QRBD

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FROM THE EDITORS

The research in this issue of *Quarterly Review of Business Disciplines* begins with Vance Johnson Lewis and Kaye McKinzie, University of Central Arkansas. Their exploratory paper investigates the intrinsic and extrinsic job satisfaction of adjuncts specifically within the college of business and the changes in satisfaction that take place over a five-year period. The study of Liqiong Deng, University of West Georgia, focuses on how gamified IS can be designed to engage users and motivate them to continue system use. This paper provides guidelines on how to design and implement gamification features to engage IS users over time. T. Thomas Lahoud, Pace University, utilizes a research framework to extend the Technology Acceptance Model in order to define and evaluate whether ECG wearable authentication devices will be accepted and used to prevent fraudulent activities by validating identity and authorizing access. Armin Roth, Reutlingen University Germany, presents a central approach to the concept of holistic and long-term performance management by introducing five equal part disciplines to illustrate and demonstrate the issue and composition complexity of a strategic and systematic system. Melody MacLean, Emerson College, explores the impact of social media on the name recognition of political candidates using the 2020 Democratic primaries. The study offers insight into American's confidence levels in identifying political posts and provides a contribution to the emerging field of digital literacy research.

Margaret A. Goralski, *Quinnipiac University*, Editor-in Chief

Charles A. Lubbers, *University of South Dakota,* Associate Editor

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SEPARATE BUT…SATISFIED? AN EXPLORATION OF THE JOB SATISFACTION OF BUSINESS COLLEGE ADJUNCTS

Vance Johnson Lewis, University of Central Arkansas

Kaye McKinzie, University of Central Arkansas

ABSTRACT

Academia has long lamented the plight of the adjunct and seemingly ever-growing dependence on these part-time, no job security academics bearing the load of teaching on four-year and two-year college campuses. As reported by the AAUP, more than 50% of today's college faculty are part-time (2018). While much attention has been paid to adjuncts, little of this focus has been directed toward adjuncts in the business college. The purpose of this exploratory paper is to investigate and discuss the job satisfaction of adjuncts within the college of business. In Study #1, a semi-random sampling of business adjuncts representing doctoral, masters, and bachelor's degree-granting institutions within the United States were administered a modified version of the Minnesota Job Satisfaction Questionnaire. Using their categorical ratings, the 192 participants' levels of intrinsic and extrinsic job satisfaction with their positions were explored in relation to demographics such as years of teaching, industry experience, degree level, and the reason for being an adjunct. In Study #2, longitudinal data was gathered from the participants to see how their job satisfaction levels had changed during a five-year period as well as to investigate how many of the participants were still teaching, either in a part-time or full-time status.

Keywords: job satisfaction, business college, adjunct faculty, college faculty, part-time faculty

INTRODUCTION

"If you don't like something, change it.
If you can't change it, change your attitude."
Maya Angelou

As enrollment at four-year universities has continued to climb, so too has the need to employ strong and capable teachers to provide quality leadership and instruction in the college classroom; however, the majority of those entrusted with teaching college-level classes are not entrusted with doing so in a full-time job capacity (AAUP, 2018). Although literature, both academic and editorial, is readily available regarding adjuncts, this literature primarily falls into four categories: 1) "the status of part-time faculty, 2) exploitation or the lack of justice for part-time faculty, 3) their morale or job satisfaction, and 4) the educational problems that are created by using part-time faculty" (Pankin & Weiss, 2011: p. 2), with a preponderance of focus going toward instructional effectiveness (e.g., Hanson, Savitz, Savitz, & Rauscher, 2018; Lyons, 2007; Mueller, Sanderson & Mandernach, 2013; Peters, Jackson, Andrew, Halcomb, & Salamonson, 2011), institutional

value (e.g., Benjamin, 2002; Dedman & Pearch, 2004; Finder, 2007; Gappa & Leslie, 1993; Ridge & Ritt, 2017), and community college faculty (e.g., Charlier & Williams, 2011; Nagle, 2016; Wallin, 2004; Wyles, 1998).

Noticeably scant in the literature is knowledge regarding adjuncts at four-year universities, particularly in the curriculum area of business. Roughly 104,000 postsecondary faculty members teach in the area of business (O*Net, 2019); however, of the business faculty population, over half hold part-time status (National Center for Educational Statistics, 2017).

