 2011; Klein, Valera, & Guo, 2011; Miller, 1996; Yaari et al., 2011). Many scholars also use characteristics of information quality to explore the effects on an array of organizational impacts and outcomes (Gorla et al., 2010), such as trust (Yi et al., 2013), user satisfaction (Urbach et al., 2010; Zheng et al., 2013), perceived usefulness and benefits (Lin, 2010; Zheng et al., 2013), and intention to use (Muslichah, 2018; Stefanovic et al., 2016). It has been shown that high information quality has a positive impact on customer satisfaction and attitude (Chen et al., 2013; Xu et al., 2013).

Every industry relies on digitized information for management and development, and this shift demonstrates the importance of information quality. In a world of ubiquitous digital intermediation, issues of information quality need to be addressed. One aspect is to expand traditional information quality and better present complex human experiences (Lukyanenko, 2016). This study focuses on the information quality of e-commerce platforms, attempting to develop a suitable scale for it. The purpose of this study is twofold:

1. Construct an information quality scale appropriate for e-commerce platforms.
2. Verify the correlation between the information quality scale and consumer behavioral intentions.

From the research motivation, a research framework was created based on an extensive analysis of the relevant literature on e-commerce platforms and information quality. Then, an information quality scale for e-commerce platforms was developed and tested on sample data. Recommendations based on the results are presented.

LITERATURE REVIEW

The main purpose of this research is to develop an information quality scale for e-commerce platforms. It is necessary to understand e-commerce platform definitions, types, and properties before delving into further discussion. We will first review e-commerce and the relevant research on information quality issues.

E-Commerce

Since its early days, e-commerce has attracted great attention in the retail market. Significant progress has been made in the strategic use of e-commerce and the development of e-commerce applications (Bidgoli, 2001; Varshney & Vetter, 2002; Kalakota & Robinson, 2001). According to the fourth revision of the United Nations International Standard Industrial Classification, e-commerce is defined as "any business transaction that transfers the ownership of the goods or service through the Internet or by other electronic means" (United Nations, 2008, p. 28). There are various types of e-commerce: B2B (business to business), B2C (business to customer), C2C (customer to customer), C2B (customer to business), and O2O (online to offline, or offline to online). For the newer O2O model, an example is Amazon and Whole Foods, in which online and offline businesses form a partnership and consumers can visit physical stores to pick up product, or a local store will deliver to customers. Another example

is purchasing a product in store but paying by scanning a QR Code. The nature of O2O commerce is a business model that combines offline business with the online platform (Wan & Chen, 2019; Xiao et al., 2018; Xiao et al., 2019).

Information Quality Research

The issue of data and information quality has attracted scholars' attention for several decades (Alshikhi & Abdullah, 2018; Eppler & Witting, 2000). Main issues include the calculation and management of information quality for information systems, databases, data security, and the Web (Knight & Burn, 2005). Information has meaning only with background contexts; therefore, data becomes information (Lillrank, 2003). Information quality means that the expectations of information workers and customers are met through information and information services (English, 1999). Information enables them to perform their work effectively and to improve decision making. A commonly held notion is that information is a product and needs to fit for use for the problem at hand (Wang & Strong, 1996). In other words, applicability is at the core of information use. Information quality is relative depending on the use context. That is, information deemed appropriate for one use may not possess sufficient attributes that are proper for another use (Tayi & Ballou, 1998). Another commonly agreed-upon notion of information quality is that it is a multi-dimensional concept with more than one aspect (Klein, 2001).

Next, we summarize exemplary information quality scales, which form the foundation of our information quality scale for e-commerce platforms. Many frameworks have been used in the field to organize the dimensions of information quality (e.g., Arazy & Kopak, 2011; Fox et al., 1993; Helfert & Foley, 2009; Huh et al., 1990; Naumann, 2002; Wang & Strong, 1996), and a number of instruments for measuring information quality have been created (Lee et al., 2002; Michnik & Lo, 2007; Wang & Strong, 1996). Based on a study of groups of MBA alumni (over 400 working professionals in various industries and at different corporate levels), Wang and Strong (1996) created an information quality framework with 15 relevant dimensions from the perspective of users. The dimensions are grouped into four categories: intrinsic data quality, contextual data quality, representational data quality, and accessibility data quality (Table 1). In total, there are 50 data attributes. These dimensions as a whole express the ideal that high-quality data and information are of intrinsic high quality, appropriate to the task context, clearly represented, and accessible to the user. This framework has since been generally accepted in the research field (Madnick, 2009).

Many scholars use the information quality dimension developed by Wang and Strong (1996) to explore the impact of information quality in various fields (Baškarada, 2011; Baškarada & Koronios, 2014; Guo & Klein, 2020; Huang et al., 1999; Katerattanakul & Siau, 2008; Klein, 2001; Klein & Callahan, 2007; Klein et al. 2011a, 2011b, 2014; Lee et al., 2002; Melkas, 2004; Michnik & Lo, 2009; Pipino et al., 2002; Strong et al., 1997; Wahyudi et al., 2018). There is a cumulative body of research on information quality, and this measure is the most robust and one of the most commonly applied frameworks of information quality. Selected works are summarized in the Appendix.

Information Quality in E-Commerce

In addition to information overload resulting from speed, volume, and variety, the focuses and concerns of consumers of online and mobile platforms have changed over time and are different from workplace usage of information. Information quality and usefulness to users have been demonstrated as an important factor for the success of the overall information system, especially in the network environment (McKinney et al., 2002). The value of information lies not only in the information itself, but also in how it affects consumers and users (Maity, 2014). Since making sure consumers and users understand that the information is the core of the process, those involved in information system design and subsequently providing information should understand the meaning of information quality from the perspective of their customers (DeLone & McLean, 2003; Miller, 1996; Wang, 1998). If a company wants potential buyers or suppliers to trade through an e-commerce platform

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: the internal characteristics of information.	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: information is to be viewed in the context of usage.	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: how system presents information affects how users use information.	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: information is available and secure.	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

and continue to use it, the platform's content should show a broad range of high information quality attributes. From individual consumer's point of view, information asymmetries between parties and the intangible nature of e-commerce result in concerns of inaccurate, incomplete, and even fraudulent information (Flanagin et al., 2014). Information needs of online shoppers are different from other system users. We need a measurement for information quality from the consumer's perspective for e-commerce platforms.

Information quality describes a set of information attributes that affect user satisfaction and behaviors. In e-commerce, evaluation of information is also multi-faceted. In prior e-commerce research, if included, information quality is often related to or as part of information systems and service quality (Swaaid & Wigand, 2009). More often than not, it was measured by a single or a few items with few exceptions (Kang & Namkung, 2019). In research, development of scales is a key factor affecting the models or frameworks in the discipline. Lack of such measures hinders future research. Thus, to address the inadequacy the current research develops an information quality scale for e-commerce platforms. Based on the prior studies of many scholars, the basic structure incorporates the framework by Wang and Strong (1996), adopting its three dimensions (intrinsic information quality, contextual information quality, and representative information quality).

When looking for information on a website, it is natural for consumers to seek high-quality information. First, information should be correct and reflect reality. In an e-commerce platform, where customers often must make a decision of choice, they compare and construct options. In this situation, objective information is particularly important, and the reputation of sources is of great value. Second, with limited cognitive capacity, more information is not always better. Nowadays,

users are overwhelmed by information overload. Presenting the information most relevant to the task at hand is critical. Third, the formatting and presentation of information is more important than ever, especially on the screens of computers and smaller mobile devices. Thus, in our proposed scale, there are items stemming from these three well-documented categories.

In Wang and Strong's original work, there was a fourth category, accessibility of information quality, including easy access to data, security, and so on. The reason for not including it in our current study is that it is believed that although network technologies continue to advance, they have already reached a certain level of maturity for the electronic service market (Klein et al., 2016). There are many channels through which consumers can obtain online information, and they are becoming more and more accessible. Although there are still doubts about security of personal and financial information, most large-scale e-commerce platforms have matured enough that consumers believe that the information presented on the platforms is free to access with little constraint. Information can be consumed indefinitely without being exhausted (Paradice & Fuerst, 1991; Wang, 1998).

Use of information systems brings both practical and hedonic values (van der Heijden, 2004; Turel et al., 2010). Venkatesh et al. (2012) put forward the hedonic value motive in research on consumer acceptance and use of information technology. Hedonic value is defined as the pleasure of using information systems, and it has been proved as part of the value of information technology. In the context of consumer use, hedonic value is also considered an important determinant of technology acceptance and use (Brown & Venkatesh, 2005; Childers, et al, 2001; Wakefield & Whitten, 2006). Sending messages can be fun, and so can online shopping. In this process, the content plays a role in facilitating or at least not hindering the joyful and fun experience. Thus, in addition to being accurate, complete, and easy to understand, information presented should be conducive and argumentative to the enjoyable experience. Therefore, this study adds hedonic quality as one dimension of information quality that affects consumer behavioral intentions toward an e-commerce platform. Facing more ubiquitous computing and the quest for communicating a fuller experience with mixed motives, we need to expand the scope of traditional information quality dimensions (Lukyanenko, 2016). Our addition of hedonic quality to the information quality scale is a step toward answering this call.

