An Evaluation of a New Investors-Based System Information Application in the Indonesian Stock Exchange

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RESEARCH ARTICLE

An Evaluation of a New Investors-Based System Information Application in the Indonesian Stock Exchange

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This study investigates the implementation of AKSes Application at the Indonesian Central Securities Depository (KSEI), adopting the Information System Success Model developed by DeLone and McLean, (2003). This model employs system quality (SYSQUAL), information quality (IQ), services quality (SERVQ), system use (SU), and user satisfaction (US) so as to evaluate the effectiveness and successful model of AKSes application. In particular, we empirically tested the relationship among the employed dimensions, in which we investigated the variance in SU and US as the dependent variables. Using a quantitative study with survey design, we used primary data that was collected by circulating questionnaires to 483 active investors in the Indonesian Stock Exchange. The obtained data was further proceeded through validity and reliability test. This study also tested the relationship between the dependent and independent variables using structural analysis. The results showed that SYSQUAL, IQ, and SERVQ exhibit positive relationships with US, but only SERVQ indicates a positive relationship with SU. Moreover, SYSQUAL and IQ showed no relation to SU. The obtained results provide several important implications for information system research and practice, in which KSEI as the application provider, should adequately pay attention to the effectiveness of the application system from the perspectives and needs of system users.

***Keywords*:** System quality, information quality, service quality, system use, user satisfaction, and AKSes.

JEL Classifications: M1, M10

A well-developed capital market is deemed as an indicator of a country's economic success (Honohan, 2008; Usman, 2019). The capital market plays an essential role in supporting national development and improving the distribution, growth, and stability of the national economy towards society's prosperity. Correspondingly, the capital market necessarily implements a strategic role as the financial

intermediaries to the business world (Beck et al., 2004; Demirgüç-Kunt & Levine, 2009). As the nature of the capital market is bridging the money supply and demand, the capital market involves a huge amount of public funds (Kamaludin et al., 2015). For this reason, it is crucial for the policymaker to create a specific rule with respect to public interest represented by market participants. A set of rules currently being implemented in the Indonesian Stock Exchange (IDX) is through the enactment of the Indonesian Central Securities Depository (or *PT Kustodian Sentral Efek Indonesia* or KSEI) policy.

Based on the KSEI Regulation number 1-C concerning Sub-Securities Accounts, the securities companies and custodian banks as KSEI account holders should open sub-securities accounts to store the securities or funds of their respective customers in accordance with the prevailing laws and regulations applicable in the capital market (KSEI, 2014). Nonetheless, in line with the implementation of a scripless[1] trading in the Indonesian capital market in 2000, all securities trades and their trading mechanisms are executed electronically, and all transactions are deposited into electronic securities accounts centrally located in KSEI. In this regard, the presence of scripless trading is defined as a form of transaction model based on information technology, which is meant to expand the openness of access to information for the community. Despite its openness, the mechanism of transaction settlement and securities-independent storage requires legal protection for the investors. The implementation of information disclosure has turned into a necessity to anticipate the possibility of asymmetric information among investors, that is, informed and uninformed investors (Lang & Lundholm, 2000; Usman & Yennita, 2018b). Therefore, KSEI, who acts as the depository and settlement institution in the IDX, committed to providing the information disclosure to investors in Indonesia through KSEI AKSes platform.

In accordance with KSEI Regulation number 1-F, AKSes is a platform provided by KSEI for parties who organize securities transactions in the IDX, in which this transaction contains the records of security ownership, funds, and or other information related to securities transaction activities (KSEI, 2014). The implementation of the AKSes platform (https://akses.ksei.co.id/) was first initiated in 2009. AKSes's feature has been introduced to investors by distributing a card containing the Single Investor Identification (SID) information to log into the AKSes platform system. Since its introduction until the first quarter of 2018, the total number of IDX's registered investors in the KSEI database has reached 1,112,462 people. However, the number of users with the printed SID cards is only for 617,521 users (i.e., in some cases, registered investors may prefer not to have a printed version of SID card). In its development, it is also reported that the number of investors who utilize the AKSes platform shows some stagnation. Thus, as an information technology artifact, the assessment of the effectiveness of the AKSes application becomes necessary to be investigated. To the best of our knowledge, this is the first study that attempts to evaluate the investors-based system information application in the Indonesian Stock Exchange. Therefore, the purpose of this study is to evaluate the effectiveness of the AKSes application platform from the point of view of AKSes users. To deal with this research objective, we followed the previous empirical literature related to the evaluation of information technology system (Li, 1997; Poon & Wagner, 2001; Rai et al., 2002; McGill et al., 2003; DeLone & McLean, 2003; Central et al., 2005; Iivari, 2005; Petter et al., 2008; Lee & Yu, 2012;) and further adopt the empirical model proposed by the existing literature to evaluate the performance of AKSes platform system.

Given the burgeoning number studies in the success of information system, the model of DeLone and McLean (D&M IS Success Model) developed by DeLone and McLean (2003) has emerged as one of the most adopted models in evaluating the information system success (Petter et al., 2008; Yi-shun Wang & Liao, 2008; Schaupp et al., 2009). A recent study by Wang et al. (2019) used D&M IS success model in the context of mobile learning applications (m-learning apps). Using the data from 160 paid m-learning apps users, they studied the interrelationships among system quality, information quality, user satisfaction, and improved the model by including perceived fee, perceived enjoyment, intention to reuse, and learning effectiveness of the m-learning apps. The obtained empirical evidence suggested that learning effectiveness is influenced by user satisfaction and intention to use. Additionally, system quality, information quality, perceived enjoyment, and perceived fee were also playing as the determinant factors of learning effectiveness and intention to reuse. Another study using D&M IS success model was

conducted by Vogelsang et al., (2019). They pointed out that the critical factors for digital transformation's (DT) success extracted from the D&M IS success model are technology, organization, and environment. For this reason, the prior empirical studies adopting the D&M IS success model is based on the concept of information system success assessment, which focuses on successful implementation at the organizational level. As highlighted by Hartono (2007) and Schaupp et al. (2009), D&M IS success model is relatively simple but offers a valid measure. Therefore, we adopt this model and further apply it to the empirical test on the AKSes application system in KSEI.