The purpose of this exploratory paper is not only to contribute to the adjunct literature but in particular to contribute to an understanding of issues specific to the adjuncts within the four-year business college. As this paper utilized longitudinal data, it also serves to contribute to the knowledge of adjuncts over time.

LITERATURE REVIEW

Definition of Being an Adjunct

Historically, identifying an adjunct was an easy process. "At one time the term adjunct faculty referred to special appointments: to specialists, though not necessarily celebrities, hired to provide particular expertise not available among the permanent faculty and rewarded with compensation and privileges commensurate with their rank" (McGee, 2002, p. 65). Holding the title of adjunct indicated that one was a true expert, usually a practitioner, on a specialized subject area. Being invited to be an adjunct held great prestige and would usually be considered an honor not just to the person who was invited to be an adjunct but the title of adjunct was respected by those who held full-time status.

Today, the term adjunct has become more connected to a part-time teacher who lacks employment security, benefits, and, to some, the actual ability to take part in full-time teaching and/or research activities; however, this definition does not adequately describe the reality of modern adjunct teaching. According to Shamos in *Handbook of Academic Titles*, an adjunct can be anyone who ranges from the historic "expert" definition to one who teaches full-time at one institution and part-time at another or one whose teaching responsibilities are restricted to teaching and office hours only (2002). Most commonly, the term adjunct is associated with someone who is part-time and/or teaches without having an expectation of job security or continued employment past the current term or academic year.

Two issues play prominently in being able to clearly define an adjunct as either temporary or part-time. The first of these issues is that adjunct faculty often carry class teaching loads that are equal to or greater than full-time faculty (e.g., Gappa & Leslie, 1993; Leatherman, 1997; Louis, 2009). Because adjuncts are teaching just as much or more than full-time faculty, the issue of whether an adjunct is truly part-time can cause confusion as to the actual standing of the adjunct.

Reasons for Being an Adjunct

The pursuit of an adjunct teaching position can occur for numerous reasons. From being a means of employment to being a manner of convenience, adjunct faculty have a wide and varied storehouse of motivations for entering into the adjunct realm. While some enter for survival, others are interested in gaining experience or fitting their professional goals with their personal lives.

Not surprisingly, the adjunct field is filled with those who someday aspire to be a full-time faculty member. Be they faculty who have recently graduated and are either looking to get their careers started (Carroll, 2017) or faculty members teaching as adjuncts because a full-time academic career has alluded them (Glenn, 2016), roughly 50 percent of all those teaching as adjunct are doing so with the hope that they will be able to secure a full-time teaching position (Banachowski, 1996; Heuer et al., 2004, Wallin, 2004; Wilson, 1998). Part-time business faculty comprise roughly 8% of this group of adjuncts hoping to secure a full-time teaching position. Unfortunately, for these two groups of adjuncts, the outlook does not look promising as colleges can be averse to promoting adjuncts into full-time positions (Fruscione, 2014).

Adjunct faculty are not necessarily academics who have no other options. In fact, some adjunct faculty members are those that choose to leave their full-time faculty positions to downsize to a part-time lifestyle. These individuals, for a variety of reasons, find it more conducive to their lifestyles to abandon their tenure track or fully tenured positions in order to enjoy spending more time on their personal academic interests or on other areas of their lives. Though they may leave their current institutions, some are often able to parlay their full-time successes into part-time employment at their current institution (McClain, 2003).

Adjunct positions are also pursued by those not interested in teaching as a career; rather, these individuals view adjunct teaching as a civic involvement opportunity. It is not uncommon to see people from the world of business or the world of civil service as adjunct instructors at both the community college and four-year university levels (Wallin, 2004). Colleges and universities might even invite certain leaders from the community to serve as adjuncts as it would increase the prestige of a program. As stated by Hayes "The county sheriff or police chief would be a prized adjunct for any criminal justice program. A local government course taught by the mayor or the county executive would be considered a 'plum' for the college" (2003, p. 139). These individuals are those that embody McGee's definition of traditional adjuncts; however, some might call into question as to whether simply having industry experience qualifies one for college-level teaching (Lewis & McKinzie, 2019).

The pursuit of an adjunct position may also be viewed as simply an opportunity to experience aspects of a chosen field while being able to "suspend the rules of competition, where there can be space for intellectual collaboration" (McGee, 2002, p. 63). Not everyone who goes into an adjunct position has aspirations of one day joining the tenured faculty. For some, the position itself is seen as a diversion from their regular employment—almost like a hobby (Carroll, 2017). For others, adjunct teaching provides them with an independent connection to their chosen field in that the adjunct position affords monetary compensation for a position that has a high degree of autonomy from supervisors or coworkers (McGee, 2002).

