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Information Quality of E-Commerce Websites: Changes of Expectation and Satisfaction Over Time

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INFORMATION QUALITY OF E-COMMERCE WEBSITES: CHANGES OF EXPECTATION AND SATISFACTION OVER TIME

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ABSTRACT

Information quality of e-commerce websites has been considered as one of the most important factors which affect users' trust and intention to purchase from the websites. There are two main objectives of this study. The first objective is to study how users' (1) expectations and (2) satisfactions toward information quality of e-commerce websites change over time. The second objective is to compare users' expectations and satisfactions toward information quality of e-commerce websites. The data were collected twice from Thai Internet users. The first data collection was in year 2011 with 365 usable responses and the second data collection was in year 2014 with 416 usable responses. T-tests and Paired-samples t-tests were applied to the collected data. The hypothesis testing results reveal that users' expectations toward information quality of e-commerce websites have increased significantly from 2011 to 2014 in almost all attributes of information quality (except for 'timeliness' and 'completeness' qualities). Users' satisfactions toward information quality of e-commerce websites have increased significantly in all attributes of information quality. Moreover, users' expectations are significantly higher than satisfactions in all aspects of information quality toward e-commerce websites, in years 2011 and 2014.

Keywords: Information quality, e-commerce, user expectation, user satisfaction, data quality.

BACKGROUND AND SIGNIFICANCE OF THE STUDY

Websites have become very important channels for businesses to communicate with their e-commerce customers. A number of studies reveal that information quality is one of the important factors to measure website quality [1][3][6], and website quality leads to customer's trust, purchase intention, and finally, website success [2][9][11][12]. Zhang and von Dran [17] studied user expectations and ranking of quality factors in different website domains. They reported that customer quality expectations change over time.

Most studies on data and information quality measure quality attributes such as accuracy, correctness, timeliness, completeness, relevancy, and reliability. Other researchers developed different and more complicate frameworks to measure data or information quality [7][8][15][16]. Original researchers in this field include Wang and Strong [15] who developed a framework with 15 quality attributes to measure data and information quality. These 15 attributes are grouped into four dimensions which are (1) Intrinsic quality (accuracy, objectivity, believability, and reputation), (2) Context quality (relevancy, timeliness, completeness, value-added, and appropriate amount of data), (3) Representational quality (ease of understanding, interpretability, representation, and concise representation), and (4) Accessibility quality (accessibility and access security).

According to Thailand Internet User Profile 2014 by Electronic Transactions Development Agency (Public Organization)[5], the top three reasons Thai Internet users decide to do online shopping are attractive discount or promotions on the websites (72.1%), high quality of information on websites (67.3%), and website security system (65.2%). Since information quality can lead to higher purchase intention from e-commerce websites, it is very important to understand which quality attributes customers expect and are still not satisfied with. E-commerce vendors can focus on improving those specific quality attributes of their websites and improve customers' satisfactions. This study uses 15 quality attributes from Wang and Strong's framework [15] to measure Thai Internet users' expectations and satisfactions toward information quality of e-commerce websites and examines how users' quality expectations and satisfactions change over time.

The remainder of this paper is organized into four sections. Section 2 is an explanation of information quality dimensions and attributes used in this research. Research objectives, hypotheses, research instrument development, and data collection are in Section 3, Research Methodology. Data analysis and hypothesis testing results are included in Section 4. And, finally, conclusion is presented in Section 5.

INFORMATION QUALITY DIMENSIONS AND ATTRIBUTES

As mentioned earlier, Wang and Strong [15] proposed data and information quality aspects that are important to data consumers and can be applied with Internet users. Their framework consists of four quality dimensions with 15 attributes. The four dimensions are (1) Intrinsic quality, (2) Context quality, (3) Representational quality, and (4) Accessibility quality. Quality dimensions and attributes in each dimension as well as their meaning are presented in Table 1.

Table 1: Quality dimensions, attributes in each dimension and their meaning (from Wang and Strong [15])

Quality Dimension	Attributes	Meaning
Intrinsic	1. Accuracy	Data is certified, error-free, correct, precise
	2. Objectivity	Unbiased, objective
	3. Believability	Believable
	4. Reputation	Reputation of the data source, reputation of the data
Contextual	1. Relevancy	Applicable, relevant, interesting, usable
	2. Timeliness	Age of data
	3. Completeness	Breath, depth, and scope of information contained in the data
	4. Value-added	Data give you a competitive edge, data add value to your operation
	5. Appropriate amount of data	The amount of data
Representational	1. Ease of understanding	Easily understood, clear, readable
	2. Interpretability	Interpretable
	3. Representational consistency	Data are continuously presented in the same format, consistently represented, consistently formatted, data are compatible with previous data
	4. Concise representation	Well presented, concise, compactly represented, well-organized, well formatted, format of data
Accessibility	1. Accessibility	Accessible, retrievable, speed of access, available
	2. Access security	Data cannot be accessed by competitors, access to data can be restricted, secure

RESEARCH METHODOLOGY

Research Objectives

The objectives of this research are:

- to study how users' *expectations* toward information quality of e-commerce websites change over time
- to study how users' *satisfactions* toward information quality of e-commerce websites change over time
- to compare users' *expectations* and *satisfactions* toward information quality of e-commerce websites.

