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Knowledge Management of Students' usage of Online Networks: a Measurement Scale

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***Abstract*—Through a systematic review of existing theories and models, various constructs and elements were identified and used to develop a conceptual framework which was quantitatively tested on a convenience sample of students (*n=300*) at Sunway University in Malaysia. Based on the results, a measurement scale was developed and analysed through structural equation modelling and confirmatory factor analysis. The results of the study emphasized the importance to proactively manage knowledge creation and sharing in online networks to enhance the learning experience and identity formation of students.**

***Keywords*—identify formation, learning experience, knowledge management**

I. Introduction

Cheung, Chiu and Lee (2011, 1337) defines online network as virtual communities where people connect and interact with each other on a specific topic or where they just 'hang out' together at a social level. In recent years research on the use of online networks in a learning virtual environment has become as powerful as the technological change in the history of the globalized world, yet a lack of theory-driven empirical research has been done. Boyd and Ellison (2007) emphasise that a lack exists of studies that explore the link between online networks and education. This paper addresses this gap through the research problem that a lack of studies exists from a communicative perspective to investigate the importance of knowledge management of students' usage of online networks for their identity formation and learning experience. It is posited that the usage of online networks could potentially eliminate barriers to the learning experience by providing increased convenience, flexibility, currency in material or tutorials, student retention, individualised learning, and feedback from lecturers and other students. Furthermore, in understanding the reasons for and the extent of usage of online networks by students, it might impact on the way in which online networks can be managed for information creation and sharing to enhance student motivation to learn and build relationships to maintain social capital with others (Ellison, Steinfield and Lampe 2007). For the purpose of this paper, the following definitions of the key concepts are prevalent. According to Rimskii (2011, 79-80), the interpretation of identity most appropriate for the analysis of *identity formation* in online networks on the Internet is that it is the *state of an individual's consciousness in which, on the basis of the aggregate set of personal characteristics, one knows oneself, one recognizes the stability of one's own personality; one determines oneself from the surrounding reality, and one determines one's membership in a particular social group and, conversely, acknowledges the impossibility of belonging to other social groups*. The definition of *online networks* has been adapted from Boyd and Ellison (2007) who define it as web-based services which allow individuals to construct a profile (identity formation) within a bounded system articulated by other users (usage patterns) with whom they share the connection, and how they perceive the connections and feedback (learning experience) that take place within this system. Hence, the usage of and identity formation and the learning experience in online networks form part of an advanced process with various phenomenological aspects, and the transference thereof from the real world might have far-reaching implications. Because online networks are a rich means of knowledge creation and sharing where individuals in the groups are united by shared activities, working information and interests, the *learning experience* will be dependent on information and knowledge obtained through interactions.

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II. Theoretical Research framework

According to Chan, Walker and Gleaves (2015, 97) a lack of consensus has exposed two distinct areas in the theorisation of online learning namely: a field of technological affordance distinct from e-learning and broadly defined in terms of educational relevance; and how it is exemplified through the ubiquitous and personalised use of technology. This study hence draws from integrative theoretical models that document and stresses the need to consider usage patterns of students. Based on the viewpoint of Farquhar and Rowley (2006, 162) that institutions with power over online networks as technological e-learning developments are in a better position to dominate and manage interactions on the Internet, it is argued that this network society offers the opportunity to knowledge-based institutions to build, enhance and maintain sustainable communication relationships with individuals through knowledge creation and sharing. In the context of this study, the main thrusts of the research were viewed and analysed from a knowledge management which is defined *as the generation, storing, representation and sharing of knowledge to the benefit of the organisation and its individuals, it is arguably specifically relevant to study the use of online networks for identity formation and the learning experience through knowledge creation and sharing* (Barker 2011, 334-350). The relevance of this theory to this study is supported by, inter alia, Hung and Cheng (2013) who posited that online networks serve as storehouses of knowledge in which information and knowledge creation and sharing is growing rapidly for problem solving and learning purposes at universities. In

line with the research problem, the objectives were to emphasise the importance to use knowledge management through an expert for students' usage of online networks and how it affects their identity formation and learning experience. After an extensive literature search using these concepts and applying inclusion and exclusion criteria, six instruments were selected of which criteria have been adapted for the purpose of this study. The findings of this review indicated that the most appropriate elements to use in order to study these concepts are the ones presented in the theoretical framework presented in Fig. 1.