RESEARCH MODEL

Based on the literature review, an information quality scale for e-commerce platforms was established. The information quality framework by Wang and Strong (1996) forms the basis for the proposed scale. At the same time, items that are more appropriate in the context of e-commerce were added, such as hedonic value from Venkatesh et al. (2012). The initial scale first went through exploratory factor analysis using data collected from a pilot study and was revised based on results. In a subsequent study, the scale was linked to consumer behavioral intentions, exploring the relationship between the dimensions of the information quality scale and behavioral intentions to demonstrate the nomological validity of the scale.

Initial Scale

Information quality is defined as "information suitable for information users" (Wang & Strong, 1996). Therefore, information quality in this study is the information and/or its form suitable for consumers to use on e-commerce platforms. Information quality includes many aspects; thus, it is a second-order factor with a set of first-order dimensions: content validity, relevancy quality, presentation quality, and hedonic quality (Table 2). This research collected relevant items from prior literature. Potential items were sorted, summarized, and modified based on expert discussions. Items used in the pilot study are listed in Table 3.

Table 2. Information quality scale for e-commerce platforms

Dimensions	Definition
Content validity	This factor is that the information content itself has high quality, including accuracy, objectivity, credibility, and reputation.
Relevancy quality	This factor emphasizes that the among the requirements of information quality is consideration of its relevance; that is, information must be relevant, timely, complete, and appropriate in a quantity to provide added value in a context.
Presentation quality	Information format (concise and consistent presentation) and information meaning (interpretability and ease of understanding) are related aspects. For information consumers, information must be well presented—not only expressed concisely and clearly, but also interoperable and easy to understand.
Hedonic quality	Conceptualized as the aspect of information and its presentation that brings pleasure to information users. It can directly affect the actual reception and use of information.

Table 3. Initial items of information quality scale

Information Quality Dimensions		Sources
Content validity of information		
IQ1	Information on e-commerce platform is believable.	Wang and Strong (1996)
IQ2	Information on e-commerce platform is accurate.	
IQ3	Information on e-commerce platform is reliable.	
IQ4	Information on e-commerce platform is objective.	
IQ5	The reputation of the source of information on e-commerce platform is adequate.	
IQ6	The reputation of the information on e-commerce platform is adequate.	
Relevancy quality of information		
IQ7	Information on e-commerce platform is applicable.	Wang and Strong (1996)
IQ8	Information on e-commerce platform is interesting.	
IQ9	The scope of information on e-commerce platform is adequate.	
IQ10	The depth of information on e-commerce platform is adequate.	
IQ11	The breadth of information on e-commerce platform is adequate.	
IQ12	The amount of information available on e-commerce platform is adequate.	
Presentational quality of information		
IQ13	Information from e-commerce platform is easily understood.	Wang and Strong (1996)
IQ14	Information on e-commerce platform is consistently formatted.	
IQ15	Information on e-commerce platform is continuously presented in the same format.	
IQ16	Information on e-commerce platform is well-formatted.	
IQ17	The format of the information from e-commerce platform is adequate.	
Hedonic quality of information		
IQ18	Using e-commerce platform is fun.	Venkatesh et al. (2012)
IQ19	Using e-commerce platform is enjoyable.	
IQ20	Using e-commerce platform is very entertaining.	

Nomological Network Model

Consumer behavioral intentions are important outcomes to businesses. It has been shown that information quality has a positive effect on user behaviors (Kang & Namkung, 2019; Muslichah, 2018; Pearson et al., 2012; Stefanovic et al., 2016). Thus, in this research, to establish the validity of the proposed scale, a nomological network model relating information quality to behavioral intentions will be tested. The relationship between information quality and behavioral intentions should hold. Therefore, this study defines consumer behavioral intention as the consumer's intention to continue using the e-commerce platform after shopping on the e-commerce platform. We posit the following hypothesis (see Figure 1):

H1: Information quality of an e-commerce platform has a positive effect on consumer behavioral intentions.

RESEARCH METHODOLOGY

Measures and data collection procedures are reported in this section. We followed steps similar to those in the scale development and validation for E-Service Quality by prior studies (Swaid and Wigand, 2009).

Measures

In addition to the information quality scale, this study included items measuring consumer intentions. They were adopted from Venkatesh et al. (2012) and are shown in Table 4. In this study, a five-point Likert scale was used; the item options were “strongly disagree,” “disagree,” “neutral,” “agree,” and “strongly agree.” To combat common method bias, good practices such as using clear and concise language, mixed order and anonymity, and confidentiality were applied in the survey design and data collection (Yoshikuni et al., 2023).

Figure 1. Nomological network model

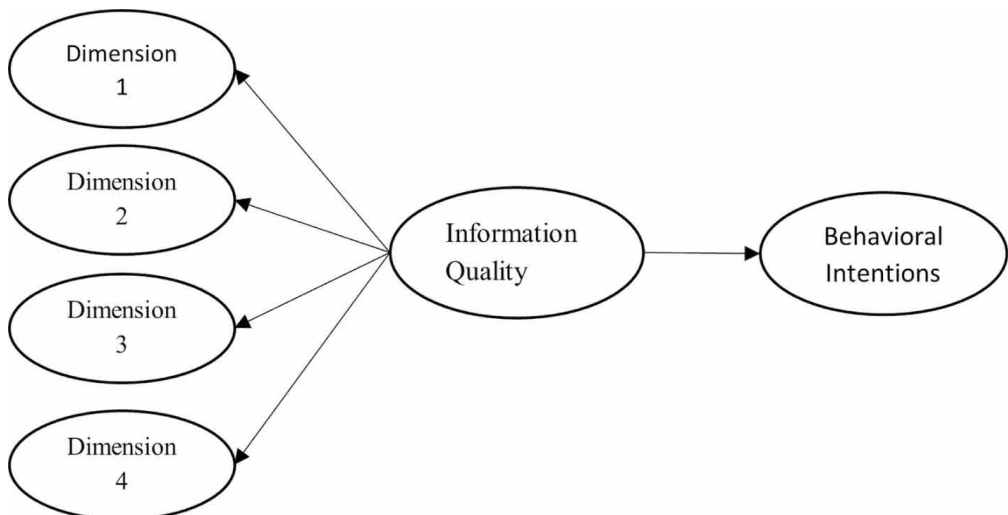


Table 4. Items for behavioral intention

Construct	Items
Behavioral intentions	BI1. I intend to continue using e-commerce platforms in the future. BI2.
	BI2. I will always try to use mobile Internet in my daily life.
	BI3. Even with money, I will not continue using e-commerce platforms in the future. (reverse)
	BI4. I plan to continue to use mobile Internet frequently

Data Collection

The targeted research subjects were buyers who had actual purchase experience on e-commerce platforms. The survey questionnaire was distributed using the SurveyCake questionnaire platform. This research hoped to obtain general research results, so the research sample included participants from different groups of genders, ages, incomes, and education levels. The data were collected in October and November of 2019. An announcement and recruiting document including a short description of the purpose of the study and the link to the questionnaires were posted in groups on social networks in Taiwan. Users with recent online shopping experience were asked to fill out the online survey.

The questionnaire distribution was divided into two phases. The first phase was for a pilot study with the initial scale of information quality including 20 items, as listed in the previous section. A total of 150 online questionnaires were collected. Invalid questionnaires were removed. Invalid questionnaires included those filled out by respondents without previous experience using the e-commerce platforms or those that were incomplete or not properly filled out, such as with identical answers for all the questions. A total of 111 valid questionnaires were included in the data analysis. The effective sample recovery rate was 74%. In the second stage, online questionnaires with a revised scale were distributed and 281 online questionnaires were collected. After checking the questionnaires, a final set of 251 valid questionnaires was used in the subsequent analyses. The effective sample recovery rate was 89%. The obtained sample in both the pilot study and the main study met the requirement of five responses per item (Hair et al., 1998; Swaid & Wigand, 2009). Additionally, another requirement of having around 10 times the maximum arrows pointing toward dependent variable and 10 times formative indicators to measure the one construct (Hair et al., 2017; Yoshikuni et al., 2023) was met.

DATA ANALYSIS AND RESULTS

Pilot Study

Exploratory factor analysis and reliability analysis using SPSS were conducted on data collected by the pilot questionnaire, which included 20 questions (listed in the previous section). The Kaiser-Meyer-Olkin (KMO) Test is a measure of whether a data set is suitable for factor analysis. The KMO value should be at least greater than 0.6. A value of .80 and above is ideal for factor analysis (Kaiser & Rice, 1974). In this study, the KMO value was 0.854, and the significance of Bartlett's spherical test was 0.000, which was significant. These showed that the data of this study was suitable for factor analysis.

Principal component analysis with the maximum variance method (Varimax) was used on the 20 items. The results of the first exploratory factor analysis (EFA) are shown in Table 5. Naturally emerged factors lessened the concern of common method bias. The criteria of eigenvalues bigger than 1 and factor loading greater than 0.6 were used. Items with factor loading less than 0.6 were deleted. Also, there were cross-loading items with differences between the two loadings of less than 0.1. These items were eliminated as well. Thus, item 4 (objective), 13 (easily understood), 7 (applicable), and 8 (interesting) were removed.

