Factors Forming Seven Layers of the Open System (OSI) Model

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Abstract: This study aims to examine the understanding of the importance of implementing standards in communicating in the network and understanding the factors that form the seven layers of Open System Interconnection. This research was carried out by conducting a survey of communication users in the network who collected information about the importance of communication standards in the network and responses about OSI and OSI networks (seven layers of the OSI model). The results showed that the importance of the communication standards applied in the network found that respondents who strongly agreed are 40.4%, agreed 55.3% and hesitated 4.3%. The respondents' knowledge for OSI was 82% of respondents understood and knew while 18% did not understand. Related to the OSI network architecture that was formed from seven physical layers, namely: data link, network, transportation, session, presentation, and application, respondents who strongly agreed are 29.2%, agreed 62.5%, and the rest did not agree and doubted. The R-Square value in this research model is 0.48 which indicates that this model is classified as moderate. This shows that the factors forming the OSI network can only be explained by 48% and the rest are other factors.

1 INTRODUCTION

Communication is very important as an effort to transfer messages or information from one place to another, both verbal, written and non-verbal. Communication acts as information, control, motivation, and disclosure of actions. The development of increasingly sophisticated information technology and telecommunications requires us to be able to communicate in the form of virtual or in a network, where the sending and receiving of information can be done using hardware, software, and devices connected to the internet. System software is a very specialized, integrated and efficient set of computer software written in machine language designed to communicate with hardware. System software performs special functions that support computer operation. This software provides operating routines that make the computer work at the computer application level. The system software performs three main functions: label checking, protection of stored data, and memory protection.

Communication in the network is communication that the way of sending and receiving messages is done by the internet network. The internet is very useful as an effective and efficient communication medium with various facilities available such as web, chat, email, Friendster, Facebook, Instagram, line and twitter. Communication in the network has several types of communication in the realm of synchronous networks (real time), and asynchronous communication (delay) in networks that refers to reading, writing, and communicating via/ using computer networks.

This model is based on the proposals from the International Standard Organization (ISO) as a step towards standardizing international regulations used in various layers. This model is called the OSI Reference Model, because it is shown for Open System interconnection. Open System is defined as an open system to communicate with other systems from different operating systems and architectures. For easier communication between two devices, it is necessary to re-examine the standards applied in computer networks, discuss what OSI is, what layer

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forms the OSI network and what functions of the network layer, and test which layers are considered to be the most dominant OSI network builders. The next section, namely the second part explains the literature review, the third part explains the research method, the fourth part provides the results of the analysis and discussion and the fifth part provides the research conclusions.

1.1 Literature Review

The system is a collection/group of sub-systems/ parts/components, both physical and non-physical that are interconnected with each other and work together harmoniously to achieve certain goals (Susanto, 2004). This can also be considered as a combination of several elements that are interconnected, and working together well to achieve a common goal. Another definition states that when a word system is used in relation to business operations, it refers to a group of elements that are integrated through a common goal to achieve several objectives (McLeod, 1998, p. 11). In modern management, a system has been integrated automatically between the elements involved in the system. With system integration, communication channels and data, and information transformation will be smoother and more accurate. Open system is a portable application in various hardware configurations. Open systems have gone a long way in the last decade. Before 2000, most suppliers offered exclusive solutions designed to lock customers with specific solutions (for example, IBM's main frame). Since then, the open system has become more than an exception in implementing web-based solutions and Unix-based operating systems. However, open systems have not led to the unlimited interoperability intended by the Open Creators Standard.

OSI (Open System Interconnection) was developed in 1978 by ISO with the aim of facilitating open interconnection on computer systems. ISO as a multinational body focusing on international agreements on international standards developed the OSI because interconnection can support many vendors in various environments. The OSI layer model is also used as a framework used to understand how information runs on networks. (SandraSenft and Frederick Gallegos, 2009), defines the text of the communication model of the OSI model using a seven-level approach to defining rules. OSI is a communication standard applied in computer networks that causes all communication devices to communicate with each other through the network. In the past when the OSI was not used, communication devices from different vendors could not communicate with each other. Communication tools made by IBM cannot communicate with other vendors. Thus, the OSI standard is set (SandraSenft and Frederick Gallegos, 2009). Open System Interconnection declares network models that can be interconnected, regardless of the hardware used, provided the communication software complies with the standard. This indirectly raises "modularity". Modularity refers to the exchange of protocols at a certain level without affecting or damaging relationships or other level functions. In a layer, protocols can be exchanged and allow communication to continue. This exchange occurs based on hardware from different vendors and different reasons. Basically, many types of protocols are developed by many manufacturers of communication equipment and computers.

