Diseño y validación de una escala para medir la gestión de la identidad digital

Design and Validation of a Scale to Measure Digital Identity Management

Projeto e validação de uma escala para medir o gerenciamento de identidade digital

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Resumen

La gestión de la identidad digital implica un proceso permanente y consciente del manejo de información personal y contenido que se comparte en Internet, con miras a proteger la privacidad y reputación digital. El objetivo del artículo es describir el proceso de diseño y validación de la escala de percepción titulada *IDentifica2.0*, creada para medir la gestión de la identidad digital, instrumento empleado para la investigación doctoral en Sistemas y Ambientes Educativos de la Universidad Veracruzana, México. La escala de Likert desarrollada contiene cinco dimensiones: creación de la identidad digital, visibilidad, privacidad y seguridad en Internet, reputación digital y efectos de la identidad digital en el ámbito personal. Se aplicó a 319 estudiantes de la licenciatura en Pedagogía de la Universidad Veracruzana (88 % de mujeres y 12 % de mujeres). Se realizó un análisis factorial exploratorio (AFE) y análisis factorial confirmatorio (AFC) para determinar su validez, que derivó en la eliminación de ítems con baja o nula correlación. Como parte de los resultados, se obtuvo un alfa de 0.80 y un índice Kaiser-Meyer-Olkin (KMO) de 0.728 global para las cinco subescalas. La versión final contiene 32 ítems agrupados en cinco factores. La escala IDentifica2.0 cuenta con un nivel aceptable de confiabilidad y validez para medir la gestión de la identidad digital, y abona al análisis de esta competencia digital.

Palabras clave: confiabilidad, escala de percepción, estudiante universitario, identidad digital, instrumento de medida, medición, validez.

Abstract

Digital identity management involves a permanent and conscious process of handling personal information and content that is shared on the Internet, protecting privacy and digital reputation. The objective of the article is to describe the design and validation process of the perception scale titled *IDentifica2.0*, created to measure the management of digital identity, an instrument used for doctoral research in Educational Systems and Environments of the Universidad Veracruzana. The developed Likert scale contains five dimensions: creation of digital identity, visibility, privacy and security on the Internet, digital reputation, and effects of digital identity in the personal sphere. It was applied to 319 students (88% women and 12% women) of the Bachelor of Pedagogy at the Universidad Veracruzana (México). An exploratory factor analysis (AFE) and confirmatory factor analysis (AFC) were performed to determine its validity, which results in the elimination of elements with little or no correlation. As part of the results, an alpha of 0.80 and a Kaiser-Meyer-

Olkin (KMO) index of 0.728 were obtained globally for the five subscales. The final version contains 32 items grouped into five factors. The IDentifica2.0 scale has an acceptable level of reliability and validity to measure the management of digital identity, contributing to the analysis of this digital competence

Resumo

A gestão da identidade digital implica um processo permanente e consciente de tratamento da informação pessoal e dos conteúdos partilhados na Internet, com vista à protecção da privacidade e da reputação digital. O objetivo do artigo é descrever o processo de desenho e validação da escala de percepção intitulada IDentifica2.0, criada para medir a gestão da identidade digital, instrumento utilizado para pesquisa de doutorado em Sistemas e Ambientes Educacionais da Universidade Veracruzana, México. A escala Likert desenvolvida contém cinco dimensões: criação da identidade digital, visibilidade, privacidade e segurança na Internet, reputação digital e efeitos da identidade digital na esfera pessoal. Foi aplicado a 319 alunos da licenciatura em Pedagogia da Universidade Veracruzana (88% mulheres e 12% mulheres). Uma análise fatorial exploratória (AFE) e análise fatorial confirmatória (CFA) foram realizadas para determinar sua validade, o que levou à eliminação de itens com baixa ou nenhuma correlação. Como parte dos resultados, um alfa de 0,80 e um índice Kaiser-Meyer-Olkin (KMO) de 0,728 foram obtidos globalmente para as cinco subescalas. A versão final contém 32 itens agrupados em cinco fatores. A escala IDentifica2.0 tem um nível aceitável de confiabilidade e validade para medir a gestão da identidade digital e apóia a análise dessa competência digital.

Introduction

Castañeda and Camacho (2012) They consider that digital identity is formed from the personal information that is shared on the Internet, in addition to the social interaction generated with other users. For Peachey and Childs (2011), digital identity "is projected by what a person does on the Internet: what they say, how they say it, the language they use, their topics of interest and a long etcetera that we basically configure every time we we click on the computer "(p. 7). So it can be considered as the set of personal data that is published on the Internet through which a person calls himself; It is complemented by the information that other users exchange and share with said person, and is associated with a digital profile (Aced, Arqués, Benítez, Llodrà and Sanagustín, 2009; Ainsa, 2016; Lara, 2009; Tusa, 2018).