Table 5. The first EFA results of initial scale

Item	Component 1	Component 2	Component 3	Component 4
IQ2	0.872			
IQ1	0.840			
IQ3	0.826			
IQ6	0.805			
IQ5	0.776			
IQ4	0.572			
IQ13	0.512		0.437	
IQ7	0.475	0.465		
IQ10		0.794		
IQ11		0.787		
IQ9		0.749		
IQ12		0.729		
IQ14			0.826	
IQ15			0.778	
IQ17			0.717	
IQ16			0.667	
IQ18				0.881
IQ20				0.844
IQ19				0.754
IQ8		0.522		0.571

The same analysis was repeated on the remaining 16 items. The KMO value was 0.819, and the Bartlett sphere test was significant at 0.000, which proved once again that the sample data were suitable for factor analysis. All items had factor loading above .6 and no cross loading. Four components emerged from factor analysis. The explained variance of the components was 39.16%, 14.722%, 10.389%, and 8.443%, respectively. The total explained variance was 72.713%. Item loadings and components can be found in Table 6. The four components that emerged corresponded to the four proposed dimensions in general. After a closer examination of the remaining items, the four resulting dimensions were labeled as content validity, information scope, presentation quality, and hedonic quality.

In the first proposed dimension, items were related to the innate characteristics of the information and the properties of the content. Wang and Strong (1996) believe that information consumers pay attention not only to the accuracy of information content, but also to the credibility and reputation of its sources. This research drew upon the intrinsic information quality of Wang and Strong (1996) as the basis for this dimension. One question was deleted after exploratory analysis of the pilot data. The remaining five items embody the extent to which the information from the e-commerce platform is reliable and trustworthy, so the first dimension is named content validity.

The second dimension was based on the contextual information quality of Wang and Strong (1996) to signify the importance of the context and relevance of the information. The context of information consumption varies with the task at hand, with time, and with the individual information consumers. Original items described the applicability, scope, depth, breadth, and quantity of information. Two

Table 6. The EFA result of initial scale after removing items

Item	Component 1	Component 2	Component 3	Component 4
IQ2	0.885			
IQ1	0.869			
IQ3	0.813			
IQ6	0.812			
IQ5	0.78			
IQ11		0.816		
IQ10		0.812		
IQ9		0.771		
IQ12		0.742		
IQ14			0.844	
IQ15			0.815	
IQ17			0.679	
IQ16			0.626	
IQ20				0.861
IQ18				0.857
IQ19				0.789

Variance explained: 72.713%

items from the initial set were removed. Following from an examination of the remaining four items in this cluster, the second dimension is named information scope.

The third dimension was based on the representative information quality in Wang and Strong (1996). Information needs to be well presented in a concise and clear form so that it can be easily interpreted and comprehended by information users (Wang & Strong, 1996). After removing one item, the remaining four items of this cluster are all related to the formatting and the way in which information is presented. Thus, the third dimension is named presentation quality.

The fourth dimension incorporated the idea that shopping tasks can be fun. In IS research, it has been found that this enjoyment motivation (conceptualized as perceived enjoyment) directly affects the acceptance and use of technology (Brown & Venkatesh, 2005; Childers et al., 2001; van der Heijden, 2004; Thong et al., 2006). E-commerce platforms need to help fulfill the entertainment needs of their customers. Thus, when deciding what information to provide and how to provide it to the customer, the aspect of hedonic quality must be taken into consideration to ensure a fun and enjoyable experience. The items belonging to this component are all related to this aspect, so this dimension is named hedonic quality.

Reliability analysis was conducted on the revised information quality scale. The Cronbach's α values were 0.913 (content validity), 0.852 (information scope), 0.828 (presentation quality), and 0.822 (hedonic quality). All were above the recommended threshold of 0.7 (Nunnally, 1978). Revised items were used in the subsequent main study to establish the validity of the scale. The list of final items is presented in Table 7. The items are renumbered, and the original item numbers are included in parentheses.

Table 7. Final set of items for information quality scale

Dimension	Item
Content Validity	F1-1 (IQ1) Information on e-commerce platform is believable.
	F1-2 (IQ2) Information on e-commerce platform is accurate.
	F1-3 (IQ3) Information on e-commerce platform is reliable.
	F1-4 (IQ5) The reputation of the source of information on e-commerce platform is adequate.
	F1-5 (IQ6) The reputation of the information on e-commerce platform is adequate.
Information Scope	F2-1(IQ9) The scope of information on e-commerce platform is adequate.
	F2-2(IQ10) The depth of information on e-commerce platform is adequate.
	F2-3(IQ11) The breadth of information on e-commerce platform is adequate.
	F2-4(IQ12) The amount of information available on e-commerce platform is adequate.
Presentation Quality	F3-1(IQ14) Information on e-commerce platform is consistently formatted.
	F3-2(IQ15) Information on e-commerce platform is continuously presented in the same format.
	F3-3(IQ16) Information on e-commerce platform is well formatted.
	F3-4(IQ17) The format of the information from e-commerce platform is adequate.
Hedonic Quality	F4-1 (IQ18) Using e-commerce platform is fun.
	F4-2 (IQ19) Using e-commerce platform is enjoyable.
	F4-3 (IQ20) Using e-commerce platform is very entertaining.

Main Study

To further test the reliability and validity of the proposed information quality scale, data were collected in a larger study. In addition to the 16 questions of the revised information quality scale, the questionnaire included questions measuring behavioral intentions. The final data set included 251 valid questionnaires.

Sample Profile

Table 8 is a summary of the respondent profile. The targeted respondents were consumers who had actual purchase experience on e-commerce platforms. In the sample, there were 67 males (26.7%) and 184 females (73.3%). The age group that accounted for the highest proportion was 25-34 years old (50.6%), and the education level of 92.4% of the respondents was that of university or above. Office workers accounted for the highest proportion (45.4%) of the occupation breakdown. The largest group in terms of monthly disposable income (New Taiwan Dollar, NT\$) was with \$20,000 or less, accounting for 46.2%. One US dollar is about 28 to 30 NT\$.

In terms of the e-commerce platform usage habits, 67% of the respondents had used the e-commerce platform within a week. The time spent on the e-commerce platform to purchase was mostly within one hour (49.4%). Regarding amount spent, NT\$501 to 1,000 was the most common (29.9%), and less than \$500 was the second largest group (23.5%). See Table 9 for details. Among the popular e-commerce platforms, the ones most frequented by the respondents in this study were “Shopee Auction,” “PChome,” and “momo,” accounting for 39% (198), 22% (114), and 18% (90), respectively. Based on industry reports, the sample and shopping behavior in the current study are representative of online shoppers of Taiwan in terms of age, amount spent, platform used, and habits (E-commerce in Taiwan, 2020; E-commerce in Taiwan, China, 2023). As for amount spent, globally an online shopper spends about US\$3.00 on average (Chevalier, 2023). In US almost half (46%) spend less than US\$50 online per visit (Petro, 2019). Thus, online shoppers in Taiwan are comparable to others.

Table 8. Respondent profile

		N	Percentage (%)	Accumulative percentage (%)
Gender	Female	184	73.3	73.3
	Male	67	26.7	100
Age	18–24	100	39.8	39.8
	25–34	127	50.6	90.4
	35–44	20	8	98.4
	45–54	2	0.8	99.2
	55–64	2	0.8	100
Education Level	High school and below	19	7.6	7.6
	College & university	185	73.7	81.3
	Master's	46	18.3	99.6
	Doctorate	1	0.4	100
Occupation	Office worker	114	45.4	45.4
	Labor & technician	3	1.2	46.6
	Military, government, teacher	23	9.2	55.8
	Freelancer	15	6	61.8
	Professional	16	6.4	68.1
	Homemaker	10	4	72.1
	Student	62	24.7	96.8
	Other	8	3.2	100
Monthly disposable income (NT\$)	20,000 and below	116	46.2	46.2
	20,001-40,000	100	39.8	86.1
	40,001-60,000	22	8.8	94.8
	60,001-80,000	10	4	98.8
	80,001-100,000	2	0.8	99.6
	100,001	1	0.4	100

Exploratory Factor Analysis

Next, exploratory factor analysis was used again to verify the stability of the scale. KMO value was 0.834 (df=120 and $\chi^2=2272.434$) and Bartlett's spherical test was 0.000, which was significant. These demonstrated that the data were suitable for factor analysis. Table 10 shows the results of the exploratory factor analysis of the final information quality scale (16 items). The same four components emerged as in the pilot study: content validity, information scope, presentation quality, and hedonic quality. The factor loadings were all greater than 0.6. The accumulative explanatory variation of the whole scale was 70.179%. The results confirmed that the information quality scale was stable.

