

USER SATISFACTION APPROACH TO IMPROVE BUSINESS INTELLIGENCE SYSTEM FOR BANKING INDUSTRY

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ABSTRACT

An information system success is also depending to user satisfaction. This study taken a sample in a Korean Bank to see the relationship between business intelligence and user satisfaction. Business intelligence in a Korean Bank was receiving complaint such as inquiry from BI website is very time consuming, the system has difficulty in processing large data, not user friendly, information is not accurate, information not updated and lack of availability especially every early month. The main aim of this research is to assess user satisfaction towards current BI system using EUCS model and give recommendation to the company for their system development in the future. Data was collected using questionnaire that distributed to BI users in the company. There are 207 responses collected. However, 203 responses are valid in the condition of the user access BI website in 2020. The result of regression analysis is content, accuracy, format, ease of use, timeliness on user satisfaction of BI has significant positive correlation simultaneously and partially. Business intelligence user satisfaction on content, format, ease of use and timeliness is fair. Meanwhile, accuracy on user satisfaction is poor. From user satisfaction scoring indicate that accuracy need to be prioritize when development because it is still poor.

Keywords: *User Satisfaction, Business Intelligence, Bank, EUCS, Analytical Tools*

1. INTRODUCTION

User satisfaction and information system are inseparable things when it comes to measuring IS success. User satisfaction is regarded as one of the most critical factors in measuring IS success [1]. User satisfaction is often referred to as a person's feeling of being satisfied or dissatisfied compared to his expectations [2]. Understanding user satisfaction by connecting with user itself help developers to identify their needs, expectation, and current system flaws. Therefore, developers able to create a success information system.

Many organizations implement various types of information systems, for instance Business Intelligence (BI). BI implementation in organization can increase revenue, compete with competitors, help formulate new strategies and help to make effective decisions [3]. Big company in banking industry mostly implement business intelligence as well. To see the relationship between BI and user satisfaction, we use a sample from a Korean bank.

This Korean Bank is a multinational bank from South Korea. They offer various products and

services which are: foreign exchange & remittance, SME and business banking, retail banking, SMS banking, bill payment, safe deposit box, EDC payment, internet banking and mobile banking. BI system has been implemented by this bank since 2017.

The BI system is web-based and manages by Management Information System division. The end users are all internal employee of this Korean Bank. This business intelligence system provides information related to dashboards, KPIs, deposits, loans, trade finance, general ledgers, report inquiries, etc. Each user has their authorization set before. Therefore, the information that can be accessed in BI system is only based on their needs.

Data and information shown in Business Intelligence website are the day before data which are processed or run by batch jobs after working hour every business day. Data obtained from the core banking system. Users can select the date of the information they want to view then business intelligence system will show the information according to the desired date. Not only the date that can be selected but there are many other filters that

can be selected according to the information they want to see so that users can sort data and view information more easily.

To operate the business intelligence website, first user must use a PC/laptop that is connected to the company's intranet and use internet explorer browser to enter website links. After the page opened, the user must log in with the employee identification number and password. Once user logged in, a pop-up notification will appear for user give their permission to open the page in a new tab. Following this, the user presses the "Allow" button then BI page will open.

Over the past years, the software is outdated and could not keep up with future technological developments. In addition, there are many complaints from end users because they feel that their work has become hampered, and the system does not meet their expectations. The complaints are: inquiry from BI website is very time consuming, system has difficulty in processing large data, BI website not user friendly, information is not accurate and information not updated and lack of availability especially every early month.

The primary concern obtained from users' complaint. The first one is inquiry from BI website is very time consuming, Several users reported that their first complaint was related to processing data. The minimum data that is inquiry each time by the user is minimal 5000 rows and takes more than 5 minutes. However, it often happens when data inquiry takes more than 20 minutes and the data fails to be inquired by the system.

Second, the system has difficulty in processing large data. When users download reports/data that have been successfully displayed on the website into excel form, they also experience problems such as data that is downloaded, the results are incomplete. For instance, there are 1000 rows of data inquired on BI website. However, only 200 rows that are downloaded successfully. Not only that, when downloading excel, timeouts often occur.

Third, BI website not user friendly. According to users, the user interface is not user friendly because to open a report it is necessary to select many menus, so it is not practical. In addition, there is a panel that difficult to maximize/minimize.

Fourth, information is not accurate. Users find information that is not updated while conducting random data checks against reports that are currently needed. The accuracy complaints received

by MIS division more or less 4 times a month. Fifth, information not updated and lack of availability especially every early month. In fact, there is only 37% of users who accessed BI website in 2020. Meanwhile, the target user accessing the BI system is 70%.