To fulfill these research objectives, an empirical study was conducted with two data collections, one in year 2011 and another one in year 2014. The data were collected from Thai Internet users on their expectations and satisfactions toward information quality of e-commerce websites. After that, statistical analysis, both descriptive and referential statistical analysis were performed on the collected data.

Hypotheses

There are three main hypotheses in this study.
H1: Users' expectations toward information quality of e-commerce websites increase over time.
H2: Users' satisfactions toward information quality of e-commerce websites increase over time.
H3: Users' expectations toward information quality of e-commerce websites are higher than their satisfactions.

Research Instrument Development

A self-report questionnaire was selected as the research instrument in this study. There were five demographic questions on gender, age, education level, occupation, and Internet usage experience. Respondents were also asked to give examples of e-commerce websites which they have visited. After that, the respondents were asked to rate their expectations and satisfactions toward information quality of e-commerce websites. Each of 15 quality attributes from Wang and Strong's framework [15] was measured using a five-point score ranging from 1 for "least expected" (for expectation) or "least satisfied" (for satisfaction), to 5 for "most expected" (for expectation) or "most satisfied" (for satisfaction). The Thai translation of 15 quality attributes' definitions on the questionnaire was adopted from Rattanawicha, Tangmanee, and Gullep [13].

Data Collection

The data in this study were collected twice, in year 2011 and year 2014 from self-reported questionnaires. 500 questionnaires were collected each year using a convenience sampling, from Internet users in Bangkok and Greater Bangkok area in Thailand. For year 2011, 135 questionnaires were discarded because of incomplete information or respondents' giving the same rating for all quality factors, leaving 365 usable responses. For year 2014, 84 questionnaires were discarded for similar reasons, leaving 416 usable responses. A summary of demographic information of respondents is shown in Table 2. The samples in year 2011 and year 2014 were about 60% female. 40% of them were between 20 and 29 years old. Major part of the respondents had Bachelor's degree, were company employees, and had more than 5 years of Internet experience.

Table 2: Summary of respondents' demographic information

Demographics	Distribution in Year 2011	Distribution in Year 2014
Number of usable responses	365	416
Gender	35.9% male 64.1% female	38.7% male 61.3% female
Age	9.3% < 20 years old 41.9% 20 - 29 years old 32.9% 30 - 39 years old 12.1% 40 - 49 years old 3.8% > or equal to 50 years old	8.9% < 20 years old 40.4% 20 - 29 years old 35.8% 30 - 39 years old 9.9% 40 - 49 years old 5.0% > or equal to 50 years old
Education level	18.7% with no university degree 63.8% with Bachelor's degree 17.5% with Master's or Doctorate degree	31.0% with no university degree 56.5% with Bachelor's degree 12.5% with Master's or Doctorate degree
Occupation	15.6% Student 54.8% Company Employee 15.9% Government Officer 7.1% Business Owner 6.6% Other Occupations	17.3% Student 45.2% Company Employee 19.7% Government Officer 8.9% Business Owner 8.9% Other Occupations
Internet Experience	3.3% < 1 year of experience 23.3% 1 – 5 years of experience 36.7% 6 – 10 years of experience 36.7% > 10 years of experience	1.0% < 1 year of experience 25.7% 1 – 5 years of experience 26.7% 6 – 10 years of experience 46.6% > 10 years of experience

DATA ANALYSIS AND HYPOTHESIS TESTING RESULTS

Changes of Users' Expectations toward Information Quality of E-commerce Websites

Descriptive Statistics

E-commerce websites which respondents visited include, for examples, www.ebay.com, www.amazon.com, www.agoda.co.th, www.tarad.com, www.pantipmarket.com, www.chulabook.com, www.7catalog.com, www.nokair.com, www.weloveshopping.com, and www.olx.co.th. Figure 1 and Table 3 indicate that Thai Internet users' expectations toward information quality of e-commerce websites have increased in year 2014 (from year 2011) in all attributes of information quality. Users had very high expectations in 'Timeliness' and 'Accessibility' qualities of information in years 2011 and 2014. In 2014, users also pay much attention to 'Relevancy' of information, while in 2011; users had more expectations for 'Ease of Understanding' quality.

Referential Statistics

To answer how Internet users' expectations toward information quality of e-commerce websites change from year 2011 to year 2014, t-tests were performed on the collected data. Differences of mean values between expectations toward information quality in year 2014 and year 2011, and results of hypothesis testing at 95% level of significance are presented in Table 3.

Hypothesis H1 testing results indicate that Thai Internet users have *significantly higher* expectations toward information quality of e-commerce websites for all attributes of quality, except for 'Timeliness' and 'Completeness' qualities which the expectations in year 2014 are higher than those in year 2011, but not significantly higher.