Validity

Table 11 shows Cronbach's α values, shared variance, and AVE values of the four dimensions. All coefficients were above 0.7, meeting the criterion of Cronbach's α (Nunnally, 1978). The procedure for measuring convergent validity and discrimination validity in Hair et al. (1998) was followed. All

Table 9. Respondent spending profile

		n	Percentage (%)	Accumulative percentage (%)
Last purchase	Within a week	170	67.7	67.7
	Within two weeks	28	11.2	78.9
	Within three weeks	10	4	82.9
	Within a month	28	11.2	94
	Within two months	4	1.6	95.6
	Within three months	11	4.4	100
Time spent during last purchase	Within an hour	124	49.4	49.4
	1–2 hours	95	37.8	87.3
	3–4 hours	15	6	93.2
	More than 4 hours	17	6.8	100
Amount spent on last purchase (NT\$)	≤\$50	59	23.5	23.5
	501–1,000	75	29.9	53.4
	1,001–1,500	42	16.7	70.1
	1,501–2,000	26	10.4	80.5
	2,001–2,500	8	3.2	83.7
	2,501–3,000	5	2	85.7
	>\$3,000	36	14.3	100

Table 10. EFA results of the revised scale

Dimensions	Items	Component 1	Component 2	Component 3	Component 4	Explained variance
Content Validity	F1-3	0.854				37.759
	F1-5	0.808				
	F1-2	0.803				
	F1-1	0.747				
	F1-4	0.725				
Information Scope	F2-3		0.84			16.459
	F2-2		0.79			
	F2-4		0.687			
	F2-1		0.648			
Presentation Quality	F3-2			0.84		8.982
	F3-1			0.817		
	F3-3			0.699		
	F3-4			0.692		
Hedonic quality	F4-1				0.879	6.979
	F4-3				0.852	
	F4-2				0.806	

Table 11. Measurement property

Items	Loadings	T-Values
Content Validity Cronbach's $\alpha = 0.87$, Share variance =0.02~0.13, AVE=.566		
F1-1	0.75	13.23
F1-2	0.77	13.71
F1-3	0.83	15.30
F1-4	0.64	10.74
F1-5	0.76	13.46
Information Scope Cronbach's $\alpha = 0.84$, Share variance =0.13 ~ .45, AVE=.582		
F2-1	0.64	10.85
F2-2	0.86	16.34
F2-3	0.87	16.61
F2-4	0.65	10.96
Presentation Quality Cronbach's $\alpha = 0.85$, Share variance =0.13 ~ .45, AVE=.593		
F3-1	0.70	11.96
F3-2	0.71	12.40
F3-3	0.83	15.34
F3-4	0.83	15.43
Hedonic Quality Cronbach's $\alpha = 0.86$, Share variance =0.02 ~ .26, AVE=.667		
F4-1	0.83	15.12
F4-2	0.82	14.85
F4-3	0.8	14.33

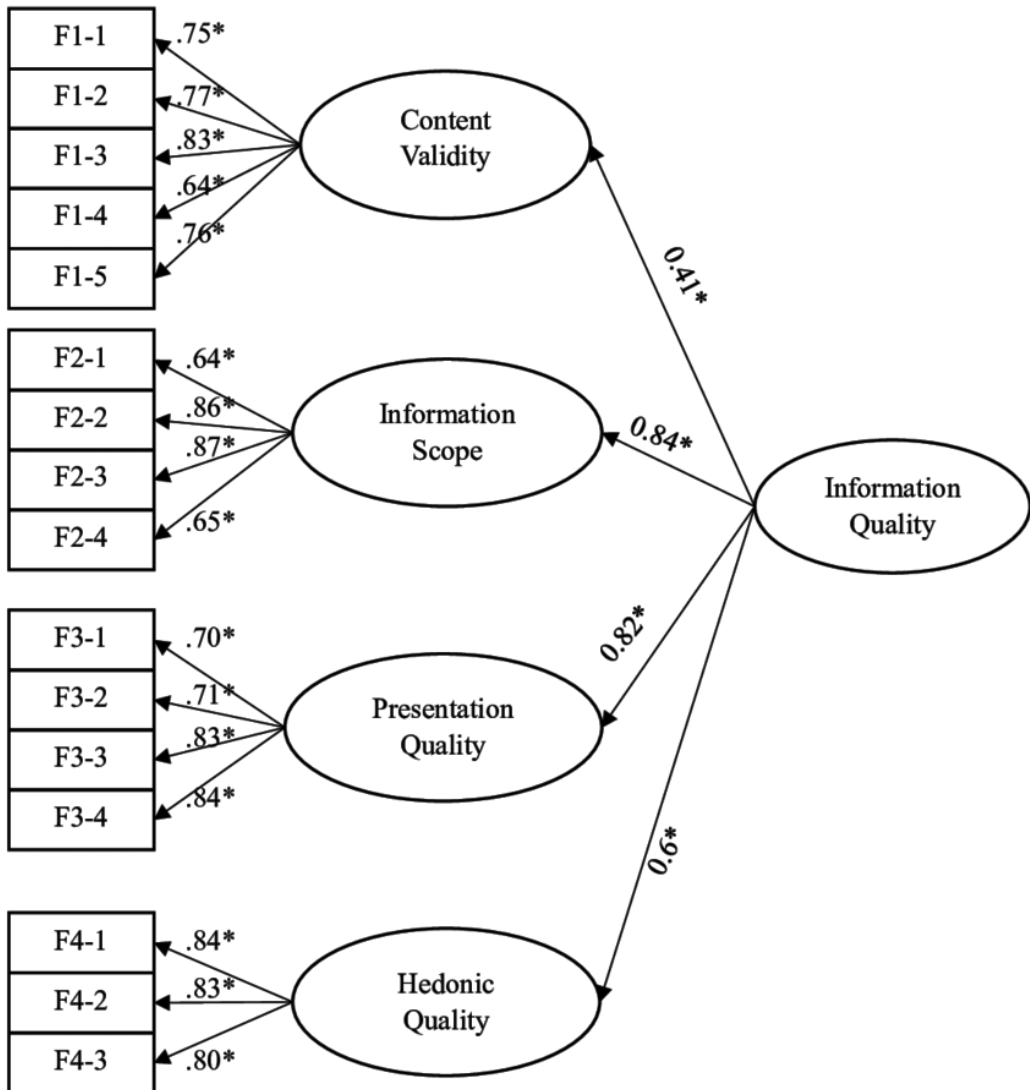
factor loadings of items were at a significant level of $p < 0.001$, and the AVE value of each dimension was greater than 0.5, meeting the requirement for convergent validity. The AVE values of the four dimensions were between 0.566 and 0.667, which were all greater than the shared variance estimates between the dimensions (ranging from 0.02 to 0.45). Thus, the requirement of discrimination validity was also met.

Second-Order Analysis

In addition to the aforementioned first-order factor analysis and testing, a second-order confirmatory factor analysis was used to further test the validity of the information quality scale. The four dimensions that emerged from exploratory factor analysis (content validity, information scope, presentation quality, and hedonic quality) were first-order factors. To demonstrate that there was a potential higher-order factor, second-order confirmatory analysis was conducted. Figure 2 shows the second-order confirmatory analysis model of this study.

In terms of model fit, $\chi^2 = 357.83$, P-Value = 0.00, $df = 100$, $\chi^2/df = 3.57$, GFI = 0.85, CFI = 0.94, NNFI = .92, and RMR = 0.042. This model did not reach the GFI requirement for being > 0.9 . Doll et al. (1994) found that if the estimated parameters of the model increase, it will be difficult for the GFI to reach the standard of 0.9, so it is recommended to relax the standard to $GFI > 0.8$. Therefore, the model met all the standards of model fit (Hu & Bentler, 1999). All t-values of the path coefficients were greater than 1.96, reaching the significant level. The second-order confirmatory analysis verified that the information quality is indeed a second-order construct, which is composed of content validity, information scope, presentation quality, and hedonic quality. Among them, the loading value of the information scope was the largest.

Figure 2. Second order model

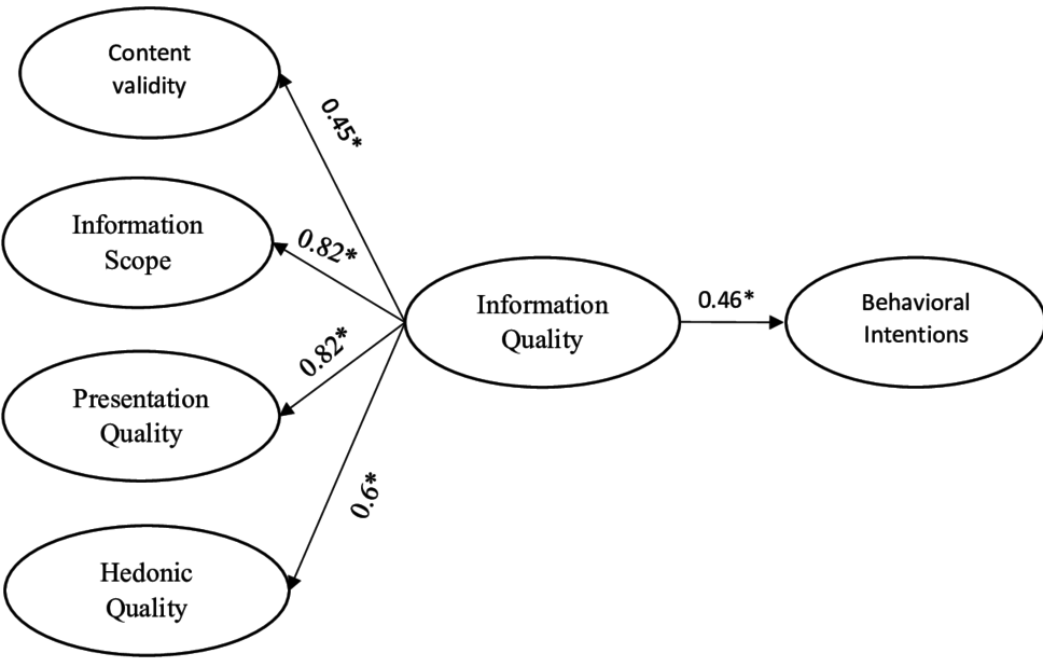


To establish the nomological validity, a nomological network model was tested by structural equation modeling analysis. Prior research supports that information quality affect customer behavioral intentions. Figure 3 shows a nomological network of information quality and customer intentions. Information quality was measured by the newly developed scale. The model had good fit, with $\chi^2=453.91$, $p\text{-value}=0.01$, $df=165$, $\chi^2/df=2.75$, $GFI=0.85$, $CFI=0.95$, $NNFI=.94$, and $RMSEA=0.084$ all meeting the fit threshold. All path coefficients were significant. The hypothesis was supported.