Virtually everything that is done on the Internet, any query, sending messages, creating content or sharing information, deepens the digital footprint of each user, a trace that says a lot about their behavior on the Internet. This digital identity "is built by through activity on the Internet, when it contributes texts, images and videos to the Internet, ultimately participating in the web world "(Giones and Serrat, 2010, p. 3). It involves a permanent process of trial and error (Gamero, 2009). And it is linked to the actions of users in digital environments, avatars and online profiles, information shared on social networks, data derived from our personal digital objects, etc. (Gabrielidis, 2015).

To place digital identity management in the context of digital competence, Ferrari (2013) points out, derived from the DigComp project, that digital competence is made up of five areas, which together result in 21 competencies (see table 1) , including competence 2.6: digital identity management.

Tabla 1. Áreas de competencias y competencias digitales

Área	Competencia
1) Información	*1.1)* Navegación, búsqueda y filtrado de información
	1.2) Evaluación de la información
	1.3) Almacenamiento y recuperación de la información
2) Comunicación	*2.1)* Interacción mediante nuevas tecnologías
	2.2) Compartir información y contenidos
	2.3) Participación ciudadana en línea
	2.4) Colaboración mediante canales digitales
	2.5) Netiqueta
	2.6) Gestión de la identidad digital
3) Creación de contenido	*3.1)* Desarrollo de contenidos
	3.2) Integración y reestructuración
	3.3) Derechos de autor y licencias
	3.4) Programación
4) Seguridad	*4.1)* Protección de dispositivos
	4.2) Protección de datos personales
	4.3) Protección de la salud
	4.4) Protección del entorno
5) Resolución de problemas	*5.1)* Resolución de problemas técnicos
	5.2) Identificación de necesidades y respuestas tecnológicas
	5.3) Innovar y utilizar la tecnología de forma creativa
	5.4) Identificación de lagunas en la competencia digital

Fuente: Ferrari (2013, p. 11)

Now, Giones and Serrat (2010) establish that "the management of digital identity is the conscious management of the web environment, the opportunities and dangers of the Internet at the time of publishing one's personal information in the knowledge society" (p . two). For its part, for Ferrari (2013) "digital identity management involves creating, adapting and managing one or more digital identities, being able to protect your digital reputation, managing the data that you produce through various accounts and applications" (p. 11). Initially, digital identity management considers three dimensions: visibility, reputation and privacy (Giones and Serrat, 2010; Pérez, 2012).

The management of digital identity starts from the construction of user profiles (Georges, 2011; Tusa, 2018), since on the Internet people can create a digital identity that totally or partially coincides with personal identity (Aguilar and Said, 2010; Dans, 2015; Perea, 2010), in addition to the fact that more than one identity can be generated in the virtual sphere (Bozkurt and Tu, 2016; Ferrari, 2013; Tusa, 2018). In short, it has a personal and a social part (Castañeda and Camacho, 2012), and it is self-constructed by the user or made up of the people with whom it interacts in the virtual environment.

Likewise, this interaction that arises in the digital sphere has an impact on the personal sphere, since the actions derived from the virtual interaction can affect the physical or social relationships between people who live together on a daily basis (Ahlquist, 2016; Fernández, 2014; Portillo, 2016). On the other hand, the effect that the personal environment generates on Internet users is also identified (Adriaanse and Rensleigh, 2017; Ainsa, 2016; Valderrama, 2017; Vargas, 2016). Based on the above, the creation of digital profiles is conceived as part of the management of digital identity, in addition to the effects that the actions of the virtual environment generate in the personal sphere of the users, so that the management of this type It would be made up of five dimensions: creation of digital identity, visibility, privacy and security on the Internet, digital reputation and the effects of digital identity in the personal sphere.

It started with the question: what level of reliability and validity does the IDentifica2.0 scale have to measure the management of digital identity in university students? The objective of the research was to describe the design and validation process of the IDentifica2.0 scale. It is based on the hypothesis that said instrument meets the reliability and validity criteria necessary to be used in university students.

Related studies

Starting from these five dimensions, a search for similar studies was carried out in order to identify trends in this regard. In a first search, 94 related studies were found. After a thorough review, in accordance with the criteria of congruence and utility for the design of the scale, 48 studies were studied. It stands out that 14 studies were found on the dimension of privacy and security on the Internet, followed by digital reputation with 12, visibility with nine, effects of personal identity in the personal sphere with seven and, finally, six of the dimension of creation of the digital identity.

It should be noted that some studies refer to more than one dimension (Ainsa, 2016; Kim and Choi, 2018; Mannerström, Hietajärvi, Muotka and Salmela, 2018;). For example, Pérez (2012) and Giones and Serrat (2010) coincide in addressing the dimensions of visibility, privacy and security on the Internet and digital reputation, while the study by Castañeda and Camacho (2012) focuses on the creation of identity digital and digital reputation. These studies have in common the

quantitative approach and that they were carried out through the application of perception scales or surveys.