Those problems make users unable to continue their work and reduce their satisfaction in using the BI system. Therefore, from all the problems and outdated technology in current BI system the company wants to create a new BI system that also considering end users satisfaction.

There are numerous models for determining the success of an information system. The most popular model are information system success model by Seddon and Kiew model [4], Delone and Mclean [5], End User Computing Satisfaction by Doll & Torkzadeh [6] etc. The EUCS model is one of the popular methods for measuring end user satisfaction.

The main aim of this research is to assess user satisfaction towards current BI system using EUCS model. The factors influencing User Satisfaction of BI system that are taking into account are Content, Accuracy, Format, Ease of Use, Timeliness. By knowing the relationship between them researcher able give recommendation to the bank for their system development in the future. The questionnaire is spread to BI user with sample 191 users. The difference between this research and previous research is this research done in banking industry specifically on business intelligence. Also, the indicator of the questionnaire is customized to overcome the Korean Bank problems in their BI system.

2. LITERATURE REVIEW

In this section, researcher will review existing theories and some previous research. Certainly, all the theories are chosen that related and relevant to this research. Developing knowledge and having a good understanding is required to answer all the research questions and solving the problems. Since the problems this Korean Bank facing are (1) inquiry from the website is time consuming, (2) the system has difficulty in processing large enough data, (3) less user friendly and uncomfortable appearance, (4) the information needed is often available late with the user's working hours, (5) inaccurate and not updated information. Therefore, by developing our knowledge and with a good understanding of the theories it can support this research.

2.1 Business Intelligence

Business Intelligence (BI) is a technology driven process that analyzes data and displays relevant information to assist managers and other end users in making business decisions. [7]. BI tools are applications that use a variety of technologies to prepare, present, and analyze data. Transactional databases, visualization, self-service analytics and clustering are some of the important technologies (i.e., reporting and dashboards) [8]. Areas covered by business intelligence in bank business include analytical customer relationship management, bank performance management, enterprise risk management, assets and liability management, compliance [9].

2.2 Analytical Tools

The major capabilities required in the toolset used in the BI environment that can help readers make informed decisions about BI tools are as follows [10]:

- Reporting

The utilization of these BI tools remains the core of every BI system, necessitating careful consideration for the simplicity of developing and implementing new reports. An ideal BI should also be able to support numerous report formats and structures (Graphic, Tabular, Financial, Operational, etc.) and allow the ability to distribute reports effectively via mobile devices or web with Intranet.

- Dashboard

Dashboard requirements are similar to reporting requirements, with a greater emphasis on dissemination and the visual aspect of a dashboard that offers a selected collection of metrics in an appealing visually displayable style. Dashboards are often used by top management and must be capable of communicating critical information in an effective and accurate manner.

- Data Visualization

Visualization can successfully express complicated concepts and complex interactions, such as by making it easier for non-business users to understand. technical to understand the analytical output. Indeed, one of the causes for people's unwillingness and adoption of analytics is a lack of excellent visualization abilities. Effective visualization eliminates the need for individual analysts to describe the analytical model's capabilities.

- Spreadsheet and Microsoft Excel Integration

Microsoft Excel remains the most popular and widely used application for performing basic and quick analysis. It goes without saying that BI must

match the needs of the most popular consuming media in order to acquire acceptability.

2.3 End User Computing Satisfaction

In EUCS it focuses on the satisfaction of using certain applications with the interaction between the user and the information system so that the measurement is not only measured from information satisfaction but includes important aspects of end-user computing [6]. Figure 1 is the EUCS model:

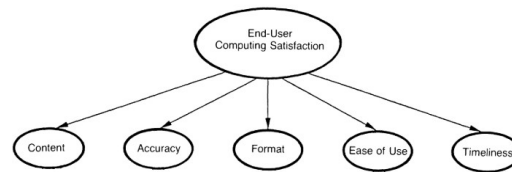


Figure 1: EUCS Model

EUCS has 5 independent variable (Content, Accuracy, Format, Ease of Use, Timeliness) and 1 dependent variable (User Satisfaction) which are:

- Content

Measuring user satisfaction with the Business Intelligence information system in terms of providing information according to user needs. This includes whether the information system can provide information according to user needs, the information generated by the information system is useful for users, accurate, up-to-date, concise, clear and detailed information.

- Accuracy

Measuring user satisfaction with the information system based on the accuracy of the data to produce correct and accurate information according to the input. It can be measured from the error in the processed information and the frequent errors in the processed data that become information occur.

- Format

Measuring user satisfaction with information systems based on the format or display of information. This includes whether the information generated is easy to read and understand, the appearance and aesthetics of the system interface is attractive, the format of the report or information generated by the system is whether the system interface is attractive.