Group Comparison

An additional analysis compared two groups of consumers in terms of their information quality perceptions. This study distinguishes high and low consumption users based on the amount spent

Figure 3. A nomological model of information quality and customer intentions



on the e-commerce platform. Consumers with a spending amount of less than 1,000 NT\$ are low-consumption users, and consumers with a spending amount of more than 1,001 are high-consumption users. There were 134 respondents who fell into the category of low and 117 in high category. SEM analysis of second-order model was conducted on both samples. Results can be found in Table 12. Both models have good fit, and all path coefficients are significant. But two samples showed different patterns in the path loadings. For the low consumption group, presentation quality has the highest loading while content validity is the lowest. For the high consumption group, information scope is the highest while hedonic quality is the lowest. It shows that groups may value different aspects of information based on the purpose and concerns of their consumption activities. If the product they are looking for is a big-ticket item, we would think that the quality and reliability of the product would weigh more. Thus, when looking through e-commerce sites for information about the product, users are to gather more relevant information rather than have fun. On the other hand, if the product involves less money, whether the information is correct will have less of an impact on us. Thus, we can relax and pay attention to other aspects of information. As a matter of fact, people sometimes engage in petty buying to relieve stress and having fun becomes more important. An appealing interface is instrumental to achieving this goal. The difference shown in our results provides evidence of the sensitivity of the information scale to different shopping tasks.

DISCUSSION

The purpose of this research was to develop a scale of information quality suitable for e-commerce platforms. Such a scale can measure consumers' perceptions of e-commerce platform information quality, which has an impact on consumer behavioral intentions.

Before creating the information quality scale, this research reviewed relevant literature of e-commerce and information quality in the past. Wang and Strong (1996) and related literature on

Table 12. Group comparison: low consumption vs. high consumption

Dimensions	Low consumption		High consumption	
	Construct Loading	T-Value	Construct Loading	T-Value
Content validity	0.25	2.35*	0.55	5.07**
Information Scope	0.73	6.25**	0.93	6.25**
Presentation Quality	0.97	7.42**	0.72	5.98**
Hedonic quality	0.76	7.12**	0.47	4.44**
Goodness of fit	GFI=0.81, CFI=0.92, RMR=0.044		GFI=0.79, CFI=0.93, RMR=0.062	

Note: t-value=1.96, * p=0.00; t-value=2.56, ** p<0.01

information quality in various fields have revealed the important role played by information quality in e-commerce environments. In addition to the dimensions created by Wang and Strong (1996), hedonic value (Venkatesh et al., 2012) was added to reflect the hedonic usage of information systems even as mundane as online shopping. The initial set of 20 items included four dimensions identified as significant aspects of the information needs of consumers on an e-commerce platform. The scale was revised using data collected in the pilot study. The final scale consisted of four dimensions: content validity, information scope, presentation quality, and hedonic quality, with a total of 16 items. More data were collected in the main study. Reliability and validity of the scale were established through a set of rigorous statistical analyses. In addition, the research showed that there is a second-order factor of information quality. When tested in a nomological model with related theoretical constructs of behavioral intention, the scale showed good model fit. The scale can be used in studying e-commerce consumer behaviors regarding information issues.

Theoretical Contribution

In various fields, the information quality scale has been considered an important aspect of information provision. However, though information quality is critical for success in e-commerce, there has been little effort to develop a scale for its own needs. Therefore, this research developed this scale considering the uniqueness of e-commerce platforms. It is recommended that future scholars follow this research approach to compare applications of information quality scales in different industries and to further explore different views on information quality.

In this research, information quality of e-commerce platforms was conceptualized as a second-order construct with contributing dimensions. Our data and analysis supported this conceptualization. The contributing dimensions are content validity, information scope, presentation quality, and hedonic quality. Although there exist a few scales for information quality, most of them focus on enterprise portals and database systems and very few are suitable for e-commerce platforms. Our research filled this gap and answered the call for meeting the challenge presented by ubiquitous information intermediation (Lukyanenko, 2016).

Online shoppers are also information consumers. They share common characteristics with information users of other types of information systems. Additionally, shopping as a task possesses both utilitarian and hedonic value for consumers. Thus, the uniqueness of the information needs of online shoppers needs to be recognized and addressed. The four dimensions of the information scale developed in this research embody this consideration. The facets of information include the information itself (internal quality), its size (depth and breadth), and its external format (presentation). Information in e-commerce contexts helps with the online shopping tasks, bringing both utilitarian and hedonic values to consumers. Correspondingly, the four dimensions of the information quality scale developed in this study are content validity, information scope, presentation quality, and hedonic

quality. Our study not only supports the conceptualization but also provides evidence of the differences of e-commerce platforms from other information systems.

The results of structural modeling of information quality and customer intentions showed that the information scope and presentation quality had the greatest influence on consumer behavioral intentions among all the information dimensions. On the other hand, it was surprising to see that the content validity made the smallest contribution.

The information scope mainly emphasizes the breadth and depth of information on the e-commerce platform. Klein et al. (2014) studied the differences between traditional information and Internet information and found that subjects paid more attention to the scope of information on the Internet because the information distributed through the Internet was usually fast and could be quickly obtained in large quantities. Maybe the same logic goes on here regarding consumers browsing e-commerce platforms. The value and advantage of platforms are in providing “collections” of vendors and thus collections of information. They are supposed to have good breadth of data with needed details. Another advantage of the e-commerce platform is to sift information for consumers, solving the information overloading problem for consumers. This is one of the reasons that consumers are attracted to e-commerce platforms. Customers save time and money while obtaining useful information. On the other hand, e-commerce platforms should be careful not to become information overloading platforms themselves.

Presentation quality is another dimension with great influence on consumers’ overall perceptions of information quality. It is interesting to see that the more external aspects, such as scope and presentation format, receive more attention from consumers. Information on e-commerce platforms is used by consumers to make purchase decisions. Most times the impact of such decisions is on individuals or a family. In this comparatively low-stake situation, the right amount of information and the right way of presenting it outweigh other aspects of information quality.

In comparison, the content validity showed the smallest influence. Does this mean that the intrinsic quality of information is not important or not valued by consumers? Xu et al. (2013) found that content validity has no significant impact on consumers in the electronic service environment; that is, when consumers use e-commerce platforms, they believe that content validity is a necessary information quality. This study believes that the content value has generally been valued as a precondition. That is, consumers perceive it as necessary and assume the baseline quality of information provided by platforms, so attention is paid to other needs. Another factor that explains this is our sample. Based on the group comparison result, more than half of the respondents engaged in less valuable purchases. In these situations, content validity is not the priority. When higher value items are involved, content validity is paid more attention as shown in the high consumption group.

The analysis of the research model shows that it has an impact on consumer behavioral intentions. This result supports the conclusions made by previous scholars (Venkatesh et al., 2012; Klein et al., 2014). The effects of information quality on consumer behavioral intentions in this study is in line with the research hypothesis. From the path analysis, the path loading value was 0.46, indicating that information quality positively affects consumer behavioral intentions.

Managerial Implications

The information quality scale developed in this study can be used as a base measure of the information quality of e-commerce platforms. E-commerce platform operators can gain insights about their businesses and thus improve the information quality of their platforms. Dimensions of information quality identified by this research can provide e-commerce operators with an in-depth understanding of the contributing factors of information quality.

Information scope is the highest contributing dimension to overall information quality assessment. With the advent of the e-commerce era, information content continues to increase. E-commerce platform operators continue to expand in hardware and software equipment in hopes of meeting the needs of consumers. The purpose is to attract more consumers to the platform and generate brand

loyalty. Therefore, updating the information of the e-commerce platform in real time and increasing the breadth, depth, and quantity of the content is imperative to ensure that “lack of information” perception will not occur.

With the increase of e-commerce platforms, the design of the platform interface also has increased in significance. Presenting content with consistent and appropriate formats, colors, fonts, and graphics improves customer understanding. The goal is to reduce search time and cognitive load. For example, the flat design and user-friendly design of Shopee Shop enables consumers to operate intuitively, without having to spend time and cost in learning how to use the platform. Customers can start searching and purchasing products immediately. Additionally, simple, clear, and visually appealing design augments a good shopping experience.