The creation of digital identity implies a process whose starting point is personal identity (Mannerström et al., 2018; Ainsa, 2016; Bjerede, 2015). In other words, what people are from a biological, social and psychological point of view is combined with the way in which they identify as Internet users: there may be direct correspondence or give rise to differences between one pole and another (Kim and Choi , 2018; Wise and O'Byrne, 2015). Likewise, we must not lose sight of a point already mentioned above: users can generate more than one identity in the same Internet service, linked to several digital profiles (Castañeda y Camacho, 2012; Mannerström *et al.*, 2018; Wise y O'Byrne, 2015).

In relation to visibility, for Van and Steinfield (2018), as well as for Pérez (2012), the process of technological interaction between the user and the information (technological interaction) and the exchange of content with other users (social interaction) is what generates the fingerprint associated with each user profile (Beck, 2015; Galera, Hurtado and Fernández, 2014; Mannerström et al., 2018). Of course, users seek to increase their level of visibility, which is related to the reach of their publications. As is known, all this published content is associated with digital citizenship (Kim and Choi, 2018; So, Wu, Xiong and King, 2018), so that people who use social networks and other Internet services must take care of the information they share (Fernández, 2014; Giones and Serrat, 2010; Kim and Choi, 2018; Pérez, 2012).

The binomial privacy and security in the Internet world refers, on the one hand, to implementing actions in the devices to protect the information that is considered valuable (Castillejos, Torres and Lagunes, 2016; Giones and Serrat, 2010; Pérez, 2012; Rodríguez and Magdalena, 2016). And on the other hand, it also implies taking care of the different risks that exist when using the Internet (García, del Olmo y del Hoyo, 2017; Ortega, del Rey y Casas, 2016; de Frutos and Vázquez, 2014). These risks include cyberbullying or harassment in virtual media (Herrera, Casas, Romera, Ortega y del Rey, 2017; Sabater and López, 2015; D'Antona, Kevorkian and Russom, 2010), pishing or theft of data for the purpose of commercial (Castillejos et al., 2016; Meraz, 2018), sexting or exchange of messages with erotic content (Herrera et al., 2017) and grooming, when minors are exposed to having contact with unknown persons who intend to make them some damage (D'Antona et al., 2010). Part of safety is also the care of visual health and posture when using devices for a long time (Saiz, Ronco and Echegaray, 2017).

There are studies that analyze the perception of these risks by young people. Some of these young participants do not see themselves as vulnerable to these situations, and also acknowledge that they are careful when browsing the Internet (Herrera et al., 2017; Moreno, Gajardo and Parra, 2016; Ramos, López and Torrecillas, 2018); Others, however, confess that they have suffered any of the above-mentioned acts, which has led them to strengthen the security and privacy measures of their digital profiles (de Frutos and Vázquez, 2014; Rodríguez and Magdalena, 2016; Sabater and López , 2015).

As already mentioned, digital reputation is built from the content that each user generates and shares on the Internet, as well as what other users think of the person or institution (Giones and Serrat, 2010; Harrell and Lim, 2017; Pérez , 2012), for which instruments have been implemented to assess this indicator (Dutot and Castellano, 2015; Nicholas, 2017; Núñez and Manolakis, 2016; Seker and Eryarsoy, 2015), as well as studies to know the practices that implement the users to generate their digital reputation and the process for the care of this (Baladán y Hernández, 2016; Castañeda y Camacho, 2012; Kelly, Christen y Snyder, 2013; Telci y Kantur, 2014).

Regarding the effects of digital identity in the personal sphere, studies that propose two directions were located. On the one hand, those who analyze the impact that the interaction and content that they have published on the Internet has on personal, social or work matters and that in one way or another can help or harm them at a certain moment (Ahlquist, 2016; Ainsa, 2016 ; Baladán and Hernández, 2016; Davis, 2013); here we also inspect the influence that certain information seen on the Internet can exert on the ideological and behavioral aspects (Dalton and Crosby, 2013; Davis, 2013). On the other hand, there are those who analyze the cause and influence of the interactions that the user makes with other people in a socio-personal environment and the way in which these are expressed in the virtual environment (de Frutos y Valle, 2014; Vargas, 2016).

Methodology

For the design of the instrument, a theoretical review was first carried out that led to the establishment of dimensions that allowed the construction of indicators and items to integrate the first version of the scale. This was reviewed by experts, piloting and statistical analysis of the respective data were carried out to determine its reliability and identification of factors from an exploratory factor analysis (EFA) and a confirmatory factor analysis (CFA).

Participants

Students of the degree in Pedagogy from the Universidad Veracruzana, from the state of Veracruz, Mexico, were chosen in a non-probabilistic way. The initial inclusion criterion was that they were enrolled in said academic program, regardless of age or school year, and that they had availability to participate in the study. Subsequently, through a simple probability sampling without replacement ($p = 0.5$, $q = 95\%$, error $= 5\%$), 319 students were selected, of which 88% were women and 22% men.