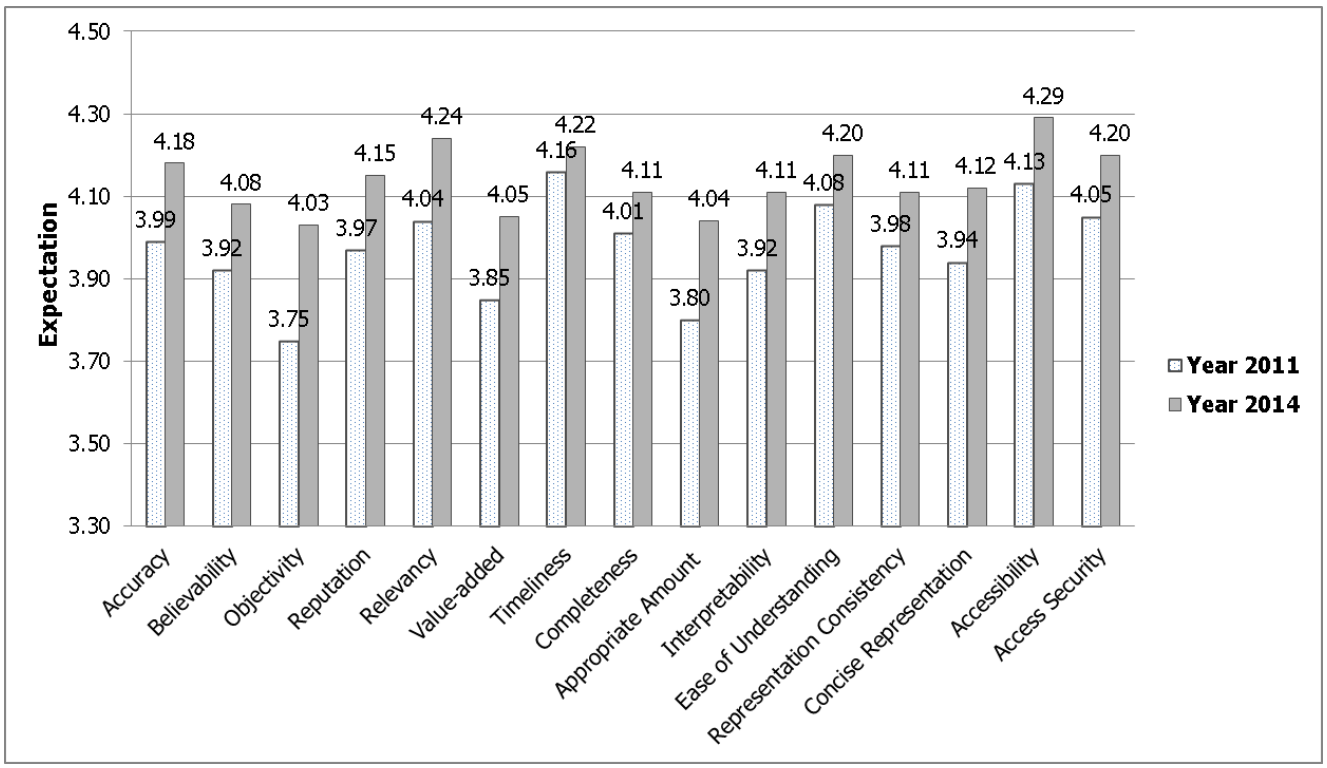

Figure 1: Users' Expectations toward Information Quality of E-commerce Websites in 2011 and 2014

Table 3: Users' Expectations toward Information Quality of E-commerce Websites in 2011 and 2014, and Hypothesis Testing Results

Information Quality Dimension	Expectations in Year 2011			Expectations in Year 2014			Differences of Expectations between Year 2014 and Year 2011			
	Mean	Std.	Rank	Mean	Std.	Rank	Mean	Std.	Rank	Sig.
Intrinsic Quality										
Accuracy	3.99	.902	7	4.18	.810	5	0.19	.061	4	.002
Believability	3.92	.808	11	4.08	.805	9	0.16	.058	6	.006
Objectivity	3.75	.964	14	4.03	.862	12	0.28	.066	1	.000
Reputation	3.97	.908	9	4.15	.826	6	0.18	.063	5	.005
Contextual Quality										
Relevancy	4.04	.904	5	4.24	.815	2	0.20	.062	3	.001
Value-added	3.85	.931	12	4.05	.885	10	0.20	.066	3	.002
Timeliness	4.16	.869	1	4.22	.812	3	0.06	.061	11	.300
Completeness	4.01	.882	6	4.11	.852	8	0.10	.063	10	.134
Appropriate Amount	3.80	.907	13	4.04	.823	11	0.24	.063	2	.000
Representational Quality										
Interpretability	3.92	.909	11	4.11	.876	8	0.19	.065	4	.003
Ease of Understanding	4.08	.837	3	4.20	.787	4	0.12	.059	9	.033
Representation Consistency	3.98	.849	8	4.11	.860	8	0.13	.062	8	.033
Concise Representation	3.94	.922	10	4.12	.857	7	0.18	.065	5	.005
Accessibility Quality										
Accessibility	4.13	.878	2	4.29	.793	1	0.16	.061	6	.012
Access Security	4.05	.926	4	4.20	.893	4	0.15	.066	7	.026

