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Student use of university digital collections: the role of technology and educators

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ABSTRACT

An increasing number of colleges and universities are beginning to digitize their museum and teaching collections. Digitization has become necessary to improve the educational value of these collections both in the classroom and beyond. The purpose of this research is to better assess the acceptance and use of technology as it relates to students' use of university digital collections. The framework of this study is based on the technology acceptance model (TAM) which evaluates the adoption and use of information technology. A survey was administered to a random national sample of 401 students. Data was analysed using descriptive, factor analysis, and structural equation modelling. The results of this research indicate that promotion by faculty and librarians is key to the use of digital collections. Furthermore, perceived usefulness was an important influence on students' intention to use a digital collection.

Introduction

Historic artefact and document collections can be found at numerous universities and colleges throughout the United States. University collections and museums, however, are often overlooked in contemporary literature about collection use and may have different objectives than public museums. The main goal of a public museum is to protect and preserve the artefacts in their care. Furthermore, they primarily focus on providing programming, education, and entertainment for the public. Although some university collections are managed in a similar manner, which includes providing exhibition space and public programming, most focus on their contribution to the educational goals of the institution (Govekar-Okoliš 2018; Simpson 2017). Many of these collections are stored out of the public eye and rely on the university for funding and support. Currently, access to many university collections is limited; however, there is an opportunity to expand the impact of these collections through digitization. University artefact and document collections contribute toward university mission statements by providing a unique educational tool and research opportunity. These collections provide a cross-disciplinary resource which can facilitate collaborative projects for undergraduates, graduates,

and faculty (Marcketti et al. 2011). Because these collections require time and resources to create and maintain, it is important to understand how they will be perceived and used by students in order to ensure the best use of resources. This research seeks to understand students' acceptance and use of technology as it relates to university digital collections.

Technology has had a large impact on how students learn, how educators disseminate knowledge, and how collections present information. Most students attending college today are presumed to adopt technology quickly and expect more use of technology in the classroom. As educational institutions push for more incorporation of technology in the classroom, university artefact and document collections need to create and/or maintain a digital presence to remain relevant and visible (Marcketti et al. 2011). Research indicates that students are more likely to engage in technology for educational purposes with encouragement and guidance from instructors (Margaryan, Littlejohn, and Vojt 2011).

There is a gap in the literature regarding how digital university collections are being used by students. Studies have examined the effectiveness of educational programs offered by or conducted in conjunction with public museums (Govekar-Okoliš 2018) and museums and have been found to have pedagogical value in higher education (Jacobs et al. 2009). There is limited research, however, on the impact and use of university collections, many of which have extensive curated artefact collections that rival collections in public museum. Research focused on higher education institutions have developed metrics to quantify engagement (i.e., visitor statistics), teaching, and research to better report collection use and how it supports the institutional strategy (Simpson 2017). Additional studies focus on various aspects of digital collections but do not specifically examine how these collections are being used by students (Biedermann 2017; Hopes 2014). Because university collections play an increasing role as a technological tool on university campuses, this study seeks to better understand how students are using these digital university collections.

Literature review

Digital collections

A university collection is one that contains physical materials such as an archive (i.e., documents, photographs) or three-dimensional objects that can be exhibited or used as educational tools (Govekar-Okoliš 2018; Marcketti et al. 2011). These materials are often collected and used by specific disciplines (Simpson 2017) and may be managed by university library staff, particularly when in digital form. University collections are different than public museums in that they focus primarily on education and research goals within the institution (Govekar-Okoliš 2018; Simpson 2017). The university collection must demonstrate that it provides a valuable educational contribution for its graduates and the community. Types of university collections include, but are not limited to fashion and textiles, history, archaeology, art, and the sciences (including biology, geology, and herbology) (Govekar-Okoliš 2018; Marcketti et al. 2011; Simpson 2017). A fashion and textile collection, for example, can be used in the classroom to assist with undergraduate research, design inspiration, history and cultural study as well as community outreach (Marcketti et al. 2011).

The physical collection enhances the classroom experience, but as university administrators continue to push for new and innovative ways to reach students, expansion of the

multi-disciplinary collaboration, and use of open educational resources, digitizing these collections has become essential (Stewart and Marcketti 2012). Without a website, collections housed in higher education institutions are considered invisible or obsolete (Lin and Hinegardner 2012; Marcketti et al. 2011). An increasing number of educational institutions are digitizing their collections and seeking methods of enhancing the web presence for these collections. Collection websites contribute to a university's mission by enabling the collection to go beyond field-specific applications and reach a global audience (Marcketti et al. 2011). Digitization for museums and special collections, particularly fashion and textile collections, is a growing trend within the field in order to justify their value to the institution and broader community (Marty 2007; Stewart and Marcketti 2012). There are many challenges, however, with creating an effective online presence. When creating websites, some institutions do not thoroughly consider collection development, digital literacy, and other facets that may contribute toward the success or failure of the website or database. The belief that any web presence will be sufficient to encourage use by students is currently being held by many university collections (Cook 2015).