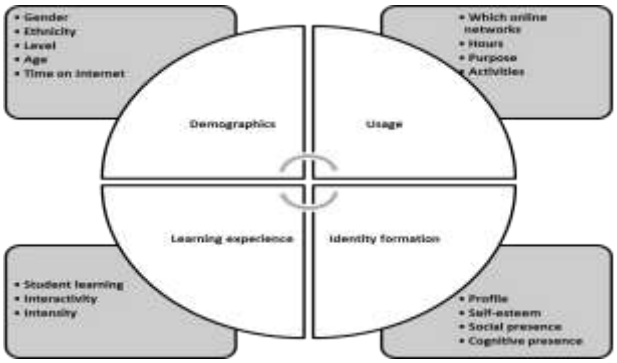

Fig. 1: Theoretical Research Framework

This framework has been adapted from existing instruments and questionnaires, based on a comprehensive review of literature on, *inter alia*, *demographics* (Ellison et al., 2007, 1149); *usage* (Ellison et al. 2007, 1150); *identity formation* (identity profile adapted from LaRose, Lai, Lange, Love and Wu 2005; self-esteem adapted from Rosenberg's 1989 self-esteem scale, updated by Ellison et al. 2007, 1152; social presence and cognitive presence adapted from Garrison, Cleveland-Innes and Fung 2004, 67); and *learning experience* (student learning adapted from Garrison et al., 2004, pp. 72-73 and Pempek, Yermolayeva and Calvert, 2008, 233; interactivity adapted from Garrison et al. 2004; Pempek et al. 2008, 234; intensity from Ellison et al. 2007, 1150).

Against this background, the main aim of this paper is to address the lack of existing theoretical approaches by developing and empirically testing a new measurement model based on the argument that a triadic relationship exists between online networks, identity formation and the learning experience. Based on the preceding theoretical discussion, corroborated by Bonboni and Pinho (2013, 223) when they state that existing approaches do not *fully capture the richness of the concept by not taking into account the social identity dimension*, a new conceptual framework as shown in Fig. 2 has been developed to address this gap.

Fig. 2: Conceptual framework

III. Methodology

A. *Sample*

This study empirically tested the above conceptual framework where the study population comprised students at different levels of study at a private university. A combination of quantitative survey methods and a qualitative literature review formed the core of the data that were used for this study. Respondents were all students at the Sunway University in Malaysia.

B. *Measures*

Before administration of the survey, a preliminary survey was conducted with 43 students in October 2014. The results indicated that the wording of questions was clear but that 21 of the 87 items did not indicate any significance. To increase the reliability of the measure, these items were removed. After the pilot test, a 66-item instrument comprising seven sub-constructs was developed where the alpha values reported in brackets are Cronbach's reliability coefficients for each construct: profile (α=0.614), self-esteem (α =0.774), social presence (α =0.894), cognitive presence (α =0.786), student learning (α =0.875), interactivity (α =0.843) and intensity (α =0.725). The Cronbach alpha for each of these constructs was between 0.6 and 0.8, which implies that the reliability of these constructs was acceptable and it can be considered that there was substantial agreement between them. These constructs were identified based on the proposed conceptual framework for theoretical research developed for this study, obtained through a thorough literature review. Theoretical statements, which are defined as summaries of central assumptions; suppositions; conjectures; and assertions of declarations based on certain theories, models or the literature, were used in the compilation of the questionnaires and were adapted based on the results of the pilot study – that is, those factors with no significant indicators were removed (Taylor, Trenkel, Kupca and Stefansson 2011, 3). The measurement scale used for the closed-ended questions was the seven-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree).* The survey data were then collected in November and December 2014 from a sample of students randomly selected in the classrooms. A short description of the study, information about confidentiality and an incentive for participation resulted in a realised sample of 300 (n=300) from the 320 students initially selected and confirmed that there were no missing data. The proposed measurement model in Fig. 2 was measured using reliability and construct measurement measures in SMARTPLS to determine the cohesiveness of the items used to measure each construct.