- Ease of Use

Measuring ease of use includes whether the appearance of the business intelligence information system is user friendly, easy to use, easy to learn and easy to access. If end users find the application easy to use, they may become more advanced users, and therefore, better able to take advantage of the

various capabilities offered by the software. Ease of use can also increase productivity or allow decision makers to examine more alternatives.

- **Timeliness**

Measuring user satisfaction with the information system used, the accuracy and speed of processing time. This includes whether the information received is always on time, users always receive the latest information and fast information that can support decision making.

- **User Satisfaction**

User satisfaction is defined as the affective attitude towards a particular computer application by a person who interacts with the application directly.

With the existence of previous research, it has enriched author's knowledge on how to measure user satisfaction. In EUCS, it focuses on the satisfaction of using certain applications with the interaction between the user and the information system so that the measurement is not only measured from information satisfaction but includes important aspects of end-user computing [6]. However, there are many previous studies using EUCS model. Previous studies have reported content, accuracy, format, ease of use and timeliness have a significant impact on user satisfaction of a hospital dashboard. Among all independent variables, format has the highest level of satisfaction and accuracy has the lowest level of satisfaction among users[11].

Surveys such as that conducted by Pauluzzo & Geretto (2018) showed that content, accuracy, format, ease of use and timeliness have a significant impact on user satisfaction that applied in internet banking user of local bank Italy[12]. However, content variable has the highest impact while format variable has the lowest impact on Internet Banking.

Azwar, Surandari and Djohar conducted a research that measure the user satisfaction in Ministry of Education and Culture Library website[13]. This is the research that measure a website since the BI system that will be researched is a web based. The result showed that content, accuracy, format, ease of use and timeliness is already good enough. In this research they also give a scoring for each variable to indicate whether the dimension already satisfy the user or not. However, in this research did not measure the significancy using statistical test (e.g., R Square, t test).

Another research by Suzart assessing The Federal Government Financial Administration (SIAFI) to find out EUCS can be used in government system[14]. The result is it has a relationship with all the variables and overall, the user is slightly satisfied with the system.

Other researcher found that EUCS model can be used to assess managers' satisfaction on ERP system [15]. The result is content, accuracy, format, ease of use, and timeliness affecting user satisfaction significantly.

From all previous research found, there are lack of updated research using EUCS model and in the specific area of business intelligence. This research will bringing up updated research, adding some new indicators to measure user satisfaction on BI system that aligned with existing theories and recommendations for the company to improve their BI system in the future.

3. METHODOLOGY

3.1 Research Model

In this study, the model adopted is End User Computing Satisfaction (EUCS) model. This research model uses EUCS with the aim of measuring employee satisfaction with the use of business intelligence to improve business intelligence during system development. The independent variables in the proposed research model will include content, accuracy, format, ease of use, timeliness with user satisfaction as the dependent variable.

Raising the issues into construct by adapting EUCS model. The following is a mapping of the problem with its indicators:

1. Inquiry from the website is time consuming

Timeliness variable is a suitable variable to measure timeliness through indicators T1, T2 and T3. By using these three indicators, can measure more detail into the problem.

2. The system has difficulty in processing large enough data

The Timeliness variable is an suitable variable to measure the frequency of timeouts in all of the indicator. While the Content variable is the

appropriate variable to measure problems related to incomplete data when downloading data from the website the indicators are from C1, C2, C3, C4 especially the C5 indicator.

3. Less user friendly and uncomfortable appearance

The Ease of Use variable with indicators EOU1, EOU2, EOU3 is suitable for measuring the problem of users who have difficulty opening the required information because there are many menus that need to be opened. While the Format variable with indicators, especially F2 and F3 is used to measure problems related to panels that are difficult to minimize/maximize.

4. The information needed is often available late with the user's working hours

Timeliness variable is a suitable variable to measure timeliness with the problem of late availability of information at the beginning of each month through indicators T1, T2 and T3.

5. Inaccurate and not updated information

Accuracy variables with indicators A1, A2 to A3 are used to measure the accuracy of data/information on the system with problems found by users when doing random checking of data.

Figure 2 is the research model proposed based on the EUCS model:

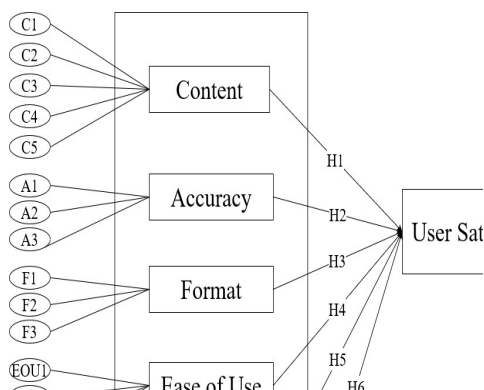


Figure 2: Research Model

Based on figure 2, author develops the hypothesis as follows:

H1: Content. positively impacts User Satisfaction in using BI

H2: Accuracy positively impacts User Satisfaction in using BI

H3: Format positively impacts User Satisfaction in using BI

H4: Ease of Use positively impacts User Satisfaction in using BI

H5: Timeliness positively impacts User Satisfaction in using BI

H6: Content, Accuracy, Format, Ease of Use and Timeliness simultaneously positively impacts User Satisfaction in using BI

3.2 Questionnaire

Questionnaire is a list of questions/statements on a topic given to respondents to give their opinion. Prepared a draft questionnaire in accordance with existing relevant research to obtain individual-specific data on Business Intelligence user satisfaction. The questionnaire covers socio-demographic elements (gender, age, education level, and working years in the bank), and the measurement items for which are drawn from established relevant research (content, accuracy, format, timeliness, user satisfaction).

The population in this study includes employees of the Korean Bank who accessed the business intelligence website in 2020. Therefore, the average number of employees who access the business intelligence website is 366 users. Taken a sample size from 366 population and the result is 191 users. Applying Slovin formula to calculate sample size as follow:

$$n = \frac{366}{1 + 366(0,1)^2}$$

$$n = \frac{366}{1,915} = 191,12 \approx 191$$

The Likert scale describes the attitudes and opinions of respondents in more detail about a phenomenon [16]. Five point of the Likert scale are: (1) Strongly Disagree, (2) Disagree, (3) Neutral, (4) Agree, (5) Strongly Agree.

3.3 Data Collection

Data collection that will be carried out in this study consist of primary data and secondary data in a Bank, Indonesia. Primary data collected from interviewing 6 BI users at an early stage to identify problems then distributes a questionnaire. The results of the questionnaire responses collected will

be used to analyze and measure the research variables. In addition, secondary data obtained from database queries using the company's Oracle database to obtain the population.

Research objectives were explained to HR division and IT department. Finally, they permit to distribute the questionnaire. Through email blast to BI users, obtained 207 responses. However, 203 valid responses were received. Due to the other 4 responses were user that never accessed BI in 2020.

3.4 Data Analysis

Data analysis were performed using SPSS version 25. The independent variable (content, accuracy, format, ease of use, timeliness) and dependent variable (user satisfaction) will be analyzed. Multiple linear regression analysis was used to determine the effect of the independent variables on the dependent variable. The multiple linear regression equation model used is as follows:

$$US = \beta_0 + \beta_1 C + \beta_2 A + \beta_3 F + \beta_4 EOU + \beta_5 T + \varepsilon$$

Description:

US=User Satisfaction

β_0 =Constant

β =Coefficient Regression

C=Content

A=Accuracy

F=Format

EOU=Ease of Use

T=Timeliness

ε =Error

These are the steps of data analysis:

3.4.1 Validity test

Validity test is used to measure the validity or validity of the questionnaire distributed to respondents[17]. The stronger the content validity, the better the item scale represents the domain or scope of the notion being measured. In other words, content validity is determined by how accurately the concept's dimensions and elements are described. This validity test is declared valid if pearson correlation value is higher than r table (sig0.05).

3.4.2 Reliability test

Reliability test is a method to measure the questionnaire an indicator of a variable or construct. A questionnaire is considered reliable if the responses to the statements are consistent throughout time[18]. Reliability is the ability of

measuring instruments to remain consistent despite changes in time because consistency is needed in research so that research data can be trusted. If Cronbach alpha value higher than 0.7 then the research variable is declared reliable.

3.4.3 Normality test

The normality test was carried out to see if the collected data were normally distributed. The normal distribution is a frequency distribution that expresses by the relative number of occurrences of each variable value. The data can be considered normally distributed if the regression residual value falls around the diagonal line in the P-P plot and the Kolmogorov-Smirnov test results p not lower than 0.05 [19].

3.4.4 ANOVA

Perform F test to determine all independent variables used in the model have a simultaneous effect on the dependent variable. If the p-value higher than 0.05 then the independent variables have no significant effect simultaneously/together with the dependent variable.

3.4.5 T test

The t-test was conducted to determine the effect of the independent variable partially influence on the dependent variable. If the p-value higher than 0.05 then there is no significant effect between the independent variables on the dependent variable.

4. RESULT AND DISCUSSION

The initial database had 207 surveys, and after further reducing the sample by eliminating the users that did not accessed business intelligence website in 2020. The total sample is 203 responses included 77 female (37.9%) and 126 male (62.1%) participants. The users' age were in the age 20-24 years (1.5%), 42 in the age 25-29 years (20.7%), 71 in the age 30-34 years (35%), 59 in the age 35-39 years (29.1%), 28 in the age 40-49 years (13.8%). From those surveys 6 users has associate degree (3%), 167 users have bachelor degree 82.3% and 30 users has master degree (14.8%). Lastly, there are 33 users that have been working 1-2 years (16.3%) in the company, 34 users have been working for 3-4 years (16.7%), and 136 users have been working for more than 4 years (67%).