One of the biggest challenges is that there is a lack of consensus and consistency regarding the incorporation of digital tools, vocabularies and metadata, and information provided when building a digital collection (Biedermann 2017). Some collections maintain a simple website and create an online repository or catalogue while others use innovative technology for creating virtual exhibits. Examples of digital tools include creating a memory network or posting educational videos and other educational media. Additional strategies used to engage students and community members have been to create exhibits in perpetuity and/or create educational units that contain external links to additional information. Furthermore, some collections work to engage students by focusing time and effort into the use of social media, blogs, and other promotional media (Marcketti et al. 2011). Social media has been successful in enhancing classroom learning as well as promoting the collection to a broader community. As a tool, social media enables the collection to quickly distribute information as well as interact and form relationships with students and visitors. The challenge with a focus on social media, however, is that it requires dedication and consistency. If it is not continually maintained and updated, it becomes ineffective (Stewart and Marcketti 2012).

Research has also been conducted to further examine the technical features of digitizing a collection including the use of collection management software, metadata management, best practices for the photographic process, and selection of technological features for the website (Kirkland et al. 2015; Lin and Hinegardner 2012). Lopatovska (2015) examined website features and aesthetics as perceived and/or desired by visitors of digital collections. Based on the study, the following are important features to a successful digital collection and will encourage future visits: aesthetics, adequate search tools, and continual improvement of the website. Although larger institutions often have the means to support an extensive website, many smaller institutions struggle to create an effective web presence (Stewart and Marcketti 2012).

The use of multi-media and interactive features increased the enjoyment of using digital collections for e-learning (Lin and Gregor 2006). Additional features that improved enjoyment in a digital collection included appearance, interactivity, ease of use, simplicity of design, and use of external hyperlinks to additional information. Other studies have examined how to make virtual museums more engaging by incorporating gaming or other hedonic factors (Hong et al. 2013). Students who feel confident and experience

enjoyment while gaming or using other online features are more likely to visit the digital archive or collection.

Student use of technology

In higher education today, students are presumed to be 'digital natives' because they were born into a generation (born 1984 or later) that has experienced the growth of personal technologies from a young age (Lieberman 2017). Prensky (2001) introduced the concept of the digital native and digital immigrant. He believed that the growing challenges in education were a result of radical changes in the students and how they learn. Students who are labelled as digital natives have grown up with computers, video games, digital media (cameras, video, music), and the internet. Digital immigrants, on the other hand, were raised prior to this technology and have adapted or assimilated into using these technologies but still retain their experience with the pre-digital world (Prensky 2001). Since Prensky's introduction of the term digital native, the term has become widely used and has influenced changes in curriculum development and educational methods (Lieberman 2017). The term digital native, however, is controversial as studies have shown that the belief that millennials are more proficient at technology as well as better at multi-tasking are unfounded (Moran 2016).

There is a remaining perception that millennials (a group considered to be digital natives) have a high expectation of technology in education. Research indicates that while digital natives may be quick to learn new technology, they lack information literacy (Šorgo et al. 2017). Thompson (2013) found that the range of technology used by students is more limited and focuses on rapid communication technology (i.e., texting and social networking sites) and web resources (i.e., looking up information, watching videos, listening to music). Many of the digital technologies that are used with educational intention showed minimal to no use by students. Neumann (2016) also suggested that while digital native students are adept at using connective technology, such as social networking and texting, they remain illiterate when it comes to using learning technology. Students are more likely to use the internet as a quick tool to look up facts or information and are less likely to engage in interactive in-depth information seeking activities (Thompson 2013). They often find difficulty distinguishing quality information and will accept presented information as fact without questioning the accuracy (Neumann 2016). Students are not taking full advantage of internet tools to support their educational needs (Thompson 2013).

Technology and the role of educators

The instructor plays an important role regarding the effective use of technology in the classroom. According to Prensky (2001), challenges arise when digital immigrant instructors are teaching digital native students. Digital immigrants have an 'accent' of the pre-digital world in the way they discuss and use technology today. Research does not support previous claims that this new generation of students have radically different learning styles than before or engage in the use of digital technologies in a more sophisticated manner (Lieberman 2017). What the findings revealed was that the instructor had the greatest impact on students' attitudes toward and use of digital technologies (Margaryan, Littlejohn, and Vojt 2011). Teaching digital and information literacy skills have become

essential. Many students continue to expect conventional teaching styles and are not likely to employ the use of technology without encouragement from instructors.