Literature Review and Hypotheses Development

Theoretical Framework

DeLone and McLean proposed theory of information system success in 1992, known as the D&M IS success model. Particularly, the variables regarding the success of an information system implementation consisted of three parts of the system itself. First is the system use, second is the impact as the result of user use, a third is the satisfaction. The theoretical framework of the success model of DeLone and McLean's (1992) information systems is shown in Figu l.

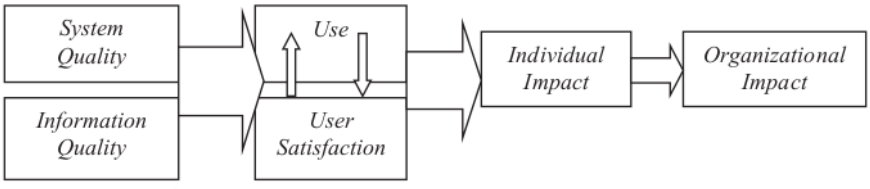
As proposed by DeLone and cLean (1992), the information system success has six variables:

1. *System quality* is used to measure the quality of the information technology tem;
2. *Information quality* is used to measure the output quality of the information system;
3. *Use* denotes the system use of the output as conducted by the receiver/user;
4. *User satisfaction* depicts the user response to the use of system information output;
5. *Individual impact* is the effect of information on user behavior; and
6. *Organizational impact* reflects the influence of information on organizational performance.

In more detail, the relationship between system quality and information quality could independently or jointly influence both usage and user satisfaction. The degree of use may affect the value of user satisfaction either positively or negatively, and user satisfaction might affect the individual impact and further influence the organ ional impact (DeLone & McLean, 1992; Wang et al., 2019; Chopra et al., 2019).

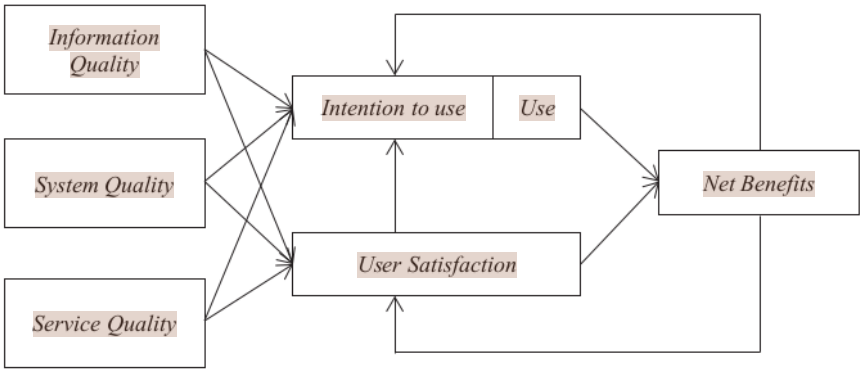
In 2003, DeLone and Mc an updated their model. The updated version of the D&M IS success model (2003) is the extension of the previous D&M IS success model in 1992. In this regard, DeLone and Mclean (2003) included several new dimensions, such as service quality, individual transformation, the organizational impact on net benefits, and improvisation to increase the measurement. Se ce quality is associated with the response of the D&M IS success model to the development of an information technology system. They assumed that information technology systems not only became the information provider but also played a role as the service providers. To measure the service providers, DeLone and McLean (2003) further added a service quality dimension.

DeLone and McLean (2003) had also transformed the individual and organizational impact variables into net benefits. They assumed that the information system not only affects individuals and organizations, but also affects user groups, inter-organization, consumers, supplier, social, and even to the state level. Due to the various impacts caused by the information



Source: DeLone and McLean (1992).

Figure 1 D&M IS Succes Model



Source: DeLone and McLean (2003).

Figure 2
The Updated Version of the DeLone and McLean's Information Success Model

system, DeLone and McLean combined all benefits into a single benefit. Correspondingly, with respect to service quality dimension and the transformation of the impact of individuals and organizations into net benefits, DeLone and McLean also suggested an improvement in measurement issues. Improvement in this context refers to an increasing intention to use several dimensions as the alternative to the use of dimensions. The improvement of measurements in the D&M IS model is included in the net benefits analysis of strategic benefits, informational benefits, and transactional benefits. DeLone and McLean's (2003) model also pointed out that the success of an information system is a complex and interrelated construct that allows for the study of relationships. The updated version of DeLone and McLean's successful model of information systems can be seen in Figure 2.

As can be seen in Figure 2, we use the model of DeLone and McLean as the foundation of research model development. We utilized the dimension from the DeLone and McLean model to empirically measure and determine the success rate of an information system implementation in the proposed setting of the study. The reason of adopting D&M IS model is also an extension of prior studies implementing D&M IS model with the setting of eGovernment system success (Wang & Liao, 2008), website beyond e-commerce (Schaupp et al., 2009), enterprise wiki success assessment (Bhatti et al., 2018), e-learning portal effectiveness (Chopra et al., 2019) m-learning apps learning effectiveness (Wang et al., 2019), and digital transformation (DT) success (Vogelsang et al., 2019).

Referring back to Figure 2, the first dimension is the *system quality.* System quality is used to measure the quality of information systems, both software and hardware. System quality is the performance of a system, which refers to how well the hardware, software, policy, and the procedures of the information system could provide the user with relevant information. System quality is subjectively measured by the user, in which the quality of the system use is perceived as the overall system quality. The second dimension is *information quality.* Information quality measures the quality of outputs of the information systems. Similar to system quality, information quality is subjectively measured by the users. Third, is the *Service Quality.* The dimension of service quality is commonly deemed as the comparison of customer expectation with the perception of the perceived actual service. According to DeLone and McLean (2003), three components could affect service quality. These components are assurance, empathy, and system responsiveness.

The fourth dimension is the *System Use.* Hartono (2007) differentiated the dimension of system use as the use of output and the use of the system, which has a close meaning to the use of information and the use of information systems. Fifth, *User Satisfaction* means the feedback based on user perception after using the information system. This refers to the user attitude

towards the information system, which is formed in a subjective judgment of user preferences.

Recall back to the research model, we adopted three items previously highlighted by DeLone and Mclean in 2003. The first item is information satisfaction, which denotes the difference between the information required and the information received. The second item is complete satisfaction, which the general measure of overall satisfaction, specifically with respect to the interaction between service satisfaction, information satisfaction, and system satisfaction. The third item is efficiency. In this regard, user satisfaction can be achieved if the system information helps the user to work efficiently. Efficiency is seen from the system information that can provide solutions to the user's work in relation to data reporting activities. System operation is presumably efficient if the goal of the user can be achieved.