The hedonic quality dimension is an addition to the research in recognition of the dual motives of information system usage, including online shopping. Our data and analysis supported its inclusion. This dimension is more important than content validity, which has been the main focus of information quality in previous research. In the era of rapidly growing social media and e-commerce, the boundaries of transactional behavior, entertainment, and social activities have become blurred. Purchasing goods can be fun. E-commerce platforms can combine these three modes and add entertainment features to provide more experiential value to customers and increase the stickiness of their platform. For example, the chat function of Shopee Shop combines the functions of social software. Customers and sellers can communicate in real time, accelerate the resolution of problems, and increase consumers’ purchase intentions.

The aspect of content validity is generally a high priority of information users (Koivumaki et al., 2008), but it is surprising to see its low path coefficient in our study, which is significant, nevertheless. However, it was not the only research to have this finding. Xu et al. (2013) also found similar results of the non-significant impact of information reliability on consumer intention, but this is not saying that this aspect is not important but rather is the basic expectation from a customer’s point of view. Therefore, it is recommended that e-commerce platform operators provide more accurate, credible, and clear information to consumers. A platform system can require merchants to enhance the quality of goods and shopping mall information. In addition, it can further improve information quality by putting in measures and algorithms on its own platform. High information quality becomes part of their brand, thus increasing consumers’ brand loyalty to the platform and strengthening their willingness to use it.

Shopping can mean different things to people. So do the information needs when the shopping tasks are different. This is shown in our findings, too. As an e-commerce platform operator, it is imperative to know target customers. If the products are high value and are important purchases, the more information the better. Presenting low stake items in a good and fun way will bring good customers perception.

Limitations and Future Research

There are limitations to this research, based on which we suggest the following future research directions.

Information Quality is highly contextual. There are many factors that affect the information quality of e-commerce platforms. This study used the information quality scale from prior research as a theoretical basis and then incorporated the aspects suitable for e-commerce platforms. However, due to time and cost constraints, it was not possible to conduct more in-depth interviews with consumers. Therefore, there might be overlooked factors, such as relevant regulations of e-commerce platforms, platform brand loyalty, and so on. It is suggested that researchers in the future include more factors and dimensions that pertain to the e-commerce environments at the time.

One example stems from online shopping items. In the current study, because of the amount spent and sample age group, we can assume that items involved were small. The information needs are different from small items, such as soft drinks and grocery items, to big and serious items, such

as washing machines or jewelry. Although small purchases are the majority of purchases made in online shopping worldwide (Chevalier, 2023), it would be beneficial to investigate what and which dimensions of information quality are important in the decision-making process.

Another example is types of e-commerce models. This research attempted to develop an information scale for all e-commerce types. However, e-commerce covers a range of different business models, with each being very different. This research mainly used the B2C and C2C models of e-commerce platforms from which to collect data. Overlooked types of e-commerce models included B2B and O2O. It is suggested that future research incorporate other business models and validate the scale by considering possible different attributes reflecting their unique characteristics.

Social environments and cultural traditions influence individuals (Klein et al. 2011b), and there is no exception for consumers. Although there were many similarities between online users and shoppers in Taiwan and those in the world (Ecommerce in Taiwan, 2020), we could argue that various cultures view the information quality of e-commerce platforms differently. In the future, researchers may test the scales developed in this research using data from different cultures to explore the differences among them. Cross-region or cross-country analyses and comparisons will further the contribution of the scale to understanding consumers via their information needs.

In this study, online channels were used for distributing questionnaires. It was found that many respondents filled in the same answers, omitted questions, and incorrectly filled out the questionnaires, resulting in many invalid responses. This phenomenon may be due to the misunderstanding of the research purpose and the inconvenience of taking online surveys. Therefore, it is recommended that future researchers pay more attention to the design of questionnaires when using online and mobile channels to collect data in order to reduce the number of invalid responses.

CONCLUSION

E-commerce platforms are the trend of the future, and they are also undergoing rapid development. Due to the outbreak of the global pandemic of Covid-19 at the end of 2019 and early 2020, people reduced going-out activities and resorted to online options to carry out many daily tasks, including shopping. While at home for a long time, their frequency of using the Internet has greatly increased, and online shopping has become the main shopping mode during the pandemic. This change of habit may extend beyond the end of the pandemic. Major brands and players in the retail industry have successively launched e-commerce platforms to facilitate making purchases at home for consumers. Information quality will only continue to be more important. We developed and tested a scale for measuring information quality for e-commerce platforms. This scale will be able to help platforms pinpoint any gaps in their information and improve their services to customers.

COMPETING INTERESTS

The authors of this publication declare there are no competing interests.

REFERENCES

- Akerlof, G. (1970). The market for “lemons”: Quality uncertainty and the market mechanism. *The Quarterly Journal of Economics*, 84(3), 488–500. doi:10.2307/1879431
- Alshikhi, A. A., & Abdullah, B. M. (2018). Information quality: Definitions, measurement, dimensions, and relationship with decision making. *European Journal of Business and Innovation Research*, 6(5), 36–42.
- Arazy, O., & Kopak, R. (2011). On the measurability of information quality. *Journal of the American Society for Information Science and Technology*, 62(1), 89–99. doi:10.1002/asi.21447
- Baškarada, S. (2011). How spreadsheet applications affect information quality. *Journal of Computer Information Systems*, 51(3), 77–84.
- Baškarada, S., & Koronios, A. (2014). A critical success factor framework for information quality management. *Information Systems Management*, 31(4), 276–295. doi:10.1080/10580530.2014.958023
- Bidgoli, H. (2001). *Electronic commerce: Principles and practice*. Elsevier Science & Technology.
- Brown, S., & Venkatesh, V. (2005). Model of adoption of technology in households: A baseline model test and extension incorporating household life cycle. *Management Information Systems Quarterly*, 29(3), 399–426. doi:10.2307/25148690
- Chen, J., Rungruengsamrit, D., Rajkumar, T. M., & Yen, D. (2013). Success of electronic commerce web sites: A comparative study in two countries. *Information & Management*, 50(6), 344–355. doi:10.1016/j.im.2013.02.007
- Chevalier, S. (2023, Feb 23). Global Online Shopper per Visit Spend 2022. *Statista*. <https://www.statista.com/statistics/239288/countries-ranked-by-average-b2c-e-commerce-spending-per-online-buyer/>
- Childers, T. L., Carr, C. L., Peck, J., & Carson, S. (2001). Hedonic and utilitarian motivations for online retail shopping behavior. *Journal of Retailing*, 77(4), 511–535. doi:10.1016/S0022-4359(01)00056-2
- DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems*, 19(4), 9–30. doi:10.1080/07421222.2003.11045748
- Detlor, B., Hupfer, M. E., Ruhi, U., & Zhao, L. (2013). Information quality and community municipal portal use. *Government Information Quarterly*, 30(1), 23–32. doi:10.1016/j.giq.2012.08.004
- Doll, W. J., Xia, W., & Torkzadeh, G. (1994). A confirmatory factor analysis of the end-user computing satisfaction instrument. *Management Information Systems Quarterly*, 12(2), 259–274. doi:10.2307/248851
- E-commerce in Taiwan*. (2020). European Chamber of Commerce Taiwan. <https://www.ecct.com.tw/e-commerce-in-taiwan/>
- E-commerce in Taiwan, China* (2023, April). International Trade Portal. <https://www.lloydsbanktrade.com/en/market-potential/taiwan/ecommerce>
- English, L. (1999). *Improving data warehouse and business information quality*. Wiley & Sons.
- Eppler, M., & Mengis, J. (2004). The concept of information overload: A review of literature from organization science, accounting, marketing, MIS, and related disciplines. *The Information Society*, 20(5), 325–344. doi:10.1080/01972240490507974
- Eppler, M. J., & Wittig, D. (2000). Conceptualizing information quality: A review of information quality frameworks from the last ten years. *Proceedings of 5th International Conference on Information Quality*, (pp. 83–96). IEEE.
- Eysenbach, G., Powell, J., Kuss, O., & Sa, E. R. (2002). Empirical studies assessing the quality of health information for consumers on the world wide web: A systematic review. *Journal of the American Medical Association*, 287(20), 2691. doi:10.1001/jama.287.20.2691 PMID:12020305
- Fehrenbacher, D. (2016). Perceptions of information quality dimensions from the perspective of commodity theory. *Behaviour & Information Technology*, 35(4), 254–267. doi:10.1080/0144929X.2015.1128974