Additional research shows that when students are interested in a topic, they do not require a high entertainment level in the method of instruction (Thompson 2013). One study found that students who are enrolled in more technology-driven disciplines, such as engineering, were more likely to use technological tools for learning than compared to students in disciplines that traditionally used little technology (Margaryan, Littlejohn, and Vojt 2011). A university's use of technology, technical support, supporting infrastructure, and promotion of digital technology in the classroom play an important role in whether students adopt technology for educational purposes.

Despite misconceptions about millennials as digital natives, the use of digital technology in the classroom is important. Established educators who are reluctant to learn and incorporate new technology in the classroom may be contributing to an educational gap (Lieberman 2017). It is important to incorporate information literacy into the curriculum in first-year or freshmen-level courses. It is also necessary for instructors to engage in activities that teach critical thinking (how to analyse information), information management (conducting good searches and identifying quality results), and clarify good writing skills (including discussions on plagiarism) (Neumann 2016). More professional development is needed for instructors to learn about new technology and effective ways to incorporate it into the classroom (Lieberman 2017).

Although students are surrounded by technology, they are often unaware of the technological tools available for educational purposes. Ng argues that 'it is the task of educators to raise awareness of the range of educational technologies that the digital natives could use for learning' (2012, 1016). It is now becoming the educator's responsibility to teach students how to use these digital tools (i.e., digital literacy) similar to how students learn to speak or read a language. Unlike social media which is peer-driven, digital educational tools are evaluated based on their perceived usefulness. In a study that investigated whether digital literacy could be taught, the results showed that students were able to quickly and effectively adopt new and unfamiliar digital educational tools as long as guidance and instruction are provided for these tools and the use of the digital technologies are incorporated within course activities (Ng 2012).

Digital collections as an educational tool

Many university collections are digitizing their objects; however, there is a gap in the literature evaluating the use of digital collections from the student perspective. Several studies examine non-digital use of university collections and have found that incorporating museum objects in the curriculum contributes toward experiential learning and increases knowledge retention (Govekar-Okoliš 2018; Marcketti et al. 2011; Quave and Meister 2017; Simpson 2017). Studies that have examined digital university collections tend to focus more on strategies and the process of digitization than use (Kirkland et al. 2015; Lin and Hinegardner 2012; Stewart and Marcketti 2012). These studies emphasize that the infrastructure of the digitization process will impact the sustainability and potential use of the collection. As museums begin to incorporate more technological advancements within their websites, the public has increased its expectation regarding the sophistication of technology in these sites (Marty 2007). The use of 'digital surrogates' or digital representations of physical artefacts

has fundamentally changed the way that collections can use, manage, and share information which in some ways can be more interactive and reach broader audiences (Biedermann 2017; Marty 2007).

Studies indicate that digital collections are being successfully used as a learning resource in the classroom to help meet the learning objectives in the course, particularly in primary and secondary education (Paquin 2015; Paquin and Barfurth 2007; Pavlou 2012). Museums, libraries, and cultural centres are offering an increasing number of digital resources available for use in the K-12 curriculum (Paquin 2015; Vidor 2008). Elementary school educators see a value in using digital collections, particularly when the websites are well designed with good navigation tools and have good quality and depth of content (Pavlou 2012). University collections have the added advantage that they are inherently educational and are often referred to as 'teaching' collections because their primary function is to contribute toward student learning (Marcketti et al. 2011). The challenge is in assuming that building a digital presence will guarantee use. Many university collections struggle with lack of use when the collection is not utilized through high-impact teaching practices (Cook 2015). Projects that are designed to make students part of the digital development process have been found to improve their professional skills, critical thinking, time management, and problem-solving skills (Saiki, Nam, and Beck 2012) as well as encourage collaboration, creativity, literacy, and engagement within the course (Ho, Nelson, and Müeller-Wittig 2011).

The purpose of this research is to better assess the acceptance and use of technology as it relates to the use of university digital collections. University collections are being used to assist with classroom activities and there is great potential to enhance access to these collections through digital technology. Pedagogical strategies are calling for more digital technology in the curriculum. Just because students were raised with technology and use it in their daily lives does not mean that they will automatically be aware of digital resources or how to use them to enhance their learning (Margaryan, Littlejohn, and Vojt 2011). Because digital collections require extensive resources in the form of time and money, it is important to understand students' likelihood to use these digital resources.