Hypotheses Development

System Quality and System Use

System quality refers to the performance of hardware, software, policy, and procedures of the information system in providing users with the required and relevant information (DeLone & McLean, 1992, 2003). In this regard, the study of Iivari (2005) characterized system quality as the desired characteristics of the information system itself, such as ease of use, convenience, and flexibility. Meanwhile, a recent study by Bhatti et al. (2018) described system quality as the production and processing of data, which generally measures the technical performance aspects. The technical performance is further evaluated by analyzing several factors such as response time, ease of system use, database structure, and system reliabil

DeLone and McLean (2003) revealed that the usefulness of a system would be seen from the frequency of system use. If the system is usable, then it shows that one will be helped by the system, and it reflects that the existing system is of good quality and can be of help during the work. Seddon and Yip, (1992) and Seddon and Kiew, (1996) previously suggested that usefulness indicates the user perception on the usefulness of the system to optimize the achievement of a system user. System quality should be able to run in accordance with the system functions that have been applied. Bhatti et al. (2018) further pointed out that system use should be referring to the system use by the end-user. The user of the system is more likely to use the system continuously if it is perceived as able to provide good quality (Wang et al., 2019).

More precisely, we define the system quality as the quality of the combination between hardware and software in the informational system (DeLone & McLean, 1992, 2003). Referring to the conceptual framework of the information systems success, we argue that the better the system quality (i.e., the ease of use, the required time to access), the higher the probability of system reuse (Wa & Liao, 2008; Schaupp et al., 2009). Thus, the intensity of system use is more likely to crease. It is obvious that the relationship between system quality and system use is expectedly positive. In this case, we argue that the higher the quality of KSEI AKSes applications, the higher system use. Hypothesis one is constructed as follows:

H_1: System quality has a positive relation to system use.

System Quality and User Satisfaction

The success of information systems used by an organization is determined by the quality of the system itself (DeLone & McLean, 2003). Seddon and Kiew (1996) stressed out that system quality focuses on the absence of system interference, consistency of the system form, easy documentation, and sometimes related to the creation of codes that can be easily understood by the system user. Users who experience the desired outputs from the system normally feel more satisfied and are more likely to continue using the same system.

In addition, it is a rare circumstance that a system failure may provide satisfaction. In this sense, user satisfaction will be higher if the system use is more reliable and credible (Schaupp et al., 2009; Bhatti et al., 2018). System performance itself could be enhanced by the ease of using hardware and software. The system quality is expected not to be only user-friendly, but also provides the optimal ability, which leads to higher user satisfaction. In terms of the quality of the combination between hardware and software, DeLone and McLean (2003) noted that good hardware would simplify the work of system users. Things that often get attention is the speed of the hardware. It is expected that the hardware capability is on the optimal performance and free from a fatal error.

The measure of user satisfaction on a computer system is reflected by the system quality (Guimaraes et al., 2001). If the users are not happy and satisfied with an information system, it is obvious that the system is unable to provide what user needs (Central et al., 2005). DeLone and McLean (2003), in this sense, argued that system quality influences user satisfaction. The study of Rai et al. (2002) confirmed that information systems quality has a positive effect on user satisfaction. The higher system quality, the higher user satisfaction is (McGill et al., 2003; Wang & Liao, 2008; Istianingsih & Utami, 2009; Schaupp et al., 2009; Wang et al., 2019). With respect to the highlight of prior studies, we argue that if the users of AKSes application have had an initial idea about the good quality of AKSes application, they would be more likely to feel satisfied using the system. Thus, we develop hypothesis two as follows:

H_2: System quality has a positive relation to user satisfaction.

Information Quality and System Use

DeLone and McLean (2003) suggested that information quality and system use could influence the success of information systems. Additionally, Poon and Wagner (2001) reported that the success of an information system would affect the decision-making taken by the executives of the organization. Seddon and Kiew (1996) previously showed that if the presence of information quality is perceived by users, there is a high propensity that users will use the information. Li (1997) not only the system aspect, but also the human aspect of IS success (ISS further explained that if the system produces good quality of information and then the information is presumably useful to the work, there is a huge probability that users will promote the system to their colleagues. Meanwhile, the studies conducted by Rai et al., (2002), Wang and Liao, (2008), Lee and Yu, (2012), and Wang et al., (2019) found that information quality influences system use in the similar way of the procedure. We argue that the better the information quality of the AKSes application, the higher is the propensity of the investor to use the AKSes application. Thus, the proposed third hypothesis is presented as:

H_3: Information quality has a positive relation to system use.

Information Quality and User Satisfaction

DeLone and McLean (2003) mentioned that the success of an information system is influenced by information quality. In addition to this, Li (1997) previously proved that the most important factors that indicate the success of information systems include the level of output accuracy, output reliability, user confidence in the system, and the timeliness of output. Information quality in this context is considered as a desirable characteristic of system output (Petter et al., 2008). As noted by Istianingsih and Utami (2009) higher information quality helps the users to make more precise decisions. Wang and Liao (2008) and Schaupp et al. (2009) also reported that information quality is a critical element in predicting satisfaction. They illustrated information quality as the degree to what extent information is produced by a certain system (e.g., e-government system, website, m-learning apps, e-learning portal, and wiki) is relevant, complete, accurate, and provided in a particular format as required by the user.

User satisfaction of information systems reflects how far the user believes an information system could provide a piece of particular information they need (Guimaraes et al., 2001). Seddon and Kiew (1996) showed that information quality is the most important determinant of user satisfaction. Additionally, Iivari (2005), Wang and Liao, (2008), and Wang et al. (2019) explained that information quality is a predictor of user satisfaction. Research in the Indonesian context confirmed that information quality of particular information systems relates to the value, benefits, and the relevance of frequency generated for the system user. When the system could provide high information quality that is complete, accurate, up-to-date, and trustworthy. Users will feel more satisfied with the information they obtained.