Instrument

Based on the literature review (Bozkurt and Tu, 2016; Castañeda and Camacho, 2012; Kim and Choi, 2018; Mannerström et al., 2018; Pérez, 2012; Tusa, 2017; Valderrama, 2018), a perception scale called IDentifica2.0 to measure the management of digital identity, understood as the conscious management of the web environment, the opportunities and dangers of the Internet when publishing one's personal information in the knowledge society (Giones and Serrat , 2010). This instrument was used in the doctoral thesis of Educational Systems and Environments of the Veracruzana University, Mexico. The piloted version is made up of five subscales, with 13 items each, for a total of 65 items, grouped into five dimensions and 15 indicators.

The five dimensions and indicators are:

1) Creation of digital identity (CID): includes the self-identity and multiplicity of identities indicators;

2) Visibility (VIS): implies digital footprint and socio-digital interaction;

3) Privacy and Internet Security (PYS): integrates preventive and corrective measures and risk protection;

4) Digital reputation (RED): encompasses self-perception and social perception, and

5) Effects of digital identity in the personal sphere (EDID): it implies the effects of the real to the virtual and from the virtual to the real.

Some example items for each dimension are the following: a) Construction of digital identity (13 items, eg: "The Internet gives me a space to express myself as I am"), b) Visibility (13 items, p eg: "I interact with members of my family online"), c) Privacy and security on the Internet (13 items, eg: "I only use original software on my devices"), d) Digital reputation (13 items , eg: "I consider that I use the Internet respecting other Internet users"), and e) Effects of digital identity

on personal identity (13 items, eg: "What I read and share on the Internet it has modified my beliefs, ideas and values ").

The instrument is made up of three parts. In the first, general data, sociodemographic and academic information is requested such as age, sex, name of the school and the school year that it is attending; In the second part, three questions are presented, in which participants can mark more than one option, about the Internet services they use (email, mobile apps, music, videos, online video games, government procedures, school procedures and purchase / sale), social networks used (Facebook, Whatsapp, Instagram, YouTube, Snapchap and another app, option in which they must specify), and the devices they use to connect to the Internet (cell phone, desktop computer, laptop, tablet, television / smart TV and video game console), and the third part includes the items with their response options, whose format used was a Likert-type response: Totally agree (TA), Agree (DA), Neutral (N), Disagree (ED) and Strongly disagree (TD). The answers were evaluated with scores of four to one, respectively.

Process

Returning to the theoretical information, a first version of the instrument was prepared that consisted of 15 items (five for each mechanism). This first version was subjected to content validity tests (theoretical, cultural and linguistic) by means of an expert judgment (three researchers on the subject and two university professors in the area of information and communication technologies [ICT] and education). After their observations, it was considered to keep only the 65 items that obtained a Kappa index of concordance between judges ≥ 0.80; Four of them reflect their opinions in favor of the content and internal coherence of the instrument, while the other reader pointed out some observations that helped to improve its structure and writing.

In order to carry out the piloting of the questionnaire prior to the analysis of the psychometric properties, the research project was presented to the direction and academic secretariat of the Faculty of Pedagogy of the Veracruzana University. After that, the students were invited to participate, informing them of the objectives of the study and requesting their voluntary participation. The duration of the application was, on average, 20 minutes.

When analyzing the psychometric properties of the instrument, evidence of reliability was established, determined from the internal consistency of the scores obtained by Cronbach's alpha, and construct validity, established through exploratory and confirmatory factor analyzes.

Analysis of data

First, the means, standard deviations, skewness and kurtosis of the items were calculated as indicators of univariate normality, as well as an internal consistency analysis of each scale using Cronbach's alpha. Subsequently, the deductive EFA was performed, from a method of extraction by principal components and varimax rotation, using the statistical software SPSS in its version 23. Finally, the CFA was carried out with the AMOS software version 23, using the method maximum likelihood estimate (ML).

Results

Descriptive analysis

Descriptive analyzes were performed as evidence of univariate normality in the distribution of item scores. Table 2 shows the mean values (M), standard deviations (SD), skewness and kurtosis of all the items that make up the IDentifica2.0 questionnaire. The asymmetry and kurtosis values suggest the existence of univariate normality in the distribution of the item scores, because the asymmetry and kurtosis values are considered acceptable, as they are in the -3 to +3 and -10 ranges. to +10, respectively (Griffin and Steinbrecher, 2013; Kline, 2016).

Consequently, all the items show univariate normality in their scores, with the exception of the items VIS14, VIS20, PYS36, PYS37 and PYS38, which present kurtosis values above +3. However, in structural equation modeling tests such as CFA, kurtosis values of up to +10 are allowed due to the robustness of the test (Griffin and Steinbrecher, 2013; Kline, 2016).