OSI has seven layers, each of which stands alone, but the function of each layer depends on the success of the previous layer's operation. (Bodner, 1998), (Nurwono, 1994). The seven layers are as follows: The first layer "physical" determines how the media form the chosen communication equipment and how to connect it. The physical layer is related to cables, emphasizing the level of electrical connections, and transmitting signals and data in binary form. This layer also provides provisions about how to channel data bits through communication channels, for example "1" bits are distributed and received as "1" bits too. The second layer "data l ink" (data chain) determines how to connect one computer to another computer, stream data flow, detect and correct transmission errors. This layer forwards data through the channel to an error-free network, because the sender sends data in accordance with the specified procedure, namely by using the protocol. The protocol makes provisions (standards) about synchronizing data transmission between terminals, confirm checks from recipients and makes error control. The third layer "network" defines and maintains electronic links between computers in terms of delivering data from source to destination. The network layer organizes the routing of the routes of data transmission (Routing), aand arrange the activity within the network itself as well as the activity between the network. Network control performs network efficiency when there is a long queue (Congestion Control). The nature of this layer governs how or what type of network you choose to communicate. The fourth layer of "transportation" regulates the transfer of data from one computer to another. In this layer the quality of data transmission

is ensured, so that no data is repeated, misplaced or lost. The transportation function is carried out by the shipping facilities provided. For example, in communicating between two or more computers using a modem, the transport function will be carried out by modem equipment or "modem card". The fifth layer is the session layer (discussant). This layer explains how the two-end user dialog, how two applications are different for exchanging f or instance data from a spreadsheet to a word processor. This layer also controls if one computer is faster than the other, arranges when data must be sent, when to wait, and when to enter a buffer. The sixth layer is presentation. This layer governs how data is formatted (the standard form of data presentation) to be displayed on the monitor screen. In this layer, the process of translating data received from application functions is changed to a more general form of data. Translations are easier to understand and use by the application in question, for example on data received through the dbase application program modified from ASCI. The seventh layer is the application. This layer functions to serve users to establish reciprocal relationships in the OSI environment. The function of this application will regulate how the interaction with the user and what will be sent, so that users of computer systems directly benefit from data communication networks between users. In this layer there are also all data sources that will be sent for example in a purchase transaction, data on items to be purchased to the purchase order section, and so on as required in the procedure of purchasing goods. Another function of this layer is to control the way in and out of files on a computer server; this functions as file transfer.

2 RESEARCH METHODS

This research uses survey research on network communication users, collects information about the importance of communication standards in the network and responds to the OSI and OSI network builders from users of communication in the network. The standards applied in computer networks discuss what OSI is, which layer forms OSI networks, what functions of the network layer, and tests which layer is the most dominant OSI network builder by formulating questionnaire formats submitted to respondents in the form of a Likert scale. The sample in this study is a classroom consisting of students, teachers, lecturers, and employees who use communication in the network in UMN Al Washliyah Medan. This study uses quantitative analysis techniques consisting of descriptive statistics and PLS using the WarpPLS 5.0 program.

2.1 Research Results and Discussion

The result of the respondent's characteristics based on sex consisted of 32 men and 15 women with respondent age 58,3% age 18 - 29 years old, 29,2% age 30 - 39, and 12,5% age 40 - 50 years. The respondent's work consisted of 39,6% students, 25% lecturers, 31,3% employees/ employees and seen from usage of communication in network, 44,7% stated frequently, 21,3% very often, and 29,8% often. This research used WarpPLS 5.0 program to test first order formative contrast with CPA obtained model as follows:

Table 1: Latent variable coefficients (z-score).