Theoretical framework

The Technology Acceptance Model (TAM) is an established theoretical framework used to assess how various forms of technology are accepted and used by selected groups of people. The TAM was an adaptation of the Theory of Reasoned Action (TRA) which was designed to better assess the acceptance and use a wide variety of information systems and other types of technology (Davis, Bagozzi, and Warshaw 1989). Like TRA, the model addresses users' attitudes toward a technology and ultimately their intention to use the technology in the future. The key difference relates to the measurement of the variables Perceived Usefulness (PU) and Perceived Ease of Use (EU) and their impact on the user's attitude toward the technology (Davis, Bagozzi, and Warshaw 1989). PU examines whether the technology being used adds value or positively contributes toward a person's job performance or task. The expectation is that when a person believes the technology has a positive impact on his/her work performance, he/she will see value in the technology. EU assesses how much effort is involved in using the technology. When less effort is required to use the technology, the perception is that it is easier to engage in using the technology and therefore more likely for a person to accept the use of the

technology (Davis 1989). TAM has been further developed to incorporate elements of TRA and the Theory of Planned Behaviour (TPB) (Venkatesh and Davis 2000). In their expanded model called TAM2, Venkatesh and Davis (2000) examine social influences as additional factors in the traditional TAM model. Particularly, the addition of subjective norms, or people within one's social circle who influence decision-making, has been found to play an important role in a person's behaviour. Furthermore, the evaluation of self-efficacy is important to understand and its impact on EU (Davis 1989). Self-efficacy is the confidence one has in his or her ability to use the technology. Self-efficacy and other contributing factors are important to assess to better understand how they impact EU (Venkatesh 2000).

Social influences, such as influences from instructors, librarians, and peers, can have an important influence on students' use of technology in the classroom (Margaryan, Little-john, and Vojt 2011; Ng 2012). Venkatesh and Davis (2000) included social influences in their expanded TAM model to better understand factors that impacted PU and EU of technology. Therefore, the hypotheses related to social influences are as follows:

H_{1a}: Perceived usefulness of digital collections will be positively influenced by social influences

H_{1b}: Perceived ease of use of digital collections will be positively influenced by social influences

Experience or enjoyment can play an important role in the use of digital collections (Lin and Gregor 2006). A person's experience using technology has been incorporated in the expanded TAM model to determine its influence on PU (Venkatesh and Bala 2008; Venka-tesh et al. 2003). Therefore the following hypothesis was developed:

H_2: Perceived usefulness of digital collections will be positively influenced by experience of using a digital collection

Self-efficacy, or the confidence one has in being able to perform a task, has often been examined within the TAM model as a factor that may influence EU (Venkatesh and Davis 2000; Venkatesh et al. 2003; Venkatesh and Bala 2008). Navigation of a technology can have an important impact on a person's EU. As many digital collections are becoming more like a database, studies have begun to examine navigation elements such as search tools (Lopatovska 2015). Therefore, the following hypotheses were developed:

H_{3a}: Perceived ease of use of digital collections will be positively influenced by self-efficacy

H_{3b}: Perceived ease of use of digital collections will be positively influenced by navigability of the digital collection site

Based on the established TAM model, EU has been found to have a positive impact on the PU of a technology. Furthermore, both PU and EU have been found to be predictors of intention to use technology (Davis, Bagozzi, and Warshaw 1989; Venkatesh and Davis 2000; Venkatesh et al. 2003; Venkatesh and Bala 2008). Therefore, the following hypoth-eses were developed:

H_4: Perceived usefulness of digital collections will be positively influenced by perceived ease of use of digital collections

H_{5a}: Intention to use a digital collection will be positively influenced by perceived usefulness of digital collections

H_{5b}: Intention to use a digital collection will be positively influenced by perceived ease of use of digital collection

Based on the above theoretical framework and supporting information, a research model was developed. Figure 1 represents the research model with the hypothesis paths included.

Methods

Sample and data collection

Data were collected via an online survey resulting in a random sample size of 401. The survey was administered through Qualtrics, a survey service, to students who have experience with digital collections and are currently attending a college or university in the United States. The respondents represented an even distribution of gender (see Table 1). Most of the participants ranged in age from eighteen to thirty-six years of age. Just over half of the students attend school full-time. The respondents primarily represented disciplines in the sciences (26.7%), technology (21.4%), and business (16.7%). Other demographic items measured included employment status, student classification, ethnicity, and income.

Students were first provided a definition of a digital collection:

> For the purposes of this study, a digital collection is defined as an online database associated with a university or college, such as a library archive, university museum, art gallery, or other collection associated with a department or school which contains documents and/or digitized information and imagery of objects. Additional examples of a digital collection may include, but are not limited to, a database or website for a fashion and textile collection, an anthropological collection, a historical collection, a manuscript collection, a geological collection, an art collection, or an audio/video collection.