On the other hand, item VIS14 was the one that presented the least variability in its response options (around options three and four), as it had the lowest standard deviation (0.69), with a mean of 3.63. For its part, the CID9 item was the one with the greatest variability (around options one and two), obtaining the highest standard deviation (1.34), around the mean of 1.94.

Tabla 2. Medias, desviaciones estándar, asimetría y curtosis de los 65 ítems iniciales de IDentifica2.0

Ítems	M	DE	Asimetría	Curtosis	Ítems	M	DE	Asimetría	Curtosis
CID1	2.74	1.10	-0.81	0.16	PYS34	2.81	1.08	-0.77	0.11
CID2	1.78	1.32	0.25	-1.01	PYS35	3.19	1.12	-1.38	0.97
CID3	2.19	1.13	-0.14	-0.98	PYS36	3.52	0.80	-2.11	5.29
CID4	2.70	1.08	-0.50	-0.53	PYS37	3.61	0.66	-2.19	6.50
CID5	2.05	1.22	0.12	-0.94	PYS38	3.45	0.78	-1.70	3.46
CID6	2.69	1.15	-0.71	-0.40	PYS39	3.30	1.03	-1.73	2.72
CID7	2.12	1.06	0.04	-0.48	RED40	3.38	0.84	-1.38	1.84
CID8	2.90	1.12	-0.85	-0.06	RED41	3.18	0.99	-1.21	1.22
CID9	1.94	1.34	0.01	-1.22	RED42	3.02	0.93	-0.84	0.55
CID10	2.04	1.20	-0.08	-0.92	RED43	2.66	0.99	-0.39	-0.38
CID11	1.55	1.25	0.50	-0.70	RED44	2.63	0.97	-0.59	0.06
CID12	2.66	1.00	-0.45	-0.23	RED45	1.91	1.08	0.08	-0.47
CID13	2.85	1.07	-0.58	-0.35	RED46	1.83	1.19	0.02	-0.77
VIS14	3.63	0.69	-2.53	8.11	RED47	3.20	0.81	-1.20	2.37
VIS15	2.08	1.24	-0.11	-0.92	RED48	2.91	1.02	-0.92	0.61
VIS16	2.74	1.02	-0.53	-0.22	RED49	1.70	1.27	0.32	-0.84
VIS17	2.20	1.16	-0.09	-1.00	RED50	2.67	1.16	-0.62	-0.51
VIS18	3.02	0.97	-1.03	0.91	RED51	2.19	1.24	-0.07	-1.08
VIS19	3.26	0.79	-1.37	2.97	RED52	3.00	1.09	-1.21	0.96
VIS20	3.34	0.72	-1.44	3.92	EID53	2.86	1.08	-0.59	-0.47
VIS21	2.54	1.19	-0.44	-0.65	EID54	1.53	1.20	0.50	-0.65
VIS22	2.71	0.98	-0.71	0.41	EID55	1.85	1.32	0.14	-1.07
VIS23	2.99	1.03	-1.32	1.69	EID56	1.88	1.32	-0.08	-1.11
VIS24	2.14	1.19	-0.25	-0.70	EID57	1.85	1.23	0.14	-0.85
VIS25	1.76	1.08	0.10	-0.31	EID58	2.05	1.30	-0.09	-0.85
VIS26	2.84	1.01	-0.83	0.28	EID59	1.78	1.23	0.18	-0.84
PYS27	3.22	0.96	-1.39	1.69	EID60	1.48	1.31	0.60	-0.66
PYS28	3.11	0.88	-1.17	1.67	EID61	2.21	1.27	-0.16	-0.94

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PYS29	2.61	1.25	-0.47	-0.93	EID62	2.43	1.09	-0.13	-0.69
PYS30	2.82	1.22	-0.91	-0.18	EID63	2.79	1.17	-0.74	-0.28
PYS31	3.17	1.12	-1.32	0.89	EID64	3.00	1.14	-1.03	0.29
PYS32	2.58	1.15	-0.47	-0.46	EID65	2.99	1.16	-0.93	-0.12
PYS33	2.99	1.03	-1.00	0.70					

CID = Construcción de la identidad digital; VIS = Visibilidad; PYS = Privacidad y seguridad en Internet;

RED = Reputación digital; EID = Efectos de la identidad digital en el ámbito personal.

Fuente: Elaboración propia

Reliability analysis

The reliability of the items was determined using Cronbach's alpha statistic. The inclusion criterion established was considering those items with correlations greater than 0.30 with respect to the total of the scale (DeVellis, 2012). As a result of the internal consistency analysis, it was decided to eliminate 18 items from the questionnaire that did not meet the inclusion criteria. As can be seen in Table 3, seven items correspond to the Digital Identity Construction scale (CID1, CID2, CID3, CID8, CID9, CID10 and CID11), two to the Visibility scale (VIS14 and VIS25), two to Privacy and Internet security (PYS28 AND PYS39), five for Digital Reputation (RED40, RED41, RED42, RED48 AND RED49) and two for Effects of digital identity (EID62 and EID65).