The logistics of an adjunct teaching position are also ideal for someone simply needing an additional income or part-time job. For someone with the appropriate credentials, teaching one or two courses a semester can be an ideal situation for balancing work and career. Women wishing to be stay-at-home-mothers find it rewarding to be in the classroom while having the flexibility to participate in their children's activities (Wilson, 1998). For those who have retired from their careers, adjunct positions can provide an opportunity to continue using their skills and experience while enjoying "less stress and less time commitment" than a full-time job (Krueger, 2005, p. 31).

Reasons for Staying an Adjunct

The reasons one might pursue an adjunct teaching position are varied and are not necessarily dependent on one's career vision. Why someone stays in an adjunct position is comprised of a much narrower, and perhaps more negative, list of options. Money, ego, and desperation play into the sustainment of an adjunct in their position, or positions.

Regardless of the reasons for being an adjunct, one item remains constant: a paycheck. While it may not be much, especially when compared to the amount of energy exerted on teaching a course, adjuncts do receive monetary compensation for their efforts. Though often affected by curriculum area, level of education, and geographic region, adjunct pay for one course typically falls between $1,500 and $5,000 (Korkki, 2018; Watanabe, 2003). While some adjuncts are able to piece together several teaching positions or garner enough courses to simulate full-time employment (Carroll, 2017; Glenn, 2016), a sobering reality is that 25% of part-time college faculty utilize some form of public assistance (Jacobs, Perry, & MacGillvary, 2015). As is true with their full-time counterparts, adjuncts in business tend to receive some of the highest levels of compensation for their part-time work (Terpstra & Honoree, 2004), which can be attributed in part to external equity issues (the act of paying employees a salary that is consistent with that of the labor market relevant to their skills) as business faculty, both full-time and part-time, have opportunities off-campus not available to other disciplines (Wallace & Fay, 1983).

An adjunct's attachment to the part-time teaching position might also be associated with ego. For one who's primary career or personal life does not include academia, being able to teach enables the individual to derive more fulfillment in their regular employment because teaching allows said individual to share in the training of students who are also interested in that particular career. These individuals also see that teaching adds an element of prestige to their daily status since being viewed as a college professor, in any capacity, is usually well regarded in society (Banachowski, 1996). Similarly, the adjunct is able to derive their own sense of accomplishment and honor from their experience (Troumpoucis, 2004). For these individuals, their attachment to being an adjunct and the identity they derive from being an adjunct is found not in the title or position but in the specific act of being in the classroom.

Though not commonly associated with the pursuit of any employment, let alone academics, some might pursue an adjunct position due to simply not knowing what else there is to do. Earning a doctoral degree can take someone nearly a decade of effort (Benton, 2009). During this time, students are conditioned to the idea of becoming a researcher and professor and are not particularly well informed of the job possibilities of their degree outside of the academy (Wood, 2019). Despite the intense competition for tenure-track positions (Shao, 2014), their lure still draws those seeking

the highest levels of job satisfaction in the academy, to conduct research, to participate in curriculum development, and to utilize the most effective teaching methods available (AAUP, 1993; Kezar & Maxey, 2013). Out of desperation, rather than joining the ranks of the public or private sector, non-profit organizations, or humanitarian groups, these individuals remain in the ranks of adjuncts hoping their service will someday result in a full-time teaching position (Papp, 2002). Roughly 34,000 part-time faculty members hold a Ph.D., of which 7% are found within the college of business (Heuer et al., 2004).

THEORY AND HYPOTHESES

Prior to 1978, little was studied regarding adjuncts nor was this population of the professoriate specifically defined. In "Who is Part-time in Academe?" Howard Tuckman (1978) delineated for the first time a taxonomy of those who taught in higher education on a part-time basis. The seven categories of this taxonomy were *semiretired*, former full-time faculty who have scaled back their work-load; *graduate students*, those teaching at an institution other than their school of study; *hopeful full-timers*, those who desire a full-time teaching contract; *full-mooners*, those teaching in addition to a full-time job; *homeworkers*, those teaching in addition to caring for children or other relatives; *part-mooners*, those teaching while holding a non-teaching part-time position elsewhere; and *part-unknowners*, those teaching part-time for unknown or highly specific reasons. Of the many elements of this study, job satisfaction was studied among these seven groups finding that each group had approximately a 30% satisfaction rate with their job, with the exception of hopeful full-timers who had only a 25% satisfaction rate (Tuckman, 1978).