4.1 Validity Test

Testing validity on the collected responses by comparing pearson correlation value with its r table. Sample obtained (N) = 203. While r table value calculated from degree of freedom (df) = N-2

= 201 with significance level for one-tailed test (0.05) = 0.115. The item will be valid if Pearson correlation value is higher than r table value. As table 1 shows, 22 items are valid.

Table 1: Validity Test Result

Construct	Item	Pearson Correlation Value	Result
Content	C1	0.666	Valid
	C2	0.834	Valid
	C3	0.789	Valid
	C4	0.782	Valid
	C5	0.787	Valid
Accuracy	A1	0.820	Valid
	A2	0.819	Valid
	A3	0.822	Valid
Format	F1	0.658	Valid
	F2	0.695	Valid
	F3	0.711	Valid
Ease of Use	EOU1	0.838	Valid
	EOU2	0.805	Valid
	EOU3	0.736	Valid
	EOU4	0.733	Valid
Timeliness	T1	0.701	Valid
	T2	0.759	Valid
	T3	0.797	Valid
User Satisfaction	US1	0.833	Valid
	US2	0.852	Valid
	US3	0.844	Valid
	US4	0.843	Valid

4.2 Reliability Test

Performed reliability test of the instrument used in the questionnaire to determine the consistency. A reliable instrument has Cronbach's Alpha value higher than 0.7. It is apparent from

table 2 that all instruments are reliable because their values are above the minimum limit of 0.7.

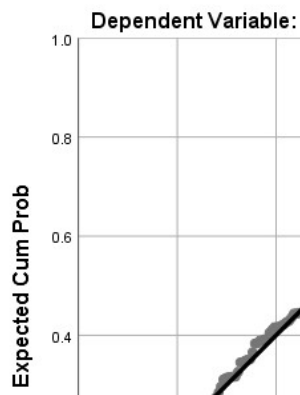
Table 2: Reliability Test Result

Construct	Item	Cronbach's Alpha	Result
Content	C1	0,968	Reliable
	C2	0,966	Reliable
	C3	0,967	Reliable
	C4	0,967	Reliable
	C5	0,967	Reliable
Accuracy	A1	0,966	Reliable
	A2	0,966	Reliable
	A3	0,966	Reliable
Format	F1	0,968	Reliable
	F2	0,967	Reliable
	F3	0,967	Reliable
Ease of Use	EOU1	0,966	Reliable
	EOU2	0,966	Reliable
	EOU3	0,967	Reliable
	EOU4	0,967	Reliable
Timeliness	T1	0,967	Reliable
	T2	0,967	Reliable
	T3	0,966	Reliable
User Satisfaction	US1	0,966	Reliable
	US2	0,966	Reliable
	US3	0,966	Reliable
	US4	0,966	Reliable

4.3 Normality Test

Normality test aim to determine the data that has been collected is normally distributed. If it is normally distributed, it can proceed to the next data test. Performed two types of normality test which are normal P-Plot and Kolmogorov-Smirnov. From figure 3, values lie around the line. This means data is normally distributed.

Normal P-P Plot of Regression



To ensure the normality test, researcher did another normality test with Kolmogorov-Smirnov. Comparing the results of Kolmogorov-Smirnov with the significance value not lower than Asymp Sig 0.05. Based on the calculation in figure 4, obtained a significance result of 0.051 which is not less than 0.05 so that it can be stated that the data is normally distributed.

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		203
Normal Parameters ^{a,b}	Mean	.0000000
	Std. Deviation	1.59801446
Most Extreme Differences	Absolute	.063
	Positive	.063
	Negative	-.034
Test Statistic		.063
Asymp. Sig. (2-tailed)		.051 ^c
a. Test distribution is Normal.		
b. Calculated from data.		
c. Lilliefors Significance Correction.		

Figure 4 : Kolmogorov-Smirnov Result

4.4 ANOVA

ANOVA is a test used to measure the impact of an independent variable on a dependent variable at the same time.