As previously documented by prior studies, Seddon and Kiew (1996) examined the effect of information quality on the user satisfaction of information systems. Their results indicated that information quality is positively associated with end-user information system satisfaction. With this, we conjecture if the capability of information system in producing timely, accurate, and relevant information is associated with user satisfaction (Rai et al., 2002; McGill et al., 2003; Istianingsih & Utami, 2009; Schaupp et al., 2009; Lee & Yu, 2012; Wang et al., 2019). Given that, the notion is that the higher information quality generated

by KSEI AKSes is positively related to the increase of AKSes user satisfaction. Thus, hypothesis four is provided as follows:

H_4: Information quality has a positive relation to user satisfaction.

Service Quality and System Use

Service quality is the system support that a user receives from the department of systems operation and information technology personnel. This support includes responsiveness, accuracy, reliability, technical competence, and the empathy of information provision (Petter et al., 2008; Schaupp et al., 2009; Wang et al., 2019). DeLone and McLean (2003) argued that service quality relates to system use. At the organizational level, the effectiveness and the role of technical staff (service quality) is positively associated with system use. The previous research shows that user perceptions of the service quality indicate a positive effect on their desire to use the e-government system (Rai et al., 2002; Wang & Liao, 2008) and m-learning app (Wang et al., 2019). In a recent study of Bautista and Tangsoc (2016) processes and outputs of the entire service system. These stakeholders include patients (service recipients, service system quality should not only be seen from the service users per se but should also be taken into consideration by the service providers through a multi-perspective framework. In doing so, the decision-maker should take into account the congruency of all crucial factors for all key stakeholders in the process of system quality assessment. Therefore, we argue that the better service quality provided by KSEI AKSes, the higher user willingness to use the AKSes platform. Hypothesis five is developed as follows:

H_5: Service quality has a positive relation to system use.

Service Quality and User Satisfaction

Myers (1997) and Wang and Liao (2008) found that service quality and system quality influence user satisfaction. If the user of system information feels that the service quality provided by the application provider is good, they will be more likely to feel satisfied to use the system (Istianingsih & Utami, 2009). Moreover, in the context of system information, user needs of system information should be well detected by the system developer and the department of system information. Therefore, the user needs could be adequately met by the system information. In this case, meeting the user needs is expected to provide user satisfaction and increase their motivation to do their job optimally.

The user of system information expects the department of system information to help them in various methods, particularly in terms of hardware and software maintenance, system installation, network connection, system development, troubleshooting, and training (Ozkan & Koseler, 2009; Chopra et al., 2019). A successful department of system information should be able to benefit the user through various channels of assistance. DeLone and McLean (2003) argued that service quality has a positive relation to user satisfaction, but the degree is different from the system quality and information quality, which depends on the work level of analysis (Istianingsih & Utami, 2009; Lee & Yu, 2012). Their findings revealed that service quality positively relates to user satisfaction. Therefore, we develop an argument where the higher service quality of the AKSes application may result in higher user satisfaction. Hypothesis six is formulated as follows:

H_6: System quality has a positive relation to user satisfaction.

System Use and User Satisfaction

DeLone and McLean (2003) noted that system use and user satisfaction are closely linked, in which system use in particular system information might affect user satisfaction. The positive experience with respect to system use leads to greater satisfaction. If the user feels that using the system information brings great benefits, the likelihood of reusing will be higher (Wang & Liao, 2008; Schaupp et al., 2009; Wang et al., 2019). In this regard, when the user indicates a high level of frequency of system use, the likelihood of user satisfaction would be higher as well (Wang & Liao, 2008). Even though in a particular case the system use can be a mandatory activity, there is a probability that different level intensity of system use might generate different benefits (DeLone & McLean, 2003). The research conducted by Rai et al. (2002) and Wang and Liao (2008) showed the empirical evidence that system use has a positive association with user satisfaction. Therefore, we conjecture that user satisfaction is greater as the level of KSEI AKSes's application

utilization (system use) gets higher. Hypothesis seven is formulated as follows:

H_7: System use has a positive relation to user satisfaction.

Research Method

This study employs a quantitative approach with a survey method. The constructs used in the study are system quality, information quality, service quality, system use, and user satisfaction. Most of the indicators are measured using five-Likert scales, ranging from 1 (strongly disagree) to 5 (strongly agree). Moreover, the items used in the questionnaire are adopted from the model of DeLone and McLean (2003). Information regarding the variable measurement are listed in Table 1.

Regarding the sampling method, the population of this study comprises of all users of the KSEI AKSes platform that is around 600K users in total. In the sample selection procedures, we used a census method, in which we focused more on covering the entire population units by circulating the survey to all AKSes users. Given that, it is also worth reporting that the minimum number of samples required is at least 10 times the number of constructs or hypotheses in the research model. We noted that the minimum sample

Table 1
Variable Measurement

Variable	Items	Statements	Source
Information quality	IQ1	The information generated by the AKSes application is error-free.	DeLone & McLean (2003)
	IQ2	The information generated by the AKSes application can be verified.	
	IQ3	The information generated by the AKSes application is relevant to user needs.	
	IQ4	The information generated by the AKSes application is available when needed.	
	IQ5	The information produced by the AKSes application is complete in accordance with applicable government regulations.	
	IQ6	The information generated by the AKSes application is clearly presented.	
	IQ7	The information generated by the AKSes application is useful for investment activities.	
Service quality	SERVQ1	The AKSes application quickly responds to user complaints.	DeLone & McLean (2003)
	SERVQ2	The AKSes application provides technical support for the development and improvement of applications.	
	SERVQ3	AKSes application is equipped with socialization and education activities.	
	SERVQ4	The AKSes application provides usage guidelines.	
	SERVQ5	AKSes application provides services according to the promised features.	
System quality	SYSQUAL1	All AKSes features can present data or information in accordance with their functions.	DeLone & McLean (2003)
	SYSQUAL2	The data presented in each AKSes menu reflects the function of the feature.	
	SYSQUAL3	It doesn't take long to access (load) the AKSes application.	
	SYSQUAL4	The time needed to present data in AKSes is proportional to the filter used.	
	SYSQUAL5	There was no system failure when processing data presentations for each AKSes function.	
	SYSQUAL6	Every AKSes feature is easy to use by users.	
	SYSQUAL7	AKSes application can be accessed at any time and anywhere as long as the internet is available.	
	SYSQUAL8	Although users have not used the AKSes application for a long time, it will be easy to use it again.	