Participants were then asked if they understood the definition and whether they had used a digital collection. If the response was positive, they were permitted to continue with the
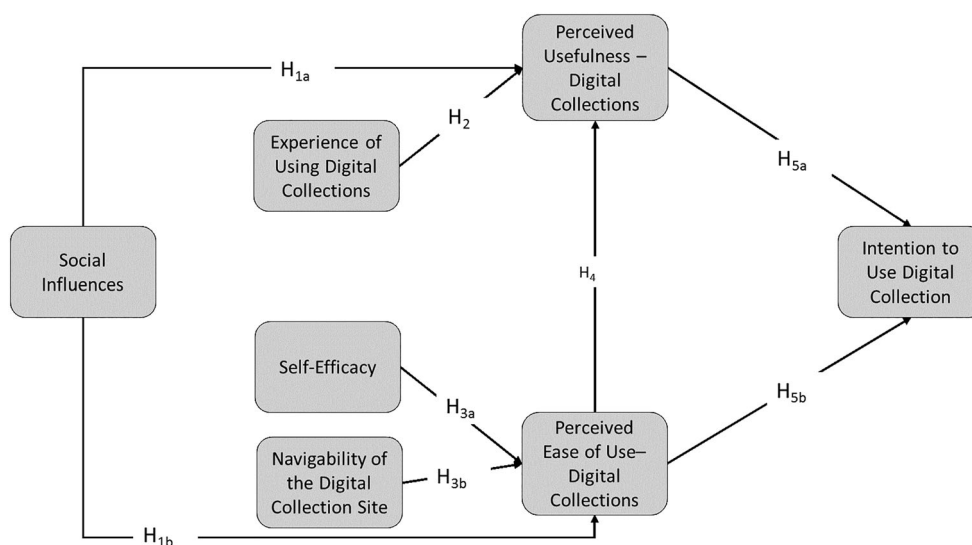

Figure 1. Research model.

Table 1. Demographic characteristics of the respondents.

Variables	Frequency (N = 401)	Percent
Gender		
Female	201	50.1
Male	200	49.9
Age		
18–25	154	38.4
26–36	162	40.4
36–45	64	16.0
46–55	16	4.0
56 or older	5	1.2
Employment status		
Not employed	60	15.0
Part-time (>20 h/week)	123	30.7
Three-quarter time (20–31 h/ week)	39	9.7
Full-time (32–40 h/week)	179	44.6
School attendance		
Part-time (typically less than 12 credit hours per semester)	166	41.4
Full-time (12 credit hours or more per semester)	235	58.6
Student classification		
Freshman	38	9.5
Sophomore	78	19.5
Junior	85	21.2
Senior	70	17.5
Graduate	130	32.4
Area of study		
Sciences (including biology, chemistry, physics, geo-sciences, medicine)	107	26.7
Arts (including art, theater, music, design, graphic design)	32	8.0
Humanities (including English, languages, history, philosophy, religious studies, interdisciplinary studies)	34	8.5
Business (including business, accounting, fashion, hospitality and tourism, economics, communication)	67	16.7
Technology (including engineering, computer science)	86	21.4
Education (including K-12, higher education, education administration)	35	8.7
Ethnicity		
White	304	75.8
Hispanic or Latino	35	8.7
Black or African American	30	7.5
Asian	25	6.2
American Indian or Alaska Native	2	0.5
Native Hawaiian or Pacific Islander	1	0.2
Other	4	1.0
Income		
Less than $9999	16	4.0
$10,000–$29,999	65	16.2
$30,000–$49,999	81	20.2
$50,000–$69,999	60	15.0
$70,000–$89,999	70	17.5
$90,000 and more	109	27.2

study. Participants were also asked to list the digital collections with which they have experience. Some collections mentioned by participants include the Stanford Historical Photograph Collection, UCLA Digital Collections, and University of Miami Digital Collections which contain digital artefact imagery and information for university collections.

Research instrument

The framework of this study is based on the expanded Technology Acceptance Model (TAM) used by Venkatesh and Bala (2008) which evaluates the adoption and use of

information technology. A seven-point Likert scale was used to measure each item and ranged from strongly disagree to strongly agree. The main variables of the acceptance model – perceived usefulness of digital collections (PU), perceived ease of use of digital collections (EU) (Venkatesh 2000; Venkatesh and Davis 2000), and intention to use digital collections (IU) (Venkatesh et al. 2003) – were adapted from established scales. Social influences are believed to impact both PU and EU. The social influences scale was based on established scales used for subjective norms (Taylor and Todd 1995; Venkatesh and Davis 2000; Venkatesh et al. 2003). The scale for the experience of using digital collections was adapted from expanded TAM models (Venkatesh and Bala 2008; Venkatesh et al. 2003). The scale items for navigability of the digital collection site were adapted from studies focused on website navigation features (Al-Qeisi et al. 2014; Kim and Stoel 2004). The scale for self-efficacy, the confidence in one's ability to use the technology, was also based on well-established scales used in TAM (Taylor and Todd 1995; Venkatesh and Davis 2000; Venkatesh et al. 2003).