H6: Content, Accuracy, Format, Ease of Use and Timeliness simultaneously positively impacts User Satisfaction in using BI

ANOVA test revealed that the significance value is 0.00, therefore it concluded that the independent variable (content, accuracy, format, ease of use and timeliness) has a significant influence on dependent variables (user satisfaction). This is because the significance value is less than

0.05 (F.Sig 0.00 < 0.05). The following figure 5 shows the significance:

ANOVA ^a				
Model		Sum of Squares	df	Mean Square
1	Regression	2058.054	5	411
	Residual	515.837	197	2

Figure 5: ANOVA Test Result

Independent variable affects the dependent variable simultaneously by 79.5% from adjusted R square value. As for R Square itself has a value of 80%. Adjusted R square is a slightly increased approximation that gives more realistic value by taking a slightly lower number than R Square. Together these result shows that content, accuracy, format, ease of use and timeliness are independent variables that simultaneously influence on user satisfaction significantly. Therefore, H6 is accepted. Figure 6 represent the R Square result as follow:

Model Summary ^b			
Model	R	R Square	Adjusted Square
1	.894 ^a	.800	.795

Figure 6: R Square Result

4.5 Descriptive Analysis

The results of the questionnaire answers on the variables distributed to business intelligence users in the bank records to 203 respondents. A score will be given to each variable with a recapitulation of numbers 0%-20% = very poor, numbers 21%-40% = poor, numbers 41%-60% = fair, numbers 61%-80% = good, 81%-100 = excellent.

Table 3 presents the answers to the questionnaire on the content variable distributed to business intelligence users:

:

Table 3 : Content Scoring

Content	Item					Total
	C1	C2	C3	C4	C5	
Strongly Disagree	56	81	75	81	82	375
Disagree	49	54	54	46	42	245
Neutral	53	28	38	33	35	187
Agree	26	23	25	29	31	134
Strongly Agree	19	17	11	14	13	74
Total						1015

- Strongly Disagree (1)

$$375 \times 1 = 375$$

- Disagree (2)

$$245 \times 2 = 490$$

- Neutral (3)

$$187 \times 3 = 561$$

- Agree (4)

$$134 \times 4 = 536$$

- Strongly Agree (5)

$$74 \times 5 = 370$$

$$\text{Total Score} = 375 + 490 + 561 + 536 + 370$$

$$= 2332$$

$$\text{Total highest score} = 1013 \times 5$$

$$= 5075$$

$$\text{Scoring} = \frac{\text{Total score}}{\text{Total highest score}} \times 100$$

$$= \frac{2332}{5075} \times 100 = 45.9\%$$

The content dimension is used to measure user satisfaction in terms of the content of a system. Percentage of content dimensions of 45.9% is included in the score range of 41-60%, which is included in the fair criteria. Current content of BI system has not fully satisfied by BI users. There is still a lack in providing information according to user's needs that includes functions and modules

that can be used by users as well as information generated by the system.

Table 4 presents the answers to the questionnaire on the accuracy variable distributed to business intelligence users:

Table 4 : Accuracy Scoring

Accuracy	Item			Total
	A1	A2	A3	
Strongly Disagree	98	100	102	300
Disagree	48	48	47	143
Neutral	26	23	18	67
Agree	17	19	18	54
Strongly Agree	14	13	18	45
Total				609

- Strongly Disagree (1)

$$300 \times 1 = 300$$

- Disagree (2)

$$143 \times 2 = 286$$

- Neutral (3)

$$67 \times 3 = 201$$

- Agree (4)

$$54 \times 4 = 216$$

- Strongly Agree (5)

$$45 \times 5 = 225$$

$$\text{Total Score} = 300 + 286 + 201 + 216 + 225$$

$$= 1228$$

$$\text{Total highest score} = 609 \times 5$$

$$= 3045$$

$$\text{Scoring} = \frac{\text{Total score}}{\text{Total highest score}} \times 100$$

$$= \frac{1228}{3045} \times 100 = 40.3\%$$

The percentage of accuracy dimension (accuracy) of 40.3% is included in the score range of 21-40%, which includes in poor criteria. Current accuracy in BI system has not fully satisfied by BI users. There is still lack of data accuracy in generating to information. It often produces an

incorrect information when the user inquire data. In fact, complaint about error occurs in data receives every month.

Table 5 presents the answers to the questionnaire on the format variable distributed to business intelligence users:

Table 5 : Format Scoring

Format	Item			Total
	F1	F2	F3	
Strongly Disagree	39	36	30	105
Disagree	61	82	80	223
Neutral	60	46	46	152
Agree	36	31	33	100
Strongly Agree	7	8	14	29
Total				609

- Strongly Disagree (1)

$$105 \times 1 = 105$$

- Disagree (2)

$$223 \times 2 = 446$$

- Neutral (3)

$$152 \times 3 = 456$$

- Agree (4)

$$100 \times 4 = 400$$

- Strongly Agree (5)

$$29 \times 5 = 145$$

$$\text{Total Score} = 105 + 446 + 456 + 400 + 145$$

$$= 1552$$

$$\text{Total highest score} = 609 \times 5$$

$$= 3045$$

$$\text{Scoring} = \frac{\text{Total score}}{\text{Total highest score}} \times 100$$

$$= \frac{1552}{3045} \times 100 = 50.9\%$$

Percentage of format dimensions is 50.9% (41-60%), which is included in the fair criteria. Current

format in BI system has not fully satisfied by BI users. There is still lack in terms of appearance and aesthetics of the system interface, the format of the report or information generated by the system and the appearance of BI does not make users feel easier when using the system so that it can indirectly affect on the level of effectiveness of the user.