C. *Results*

Descriptive characteristics

The descriptive characteristics of respondents' demographic information indicated that from the realised sample (n=300), 191 respondents were male (63%) and 110 were female (37%). Most of the students were Chinese (85%), Indian (6%) and Malaysian (5%), with the majority of students being between the ages of 18 to 20 years (81%), followed by 20 to 25 years (18%); only 1% were younger than 18 years. Interestingly, most of the students who made

use of online networks were at first-year level (73%), followed by second-year level and honours level (both at 11%), and third-year level (only 5%). The reasons they gave for their usage of online networks were as follows: Facebook (social interaction *n*=267 and to stay on trend *n*=226, but still a high result for using it for personal information *n*=122 and for learning purposes *n*=103), Elearn (for learning purposes *n*=26) and Twitter (social interaction *n*=133 and to stay on trend *n*=108). It is clear that Elearn is mostly used for learning purposes; it scored the lowest for social interaction. An interesting observation is that Twitter scored fairly high on usage for learning purposes compared to the remaining online networks, while MySpace was not used at all. It can be deduced that, in general, the online networks Facebook, Elearn and Twitter are indeed used for learning purposes and that students rely more on Facebook, Twitter and other online networks for their identity formation. Most students had more than 50 online connections on Facebook (*n*=238), followed by Twitter (*n*=107). A substantial number of respondents (*n*=151) had fewer than 20 connections on Elearn, which is quite interesting as this is the formal online networks of the university.

Results of the measurement model

The proposed measurement model was analysed and interpreted in two stages: an assessment of the construct validity of the measurement model through common method variance (CMV) factor analysis; and an assessment of the structural model. All the sub-constructs in the structural model were specified as latent variables. The following section explains these stages.

CMV factor analysis: SMARTPLS

Data collected may be subject to self-reported biasness, which could mean that there may be a potential for CMV biasness. Conway and Lance (2010, 328) mention "that it is widely assumed that common method bias inflates relationships between variables measured by self-reports". The Harman one-factor test (CMV biasness) was conducted to determine the extent of biasness in various proportion distributions of the items (Ramayah, Lee and In, 2011). According to Podsakoff and Organ (1986), common method bias is problematic if a single latent factor would account for the majority of the explained variance; in this case it would be more than 50%. In this study, the un-rotated factor analysis showed that the one factor accounted for only 31.56% of the total variance, and thus the common method bias was not a serious threat.

The CMV, using factor analysis by forcing all the measurements into one single factor, appears to be less than 50%, indicating that no major common method problems were evident; hence, the researchers proceeded with the building of the measurement model. Once all the data was finally ready to be fitted into a structural equation model (SEM), the data was imported into SMART PLS software for analysis. The measurement model was deemed valid because the usage of an SEM implied that it complied with the definition proposed by Hair, Black, Babin and Anderson (2010, 636), namely "the rules of correspondence between measure and latent variables (constructs) were accessed for their validity". The results are indicated in Fig. 3.

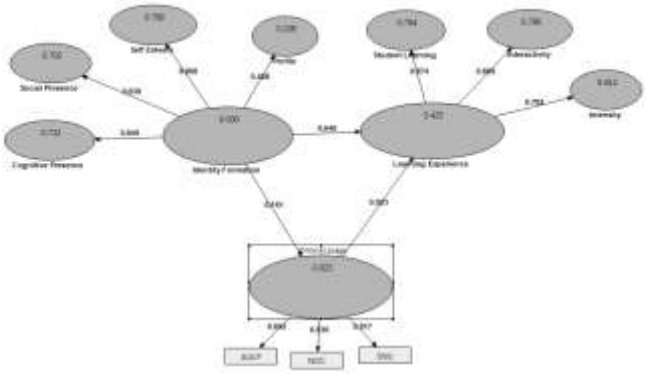

Fig. 3: Measurement Model

Reliability and validity

Indicator reliability denotes the proportion of indicator variance that is explained by the latent variable, which is between 0 and 1. When the indicator and latent variables are standardised, the indicator reliability equals the *squared indicator loading*, which should normally be about 0.25 to 0.5. Reflective indicators with loadings within the PLS model that were less than 0.4 were removed (Hulland 1999, 198). Because loadings of measurements < 0.5 suggest a negligible effect, these items were removed, as indicated in Table 1.