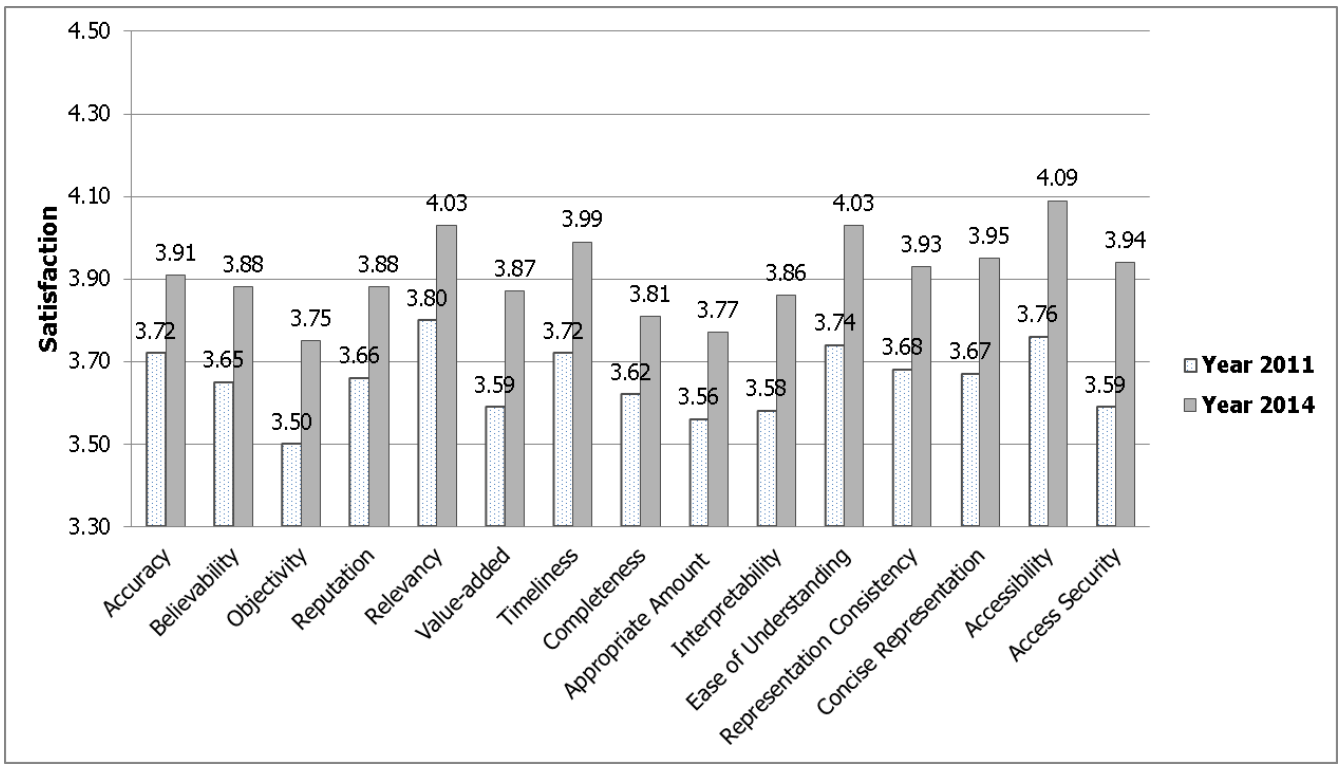

Figure 2: Users' Satisfactions toward Information Quality of E-commerce Websites in 2011 and 2014

Table 4: Users' Satisfactions toward Information Quality of E-commerce Websites in 2011 and 2014, and Hypothesis Testing Results

Information Quality Dimension	Satisfactions in Year 2011			Satisfactions in Year 2014			Differences of Satisfactions between Year 2014 and Year 2011			
	Mean	Std.	Rank	Mean	Std.	Rank	Mean	Std.	Rank	Sig.
Intrinsic Quality										
Accuracy	3.72	.855	4	3.91	.802	7	0.19	.059	10	.001
Believability	3.65	.824	8	3.88	.773	8	0.23	.057	7	.000
Objectivity	3.50	.909	13	3.75	.840	13	0.25	.063	6	.000
Reputation	3.66	.893	7	3.88	.892	8	0.22	.065	8	.001
Contextual Quality										
Relevancy	3.80	.867	1	4.03	.825	2	0.23	.061	7	.000
Value-added	3.59	.918	10	3.87	.911	9	0.28	.066	4	.000
Timeliness	3.72	1.011	4	3.99	.868	3	0.27	.068	5	.000
Completeness	3.62	.928	9	3.81	.896	11	0.19	.066	10	.005
Appropriate Amount	3.56	.916	12	3.77	.842	12	0.21	.064	9	.001
Representational Quality										
Interpretability	3.58	.935	11	3.86	.873	10	0.28	.065	4	.000
Ease of Understanding	3.74	.935	3	4.03	.805	2	0.29	.063	3	.000
Representation Consistency	3.68	.912	5	3.93	.830	6	0.25	.064	6	.000
Concise Representation	3.67	.939	6	3.95	.843	4	0.28	.065	4	.000
Accessibility Quality										
Accessibility	3.76	.969	2	4.09	.817	1	0.33	.065	2	.000
Access Security	3.59	.987	10	3.94	.884	5	0.35	.068	1	.000