Table 6 presents the answers to the questionnaire on the ease of use variable distributed to business intelligence users:

Table 6 : Ease Of Use Scoring

Ease of Use	Item				Total
	EOU1	EOU2	EOU3	EOU4	
Strongly Disagree	92	41	39	31	203
Disagree	64	97	88	93	342
Neutral	18	35	41	48	142
Agree	21	20	22	22	85
Strongly Agree	8	10	13	9	40
Total					812

$$203 \times 1 = 203$$

- Disagree (2)

$$342 \times 2 = 684$$

- Neutral (3)

$$142 \times 3 = 429$$

- Agree (4)

$$85 \times 4 = 336$$

- Strongly Agree (5)

$$40 \times 5 = 200$$

$$\text{Total Score} = 203 + 684 + 429 + 336 + 200$$

$$= 1852$$

$$\text{Total highest score} = 812 \times 5$$

$$= 4060$$

$$\text{Scoring} = \frac{\text{Total score}}{\text{Total highest score}} \times 100$$

$$= \frac{1852}{4060} \times 100 = 45.6\%$$

The percentage of Ease of Use dimensions is 45.6% (score range 41-60%), which is included in the fair criteria. Users is not fully satisfied with the ease of use of BI. There is still lack of simple appearance for searching for information needed.

Table 7 presents the answers to the questionnaire on the timeliness variable distributed to business intelligence users:

Table 7 : Timeliness Scoring

Timeliness	Item			Total
	T1	T2	T3	
Strongly Disagree	49	39	49	137
Disagree	68	73	68	209
Neutral	56	49	51	156
Agree	20	29	21	70
Strongly Agree	10	13	14	37
Total				609

- Strongly Disagree (1)

$$137 \times 1 = 137$$

- Disagree (2)

$$209 \times 2 = 418$$

- Neutral (3)

$$156 \times 3 = 468$$

- Agree (4)

$$70 \times 4 = 280$$

- Strongly Agree (5)

$$37 \times 5 = 185$$

$$\text{Total Score} = 137 + 418 + 468 + 280 + 185$$

$$= 1488$$

$$\text{Total highest score} = 609 \times 5$$

$$= 3045$$

$$\text{Scoring} = \frac{\text{Total score}}{\text{Total highest score}} \times 100$$

$$= \frac{1488}{3045} \times 100 = 48.8\%$$

The percentage of timeliness dimensions is 48.8% (score range 41-60%), which is included in the fair criteria. Users has not completely satisfied. Lateness in presenting or providing data and information needed by users especially in early months still occurred and time consuming in inquiry data.

4.6 T Test

The T test were used to analyze independent variable (Content, Accuracy, Format, Ease of Use, Timeliness) on dependent variable (User satisfaction). This result is significant at the p = 0.05 level shows in figure 7.

Coefficients^a

Model		Unstandardized Coefficients		Standard Coefficient Bet
		B	Std. Error	
1	(Constant)	2.256	.347	
	Content	.142	.035	
	Accuracy	.279	.058	

Figure 7 : T Test Result

H1: Content positively impacts User Satisfaction in using BI

From the results of t-test, there was a significant positive correlation between Content on the satisfaction of BI users. It can be seen from the value of t statistic and t table. The result of the t-statistic calculation is 4.016 while the t-table value is 1.654. The value of t statistic is higher than t table. In addition, to strengthen the test, a comparison is made again using a significance value for Content variable of 0.00. Where the significance value lower 0.05 then the hypothesis is also accepted.

H2: Accuracy positively impacts User Satisfaction in using BI

The test is done by comparing t statistic and t-table values. The result of t-count calculation is 4.830 while the t-table value is 1.654. The value

of t statistic higher than t table value. Further analysis was carried out by comparing at the significance value of Accuracy variable which is 0.00. This result is lower than 0.05. Those analysis indicate there was a significant positive correlation between Accuracy and User Satisfaction.

H3: Format positively impacts User Satisfaction in using BI

A positive correlation was found between Format variable and User Satisfaction can be seen for its significance by performing a t test. T statistic value is 2.575 while the T table value is 1.654. The value of t statistic higher than t table value which indicate Format variable has a significant effect. Further statistical tests revealed significance value of Format is 0.011. Therefore, 0.011 is lower than 0.05 so that H3 is accepted.