Phisik	DLink	NWork	Transpo	Sesi	Present	Aplikasi	Osi	Type	SE	P	value
PH1	0.882	-0.143	-0.021	0.161	-0.397	0.311	0.267	-0.152	Reflect	0.096	<0.001
PH2	0.870	-0.248	-0.002	-0.084	0.409	-0.187	-0.230	0.139	Reflect	0.096	<0.001
PH3	0.381	0.897	0.053	-0.181	-0.015	-0.294	-0.091	0.035	Reflect	0.096	<0.001
DL1	0.431	0.683	0.088	0.023	-0.580	0.160	0.287	0.050	Reflect	0.096	<0.001
DL2	-0.226	0.890	-0.135	-0.034	0.155	-0.424	0.063	-0.061	Reflect	0.096	<0.001
DL3	-0.172	0.542	0.111	0.027	0.476	0.494	-0.465	0.037	Reflect	0.096	<0.001
NW1	-0.045	-0.184	0.881	-0.476	0.205	-0.148	-0.060	-0.092	Reflect	0.096	<0.001
NW2	-0.093	0.046	0.583	0.847	-0.162	-0.048	0.509	-0.179	Reflect	0.096	<0.001
NW3	0.121	0.175	0.774	-0.095	-0.112	0.205	-0.314	0.240	Reflect	0.096	<0.001
TP1	-0.083	-0.120	-0.207	0.850	-0.125	0.008	0.326	-0.161	Reflect	0.096	<0.001
TP2	0.052	0.325	-0.078	0.753	-0.415	0.419	-0.137	-0.136	Reflect	0.096	<0.001
TP3	0.046	-0.210	0.346	0.678	0.619	-0.476	-0.257	0.353	Reflect	0.096	<0.001
SS1	-0.010	-0.146	0.558	-0.296	0.903	-0.268	-0.135	0.015	Reflect	0.096	<0.001
SS2	0.260	-0.030	-0.698	0.623	0.799	-0.026	0.235	-0.232	Reflect	0.096	<0.001
SS3	-0.288	0.226	0.078	-0.335	0.691	0.381	-0.096	0.249	Reflect	0.096	<0.001
PR1	0.362	-0.308	0.503	0.090	-0.256	0.080	0.151	0.162	Reflect	0.096	0.205
PR2	-0.001	0.134	0.301	-0.228	0.178	0.944	-0.154	-0.047	Reflect	0.096	<0.001
PR3	-0.030	-0.108	-0.346	0.222	-0.157	0.938	0.142	0.033	Reflect	0.096	<0.001

AP1	-0.138	-0.016	0.125	0.114	-0.281	0.255	0.849	-0.062	Reflect	0.096	<0.001
AP2	0.133	0.380	0.091	-0.348	0.099	-0.478	0.788	-0.224	Reflect	0.096	<0.001
AP3	0.015	-0.348	-0.216	0.215	0.195	0.195	0.823	0.279	Reflect	0.096	<0.001
OS1	0.037	0.343	-0.388	-0.339	0.397	-0.262	0.002	0.615	Formati	0.096	<0.001
OS2	0.058	-0.104	-0.018	-0.109	-0.209	0.216	-0.212	0.710	Formati	0.096	<0.001
OS3	-0.073	-0.025	0.377	0.018	0.120	-0.023	-0.258	0.648	Formati	0.096	<0.001
OS4	0.280	0.296	-0.962	0.624	-1.004	0.427	0.660	0.673	Formati	0.096	<0.001
OS5	-0.331	-0.519	1.058	-0.235	0.812	-0.429	-0.207	0.619	Formati	0.096	<0.001

Notes: Loadings are unrotated, and cross-loadings are oblique-rotated. SEs and P values are for loadings. P values < 0.05 are desirable for reflective indicators.

Based on the above table, it can be seen that there is no outlier with the range value less than -4 or 4

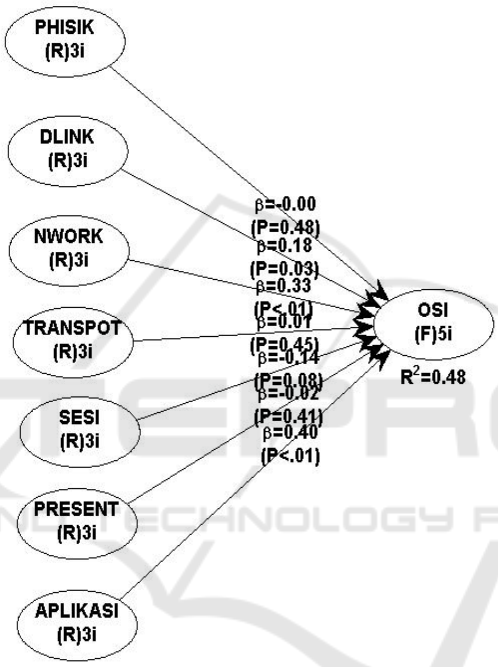

Figure 1: Range value.