Changes of Users' Satisfactions toward Information Quality of E-commerce Websites

Descriptive Statistics

It is found from Figure 2 and Table 4 that similar to users' expectations; their satisfactions toward information quality of e-commerce websites are higher in year 2014 than those in year 2011 for all attributes of information quality. Users have very

high satisfactions in 'Accessibility', 'Relevancy', and 'Ease of Understanding' qualities of information in both 2011 and 2014.

Referential Statistics

To study how Internet users' satisfactions toward information quality of e-commerce websites change from year 2011 to year 2014, t-tests were again performed on the collected data. Differences of mean values between users' satisfactions toward information quality in year 2014 and year 2011, and results of hypothesis testing at 95% level of significance are presented in Table 4.

Hypothesis testing results indicate that Thai Internet users have *significantly higher* satisfactions toward information quality of e-commerce websites for all attributes of quality. Hence, Hypothesis H2 is accepted.

Comparison of Users' Expectations and Satisfactions toward Information Quality of E-commerce Websites

Descriptive Statistics

Figure 3 and Figure 4 show that, in year 2011 and year 2014, users' expectations are higher than their satisfactions toward information quality of e-commerce websites for all attributes of information quality.

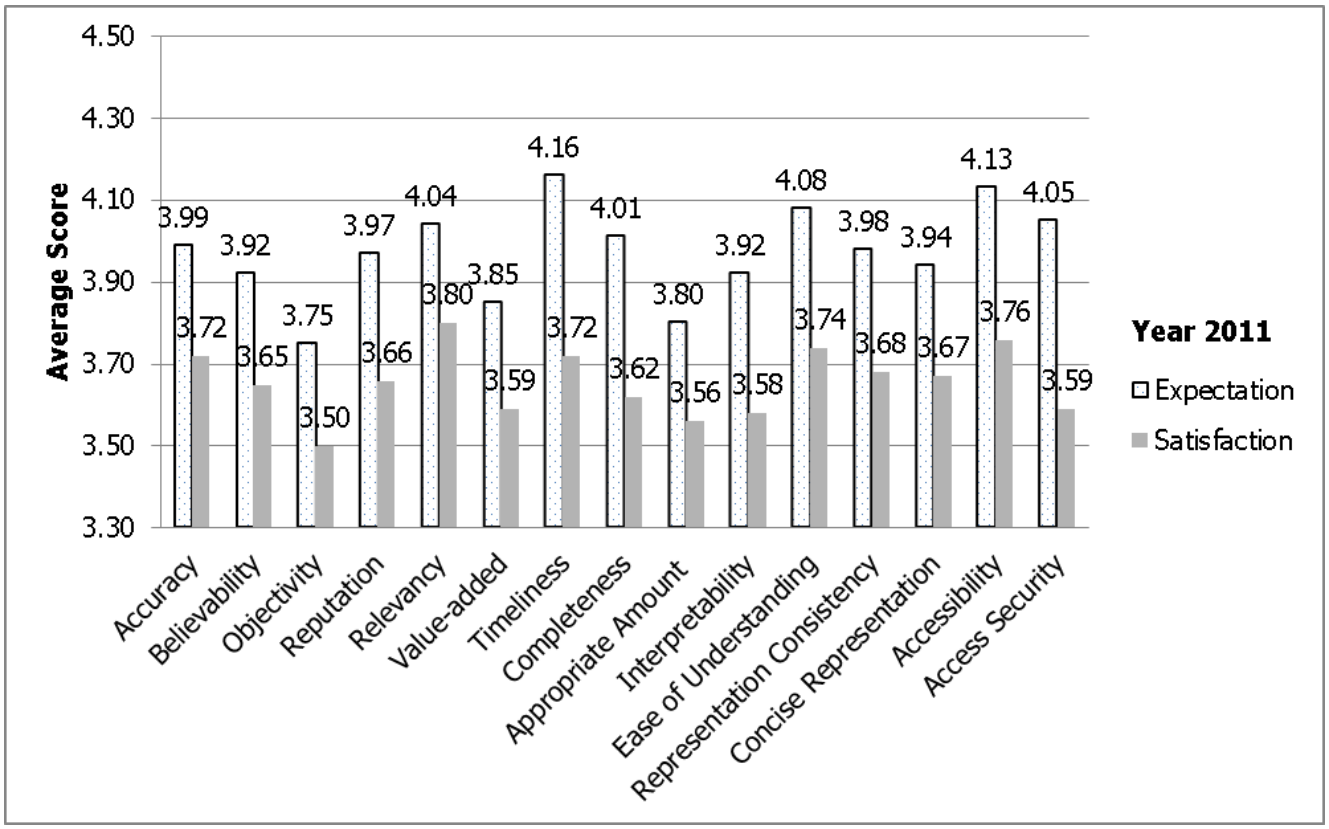

Figure 3: Users' Expectations and Satisfactions toward Information Quality of E-commerce Websites in 2011