Table 1: Measurements removed

Constructs	Removed Item	Definition
Online Usage	AUWE	Average Usage Weekends
	AUWD	Average Usage Weekdays
Profile	IYS 4, IYS 6 - IYS13	
Self Esteem	NONE	
Social Presence	PYA 1, PYA 2	
Cognitive Presence	NONE	
Student Learning	OLE 3	
Interactivity	NONE	
Intensity	IWO 1, IWO 3,IWO4	

To achieve *convergent reliability*, the *average variance extracted (AVE)* was calculated. The AVE is comparable to the proportion of variance explained in factor analysis, with values again ranging from 0 and 1. As explained by Bagozzi and Yi (1988) and Fornell and Larcker (1981), a latent variable with an AVE *exceeding 0.5* suggests adequate convergent reliability (CR). The calculations of the AVE and CR are presented in Table 2.

Table 2: Calculation of the Average Variance Extracted (AVE) and the Convergent Reliability (CR)

	AVE	CR
Online Usage (OU)	0.673614	0.859164
Cognitive Presence (CP)	0.553029	0.896283
Self Esteem (SE)	0.542525	0.928344
Social Presence (SP)	0.561755	0.899171
Profile (PR)	0.573781	0.843248
Student Learning (SL)	0.503428	0.901022

Interactivity (IA)	0.611696	0.933949
Intensity (IT)	0.604507	0.883533
Identity Formation (IF)	0.612	0.858
Learning Experience (LE)	0.722	0.886

Tables 3 and 4 present the calculations for identity formation and learning experience respectively.

Table 3: Calculation for identity formation

Calculation for Identity Formation			
	STD Loading	**STD Loading squared**	**Error Variance = 1- loadings squared**
Cognitive Presence	0.849	0.720801	0.279199
Social Presence	0.838	0.702244	0.297756
Self Esteem	0.888	0.788544	0.211456
Profile	0.488	0.238144	0.761856
Total Loadings	3.063	2.449733	1.550267
Total Loadings Squared	9.381969		
			10.932236
	AVE	**0.612**	
	Composite Reliability		**0.858**

Table 4: Calculation for learning experience

Calculation for Learning Experience			
	Std Loading	**STD Loading squared**	**Error Variance = 1- loadings squared**
Student Learning	0.874	0.763876	0.236124
Interactivity	0.889	0.790321	0.209679
Intensity	0.782	0.611524	0.388476
Total Loadings	2.545	2.165721	0.834279
Total Loadings Squared	6.477025		
			7.311304
	AVE	**0.722**	
	Composite Reliability		**0.886**

Based on the above, the full measurement model is presented in Table 5.