The seminal work regarding adjuncts, *The Invisible Faculty* (Gappa & Leslie, 1993), provides a cross-section of 18 universities as well as interviews with over 200 part-time faculty members. Building upon the work of Tuckman (1978) and Gappa and Leslie (1993) created four broad categories of adjuncts: career enders, specialists/experts, aspiring academics, and freelancers. Of these groups, specialists/experts were found to have little economic motivation to teach because they already had full-time positions with high salaries and job security and thus were teaching because they wanted to teach. In addition to discussing the adjunct as a person, Gappa and Leslie also suggest methods by which education can be enhanced by the use of part-time faculty.

Other studies have investigated job satisfaction within the general faculty without specifically investigating adjuncts. Boyer, Altbach, & Whitelaw (1994) found that both Intrinsic and Extrinsic factors can contribute to job satisfaction with high levels of satisfaction being connected to the courses taught, collegial relationships, and intellectual lives. Similar results were found by Lacy and Sheehan (1997) where faculty in the United States expressed overall job satisfaction with notable levels of satisfaction found with job security (but not opportunities for promotion), collegial relationships, and opportunities to pursue their own interests.

Though highly minimal in the literature, two found studies focused on job satisfaction specifically within the business college. Parker (1990) examined part-time business instructors at community colleges whose job was either their vocation or avocation. The results of this study were that there was no significant difference in the job satisfaction of part-timers who were vocational or avocational. Seventy-nine percent of respondents had full-time work in addition to their adjunct position with most of the respondents reporting they were primarily business people and not

aspiring academics. The researchers noted in this study that frustration stemming from not being able to find full-time academic work was not the driving factor in satisfaction of the population as it might be for adjuncts in the liberal arts (Parker, 1990).

In the second found study, Gara (1997) examined the job satisfaction of business faculty at schools within the Western Association of Schools and Colleges in California with Herzberg's Two Factory Theory of Motivation serving as her basis for research. Among her findings, she determined that interpersonal relationships provided the highest levels of jobs satisfaction while salary provided the lowest, men had higher levels of satisfaction than women, those over the age of 36 had higher levels than those under 35, and that those with doctoral degrees had higher levels of satisfaction than those with masters degrees.

From these studies and the previously mentioned research, we began forming our research questions.

RQ1: Do business adjuncts at four-year universities indicate a larger Intrinsic than Extrinsic job satisfaction?

Though not specific to business, the job satisfaction of adjunct faculty has been viewed by researchers Feldman and Turnely (2004). Utilizing the theory of relative deprivation, which in essence explores why an individual might deprive themselves of a certain condition, they explored how adjuncts respond to their temporary/contingent employment status. Utilizing faculty at a large public university, a set of 20 factors were measured in relation to relative deprivation and job satisfaction, including age, educational level, and intent to stay as an adjunct. Those who accepted employment as an adjunct due to not being able to find permanent employment were likely to experience frustration in their positions. Adjuncts who selected contingent employment as a means to balance work and personal life were found to experience significantly smaller levels of frustration with their positions (Feldman & Turnely, 2004).

RQ2: Does one's reason for teaching as an adjunct of business affect their overall job satisfaction?

Feldman & Turnely's (2004) study also explored the various demographics in relation to selecting the adjunct position. The age of the participants also indicated a relationship with frustration as younger adjunct faculty experienced greater levels of frustration. Combining this with Gara's (1997) finding about those over the age of 36, we derived our next research question.

RQ3: Does age increase business adjuncts overall job satisfaction?

Adjuncts who intended to stay an adjunct only a short time experienced significantly more frustration with their positions than did adjuncts who intended to stay in their positions for a least one more year (Feldman and Turnely, 2004).

Within this current study, participants were surveyed at two points in time, five years apart. The impact of time has been shown to affect one's levels of job satisfaction, although the relationship is somewhat murky. While tenure, the time one spends in an organization, has been shown as a

stable predictor of job satisfaction (Bedein, Ferris, & Kacmar, 1992), that predication has not been shown to be stably correlated to either positive or negative effects on job satisfaction (Riza, Ganzach, & Liu, 2018). Age (RQ3) on the other hand has been consistently shown to be positively related to job satisfaction (Ng & Feldman, 2010) with some indication that job satisfaction begins to increase during one's early 30s (Clark, Oswald, & Warr, 1996). Based on this information, we expect to see that job satisfaction levels will decrease over time as adjuncts remain in these no job security positions.