Referential Statistics

To compare the differences between Internet users' expectations and satisfactions on information quality of e-commerce, we performed paired-samples t-tests on the collected data. Comparisons of mean values between expectations and satisfactions on information quality and results of hypothesis testing at 95% level of significance are presented in Table 4, for year 2011, and in Table 5, for year 2014.

Table 4 indicates that, in year 2011, Thai Internet users have *significantly higher* expectations than satisfactions toward information quality of e-commerce websites for all attributes of quality. The biggest gaps between expectations and satisfactions are those of 'Access Security', 'Timeliness', and 'Completeness' qualities.

For year 2014, we found similar results from Table 5 that users have *significantly higher* expectations than satisfactions toward information quality of e-commerce websites for all attributes of quality. However, for year 2014, the biggest gaps between expectations and satisfactions are the gaps of 'Completeness', and 'Objectivity' qualities. From Table 4 and Table 5, Hypothesis H3 is accepted.

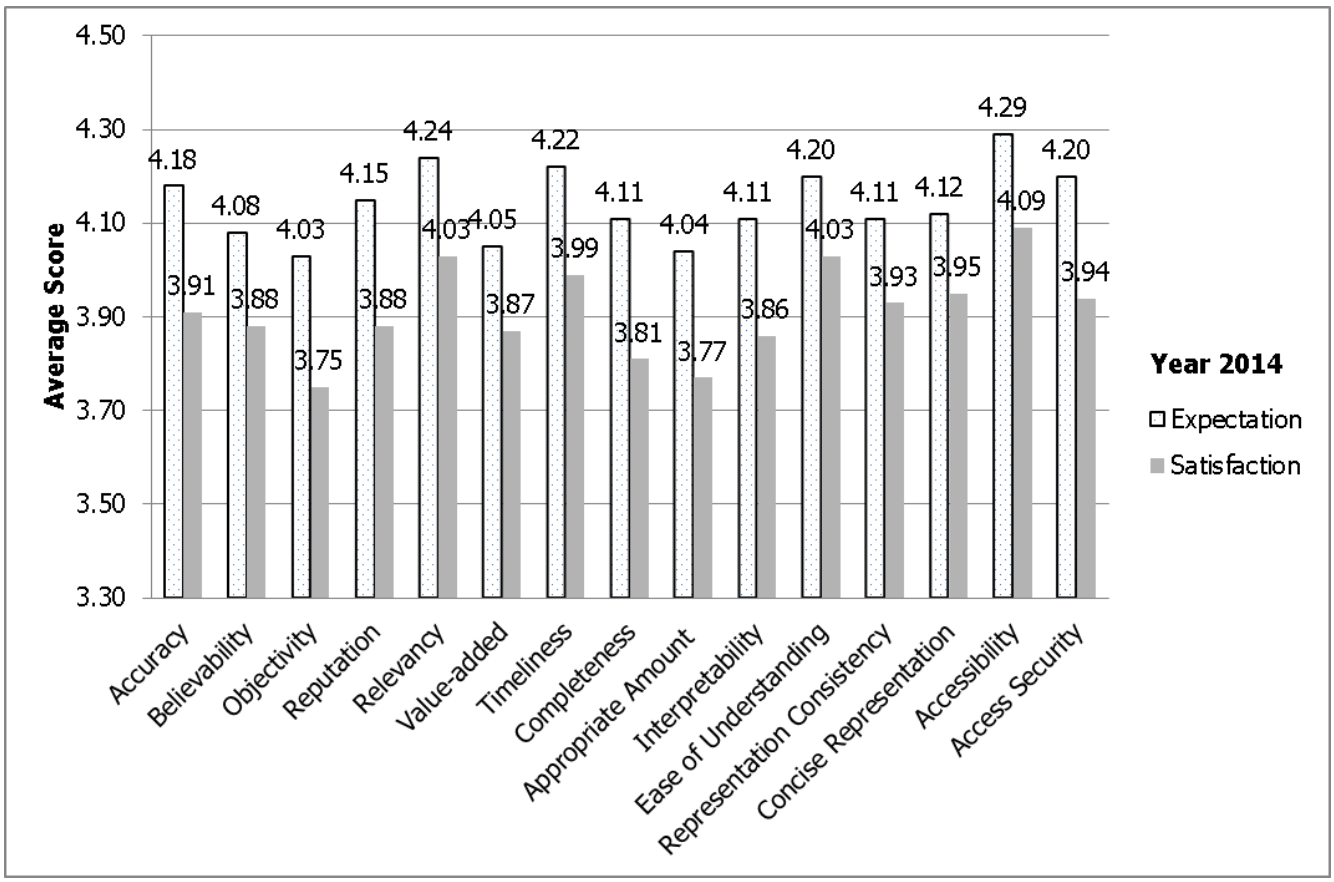

Figure 4: Users' Expectations and Satisfactions toward Information Quality of E-commerce Websites in 2014