Table 5: Full Measurement Model

2nd Order Construct	AVE	CR	Construct	Item	Loadings	AVE	CR
			Online Usage	AULP	0.692	0.674	0.859
				NOC	0.936		
				SNU	0.817		
Identity Formation	0.612	0.858	Cognitive Presence	YP_1	0.690	0.553	0.896
				YP_2	0.752		
				YP_3	0.775		
				YP_4	0.693		
				YP_5	0.786		
				YP_6	0.764		
				YP_7	0.739		
			Self Esteem	SYS_1	0.707	0.543	0.928
				SYS_10	0.709		
				SYS_11	0.676		
				SYS_2	0.830		
				SYS_3	0.707		
				SYS_4	0.810		
				SYS_5	0.747		
				SYS_6	0.806		
				SYS_7	0.661		
				SYS_8	0.777		
				SYS_9	0.645		
			Social Presence	PYA_3	0.623	0.562	0.899
				PYA_4	0.737		
				PYA_5	0.774		
				PYA_6	0.806		
				PYA_7	0.802		
				PYA_8	0.771		
				PYA_9	0.717		
			Profile	IYS_1	0.734	0.574	0.843
				IYS_2	0.796		
				IYS_3	0.740		
				IYS_5	0.679		
Learning Experience	0.772	0.886	Student Learning	OLE_1	0.661	0.503	0.901
				OLE_10	0.710		
				OLE_2	0.725		
				OLE_4	0.693		
				OLE_5	0.754		
				OLE_6	0.740		
				OLE_7	0.752		
				OLE_8	0.669		
				OLE_9	0.675		
			Interactivity	OCI_1	0.750	0.612	0.934
				OCI_2	0.687		
				OCI_3	0.823		
				OCI_4	0.760		
				OCI_5	0.809		
				OCI_6	0.804		
				OCI_7	0.799		
				OCI_8	0.819		
				OCI_9	0.777		
			Intensity	IWO_2	0.652	0.605	0.884
				IWO_5	0.815		
				IWO_6	0.823		
				IWO_7	0.828		
				IWO_8	0.756		

The measurement model achieved *convergent validity* with measurement loadings > 0.5, average variance extracted > 0.5, and convergent reliability > 0.7. The *discriminant validity* of every latent variable was assessed to ensure that each latent variable is subjectively independent of other indicators. Two measures were used: the Fornell and Larcker (1981) criterion, and the cross-loading criterion (Chin 2010). According to them, a latent variable should explain the variance of its own indicators better than that of other latent variables. This is to ensure that no multicollinearity exists amongst the latent variables. In this instance the AVE of a latent variable was higher than the squared correlations between the latent variable and all other variables (Chin 2010; Fornell and Larcker 1981). Table 6 presents the latent variable correlations.

Table 6: Latent Variable Correlations (Discriminant Validity)

	CP	IF	IT	IA	LE	OU	PR	SE	SP	SL
CP	***0.744***									
IF	0.849	***0.782***								
IT	0.426	0.472	***0.782***							
IA	0.548	0.575	0.553	***0.889***						
LE	0.592	0.651	0.772	0.782	***0.850***					
OU	0.113	0.151	0.144	0.102	0.121	***0.821***				
PR	0.357	0.488	0.251	0.182	0.279	0.023	***0.757***			
SE	0.616	0.888	0.375	0.458	0.526	0.098	0.355	***0.737***		
SP	0.662	0.838	0.430	0.534	0.598	0.214	0.314	0.599	***0.750***	
SL	0.510	0.592	0.612	0.615	0.874	0.080	0.299	0.488	0.539	***0.710***

Note: Diagonals (bolded) represent the square root of the AVE while off diagonals represent the correlations

According to the Fornell and Larcker criterion (1981), the values of the diagonals MUST be higher than those of the row and column. From this table it is clear that the respondents were able to understand and discriminate between the different variables, as the diagonal correlations are higher than the off-diagonal correlations. Table 7 presents the cross loadings of the measurement and latent variables.