- Flanagin, A. J., Metzger, M. J., Pure, R., Markov, A., & Hartsell, E. (2014). Mitigating risk in ecommerce transactions: Perceptions of information credibility and the role of user-generated ratings in product quality and purchase intention. *Electronic Commerce Research*, 14(1), 1–23. doi:10.1007/s10660-014-9139-2
- Fox, C., Levitin, A., & Redman, T. (1993). The notion of data and its quality dimensions. *Information Processing & Management*, 30(1), 9–19. doi:10.1016/0306-4573(94)90020-5
- Ghasemaghaei, M., & Hassanein, K. (2015). Online information quality and consumer satisfaction: The moderating roles of contextual factors – A meta-analysis. *Information & Management*, 52(8), 965–981. doi:10.1016/j.im.2015.07.001
- Gorla, N., Somers, T. M., & Wong, B. (2010). Organizational impact of system quality, information quality, and service quality. *The Journal of Strategic Information Systems*, 19(3), 207–228. doi:10.1016/j.jsis.2010.05.001
- Guo, Y. M., & Klein, B. D. (2020). User perceptions of information quality in China: The boomerang decade. *Journal of the Midwest Association for Information Systems*, 2020(1), 9–30.
- Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate data analysis* (5th ed.). Prentice Hall.
- Hair, J. F., Hult, G., Ringle, C., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM)* (2nd ed.). Sage Publications, Inc.
- Helfert, M., & Foley, O. (2009). A context aware information quality framework. *Fourth International Conference on Cooperation and Promotion of Information Resources in Science and Technology*, (pp. 187-193).
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6(1), 1–55. doi:10.1080/10705519909540118
- Huang, K., Lee, Y. W., & Wang, R. Y. (1999). *Quality information and knowledge*. Prentice Hall.
- Huh, Y. U., Keller, F. R., Redman, T. C., & Watkins, A. R. (1990). Data quality. *Information and Software Technology*, 32(8), 559–565. doi:10.1016/0950-5849(90)90146-I
- Kahn, B. K., Strong, D. M., & Wang, R. Y. (2002). Information quality benchmarks: Product and service performance. *Communications of the ACM*, 45(4), 184–192. doi:10.1145/505248.506007
- Kaiser, H. F., & Rice, J. (1974). Little jiffy, mark IV. *Educational and Psychological Measurement*, 34(1), 111–117. doi:10.1177/001316447403400115
- Kalakota, R., & Robinson, M. (2001) e-Business 2.0: roadmap for success. Addison-Wesley.
- Kang, J. W., & Namkung, Y. (2019). The information quality and source credibility matter in customers' evaluation toward food O2O commerce. *International Journal of Hospitality Management*, 78, 189–198. doi:10.1016/j.ijhm.2018.10.011
- Katerattanakul, P., & Siau, K. (2008). Factors affecting the information quality of personal web portfolios. *Journal of the American Society for Information Science and Technology*, 59(1), 63–76. doi:10.1002/asi.20717
- Klein, B. D. (2001). User perceptions of data quality: Internet and traditional text sources. *Journal of Computer Information Systems*, 41(4), 9–15.
- Klein, B. D., & Callahan, T. J. (2007). A comparison of information technology professionals' and data consumers' perceptions of the importance of the dimensions of information quality. *International Journal of Information Quality*, 1(4), 392–411. doi:10.1504/IJIQ.2007.016715
- Klein, B. D., Guo, Y. M., & Zhou, C. (2011). Perceptions of the information quality of internet and traditional text sources among Chinese users of the internet. *International Journal of Information Quality*, 2(3), 231. doi:10.1504/IJIQ.2011.040670
- Klein, B. D., Guo, Y. M., & Zhou, C. (2014). Chinese perceptions of information quality on and off the Internet: A view from the second decade of the twenty-first century. *American Journal of Information Technology*, 4(1), 19–32.
- Klein, B. D., Guo, Y. M., & Zhou, C. (2016). Are importance ratings stable? A study of perceptions of information quality. *Journal of The Midwest Association for Information Systems*, 2016(1), 21–36. doi:10.17705/3jmw.00015

- Klein, B. D., Valero, M., & Guo, Y. M. (2011). An examination of the information quality perceptions of Mexican Internet users. *International Journal of Information Quality*, 2(4), 287–299. doi:10.1504/IJIQ.2011.043779
- Knight, S. A., & Burn, J. (2005). Developing a framework for assessing information quality on the world wide web. *Information Science Journal*, 8, 159–172. doi:10.28945/2854
- Koivumaki, T., Ristola, A., & Kesti, M. (2008). The effects of information quality of mobile information services on user satisfaction and service acceptance – Empirical evidence from Finland. *Behaviour & Information Technology*, 27(5), 375–385. doi:10.1080/01449290601177003
- Kullada, P., & Kurniadjie, C. R. M. (2020). Examining the influence of digital information quality on tourists' experience. *Journal of Quality Assurance in Hospitality & Tourism*, 1–27. doi:10.1080/1528008X.2020.1769522
- Lee, Y. W., Strong, D. M., Kahn, B. K., & Wang, R. Y. (2002). AIMQ: A methodology for information quality assessment. *Information & Management*, 40(2), 133–146. doi:10.1016/S0378-7206(02)00043-5
- Lillrank, P. (2003). The quality of information. *International Journal of Quality & Reliability Management*, 20(6), 691–703. doi:10.1108/02656710310482131
- Lin, H. F. (2010). An investigation into the effects of IS quality and top management support on ERP system usage. *Total Quality Management & Business Excellence*, 21(3), 335–349. doi:10.1080/14783360903561761
- Lukyanenko, R. (2016). Information quality research challenge: Information quality in the age of ubiquitous digital intermediation. *Journal of Data and Information Quality*, 7(1-2). 10.1145/2856038
- Madnick, S. E., Lee, Y. W., Wang, R. Y., & Zhu, H. (2009). Overview and framework for data and information quality research. *ACM Journal of Data and Information Quality* 1. ACM. . [https://doi.acm.org/10.1145.1515693.1516680](https://doi.acm.org/10.1145.1515693.151668010.1145/1515693.1516680)
- Maity, M. (2014). The role of information quality of a website: Examining consumer information search through the IS success model. *International Journal of Technology and Human Interaction*, 10(1), 61–82. doi:10.4018/ijthi.2014010105
- McKinney, V., Yoon, K., & Zahedi, F. M. (2002). The measurement of web-customer satisfaction: An expectation and disconfirmation approach. *Information Systems Research*, 13(3), 296–315. doi:10.1287/isre.13.3.296.76
- Melkas, H. (2004). Attention to information quality: The case of safety telephone services for ageing people in Finland. *Interdisciplinary Information Sciences*, 10(2), 83–97. doi:10.4036/iis.2004.83
- Michnik, J., & Lo, M. C. (2009). The assessment of the information quality with the aid of multiple criteria analysis. *European Journal of Operational Research*, 195(3), 850–856. doi:10.1016/j.ejor.2007.11.017
- Miller, H. (1996). The multiple dimensions of information quality. *Information Systems Management*, 13(2), 79–82. doi:10.1080/10580539608906992
- Miller, H. (2005). Information quality and market share in electronic commerce. *Journal of Services Marketing*, 19(2), 93–102. doi:10.1108/08876040510591402
- Muslichah, M. (2018). The effect of self efficacy and information quality on behavioral intention with perceived usefulness as intervening variable. *JABM Journal of Accounting - Business & Management*, 1(25), 21-34.
- Naumann, F. (2002). *Quality-driven query answering for integrated information systems*. Springer-Verlag. doi:10.1007/3-540-45921-9
- Nicolaou, A. I., Ibrahim, M., & van Heck, E. (2013). Information quality, trust, and risk perceptions in electronic data exchanges. *Decision Support Systems*, 54(2), 986–996. doi:10.1016/j.dss.2012.10.024
- Nunnally, J. C. (1978). *Psychometric theory*. McGraw-Hill.
- O'Reilly, C. A. III. (1980). Individuals and information overload in organizations: Is more necessarily better? *Academy of Management Journal*, 23(4), 684–696. <https://0-search-proquest-com.wizard.umd.umich.edu/scholarly-journals/individuals-information-overload-organizations-is/docview/229608850/se-2?accountid=14578>. doi:10.2307/255556
- Paradice, D., & Fuerst, W. (1991). An MIS data quality methodology based on optimal error detection. *Journal of Information Systems*, 5(1), 48–66.