Table 4: Comparison of Users' Expectations and Satisfactions toward Information Quality of E-commerce Websites in *Year 2011* and Hypothesis Testing Results

Information Quality Dimension	Expectations			Satisfactions			Differences between Expectations and Satisfactions in Year 2011			
	Mean	Std.	Rank	Mean	Std.	Rank	Mean	Std.	Rank	Sig.
Intrinsic Quality										
Accuracy	3.99	.902	7	3.72	.855	4	0.27	.841	8	.000
Believability	3.92	.808	11	3.65	.824	8	0.27	.804	8	.000
Objectivity	3.75	.964	14	3.50	.909	13	0.25	.837	10	.000
Reputation	3.97	.908	9	3.66	.893	7	0.31	.920	6	.000
Contextual Quality										
Relevancy	4.04	.904	5	3.80	.867	1	0.24	.900	11	.000
Value-added	3.85	.931	12	3.59	.918	10	0.26	.875	9	.000
Timeliness	4.16	.869	1	3.72	1.011	4	0.44	1.059	2	.000
Completeness	4.01	.882	6	3.62	.928	9	0.39	.906	3	.000
Appropriate Amount	3.80	.907	13	3.56	.916	12	0.24	.997	11	.000
Representational Quality										
Interpretability	3.92	.909	11	3.58	.935	11	0.34	.992	5	.000
Ease of Understanding	4.08	.837	3	3.74	.935	3	0.34	.886	5	.000
Representation Consistency	3.98	.849	8	3.68	.912	5	0.30	.912	7	.000
Concise Representation	3.94	.922	10	3.67	.939	6	0.27	.978	8	.000
Accessibility Quality										
Accessibility	4.13	.878	2	3.76	.969	2	0.37	.962	4	.000
Access Security	4.05	.926	4	3.59	.987	10	0.46	.963	1	.000

Table 5: Comparison of Users' Expectations and Satisfactions toward Information Quality of E-commerce Websites in *Year 2014* and Hypothesis Testing Results

Information Quality Dimension	Expectations			Satisfactions			Differences between Expectations and Satisfactions in Year 2014			
	Mean	Std.	Rank	Mean	Std.	Rank	Mean	Std.	Rank	Sig.
Intrinsic Quality										
Accuracy	4.18	.810	5	3.91	.802	7	0.27	.809	3	.000
Believability	4.08	.805	9	3.88	.773	8	0.20	.772	8	.000
Objectivity	4.03	.862	12	3.75	.840	13	0.28	.837	2	.000
Reputation	4.15	.826	6	3.88	.892	8	0.27	.859	3	.000
Contextual Quality										
Relevancy	4.24	.815	2	4.03	.825	2	0.21	.774	7	.000
Value-added	4.05	.885	10	3.87	.911	9	0.18	.772	9	.000
Timeliness	4.22	.812	3	3.99	.868	3	0.23	.834	6	.000
Completeness	4.11	.852	8	3.81	.896	11	0.30	.812	1	.000
Appropriate Amount	4.04	.823	11	3.77	.842	12	0.27	.851	3	.000
Representational Quality										
Interpretability	4.11	.876	8	3.86	.873	10	0.25	.918	5	.000
Ease of Understanding	4.20	.787	4	4.03	.805	2	0.17	.852	10	.000
Representation Consistency	4.11	.860	8	3.93	.830	6	0.18	.812	9	.000
Concise Representation	4.12	.857	7	3.95	.843	4	0.17	.778	10	.000
Accessibility Quality										
Accessibility	4.29	.793	1	4.09	.817	1	0.20	.856	8	.000
Access Security	4.20	.893	4	3.94	.884	5	0.26	.913	4	.000

CONCLUSION

This study has two main objectives: (1) to study how users' expectations and satisfactions toward information quality of e-commerce websites change over time, and (2) to compare users' expectations and satisfactions toward information quality of e-commerce websites. Information quality is measured using 15 quality attributes from Wang and Strong's framework [15]. Based on two data collections, in year 2011 and year 2014, it is found that Thai Internet users' expectations toward information quality of e-commerce websites are significantly higher when time passes. This is consistent with study by Zhang and von Dran [17] that quality expectations changes over time. The study results show that users' satisfactions toward information quality of e-commerce websites are significantly higher in year 2014; there are still big gaps between users' expectations and satisfactions toward information quality of e-commerce websites, as show in Figure 5 and Figure 6. In year 2011, from Figure 5, users had 'high' or 'very high' expectations toward information quality of e-commerce websites. However, the satisfactions were at only 'high' level. Figure 6 indicates that in year 2014, users have 'very high' expectations toward information quality of e-commerce websites, but the satisfactions are mostly at 'high' level.