Table 7: Cross Loadings of measurement and latent variables

	OU	CP	SE	SP	PR	SL	IA	IT
AULP	**0.692**	0.011	0.059	0.118	-0.017	0.021	0.026	0.003
NOC	**0.936**	0.135	0.109	0.228	0.054	0.086	0.132	0.169
SNU	**0.817**	0.072	0.052	0.137	-0.025	0.063	0.037	0.108
YP_1	0.064	**0.690**	0.409	0.364	0.279	0.312	0.327	0.254
YP_2	0.113	**0.752**	0.465	0.519	0.241	0.398	0.451	0.257
YP_3	0.121	**0.775**	0.500	0.570	0.221	0.378	0.451	0.298
YP_4	0.058	**0.693**	0.341	0.450	0.201	0.325	0.329	0.292
YP_5	0.044	**0.786**	0.449	0.544	0.309	0.476	0.463	0.426
YP_6	0.063	**0.764**	0.463	0.434	0.274	0.328	0.370	0.314
YP_7	0.114	**0.739**	0.550	0.538	0.325	0.418	0.436	0.364
SYS_1	0.001	0.386	**0.707**	0.380	0.308	0.359	0.282	0.264
SYS_10	0.092	0.474	**0.709**	0.497	0.238	0.398	0.341	0.251
SYS_11	0.175	0.383	**0.676**	0.445	0.268	0.353	0.336	0.210
SYS_2	0.058	0.514	**0.830**	0.515	0.312	0.477	0.398	0.345
SYS_3	0.046	0.426	**0.707**	0.378	0.261	0.348	0.335	0.229
SYS_4	0.068	0.529	**0.810**	0.451	0.306	0.383	0.363	0.329
SYS_5	0.088	0.426	**0.747**	0.423	0.270	0.276	0.264	0.288
SYS_6	0.042	0.471	**0.806**	0.453	0.274	0.420	0.367	0.297
SYS_7	0.114	0.396	**0.661**	0.406	0.146	0.249	0.307	0.183
SYS_8	0.079	0.545	**0.777**	0.527	0.246	0.414	0.433	0.326
SYS_9	0.040	0.403	**0.645**	0.354	0.232	0.226	0.252	0.288
PYA_3	0.173	0.323	0.312	**0.623**	0.248	0.327	0.236	0.256
PYA_4	0.155	0.376	0.373	**0.737**	0.219	0.380	0.343	0.324
PYA_5	0.205	0.520	0.528	**0.774**	0.228	0.460	0.400	0.408
PYA_6	0.181	0.533	0.522	**0.806**	0.220	0.450	0.442	0.381
PYA_7	0.179	0.571	0.518	**0.802**	0.252	0.396	0.437	0.262
PYA_8	0.118	0.541	0.404	**0.771**	0.259	0.394	0.474	0.340
PYA_9	0.114	0.558	0.442	**0.717**	0.231	0.408	0.429	0.276
IYS_1	0.057	0.344	0.326	0.336	**0.734**	0.270	0.171	0.248
IYS_2	-0.051	0.234	0.203	0.140	**0.796**	0.148	0.081	0.168
IYS_3	-0.013	0.209	0.218	0.226	**0.740**	0.214	0.140	0.178
IYS_5	0.053	0.260	0.294	0.205	**0.758**	0.246	0.139	0.144
OLE_1	0.012	0.481	0.426	0.442	0.329	**0.661**	0.424	0.389
OLE_10	0.007	0.292	0.219	0.289	0.155	**0.710**	0.440	0.422
OLE_2	0.086	0.409	0.456	0.399	0.292	**0.725**	0.429	0.443
OLE_4	0.180	0.355	0.363	0.444	0.176	**0.693**	0.420	0.472
OLE_5	0.120	0.331	0.366	0.353	0.182	**0.754**	0.436	0.455
OLE_6	-0.048	0.295	0.280	0.297	0.157	**0.740**	0.472	0.417
OLE_7	-0.020	0.337	0.243	0.393	0.214	**0.752**	0.481	0.514
OLE_8	0.085	0.383	0.426	0.382	0.218	**0.669**	0.387	0.371
OLE_9	0.099	0.390	0.363	0.458	0.197	**0.675**	0.433	0.414
OCI_1	0.081	0.474	0.377	0.450	0.191	0.534	**0.750**	0.432
OCI_2	-0.004	0.349	0.299	0.323	0.108	0.429	**0.687**	0.294
OCI_3	0.141	0.500	0.402	0.472	0.171	0.479	**0.823**	0.456
OCI_4	0.141	0.452	0.409	0.420	0.096	0.439	**0.760**	0.414
OCI_5	0.087	0.458	0.424	0.473	0.183	0.459	**0.809**	0.400
OCI_6	0.069	0.425	0.393	0.392	0.164	0.474	**0.804**	0.494
OCI_7	0.074	0.386	0.270	0.398	0.060	0.451	**0.799**	0.403
OCI_8	0.063	0.405	0.332	0.374	0.096	0.535	**0.819**	0.489
OCI_9	0.053	0.401	0.315	0.451	0.203	0.520	**0.777**	0.483
IWO_2	0.189	0.311	0.270	0.310	0.149	0.365	0.396	**0.652**
IWO_5	0.143	0.368	0.317	0.392	0.195	0.495	0.461	**0.815**
IWO_6	0.012	0.356	0.344	0.329	0.208	0.558	0.462	**0.823**
IWO_7	0.096	0.331	0.254	0.322	0.190	0.467	0.450	**0.828**
IWO_8	0.147	0.286	0.267	0.317	0.230	0.477	0.373	**0.756**