Data analysis

Data were analysed using Statistical Package for the Social Sciences (SPSS). Frequency statistics were used to examine demographic variables. Construct validity was assessed using exploratory factor analysis (Cronbach and Meehl 1955). Internal reliability was evaluated using Cronbach's standardized alpha (Cronbach 1951). Measurement properties, including reliability and validity of the measures, used confirmatory factor analysis. Convergent validity was examined using Fornell and Larcker's (1981) suggested steps. A structural equation model (SEM) was used to test the hypotheses and explore causal relationships.

Results

Measurement model and structural model testing

To test the SEM, Mulaik and Millsap (2000) recommend a four-step approach. This approach consists of a common factor analysis to establish the number of latent variables, a CFA to confirm the measurement model, test of the structural model, and testing of nested models or model modification to obtain the model of best fit. The causal model testing was conducted using LISREL 8.72 with maximum-likelihood estimation method. Fit statistics including chi-square, comparative fit index (CFI), Non-normed Fit Index (NNFI), and root mean square error of approximation (RMSEA) assessed model fit. The adequacy of the hypothesized model to reflect the variance and covariance of the data was assessed using a chi-square test. For the statistical significance of parameter estimates, t values were used. Fit statistics greater than or equal to .90 for CFI and NNFI indicate a good model fit (Bentler and Bonett 1980). Furthermore, RMSEA values lower than 0.07 indicate adequate model fit.

The first step involved conducting an Exploratory Factor Analysis using SPSS. The latent variables in the model were identified by using Principal Component with Varimax rotation. Kaiser's (1960) rule of a minimum Eigen value of one (K1) is typically used as the criterion to control the number of factors extracted; however, it has been suggested that the number of available components may become limited when using this rule.

Mote (1970) and Humphreys (1964), argue that following the K1 rule can sometimes result in retaining too few components; therefore, this study did not employ K1 rule. Measured variables with factor loading coefficients greater than .40 on a single factor were included as part of the factor (see Table 2). The scale for navigability of the digital collection site loaded on one factor and explained 60.20% of the variance ($a = 0.93$). The scales for self-efficacy and experience of using a digital collection each loaded as a separate factor and explained 6.35% and 4.28% of the variance respectively ($a = 0.93$ for both). PU explained 2.91% of the variance ($a = 0.93$) and PEOU explained 2.66% ($a = 0.89$). The scale for social influences loaded as one factor and explained 2.44% of the variance ($a = 0.90$). Intention to use a digital collection explained 3.73% of the variance ($a = 0.94$).

The fit of the measurement model was tested by constraining or referencing the factor loading of one variable per latent construct to one. The fit of the measurement model was acceptable ($\chi^2 = 736.59$, df. = 299, $P = .00000$, RMSEA = 0.060, NFI = 0.97, NNFI = 0.97). Therefore, the measurement model was retained without any modifications. The third step involved testing the fit of the structural model by adding the hypothesized relationships between the latent variables as shown in Figure 1. The fit indices of the overall structural model ($\chi^2 = 792.26$, df. = 305, $P = .00000$, RMSEA: 0.063, NFI: 0.98, NNFI: 0.99)

Table 2. Factor analysis for study variables.