Variable	Items	Statements	Source
User satisfaction	US1	I am satisfied with the AKSes application that has provided the information I need.	DeLone & McLean (2003)
	US2	I am satisfied with the AKSes application that has presented the report as I need.	
	US3	I am satisfied with the AKSes application that has provided information on time when I need it.	
	US4	I am satisfied with the AKSes application that has displayed clear and easy to use information.	
	US5	I am satisfied with the AKSes application that is free of interference in operation.	
	US6	I am satisfied with the AKSes application that presents accurate information.	
	US7	I am satisfied with the AKSes application that is easy to use.	
	US8	I am satisfied with the AKSes application that is easy to learn.	
	US9	I am satisfied with the AKSes application that is quickly accessed.	
	US10	I am satisfied with the features of the AKSes application.	
System use			
1. How long do you spend using the KSEI AKSes Application every day?			
1) ½ hour a day ☐			
2) 1/2 - 1 hour a day ☐			
3) 1 - 2 hours a day ☐			
4) 2-3 hours a day ☐			
5. More than 3 hours a day ☐			
2. How often do you use the KSEI AKSes Application?			
1) 1 time a month ☐			
2) Several times in one month ☐			
3) Several times in 1 week ☐			
4) Once a day ☐			
5) Several times in 1 day ☐			

size is supposed to be taken from 90 respondents. However, we eventually ended up with a sample of 483 active AKSes users as the final respondents. More precisely, we utilized primary data collected directly through the survey on the active investors in the Indonesian capital market during the period of observation ranges from the early of March to the last week of June 2018. Using the dataset from this period, we also performed a pilot study utilizing the data from the first 90 respondents as the minimum number of samples required in the study. A pilot test is deemed important to investigate for problems or possible errors in the proposed questionnaires. In this stage, we also ran a reliability test to ensure the internal consistency of the items used in the questionnaire.

Results and Discussion

Descriptive Statistics

Before conducting the structural analysis, we report the demographical data of respondents through a descriptive statistics analysis. This information is deemed important in providing initial idea about the respondents. In this section, we elaborate on the information on gender, age, education, socialization, and the respondents' experience as investors. Each investor has to be registered in the AKSes system provided by KSEI, particularly to enable them to give the response regarding their experience of using the AKSes application system. The details of respondents' characteristics are listed in Table 2.

Table 2 illustrates some criteria of information regarding the characteristics of the respondents. In this case, we use active investors as the respondents because their nature represents the actual investor behavior. In Table 2, it can be observed that female respondents

Table 2
Respondents' Characteristics

Characteristics	Interval		Percentage (%)
Gender	Male	214	44.30
	Female	269	55.70
	Σ	*483*	*100%*
Age	17-25 Years	416	86.12
	26-50 Years	65	13.45
	>50 Years	2	0.43
	Σ	*483*	*100%*
Education	Postgraduate	35	7.24
	Undergraduate	73	15.11
	Diploma	7	1.45
	Higher Education	368	76.20
	Σ	*483*	*100%*
Socialization	Yes	112	23.2
	No	371	76.8
	Σ	*483*	*100%*

dominate the users of the AKSes application with the composition as 55.70%. Moreover, in terms of the age category, the average active investors are within the age ranges between 17 and 25 years old (86.12%). On the educational background, 76.20% of the respondents have higher educational background, followed by undergraduate (15.11%), postgraduate (7.24%), and diploma (1.45%). Highlighting the duration of their participation as active members, the respondents show that they have been actively engaging as investors for less than a year (78.05%). Pertaining to the socialization, we note that in early 2017, KSEI has been initiating massive socialization and training on the AKSes application to investors in Jakarta and other big cities in Indonesia (i.e., Yogyakarta, Surabaya, Medan). KSEI also disseminated the AKSes facility to the securities company to further inform the AKSes facility to its customers, where 23.2% of the total respondents acknowledged that they had been exposed by the socialization and other information regarding the AKSes application system.

Measurement Model

As previously highlighted, we need to firstly deal with the convergent validity, discriminant validity, and reliability tests of parameters. As we utilized statistical tool software (Smartpls3), the parameters of the measurement model are obtained through the algorithm iteration process. At the convergent validity stage, it is expected that the measurements of the constructs should be highly correlated. Convergent validity is measured with a minimum AVE value from 0.5 to 0.6 for each construct (Fornell & Larcker, 1981; Chin, 1998; Abdillah, 2009; Abdillah & Hartono, 2015; Usman & Yennita, 2018a; 2019; Abdillah, Hartono, & Usman, 2020). It is also expected that the loading factors of items are greater than 0.50. However, given the small value (< 0.50) of the loading factor at item IQ3, IQ5 and IQ7, it is necessarily important to drop them out of the estimation as if would harm the validity of measures (Hair, Hult, Ringle, & Sarstedt, 2016). The summary of constructs' validity and reliability test is detailed in Table 3.

In addition to validity test, we also provided the reliability test output. In this case, we measured the internal consistency of instrument measurement. Reliability is the ability to measure accuracy, consistency, and precision (Hair et al., 2010; Hair et al., 2016). To empirically test the reliability of instruments, Cronbach's alpha and composite reliability were used. Cronbach's alpha measures the lower limit of the reliability value of a construct, whereas the composite reliability measures the true value of a construct's reliability (Chin & Todd, 1995). This study also used the composite reliability method due to its ability to efficiently estimate the

Table 3
The Output of Measurement Model

Construct	Indicators	Loading	Cronbach's Alpha	Composite Reliability	(AVE)	R square
Information Quality	IQ1	0.649	0.866	0.868	0.626	
	IQ2	0.804				
	IQ4	0.794				
	IQ6	0.897				
Service Quality	SERVQ1	0.806	0.905	0.905	0.657	
	SERVQ2	0.811				
	SERVQ3	0.799				
	SERVQ4	0.778				
	SERVQ5	0.856				
System Quality	SYSQUAL1	0.817	0.929	0.929	0.621	
	SYSQUAL2	0.801				
	SYSQUAL3	0.756				
	SYSQUAL4	0.799				
	SYSQUAL5	0.730				
	SYSQUAL6	0.837				
	SYSQUAL7	0.794				
	SYSQUAL8	0.763				
System Use	SU1	0.626	0.482	0.487	0.324	0.086
	SU2	0.507				
User Satisfaction	US1	0.872	0.968	0.968	0.750	0.868
	US2	0.862				
	US3	0.888				
	US4	0.876				
	US5	0.854				
	US6	0.847				
	US7	0.845				
	US8	0.879				
	US9	0.876				
	US10	0.857				

Notes: The lower Cronbach's alpha value of system use (SU) is due to the different measures employed for this construct. In this regard, SU1 is measured by counting the frequency of system use, and SU is measured by calculating the intensity of system use. Therefore, from the point of reliability test, this dimension has good loading value but indicates low Cronbach's alpha and AVE value.

internal consistency of a construct (Werts et al., 1974). In practice, we used 0.7 as the threshold level of Cronbach's alpha and composite reliability outputs even though the obtained value as of 0.60 is considered acceptable by some researchers (Hair et al., 2016).