Table 2: Indicator Reliability.

Type		P value	VIF	WLS	ES
Reflect	0.096	<0.001	1.631	1	0.463
Reflect	0.096	<0.001	1.612	1	0.451
Reflect	0.096	0.011	1.030	1	0.086
Reflect	0.096	<0.001	1.298	1	0.300
Reflect	0.096	<0.001	1.483	1	0.511
Reflect	0.096	<0.001	1.199	1	0.189
Reflect	0.096	<0.001	1.615	1	0.453
Reflect	0.096	<0.001	1.157	1	0.198
Reflect	0.096	<0.001	1.429	1	0.349
Reflect	0.096	<0.001	1.484	1	0.413
Reflect	0.096	<0.001	1.312	1	0.324
Reflect	0.096	<0.001	1.192	1	0.262
Reflect	0.096	<0.001	2.045	1	0.422
Reflect	0.096	<0.001	1.667	1	0.331

Reflect	0.096	<0.001	1.319	1	0.247
Reflect	0.096	0.319	1.032	1	0.004
Reflect	0.096	<0.001	2.567	1	0.501
Reflect	0.096	<0.001	2.548	1	0.495
Reflect	0.096	<0.001	1.663	1	0.357
Reflect	0.096	<0.001	1.422	1	0.308
Reflect	0.096	<0.001	1.559	1	0.336
Formati	0.096	0.002	1.226	1	0.177
Formati	0.096	<0.001	1.353	1	0.236
Formati	0.096	0.001	1.277	1	0.197
Formati	0.096	0.001	1.390	1	0.212
Formati	0.096	0.002	1.281	1	0.179

Based on the results of the table above, it can be seen that the indicator reliability of all items forming the OSI coil collector is invalid. This is seen because the value factor loading values vary medium for P-Value overall <0.001. OSI builder construct indicator produces weight significance varies VIF value per indicator generated <3.3. 3.665.

Table 3: Latent variable coefficients.

	Phisik	D Link	NWork	Traspo	Sesi	Present	Aplikasi	Osi
R-Squared								0.477
Adj. R-Squared								0.381
Composite Reliab	0.775	0.755	0.796	0.806	0.843	0.759	0.860	0.788
Cronbach'c alpha	0.567	0.508	0.611	0.638	0.716	0.538	0.756	0.664
Avg var extrac	0.560	0.517	0.572	0.583	0.643	0.592	0.673	0.428
Full colin VIF	2.188	2.290	3.665	2.330	2.820	2.390	2.009	1.914
Q-Squared								0.495
Min	-1.974	-3.156	-3.110	-3.389	-3.255	-4.476	-2.598	-2.202
Max	2.491	2.423	2.310	1.716	2.065	1.489	2.107	2.262
Median	-0.230	-0.169	-0.138	-0.056	-0.011	-0.110	-0.245	-0.115
Mode	-0.230	-0.169	-0.138	-0.056	-0,011	-0.110	-0.245	-0.688
Skewness	1.065	-0.223	0.106	-1.384	-0.486	-1.851	0.069	0.312
Exc kurtosis	1.301	2.211	1.975	4.283	2.217	7.455	1.390	-0.136
Unimodal-RS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Unimodal KMV	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Normal JB	No	No	No	No	No	No	No	No
Normal RJB	No	No	No	No	No	No	No	No
Histogram	View	View	View	View	View	View	View	View

Note: Square roots of average variances extracted (AVEs) are shown on diagonal.

From the table above, it can be seen that the value of AVE for CONSTRUCTS seven-layer OSI is excellent s ie> 0.5. Therefore it meets the criteria of convergent validity, and so does the value of Composite Reliability generated construct of the seven-layer OSI whhich is also very good ie> 0.7 that it also meets internal consistency reliability. Full Collinearity VIF values for each construct are also very good ie<3.3 but on the NWork construct there is a collinearity problem in model > 3.3 ie 3.665.

Tabel 4: Correlations among l.vs. with sq. rts. of AVEs.