RQ4: Does overall job satisfaction of adjuncts decrease over time?

As unemployment has an inverse relationship to level of education (Bureau, 2015), the higher the degree one has, the less likely they are to select an undesirable position. We would expect to see a lower job satisfaction for those with higher degrees who hold adjunct positions.

RQ5: Does the level of degree held by business adjuncts affect their overall job satisfaction?

There does seem to be lower levels of job satisfaction for female faculty as compared to males (Sabharwal & Corley, 2009; Gara, 1997). Where Sabharwal & Corley's (2009) study was in the Social Sciences, Gara's (1997) was with business faculty. We decided to explore if this held true for adjunct faculty as well.

RQ6: Does gender affect the job satisfaction levels of business adjuncts?

Various studies have looked into specific academic disciplines and exhibit little variance in either the job satisfaction or facets leading to job satisfaction. While there are lower levels for those in the liberal arts as compared to the social and technical sciences (Truong, 2010), business faculty have been found to have the highest level of satisfaction, particularly regarding salary (Terpstra & Honoree, 2004). Across academic disciplines, business faculty have been found to have the highest salaries (Jaschik, 2016) possibly due to their high external earning potential (Wallace & Fay, 1983). Within the business college itself, pay structures vary by discipline with those in accounting, finance, and operations management being the top earners while those in economics, operations research, and management being the lower wage earners (AACSB, 2019). This led to our final research question to see if there were differences by discipline.

RQ7: Does specific academic discipline affect the job satisfaction of business adjuncts?

METHODOLOGY

Instrument

This study utilized a modified form of the Minnesota Job Satisfaction Questionnaire (MSQ) 20 Question Short Form (Weiss, Dawis, England, & Lofquist, 1967). As this study was not attempting to validate a revision of the MSQ nor compare its results to previous versions, these changes were made specifically for use in this study to match the participant base and research questions. A

simple change in semantics was altering "boss" to "supervisor" as the term "boss" has become outdated and carries with it somewhat of a negative context (Brandon, 2015; Haeber, 2007).

Of significance, but not without precedence (e.g., DeMato & Curcio, 2004; Lu, Siu, & Cooper, 2005; Mathieu & Babiak, 2016; Mathieu, Neumann, Hare, & Babiak, 2014; Worrell, Skaggs, & Brown, 2006), was the alteration of the MSQ from a five-point to six-point Likert scale. Within the original scale (*very dissatisfied, dissatisfied, neutral, satisfied*, and *very satisfied*), participants had the option of selecting "N" to indicate that they are neither satisfied or dissatisfied (Weiss et al, 1967); however, research has shown that this terminology is unclear as to whether the respondent actually has no opinion, is indifferent, or simply cannot determine what their opinion is (Willits, Theodori, & Luloff, 2016). Therefore it is inappropriate to assume that a neutral response is simply a score half-way between satisfied and dissatisfied but rather it is its own dichotomous category (Chang, 1994). Removal of the midpoint also aids in increasing honesty in situations where social desirability might affect one's response, such as with job satisfaction (Garland, 1991; Johns, 2005). Our decision to alter the Likert scale was further justified by findings that a greater number of Likert points reduces the potential for skewed data (Dawes, 2008) and that an even number of Likert points increases reliability (Chang, 1997).

In the current study, the markers *very dissatisfied, somewhat dissatisfied, slightly dissatisfied, slightly satisfied, somewhat satisfied*, and *very satisfied* were used. These changes in semantics did not affect the validity of the scale as neutral response options can be split into *slightly disagree* and *slightly agree* without harm to the survey (Thompson, 2018). Additionally, the word *somewhat* is often used in satisfaction scales as the Likert point which follows and precedes the *very* choice on the Likert scale (Jovancic, 2018; What is a Likert scale?, 2019) and grammatically can allow for better understanding of depth (Somewhat, 2019). Though the original placement of *very dissatisfied* and *very satisfied* remained, the use of labels on Likert scales in general has been shown to have no effect on means (Frisbie & Brandenburg, 1979) nor on reliability and validity (Boote, 1981; McKelvie, 1978)

Basic demographic questions were added to the questionnaire. While the predominant demographics of the study were dictated by the research questions, some demographics were inspired by the taxonomy created by Tuckman (1978). The work of Wood (1973) was also utilized in the creation of demographic variables who, in his own creation of a job satisfaction questionnaire, tested select demographic variables for significance within the North Carolina Community College System in relation to faculty motivation. Though Wood's demographics are not used specifically, his findings of significance and non-significance were considered. Two filter or screening questions were added to the beginning of the survey to eliminate any incorrectly identified participants who did not fit the necessary definition of adjunct (Rea & Parker, 2005).