Tabla 3. Alfa de Cronbach de la escala IDentifica2.0 con los ítems originales y alfa después de eliminar ítems

Subescala	Alfa inicial	Número de ítems originales	Alfa eliminando los ítems	Número de ítems finales
CID	0.66	13	0.77	6
VIS	0.81	13	0.81	11
PYS	0.81	13	0.82	11
RED	0.77	13	0.76	8
EDID	0.82	13	0.84	11

CID = Construcción de la identidad digital; VIS = Visibilidad; PYS = Privacidad y seguridad en Internet; RED = Reputación digital; EDID = Efectos de la identidad digital en el ámbito personal.

Fuente: Elaboración propia

Exploratory factor analysis (EFA)

A deductive EFA was performed, with a method of extraction of principal components with Varimax rotation. The exclusion criterion was that those items with factor loadings less than 0.30 and those that presented loads greater than this value in two factors (DeVellis, 2012). In the case of the Digital Identity Construction (CID) subscale, the Kaiser, Meyer and Olkin (KMO) index was mediocre, 0.67, and the Bartlett sphericity test was significant ($\square 2 = 288.4$, p <0.000). A two-factor solution was obtained that explained 77.4% of the total variance of the scores.

The KMO of the Visibility subscale (VIS) was normal upon reaching a value of 0.73, and the Bartlett sphericity test was significant ($\square 2 = 586.93$, p <0.000). A solution was obtained with two factors that explain 61.9% of the total variance of the scores. For the Privacy and Internet Security subscale (PYS), the KMO was 0.78 normal, and the Bartlett's sphericity test was significant ($\square 2 = 622.42$, p <0.000). A solution with three factors was obtained that results in 63.3% of the total variance of the scores. In the case of the Digital Reputation (RED) subscale, the KMO was mediocre, reaching just 0.65, and the Bartlett sphericity test was significant ($\square 2 = 331.60$, p <0.000). It produced a solution with two factors that refers to 68.6% of the total variance of the scores.

For the scale of Effects of digital identity in the digital field (EDID), the KMO was calculated again, which was remarkable when it reached 0.805, and the Bartlett test of sphericity was once again significant ($\square 2 = 881.00$, p < 0.000). The reduction of terms was obtained with two factors that manage to explain 50.8% of the total variance of the scores. On this last scale, the items loaded towards two or more factors with loads greater than 0.30, so that an adequate extraction of factors that was consistent with the theory of the scale design and could explain 60% of the total variance was not achieved. . In this way, an adaptation of the model was sought by means of a CFA.

Based on the exclusion criteria established by DeVellis (2012), it was decided to eliminate nine items from the questionnaire: one from the Construction of digital identity scale (CID7), four from the Visibility scale (VIS21, VIS22, VIS23 and VIS26), none for Privacy and Internet security, three for Digital Reputation (RED43, RED45 and RED46) and one for Effects of digital identity in the personal sphere (EID56). In total, the final items were 38 divided into 11 factors, as shown in table 4.

Tabla 4. Resultados del AFE de las subescalas que componen el cuestionario IDentifica2.0

Escala	KMO	χ^2	gl	χ^2/gl	% de var	factores	ítems
CID	0.67	288.44	10	28.84	77.4%	2	5
VIS	0.73	586.93	21	27.95	61.9%	2	7
PYS	0.78	622.42	55	11.32	63.3%	3	11
RED	0.65	331.60	10	33.16	68.6%	2	5
EDID	0.81	881.00	45	19.58	50.9%	2	10

Nota. CID = Construcción de la identidad digital; VIS = Visibilidad; PYS = Privacidad y

seguridad en Internet; RED = Reputación digital; EDID = Efectos de la identidad digital en el

ámbito personal.

Fuente: Elaboración propia

Confirmatory factor analysis (CFA)

In order to corroborate the association of factors obtained in the EFA, the CFA was carried out taking as a base criterion the theory of the instrument and the factor analyzes consistent with the design of the subscales. In addition, the minimum of three items per factor was considered. For this purpose, the maximum likelihood estimation method was used to determine the empirical goodness of fit of the model.

As a result of the CFA, the items that were not associated with the model factors were eliminated (Byrne, 2010; Cea, 2004). In this way, the measurement models were obtained for each scale that met the goodness of fit indices, in order to confirm the empirical sustainability of the model. The indices considered were: the chi-square index on degrees of freedom or relative ($\square 2$ / gl), the square root of standardized residual (SRMR), the adjusted goodness of fit index (AGFI), the comparative fit index (CFI) and, finally, the error of the square root of the mean of approximation (RMSEA). These indices are considered acceptable if their values exceed the established adjustment criteria, which are $\square 2$ / gl> 1; CFI and AGFI> 0.95; SRMR <0.08 and RMSEA <0.06 (Brown, 2015; Hooper, Coughlan and Mullen, 2008; Hu and Bentler, 1999;). The results obtained in the goodness of fit indices for each of the subscales are presented below (see table 5).