In detail, SU has two items that are not measured based on the five-point Likert scales. These two items are measured based on the frequency of use (SU1) and the intensity of system use (SU2). Thus, when dealing with the reliability test with Cronbach's alpha, these two items do not provide an alpha value greater

than 0.50 (0.482). Even so, the low alpha value of system use (0.482) is still deemed tolerable given the value of 0.482 is slightly under 0.50. In terms of the operationalization of the variable, we argue that the indicators of system use (frequency and intensity) were coded with the data points range from 1 to 5 (see variable measurement in Table 1). Thus, even though the operationalization of the dependent variable (SU) uses discrete data, in the data processing, we employed the coded data instead of the actual value of frequency and intensity of system use. Hence, as argued by Winship and Mare (1983), it is possible for the researchers to employ discrete data in the structural equations and path analysis. Moreover, Harman's factor computed in the complete dataset also indicates the minimal risk of potential common method bias, with a score of 0.47. The obtained Harman's factor value satisfactorily meets the recommended threshold level of less than 0.70. As shown in Table 3, it can be concluded that the remaining constructs (IQ, SERVQ, SYSQUAL, and US) tested in this study have met the criteria of reliability test. In the next stage, we did discriminant validity test. The output of the discriminant validity indicates that the square root AVE value for each construct is higher than the inter-latent correlation for each construct (Fornell & Larcker, 1981). After empirically confirming the measurements through the reliability and validity test, we also provided the inter-latent correlation among variables in Table 4 and further continue to the structural analysis procedure.

Structural Analysis

The previous test of model measurements has confirmed that the proposed model has satisfactorily met the validity and reliability test criteria. Thus, we proceeded through the structural analysis. The results of the structural analysis are shown in Table 5.

Table 5 presents the information regarding the statistical test output of the proposed hypotheses. As can be seen in Table 5, the justification of whether a

Table 4
Inter-Latent Correlation Matrix

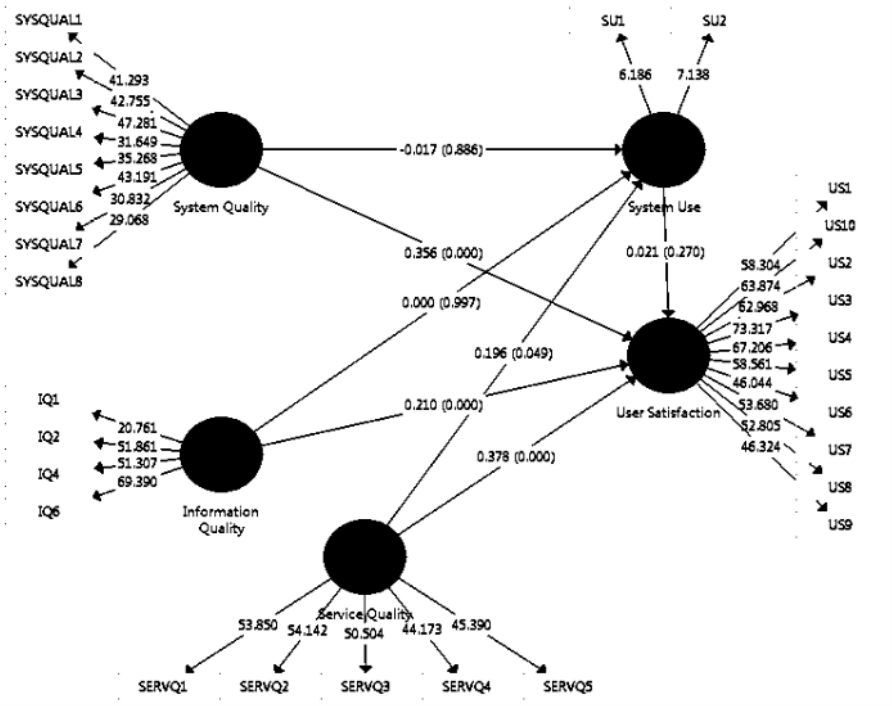
Variable	Mean	Stdv	IQ	SERVQ	SYSQUAL	SU	US
IQ	3.852	0.145	**1**				
SERVQ	3.802	0.115	0.856**	**1**			
SYSQUAL	3.862	0.141	0.883**	0.842**	**1**		
SU	1.870	0.082	0.144**	0.181**	0.147**	**1**	
US	3.803	0.041	0.867**	0.857**	0.858**	0.173**	**1**

*Notes: *** p < 0.01, ** p < 0.05, * p < 0.1. IQ= information quality, SERVQ= service quality, SYSQUAL= system quality, SU= system use, US= user satisfaction.*

Table 5
Structural Model Results

Hypotheses	Path	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	p values	Decisions
1	SYSQUAL -> SU	-0.017	-0.010	0.122	0.144	0.886	Unsupported
2	**SYSQUAL -> US**	**0.356*** **	**0.355**	**0.056**	**6.301**	**0.000**	**Supported**
3	IQ -> SU	0.000	0.000	0.085	0.004	0.997	Unsupported
4	**IQ -> US**	**0.210*** **	**0.209**	**0.049**	**4.251**	**0.000**	**Supported**
5	**SERVQ -> SU**	**0.196** **	**0.195**	**0.099**	**1.974**	**0.049**	**Supported**
6	**SERVQ -> US**	**0.378*** **	**0.379**	**0.059**	**6.402**	**0.000**	**Supported**
7	SU -> US	0.021	0.021	0.019	1.103	0.270	Unsupported

*Notes: *** p < 0.01, ** p < 0.05, * p < 0.1. IQ= information quality, SERVQ= service quality, SYSQUAL= system quality, SU= system use, US= user satisfaction.*



*See the online version for the colored chart.