H4: Ease of Use positively impacts User Satisfaction in using BI

T test was conducted on the Ease of Use variable on User Satisfaction. The result shows there was a significant positive correlation between Ease of use and user satisfaction from t statistic and significant value. T statistic of Ease of Use is 2.891 while the t table value is 1.654. In the calculation of the significance, the significance value is 0.004. When compared with the provisions of significance, 0.004 lower than 0.05 so it can be stated that H4 is accepted.

H5: Timeliness positively impacts User Satisfaction in using BI

A positive correlation was found between Timeliness and User Satisfaction by comparison of the t statistic value with t table and its significant value. The T statistic result is 4.976 for the t statistic value while the t-table value is 1.654. Meanwhile, the calculation results show the significant value of the Timeliness variable is 0.000. The results of this calculation show that the Timeliness variable is significant because 0.000 lower than 0.05 then H5 is accepted.

5. SUGGESTION

5.1 Managerial Implication

It is recognized that independent variables (content, accuracy, format, ease of use, timeliness) are the factors that influence user satisfaction positively of BI users, there are several suggestions for the bank in preparing BI development. Firstly, prioritize accuracy in BI website because it is poor. Pay attention to the data sources used every day

before the data is processed into information and before being used during working hours in order to produce correct and accurate information every time on the new BI website in the future. Ensure the query in the batch job is correct and be aware with database error.

Secondly, content on BI website needs to be improved by providing information according to user needs, ensure that BI can process large amounts of data, the information generated by BI can be downloaded completely by users.

Thirdly, format on the BI website can still be improved by paying attention to the provision of information that is easy to read, understand, paying attention to the aesthetics of the user interface, the format of reports or information generated by an attractive user interface.

Fourthly, ease of use from BI can be further improved so that it is in the good to excellent category where it is necessary to pay attention to ease of use, create simpler menu, make sure it is easy to learn and easy to access by users. In addition, conduct training and socialization on how to use the new BI after development completed.

Finally, timeliness in BI need to be improved by paying attention to the information received by user is on time. Especially at the beginning of the month, users need the latest information and fast information that can support decision making.

5.2 Theoretical Contributions

This work contributes to existing research of End User Computing Satisfaction model by providing sample in banking industry and business intelligence. Adding and modify some new indicators to measure business intelligence on user satisfaction. Most previous studies applied EUCS model in e-learning cases to examine students' satisfaction toward their learning management system (LMS). Not much latest update found on applying EUCS model beyond LMS cases. However, in the beginning of EUCS model was found is for measuring on a decision support system. The result confirms that EUCS model still valid until today.

5.3 Limitation and Future Research

Like all other research there always be limitation found. The current study has only examined content, accuracy, format, ease of use, timeliness variable to measure user satisfaction. Determining those variables were from user interview. That can be seen from ANOVA test

result of 79.95% independent variables in this research simultaneously influence user satisfaction. There are 20.05% more that need to be identified. Also the validity of the result is based on the BI system in 2020, because researcher doesn't have the access to the BI system anymore. It is possible that in the BI system 2021 there is changes to the system between content, accuracy, format, ease of use and timeliness dimension that can make it better or worse. As a result, future study should incorporate more variables and interview more users as well as a measuring of their influence on user satisfaction.

6. CONCLUSION

This study is using EUCS model that has been customized for the Korean bank case. To measure User Satisfaction of the BI system in the bank, the factors that are taking into account are: Content, Accuracy, Format, Ease of Use and Timeliness. From those variables used has shown that the factors that influence User Satisfaction on web-based BI system of a bank by 79.95% based on the adjusted R square result. For each variables Content, Accuracy, Format, Ease of Use and Timeliness has a positive relationship and significant influence towards User Satisfaction of BI system. The data obtained by distributing questionnaires to respondents showed that Content, Accuracy, Format, Ease of Use and Timeliness impact on user satisfaction.

More to add, some of the variables consider in a fair category result which is it can be better in the future development if we pay attention to them which are Content, Format, Ease of Use and Timeliness. However, the variable that needs to a priority is Accuracy. It is since the result of the descriptive analysis indicate Accuracy is in a poor category. Accuracy dimensions need to be improved more than other variables. Lastly, by paying attention to content, format, ease of use, timeliness and prioritize accuracy can increase user satisfaction on BI. BI website is an important thing for the company to support users in making decisions, which decisions will certainly have an impact on the company. Therefore, the company needs to be more paying attention to what makes the user satisfy in using it and fixing the weakness of the current BI system in the future development so that it can later be utilized optimally by users.

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