According to Chin (2010), the loadings of an indicator on its assigned latent variable should be higher than its loadings on all other latent variables. Table 7 shows the *discriminant validity* and *convergent validity* of latent variables used in this study. To ensure discriminant validity, bold loadings should be higher than all other loadings within the same row, whereas convergent validity is achieved when bold loadings are higher than all other loadings within the same column. Convergent reliability is also achieved when AVE exceeds 0.5 (Bagozzi and Yi 1988; Fornell and Larcker 1981). From Table 7 it is clear that the cross loadings of the

measurement indicators are the highest on the prescribed latent variables, and therefore validity and reliability have been achieved.

IV. Discussion

This study suggests that students and educators should pay attention to three main aspects when using online networks for learning purposes. Firstly, cognisance should be taken of students' identity formation, including their profiles and usage patterns, to ensure that effective communication takes place between the student and lecturer in order to enhance the knowledge creation and sharing process that takes place through the teaching or training of students, with the ultimate aim of ensuring that a comprehensive knowledge system of a specific domain or subject is established. Secondly, students should pay attention to their online identity formation and usage patterns to ensure that they behave ethically and in line with the required values of the institution. Thirdly, although interactivity and intensity of usage might benefit students' learning experience, the results of this study suggest that 'being active online' should not simply be measured by the number of messages posted on online networks or the frequency of online responses or feedback; rather, it should be measured by the learning experience that takes place through that interactivity and intensity of usage.

V. Limitations and Future Research

The main limitation of this study is that the sample population consisted of randomly selected graduate students from different domains at one university only; hence, the results cannot be generalised. Access to the Internet, the culture of the university and students' creativity requirements might also differ at other universities. Despite these limitations, this paper does contribute at an academic level to address the need for a new and/or improved measuring scale which proved to be reliable and valid. Given the scarcity of research on this new and relatively under-explored area, this study can be seen as an important starting point for future research to clarify and consider the wider implications of identity formation and the learning experience in online networks in theory and in practice, where the former may evoke enhancements of research in general and the latter may take place across different areas and sectors.

VI. Conclusion

In an effort to expand on the knowledge of students' usage of online networks for identity formation and the learning experience, this study investigated the triadic relationship among these constructs and sub-constructs of each.

[The results have important implications for students and lecturers with regard to the usage of online networks in the learning environment and highlighted the need for proactive knowledge management of the lecturer as an 'expert'.]

The results of the new measurement scale confirmed that a link exists between the usage of the Internet for learning purposes (students were more open for information sharing in order to build a sense of belonging, gain group cohesion, encourage participation, obtain feedback, etc.) and identity formation (they tried to increase their self-confidence and self-esteem by establishing a social and cognitive presence through their online profiles, developed positive attitudes, etc.); and that students realise the importance of interactivity and intensity in online networks, especially for learning purposes (many adapted their identity to be accepted by the in-groups, managed information to enhance student learning, took responsibility, networked, collaborated, etc.). While this paper outlined some of the basic concepts and approaches, much remains to be done and several options exist to further extend this initial study. The importance of this is borne out by the following quote from Tang and Ding (2014, p. 464): *The Internet is becoming an important information or knowledge source and a widely used communication platform for college students. With the development of internet technology, virtual interactions among professional persons are being increased quickly, [...] [leading] to the emergence of a virtual networked knowledge society.*

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