Figure 3
Structural Model

hypothesis is statistically supported or unsupported is based on the p-value or by comparing the t-statistic value with the t-table (1.64 is the threshold level of 5% alpha value). Moreover, to complete the statistical test, we also provided the structural analysis output, as can be seen in Figure 3.

Referring to the information on coefficient beta, t-statistics, and p-value in Table 5, it can be inferred that four (hypotheses 2, 4, 5, and 6) out of seven hypotheses are statistically supported. We ran the structural model using Smartpls3 with 1,000 times maximum iteration in the bootstrapping procedure. As can be observed in Figure 3, we also reported the path of coefficient value and the information of p-value, which is available in the parentheses. We examined the first hypothesis of whether there is a positive relationship between system quality and system use. The obtained output (see Table 5 or Figure 3) shows that system quality is not related to system use, indicating that hypothesis one is statistically unsupported (β= -0.017; p> 0.05).

With respect to hypothesis two, we find that there is a positive and significant (β= 0.356; p< 0.05) relationship between system quality and user satisfaction. This result shows that hypothesis two is statistically supported. Furthermore, we tested hypothesis three by investigating the relationship between information quality and system use. Information in Table 5 and Figure 3 shows that there is a positive relationship (β= 0.000) between these two variables but statistically insignificant (p> 0.05). This result indicates that hypothesis three is unsupported. In hypothesis four, we argued that information quality positively relates to user satisfaction. The result of the structural analysis indicates that there is a positive relationship between information quality and user satisfaction (β= 0.210; p< 0.05). Correspondingly, the empirical test on hypothesis five shows that there is a positive relationship between service quality and system use. The finding indicates that hypothesis five is statistically supported (β= 0.196; p< 0.05). With

regard to hypothesis six, we examined the relationship between service quality and user satisfaction. The empirical finding shows a positive (β= 0.378) and significant (p< 0.05) relationship between service quality and user satisfaction, which provides support for hypothesis six. The last hypothesis testing shows that no relationship between system use and user satisfaction (β=0.021; p> 0.05) is found. This suggests that hypothesis seven is statistically unsupported.

Discussions

This study appears as an empirical test to revisit the implementation of the D&M IS success model with different settings of study. With this, we aim at capturing the multidimensional and interdependent context of AKSes application system that has been launched to active investors in the Indonesian Stock Exchange (IDX). The findings suggest that system quality, information quality, services quality, system use, and user satisfaction are empirically deemed as valid measures of AKSes application system success in IDX. In relation to their implications, we sequentially discuss each hypothesis testing outcome and elaborate on the association between the variables of interest.

First, we developed an argument where system quality is positively related to system use. The finding suggests that due to the voluntary adoption of system use (AKSes), not many users are keen enough to utilize the benefit of the AKSes system. Therefore, the rate of system use is relatively low. Additionally, we argued that most of the investors in IDX rely on the recommendation of financial analysts, in which the securities companies and brokers play a significant role in influencing the investors' decision when dealing with investment activity. This phenomenon is contrasting the benefit that could be taken by the investors if they could optimize the value and benefit of using the AKSes system. In line with its objective, the AKSes application is meant to be the medium of information distribution and circulation among investors or companies. However, most of the investors prefer to make decisions based on the broker or financial analyst recommendations. The reason behind this action could be linked to the demographical information of respondents, where most of the respondents (86.12%) are considered as young investors (between 17 and 25 years old) with investment experiences less than a year (78.05%).

Second, we designed a notion that system quality has a positive relation to user satisfaction. The finding suggests that the more qualified the system (i,e., AKSes) as offered and facilitated by KSEI, the higher user satisfaction is. Concerning the system quality, the active users of the AKSes application indicate that they have a good sense of satisfaction due to the system's ability to provide relevant, accurate, and timely information to the users. This circumstance further confirms that the AKSes application could meet the criteria of accuracy, easy-to-use, easy-to-learn, and easy-to-access by the users. We conjecture that these criteria might drive the active users of the AKSes application to indicate a high score in their perception based assessment.

Third, we considered that information quality is positively associated with system use. Considering the obtained evidence of empirical tests, we report that the finding is in line with the study of Iivari (2005), who found no relationship between information quality and system usage. Digging deeper, the absence of a relationship between information quality (IQ) and system use (SU) is driven by the low perception of users about information quality. Even though the system (AKSes) has tried to provide accurate, reliable, relevant, timely, and complete information in a simple format of presentation, the information quality is still unable to encourage the higher use of information. This argument is enforced by the information on the education level of respondents. As the active individual investors in the survey are dominated by those with higher education (slightly lower than diploma but higher than high school), we thus argue that the investors might have insufficient comprehension of the information quality because it is perceived as too technical. They need a third-party (securities company or financial analyst) who can simplify the available information and convert it to more understandable and readable information. Due to the voluntary use of the system, users have perceived no obligation to regularly access the information and further use it because the securities companies and financial analysts also provide ready-to-execute information (i.e., recommendation) of investment advice. Therefore, KSEI needs to further increase user awareness of the importance and benefits of AKSes application for its users.

Fourth,we formulated an argument that information quality is positively related to system use. As previously reported by the study of Sajady et al. (2008),

the information system is presumably effective if the information provided can serve the needs of users. According to Guimaraes et al. (2003), user satisfaction also reflects the degree of user trust in the ability of a system to provide the required information. Therefore, the findings on the positive relationship between information quality and system use indicate investor confidence to use the AKSes application. According to Li (1997) information quality is considered as one of the important aspects that drives the success of an information system.

Fifth, we argued that service quality has a positive relation to system use. As we found a positive result, we suggest that the service quality offered by the AKSes system has been able to meet the user needs for information. Also, in the practical issue, the manager of application (AKSes) is deemed able to respond to the user problems. The application manager must have sufficient knowledge and adequate technical capability with a good attitude and sincerity during the service process. These factors are necessarily required by the users because users need fast response and solution to the problems they face. Therefore, by empirically testing the relationship between service quality and system use, we report that the service quality offered by the AKSes application could help increase the system use.