Tabla 5. Índices de los modelos para medir las subescalas del cuestionario IDentifica2.0

Modelo	Chi-cuadrado χ^2	gl	χ^2 relativa (χ^2/gl)	CFI	SRMR	RMSEA	AGFI
CID	4.677	8	0.5846*	1.000	0.033	0.000	0.975
VIS	18.084	8	2.2605	0.980	0.041	0.063*	0.951
PYS	8.761	8	1.0951	0.999	0.027	0.017	0.976
RED	14.139	6	2.3565	0.979	0.038	0.065*	0.949*
EDID	18.632	12	1.5530	0.993	0.027	0.042	0.958

Nota. CID = Construcción de la identidad digital; VIS = Visibilidad; PYS = Privacidad y

Seguridad en Internet; RED = Reputación digital; EDID = Efectos de la identidad digital en el
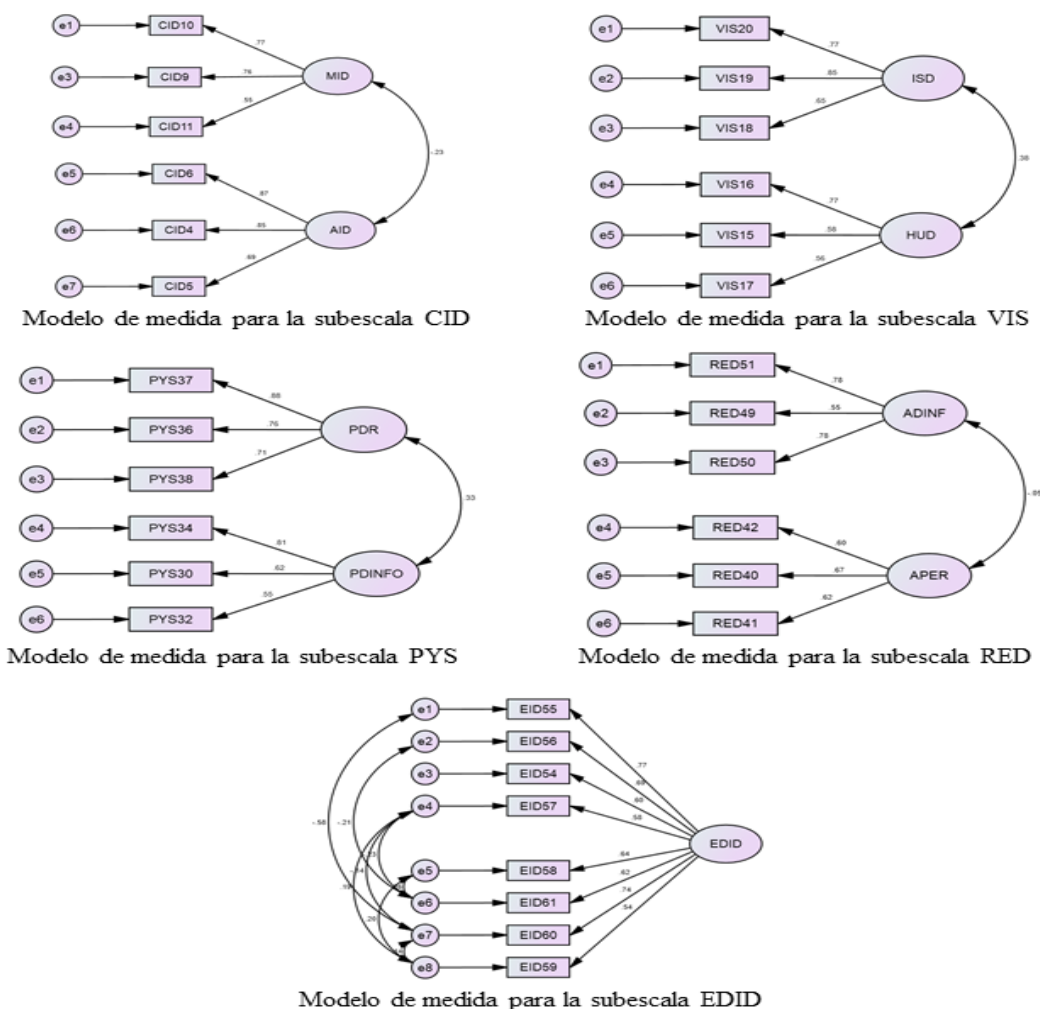
ámbito personal.

*Marca los índices que no cumplen con los criterios de bondad de ajuste del modelo.