- Pearson, A., Tadisina, S., & Griffin, C. (2012). The role of e-service quality and information quality in creating perceived value: Antecedents to web site loyalty. *Information Systems Management*, 29(3), 201–215. doi:10.1080/10580530.2012.687311
- Peter, G. R. (2019). Information overload in the information age: A review of the literature from business administration, business psychology, and related disciplines with a bibliometric approach and framework development. *Business Research*, 12(2), 479–522. doi:http://0-dx.doi.org.wizard.umd.umich.edu/10.1007/s40685-018-0069-z
- Petro, G. (2019, Mar 29). More per visit in-store than online. What does this mean for retailers? *Forbes*. <https://www.forbes.com/sites/gregpetro/2019/03/29/consumers-are-spending-more-per-visit-in-store-than-online-what-does-this-mean-for-retailers/?sh=7e2c5c5d7543>
- Pipino, L. L., Lee, Y. W., & Wang, R. Y. (2002). Data quality assessment. *Communications of the ACM*, 45(4), 211–218. doi:10.1145/505248.506010
- Stefanovic, D., Marjanovic, U., Delic, M., Culibrk, D., & Lalic, B. (2016). Assessing the success of e-government systems: An employee perspective. *Information & Management*, 53(6), 717–726. doi:10.1016/j.im.2016.02.007
- Strong, D. M., Lee, Y. W., & Wang, R. Y. (1997). Data quality in context. *Communications of the ACM*, 40(5), 103–110. doi:10.1145/253769.253804
- Swaid, S., & Wigand, R. (2009). Measuring the quality of e-service: Scale development and initial validation. *Journal of Electronic Commerce Research*, 19(1), 13–28.
- Tayi, G. K., & Ballou, D. P. (1998). Examining data quality. *Communications of the ACM*, 41(2), 54–57. doi:10.1145/269012.269021
- Thong, J. Y. L., Hong, S. J., & Tam, K. Y. (2006). The effects of post-adoption beliefs on the expectation-confirmation model for information technology continuance. *International Journal of Human-Computer Studies*, 64(9), 799–810. doi:10.1016/j.ijhcs.2006.05.001
- Turel, O., Serenko, A., & Bontis, N. (2010). User acceptance of hedonic digital artifacts: A theory of consumption values Perspective. *Information & Management*, 47(1), 53–59. doi:10.1016/j.im.2009.10.002
- United Nations. (2008). International standard industrial classification of all economic activities. UN.. https://unstats.un.org/unsd/publication/SeriesM/seriesm_4rev4e.pdf
- Urbach, N., Smolnik, S., & Riempp, G. (2010). An empirical investigation of employee portal success. *The Journal of Strategic Information Systems*, 19(3), 184–206. doi:10.1016/j.jsis.2010.06.002
- van der Heijden, H. (2004). User acceptance of hedonic information systems. *Management Information Systems Quarterly*, 28(4), 695–704. doi:10.2307/25148660
- Varshney, U., & Vetter, R. (2002). Mobile commerce: Framework, applications and networking support. *Mobile Networks and Applications*, 7(3), 185–198. doi:10.1023/A:1014570512129
- Venkatesh, V. Y. L., Thong, J., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *Management Information Systems Quarterly*, 36(1), 157. doi:10.2307/41410412
- Wahyudi, A., Kuk, G., & Janssen, M. (2018). A process pattern model for tackling and improving big data quality. *Information Systems Frontiers*, 20(3), 457–469. doi:10.1007/s10796-017-9822-7
- Wakefield, R. L., & Whitten, D. (2006). Mobile computing: A user study on hedonic/utilitarian mobile device usage. *European Journal of Information Systems*, 15(3), 292–300. doi:10.1057/palgrave.ejis.3000619
- Wan, X., & Chen, J. (2019). The relationship between platform choice and supplier's efficiency - Evidence from China's online to offline (O2O) e-commerce platforms. *Electronic Markets*, 29(2), 153–166. doi:10.1007/s12525-017-0280-3
- Wang, R., & Strong, D. (1996). Beyond accuracy: What data quality means to data consumers. *Journal of Management Information Systems*, 12(4), 5–33. doi:10.1080/07421222.1996.11518099

- Wang, R. Y. (1998). A product perspective on total data quality management. *Communications of the ACM*, 41(2), 58–65. doi:10.1145/269012.269022
- Xiao, L., Fu, B., & Liu, W. (2018). Understanding consumer repurchase intention on O2O platforms: An integrated model of network externalities and trust transfer theory. *Service Business*, 12(4), 731–756. doi:10.1007/s11628-018-0370-0
- Xiao, L., Mi, C., Zhang, Y., & Ma, J. (2019). Examining consumers' behavioral intention in O2O commerce from a relational perspective: An exploratory study. *Information Systems Frontiers*, 21(5), 1045–1068. doi:10.1007/s10796-017-9815-6
- Xu, J., Benbasat, I., & Cenfetelli, R. (2013). Integrating service quality with system and information quality: An empirical test in the e-service context. *Management Information Systems Quarterly*, 37(3), 777–794. doi:10.25300/MISQ/2013/37.3.05
- Yaari, E., Baruchson-Arbib, S., & Bar-Ilan, J. (2011). Information quality assessment of community-generated content – A user study of Wikipedia. *Journal of Information Science*, 37(5), 487–498. doi:10.1177/0165551511416065
- Yi, M. Y., Yoon, J. J., Davis, J. M., & Lee, T. (2013). Untangling the antecedents of initial trust in Web-based health information: The roles of argument quality, source expertise, and user perceptions of information quality and risk. *Decision Support Systems*, 55(1), 284–295. doi:10.1016/j.dss.2013.01.029
- Yoshikuni, A. C., Dwivedi, R., Dutra-de-Lima, R. G., Parisi, C., & Oyadomari, J. C. T. (2023). Role of emerging technologies in accounting information systems for achieving strategic flexibility through decision-making performance: An exploratory study based on North American and South American firms. *Global Journal of Flexible Systems Management*, 24(2), 199–218. doi:10.1007/s40171-022-00334-9
- Zheng, Y., Zhao, K., & Stylianou, A. (2013). The impacts of information quality and system quality on users' continuance intention in information-exchange virtual communities: An empirical investigation. *Decision Support Systems*, 56, 513–524. doi:10.1016/j.dss.2012.11.008

APPENDIX

Selected Research on Information Quality

Table 13. Selected research on information quality

Research	Focus	Methods/Subjects	Major dimensions
Miller (1996)	Define information quality dimensions from user perspective	Opinion	<ol style="list-style-type: none"> 1. Relevance 2. Accuracy 3. Timeliness 4. Completeness 5. Coherence 6. Format 7. Accessibility 8. Compatibility 9. Security 10. Validity
McKinney et al. (2002)	Web customers' information needs	Survey of 586 students (web shoppers)	<ol style="list-style-type: none"> 1. Relevance: applicable, related, clear 2. Timeliness: current, continuously updated 3. Reliability: believability, accurate, consistent 4. Scope: sufficient, complete, covers a wide range, detailed 5. Perceived usefulness: informative, valuable, instrumental
Kahn et al. (2002)	Develop a two-by-two conceptual model for describing information quality from a product and service performance perspective	Study 1: 45 professionals, Study 2: survey of 75 in each 3 healthcare companies	<ol style="list-style-type: none"> 1. Sound information: free of error, concise representation, completeness, consistent representation 2. Dependable information: timeliness, security 3. Useful information: appropriate amount, relevancy, understandability, interpretability, objectivity 4. Usable information: believable, accessible, ease of manipulation, reputation, value-added
Lee et al. (2002)	Develop a methodology for assessing information quality	Survey of 261 respondents in five organizations.	<ol style="list-style-type: none"> 1. Accessibility 2. Appropriate Amount 3. Believability 4. Completeness 5. Concise Representation 6. Consistent Representation 7. Ease of Operation 8. Free of Error 9. Interpretability 10. Objectivity 11. Relevancy 12. Reputation 13. Security 14. Timeliness 15. Understandability
DeLone and Mclean (2003)	Update D&M success model, its application for e-commerce	Literature review	<ol style="list-style-type: none"> 1. Completeness 2. Ease of understanding 3. Personalization 4. Relevance 5. Security

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Table 13. Continued

Research	Focus	Methods/Subjects	Major dimensions
Melkas (2004)	Information quality within multi-actor service networks offering safety telephone services for aging people	Structured interviews and written questionnaires of 40 participants from several companies	All dimensions from Wang and Strong (1996); additional attributes include traceability, appropriate velocity, flexibility, cost effectiveness, ease of operation, authority of person handling, and sustainability
Miller (2005)	Information quality's effect on market share in e-commerce	Simulation of 3 firms, over 40 periods	1. Intrinsic IQ 2. Contextual IQ 3. Representational IQ 4. Accessibility IQ
Katerattanakul and Siau (2008)	Refine and validate an instrument to assess information quality of personal web portfolio	Pilot study: 64 participants Main study: 307 students	1. Presentation Quality 2. Contextual Quality 3. Accessibility Quality
Michnik and Lo (2009)	Develop strategies for improving information quality	Focus groups of experts, case study	In addition to all dimensions from Wang and Strong (1996), Convenience
Gorla et al. (2010)	Impact of information quality on organizations	Survey of 90 managers	Content, Format
Başkarada (2011)	The effect of spreadsheet on information quality	Ethnographical study of user behaviors in a big company	All dimensions from Wang and Strong (1996)
Urbach et al. (2010)	Company portal websites	Online survey of 6,210 employees from 22 companies	1. Useful 2. Understandable 3. Interesting 4. Reliable 5. Complete 6. Up-to-date
Xu et al. (2013)	Information quality's effect on website adoption, in addition to system quality and service quality	Experiments of four types of services, 128 subjects	1. Completeness 2. Accuracy 3. Format 4. Currency
Fehrenbacher (2016)	The influence of satisfaction and complexity and their information quality tradeoffs.	121 students of one large German and one large Irish university	1. Accessible 2. Accurate 3. Believable 4. Complete 5. Concise 6. Consistently represented 7. Secure 8. Timely
Wahyudi et al. (2018)	Develop a generic process pattern model for improving big data quality.	A case study of a large telecom company	All dimensions from Wang and Strong (1996)
Guo and Klein (2020)	Longitudinal studies of user perceptions of information quality of Internet sources and traditional text sources in China	A series of studies of survey of college students	All dimensions from Wang and Strong (1996)

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