Sixth, the idea of the positive relationship between system quality and user satisfaction is empirically proven. The finding is in line with the proposed model of DeLone and McLean (2003), which conjectures that user satisfaction is higher as the service quality gets better. However, the relationship between system use and user satisfaction does not seem to be statistically significant. We argued that in this stage, the presence of the AKSes facility is deemed by the users as the alternative way to get the investment-related source of information. At the same time, there are several possible sources of information that could be utilized by the users (e.g., securities companies, brokers, financial analyst recommendations). Furthermore, because only 23.2% of the respondents have been exposed by direct socialization, it is worth arguing that investors with less or no socialization at all might use the system regularly but perceive less satisfaction.

Overall, the findings of the study encourage the application provider to improve the system performance and its potential benefits for the application users. As this research utilized the self perception-based data with the actual investors (users) as the unit of analysis, we believe that this study might satisfactorily provide a reliable and valid measure of instruments of information system success model. For this reason, KSEI, as the application provider, might enhance their understanding of the effectiveness of the AKSes system based on the investors' perceived system use and its determinants (i.e., antecedents) that may allow the KSEI to take plausible corrective actions to improve the system further. Correspondingly, as the literature in the information system relates the system evaluation to the organizational level, we are aware of the potential work that could have been explored on the adoption of a new IT system. As pointed by Orlikowski and Gash (1992), the existing literature on technological changes at the organizational level is unsettled and somehow overlooks the underlying assumptions, meanings, and user expectations of the adopted information technology. Therefore, recent literature of Lorenzi and Riley (2004) on the relationship of people and organizational issues to the technological changes process describes several setting stages. The first stage focuses on the imperative for changes, confounding, and technical plan. The second stage tries to unravel the so-called "black box" of people and organizational concepts. The third stage affirms the implementation of plans and integrates the technical aspects with the black box knowledge. The fourth and fifth stages eventually arrive in the improvement of informatics and organizational outcomes. These stages need further investigation to empirically prove that technological changes at the organizational level bring more dynamism towards people's behavior in the organization.

Conclusion Remarks

This research was carried out in response to the broad call for continuous revisit and challenges of information system success model in a different study setting. Hence, this study aims at examining the implementation of the AKSes application platform by utilizing the success models of the DeLone and McLean (2003) information systems. Overall, the findings provide partial support to the success model of information systems developed by DeLone and McLean in 2003.

This study contributes to the advancement of literature by providing empirical evidence of the

AKSes system application in the Indonesian Capital Market (IDX). We evaluated to what extent the AKSes system is perceived beneficial by the users. The results suggest that KSEI, as the system provider, needs to encourage the users to more frequently and regularly use the AKSes system. One of the ways is mandatorily requiring the registered users (investors) to use and benefit from the system application. Even though this proposition is presumably difficult to enact, the voluntary use of system application remains the best option at the moment. In the future, the policymaker must find the best strategic implication to manage better the information distributed among the market participants.

Finally, this study is not undeniably free from caveats. Methodologically, this study uses a survey design with a quantitative approach. The consequence of using a survey design might result in the inability to ensure full validity. Hence, the study findings can only generalize the small scope of the sample taken from the population, but not to the overall population. Future research can address this problem by increasing the number of respondents, particularly to improve the generalizability of the obtained output. Moreover, we are aware that a quantitative approach per se is incapable of explaining more deeply the phenomenon in the research context. Thus, we suggest the mixed-method study because the combination of quantitative and qualitative studies may enhance the research outputs. Given that, there is still much room for further explorative investigation.

Note

[1] Scripless trading system suggests that a settlement is conducted through the book entries, which reflects that there is no physical movement on the securities (please refer to Woon, 1993 for further details on scripless trading system).

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Conflict of Interest

The authors declare that they have no conflict of interest.

Ethical Clearance

All procedures performed in this study was involving human participants, which already in accordance with the ethical standards of the General Data Protection Regulation. The informing is dealt with privacy notices as delivered to the respondents.

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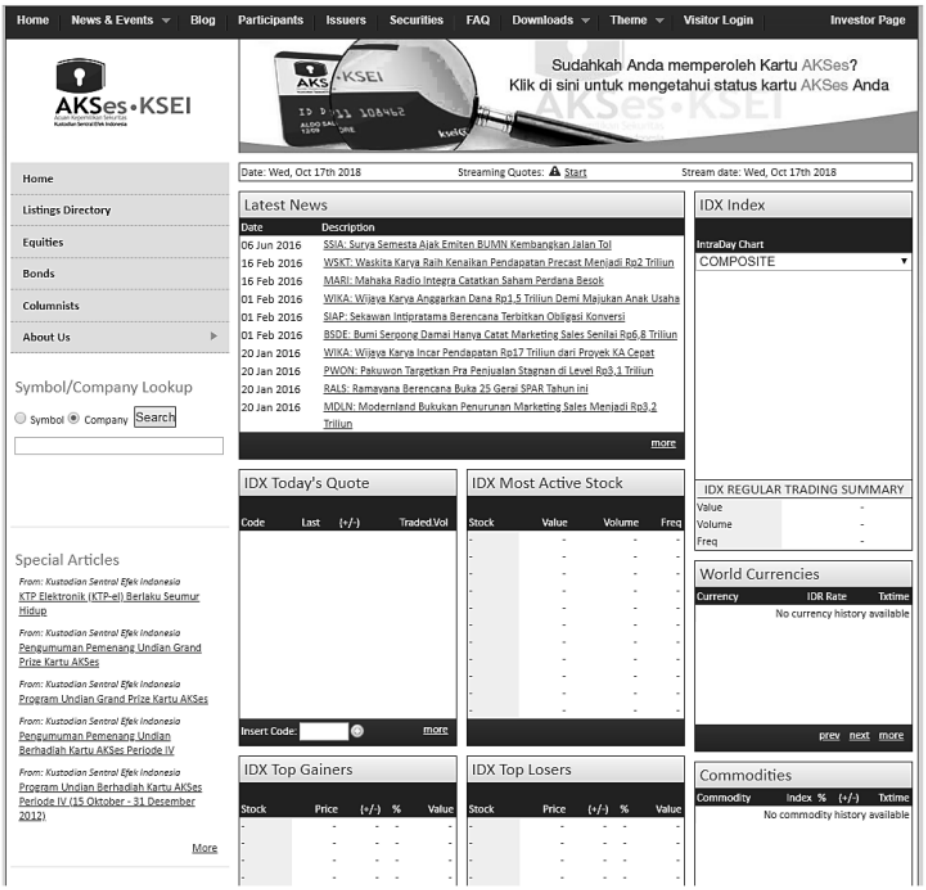

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