Fuente: Elaboración propia

Likewise, as a result of the CFA, it is obtained that the PYS and EID subscales are the only ones validated by all of their goodness-of-fit indices. Meanwhile, the CID and VIS scales do not satisfy the adjustment criteria in one of their indices, the relative □2 and the RMSEA, respectively, which is disregarded, since they can be considered validated by their four remaining indices. However, the RED scale does not satisfy two (RMSEA and AGFI) of its five indices. However, one of them (AGFI) does not satisfy the criterion because it is just one thousandth below the minimum adjustment value (0.949 <0.95), which can be neglected and, like the two previous subscales, it is considered moderately validated by four of its five goodness-of-fit indices.

Once the scales have been validated, their respective measurement models are presented, of which only the one corresponding to the EDID subscale includes a one-dimensional model, the rest of them were two-factor models, with three observable variables per component. It is worth mentioning that for this model (EDID), which generated so many problems when doing the EFA, a one-factor solution was reached that fits with the theory, despite the fact that no difference is made between the effects of the real in the virtual and the virtual. the virtual in the real. Therefore, an eight-item model was arrived at (EID54, EID55, EID56, EID57, EID58, EID59, EID60 y EID61) (ver figure 1).

Figura 1. Modelos de medida de la escala IDentifica2.0 (subescalas CID, VIS, PYS, RED y EDID)

Modelo de medida para la subescala CID

Modelo de medida para la subescala VIS

Modelo de medida para la subescala PYS

Modelo de medida para la subescala RED

Modelo de medida para la subescala EDID

Fuente: Elaboración propia

Discussion

The reported validity and reliability process accounts for the findings found about the IDentifica2.0 scale, with a Cronbach's alpha of 0.80 and a KMO index of 0.728 in the five subscales it comprises, allows to affirm the verification of the proposed hypothesis, so it can be used in university students to measure the management of digital identity. The integration of the subscales that comprise it stands out as a strength; Some quantitative instruments that measure digital identity management position digital identity as an essential part of digital citizenship, focusing more on measuring the latter (Kim and Choi, 2018; Mannerström et al., 2018: So et al. ., 2018).

On the other hand, the privacy and security dimension is addressed separately in studies that focus on Internet risks (Castillejos et al., 2016; Herrera et al., 2017; de Frutos and Vázquez, 2014), without pointing out the relationship with visibility and digital reputation, or address a specific social perspective of digital reputation, without considering the relationship with the other four dimensions that are contemplated in the scale (Castañeda and Camacho, 2012; Núñez and Manolakis, 2016).

Among the limitations of the study is the study population, university students of the degree in Pedagogy from Veracruz, Mexico, so it would be convenient to carry out a new application with students from other areas of training or from other states of Mexico or countries, in addition to testing with high school or graduate level students.

Conclusions

After analyzing the metric properties of the IDentifica2.0 scale, a negative relationship between AID and MID was found in the CID scale, so it was decided to exclude the MID construct from the scale despite having a good consistency index internal (CID9, CID10 and CID11; alpha = 0.71). The CVR construct has only two items with a good factorial load, and a third with a sufficient load, so this construct was eliminated. On the VIS scale, the Preventive Actions (APR) construct was excluded due to the lack of adequate indicators. On the PYS scale, PDI and PDR remained, and Technological Skill (DTE) was excluded due to the lack of adequate indicators.

In the RED scale, perhaps because it is a scale of perception of the participants, the answers were biased. Finally, the Self-perception indicators (AUP) and Spheres of influence (AMI) were taken into account; Social Perception (PES) was excluded because it lacked adequate indicators.

Finally, on the EDID scale, which sought to identify three constructs, the one for Preventive and Corrective Measures (PCA) was first excluded because it lacked adequate indicators. For the two remaining constructs, Effects of the digital identity from the real to the virtual (ERV) and Effects of the digital identity from the virtual to the real (EVR), two models were made in the CFA, a multifactorial model and a model unifactorial; the latter resulted in better indexes of goodness of fit, so it is recommended to handle it as Effects of digital identity, without making distinctions between the direction of the effect.

Regarding reliability, the global Cronbach's alpha of the five scales was high (0.80), which indicates that, as a whole, the subscales measure the construct for which they were created, so the

IDentifica2.0 scale allows the measurement of digital identity management. After the analyzes presented here, the scale is made up of five factors and 32 items.

In general, in the five subscales that make up the instrument, several opportunities for improvement were found to obtain the empirical evidence necessary to support the constructs to be identified. With the above, the initial hypothesis is verified, and it is concluded that the IDentifica2.0 scale has acceptable levels of reliability to measure the management of digital identity in university students. The number of appropriate items for each of the four constructs is only three (six for each dimension), except for the EDID indicator, which remained at six, so it is suggested to pilot new indicators that improve the identification of an attribute or variable.

Future lines of research

From the results described here, future lines of research can be generated, such as the design of quantitative instruments that evaluate knowledge or skills about digital identity management, as well as studies with different population groups such as high school or graduate students. The measurement in teachers of different educational levels, as well as other professions, is identified as an area of opportunity, which will allow us to assess these constructs presented.

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