| Factor items	Factor loading	% of variance	a
Navigability of the digital collection site		60.20%	0.93
The pages load quickly for the digital collection	0.78		
I can interact with the digital collection in order to get information tailored to my needs	0.77		
The digital collection is easy to access	0.75		
The digital collection can be personalized or customized to meet my needs	0.69		
The digital collection has interactive features which help me accomplish my task	0.66		
The digital collection has adequate search facilities	0.66		
Self-efficacy		6.35%	0.93
I would feel comfortable enough to use a digital collection.	0.727		
I know enough to use a digital collection on my own.	0.71		
If I wanted to, I could easily use a digital collection.	0.70		
I would be able to use a digital collection even if there is no one around to help me	0.68		
Experience of using digital collections		4.28%	0.93
I find using digital collections to be enjoyable	0.75		
I have fun using digital collections	0.74		
The actual experience of using a digital collection is pleasant	0.74		
Perceived usefulness – digital collections		2.91%	0.93
I find digital collections to be useful in my coursework	0.68		
Using digital collections improves my performance in my classes	0.67		
Using digital collections enhances my effectiveness in my classes	0.64		
Using digital collections in my coursework increases my productivity	0.64		
Perceived ease of use – digital collections		2.66%	0.89
Interacting with digital collections does not require a lot of my mental effort	0.78		
I find digital collections to be easy to use	0.72		
I find it easy to get digital collections to do what I want them to do	0.66		
Social influences		2.44%	0.90
My librarians would think that I should use digital collections	0.72		
My professors would encourage me to use digital collections	0.68		
My professors would recommend that I use digital collections	0.61		
My peers would think that I should use digital collections	0.46		
Intention to use digital collection		3.73%	0.94
I predict that I will use a digital collection in the next 3 months	0.79		
I plan to use a digital collection in the next 3 months	0.78		
I intend to use a digital collection in the next 3 months	0.77		
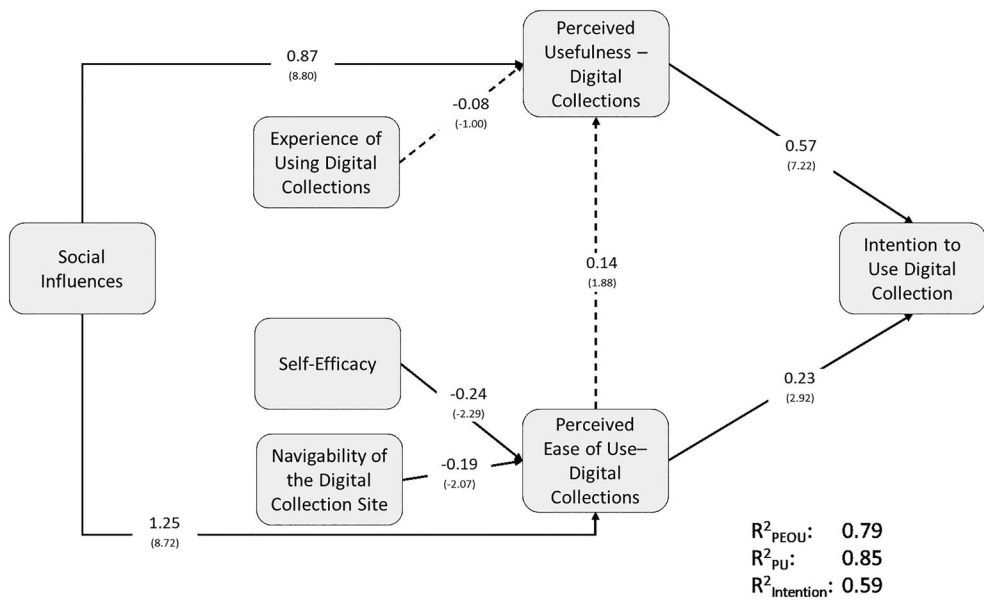
Figure 2. Research model including results.

supported the model fit. Figure 2 displays the results of the causal model analysis showing the statistically significant paths. The effect size is placed directly below the path coefficient. A parameter estimate t value greater than 2.00 was considered an indicator of statistical significance (Byrne 1998).

According to Fornell and Larcker (1981), the convergent validity can be assessed by three measures: item reliability, construct (composite) reliability, and average variance extracted. All the items in this current study had a significant t-value which is considered evidence of convergent validity (Chau 1996). The construct reliability ranged from 0.66–0.83. The average variance extracted (AVE) was greater than 0.5 for all the seven constructs (see Table 3).

Analysis of results

All the hypotheses were supported except for the influence of the experience of using digital collections and perceived ease of use (EU) on perceived usefulness (PU) (see Figure 2). Social influences (i.e., professors, librarians, and peers) had an important impact on both PU ($\beta = 1.08$) and EU ($\beta = 1.38$) which indicates that social influence, particularly encouragement from professors has an important impact. Interestingly, self-efficacy ($\beta = -0.26$) and navigability ($\beta = -0.24$) had a negative impact on EU. Both PU ($\beta = 0.58$) and EU ($\beta = 0.26$) influenced students' intention to use digital collections with PU indicating a greater influence on intention to use digital collections.

Social influences such as professors, peers, and librarians are important when it comes to both PU and EU which has a positive impact on the intention to use digital collections. The results of this research indicate that promotion by faculty and librarians is key to the use of digital collections. This supports the notion that students are less likely to seek out and use digital collections unless encouraged through pedagogical activities (Cook 2015).

Table 3. Convergent and Discriminant Validity.