Results of this study can be used as a guideline for web vendors to improve information quality on their websites. For example, 'Completeness' and 'Objectivity' qualities of information must be improved quickly because of the big gap between users' expectations and satisfactions in year 2014. Moreover, web vendors have to pay more attention to 'Timeliness' and 'Accessibility' qualities since users have very high expectations for these qualities in year 2011 and year 2014.

For future research, similar studies can be conducted for different website domains, for example, e-government websites, financial/banking websites, entertainment websites, and so on, in order to learn and compare important information quality attributes for each domain.

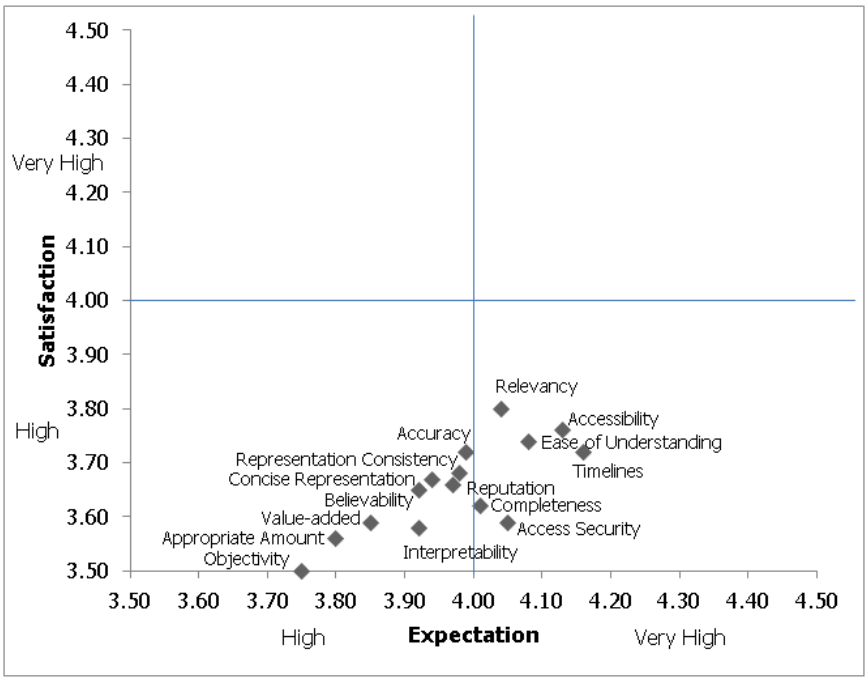

Figure 5: Users' Expectations and Satisfactions toward Information Quality of E-commerce Websites in Year 2011

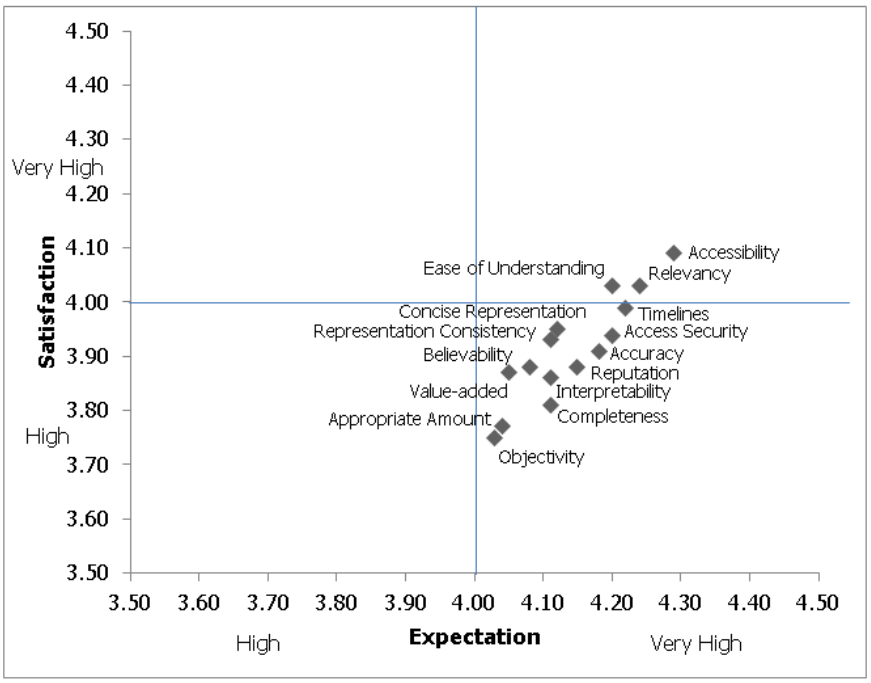

Figure 6: Users' Expectations and Satisfactions toward Information Quality of E-commerce Websites in Year 2014

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