	Phisik	D Link	NWork	Traspo	Sesi	Present	Aplikasi	Osi
Phisik	(0.748)	0.476	0.620	0.446	0.526	0.380	0.539	0.423
D Link	0.476	(0.719)	0.647	0.501	0.393	0.503	0.334	0.463
NWork	0.620	0.647	(0.756)	0.690	0.276	0.263	0.503	0.605
Traspo	0.446	0.501	0.690	(0.764)	0.360	0.128	0.424	0.443
Sesi	0.526	0.393	0.276	0.360	(0.802)	0.659	0.465	0.195
Present	0.380	0.503	0.263	0.128	0.659	(0.769)	0.231	0.154
Aplikasi	0.539	0.334	0.503	0.424	0.465	0.231	(0.820)	0.558
Osi	0.423	0.463	0.605	0.443	0.195	0.154	0.558	(0.654)

Note: Square roots of average variances extracted (AVEs) shown on diagonal.

P values for correlations

	Phisik	D Link	NWork	Traspo	Sesi	Present	Aplikasi	Osi
Phisik	1.000	<0.001	<0.001	0.002	<0.001	0.009	<0.001	0.003
DLink	<0.001	1.000	<0.001	<0.001	0.007	<0.001	0.024	0.001
NWork	<0.001	<0.001	1.000	<0.001	0.064	0.078	<0.001	<0.001
Transpo	0.002	<0.001	<0.001	1.000	0.014	0.397	0.003	0.002
Sesi	<0.001	0.007	0.064	0.014	1.000	<0.001	0.001	0.195
Present	0.009	<0.001	0.078	0.397	<0.001	1.000	0.122	0.305
Aplikasi	<0.001	0.024	<0.001	0.003	0.001	0.122	1.000	<0.001
Osi	0.003	0.001	<0.001	0.002	0.195	0.305	<0.001	1.000

From the results of the table above, it can be seen that the value of the square root of AVE for the OSI seven-layer construction is greater than the correlation between constructs so as to show good discriminative validity.

From the survey results on the importance of the communication standards applied in the network, it was obtained that respondents strongly agreed 40.4%, agreed 55.3% and doubted 4.3%. The respondents' knowledge of the OSI, which is a standard for communication in the network that is applied globally, 82% of respondents understand and know while 18% do not understand. In terms of establishing OSI network architecture consisting of seven layers, namely physical, data link, network, transportation, session, percentage, and application, respondents strongly agreed 29.2%, agreed 62.5%, and the rest did not agree and were hesitant. The R-Square value in this research model is 0.48, and this shows that this model is moderate, and shows that the factors forming the OSI network are only able to explain 48% and the rest form other factors. This is due to respondents who do not know and understand about OSI (Open System Interconnection) and form the OSI network, respondents in the previous survey were information system managers who had understood and understood Open Interconnected Systems.

3 CONCLUSION AND SUGGESTIONS

Communication is very important as an effort to transfer messages or information from one place to another, both verbally (verbal), written and non-verbal. Communication acts as information, control, motivation, and as an expression of action. OSI is a communication standard that is applied in computer networks. Standard that causes all communication devices to communicate with each other through the network. Open System Interconnection (OSI) is a model of a globally accepted framework for the development of complete and open standards. The OSI model helps create open standards between systems to interact and communicate with each other, especially in the field of information technology. OSI can provide a network architecture display that is divided into 7 (seven) layers. Based on the discussion above, the OSI model can only be explained by 48% and the rest form other factors. This is caused by respondents who do not know and understand about OSI (Open System Interconnection) and form the OSI network. Respondents in the previous survey were information system managers who had understood and understood Open System Interconnected so this study was still very weak and needed to conduct research with respondents who really understand and understand about OSI (Open System Interconnection).

REFERENCES

Azhar Susanto., 2004. Accounting Information System: Computer Based Concept and Development, First Edition. Bandung: Lingga Jaya

Bodner, H. George., 1998. Accounting Information System, 7th Ed. New Jersey: Prentice-Hall International, Inc.

Mcleod, JR. Raymond., 1998. Management Information System: A Study of Computer Based information Systems, 6th ed., New Jersey: Prentice Hall, Inc.

Sandra Senft and Frederick Gallegos., 2009. Information Technology Control and Audit, Third Edition ISBN: 978-1-4200-6550-3

Imam, Ghozali., 2017. Partial Least Squares, Concepts, Methods and Applications Using the WarpPLS 5.0 Program. Diponegoro University Publishing Agency.