Constructs	Variance extracted	Construct reliability	Average variance extracted (AVE)	Squared inter-construct correlations (SIC)
Navigability of the digital collection site	66.40	0.92	0.66	0.37–0.54
Self-efficacy	76.60	0.93	0.77	0.39–0.57
Experience of using digital collections	81.60	0.93	0.82	0.37–0.56
Perceived usefulness – digital collections	77.90	0.93	0.78	0.47–0.62
Perceived ease of use – digital collections	73.50	0.89	0.74	0.37–0.56
Social Influences	66.50	0.89	0.77	0.45–0.62
Intention to use digital collection	82.80	0.94	0.83	0.39–0.51

Furthermore, PU was an important influence on students' intention to use digital collections which suggests that emphasizing the necessity of using these collections as part of class activities, assignments, and research projects is an important motivational factor. The lack of influence of experience using digital collections on PU further emphasizes that students perceive university digital collections as an educational tool rather than the technology they would use in their daily lives. This supports more recent interpretations of technology use by millennials as being limited in scope for communication and as a quick web resource tool (Neumann 2016; Thompson 2013). Furthermore, even though hedonic factors such as fun and enjoyment were stated to be an important factor in previous studies, the results do not support this (Lin and Gregor 2006). This is an important finding especially since universities and other institutions often focus on making their online site 'fun' when it may not have the greatest impact on whether students will use the digital collection. It may be more important to design digital sites in collaboration with faculty and librarians to support high-impact teaching practices rather than creating a repository with no associated instruction.

Navigation as well as self-efficacy both influence EU, however, the relationship is negative. The negative relationship of self-efficacy to EU supports the idea that while students are familiar with technology, they often do not understand how to use these digital tools to support their own learning (Margaryan, Littlejohn, and Vojt 2011). This further emphasizes that the role of faculty, librarians, and peers should not be taken for granted in their ability to promote and motivate students to use digital collections. In order to encourage the use of university digital collections, instructors need to incorporate the use of these collections into class activities and review information literacy skills such as best practices for locating information and assessing information quality (Ng 2012; Neumann 2016).

Another important finding is that PU is not influenced by EU. Usefulness and ease of use are two distinctly different aspects of the digital collection as far as users are concerned and are not dependent on each other. In other words, a student's willingness to use a digital collection is not dependent on how easy it is to navigate and use. When a digital collection is integrated as part of a class lesson, it is considered useful regardless of whether it is easy to use. This is an important finding since a lot of time is spent on ensuring that the website is easy to use, especially when the main audience, millennials and generation Z students, have literacy issues when it comes to using an educational website.

The negative relationship between navigation and EU suggests that if the students find the website difficult to navigate, their perception of the ease of use will decrease. It is imperative that universities understand that users of digital collections utilize these online resources as an educational tool which should provide both depth as well as breadth of information; however, the digital collection needs to maintain good organization as well as an appropriate use of terminology and metadata which will facilitate better navigation. This also supports the incorporation of more advanced technology tools such as good search tools, innovative and detailed graphics, and the addition of external links within the digital collection website (Biedermann 2017; Lin and Gregor 2006; Lopatovska 2015).

Discussion and conclusions

This research has many implications for academics. Instructors and librarians should continue to include information literacy into their classroom instruction. Instructors should take initiatives to include the use of digital collections within their class instruction as well as class assignments. Students are less likely to use digital collections if they do not believe they are useful or relevant to their success in a class.

More consideration should be given to how the university collection will be used when planning and developing the digital presence. An important influence for student engagement is the usefulness of the collection which is often determined by the incorporation of the digital collection in course curriculum and assignments. While factors related to ease of use such as navigation, depth of content, and self-efficacy are important, the time and energy spent on developing a highly functional and entertaining website may be ineffective if not promoted in the classroom.

This has implications for faculty and staff who manage or work with university collections. It would be beneficial to collaborate with librarians or information professionals who have more experience with digital technologies. When developing online content, the information should be relevant and reinforced within the classroom to ensure the use of the digital collection by students. Digital collections that are designed in collaboration with instructors who will incorporate the collection within their class activities are likely to result in a more sustainable digital presence.

Further research is needed to continue to better understand students' acceptance and use of university digital collections. The findings indicate that social influence is critical which suggests that it would be helpful to investigate how social media could aid in the greater use of digital collections. Additionally, it would be beneficial if the museum or university collection was able to observe students using the digital collections to better understand the challenges experienced in order to make the digital collections more accessible and useful. This research indicates that the key to getting students to use university digital collections is to increase student exposure through faculty and librarian promotion and incorporate digital collections into class instruction.

Limitations/recommendations

This was a national random sample; however, the research relied on students' experience with a wide range of digital collections on their own campuses. Future research should examine student attitudes using a digital collection website where the website navigation

and features can be controlled by the researchers. Furthermore, the role of self-efficacy and navigational tools can be further explored. Additional studies should examine and evaluate effective methods of introducing and incorporating these collections within the classroom.

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