Two demographic questions were asked in an open-ended manner: *How much compensation do you typically receive for teaching per credit hour?* and *Including your adjunct salary what is your total household income?* While these two questions were in keeping with the literature on adjunct job satisfaction, the responses to both questions were discarded as they required too many assumptions to be made on the part of the research team. For instance, while most responses offered numbers ranging from $600 to $1,500 which appeared logical for a per credit hour assignment, several responses indicated amounts nearer $4,000 to $7,000 which seemingly

indicated more of a compensation per class situation, not per credit-hour. One respondent even stated $30,000 per semester which clearly indicated an answer not in keeping with the question. Given the lack of clarity in the responses, the researchers felt it better not to use this data.

The survey itself was a self-administered online survey created on the independent website SurveyMonkey. Only participants who were directly invited could participate in the survey which was necessary to ensure that participants met specific criteria and that the data could be collected within a specific time frame. Within the survey, participants had the option of clicking one response per question or statement. Some questions also allowed the participants to submit a qualitative response to the statement or question.

Participants

2011 data collection. The participants for this study were a stratified-random sampling based on three main criteria: their position as an adjunct in one of the curriculum fields of business, their geographic location, and their institutional type. Participants were populated from a random sampling of institutions created from a purposeful list of potential institutions (Creswell, 2014) and determined by the categories within the Carnegie Foundation (Carnegie, 2010). As their geographic location was undetermined, strictly online schools were eliminated. In total, 1,179 faculty members from 61 institutions were invited to participate in the study with 222 responses being received. Due to incomplete surveys, 30 responses were unusable. Leaving N=192.

2016 data collection. Five years past the original data collection, the 192 participants were researched for potential participation in a follow-up study. Each were first researched to identify if the institutional email address used in 2011 was still valid. For those who were not still valid, an internet search was completed to attempt to identify (either from other websites or public CV/Resumes) a valid email address. Of the original 192 participants, 103 were found. Those 103 were sent the exact same SurveyMonkey instrument as in 2011, with the addition of two questions: *Are you still teaching at the institution at which you were teaching as an adjunct during the 2011-2012 school year? - If Yes, please offer why you have stayed. If No, why did you leave?* and *OVERALL, how satisfied are you with your adjunct teaching position?*. Of those contacted, 23 responded to the survey, of which one was incomplete, for an N=22.

While the response rate was low in this second data collection, there are some very important factors to consider. First, there were only a potential 192 individuals to contact. Given that response rates to internet surveys are usually roughly 25% (Converse, 2017), the responses to the 2016 data collection are not decidedly low. Great effort was made to locate all of the 2011 participants even when they were no longer at the original institution. Of the 53% that were found, the response rate was 21%, which included responses to the initial survey request and two follow-ups. While no data was collected, and in many cases was impossible to determine, as to why the 2011 adjuncts had either gone missing or silent, the research of Feldman (2004) does find that the longer one stays an adjunct, the more frustrated they become with being so; thus, it is not unreasonable to determine that many of the 2011 participants had left the profession by 2016 and/or that they simply did not want to discuss being in the profession again.

Analysis

In keeping with the foundational, exploratory nature of this study, t-tests, ANOVA, generalized linear models (glm), and regression techniques were conducted using SPSS 25 software. Participant responses to the MSQ were averaged to create the overall Intrinsic and Extrinsic satisfaction mean for each participant. For the string variables of Reason for Teaching, Level of Degree, Gender, and Academic Discipline, responses were transformed by automatic recoding within the statistics program so statistical (factor) analysis could be performed. Within the analysis, the effects of the various demographic variables (independent variables) were tested on the calculated Job Satisfaction (Intrinsic/Extrinsic) means (dependent variable) from 2011 and 2016.

RESULTS

Demographics

When the survey was initially deployed in 2011, a total of 192 usable responses were gathered. However, in 2016 only 22 responses were obtained. The significantly smaller sample size in 2016 did have an impact on the ability to obtain significant results with the second sample.

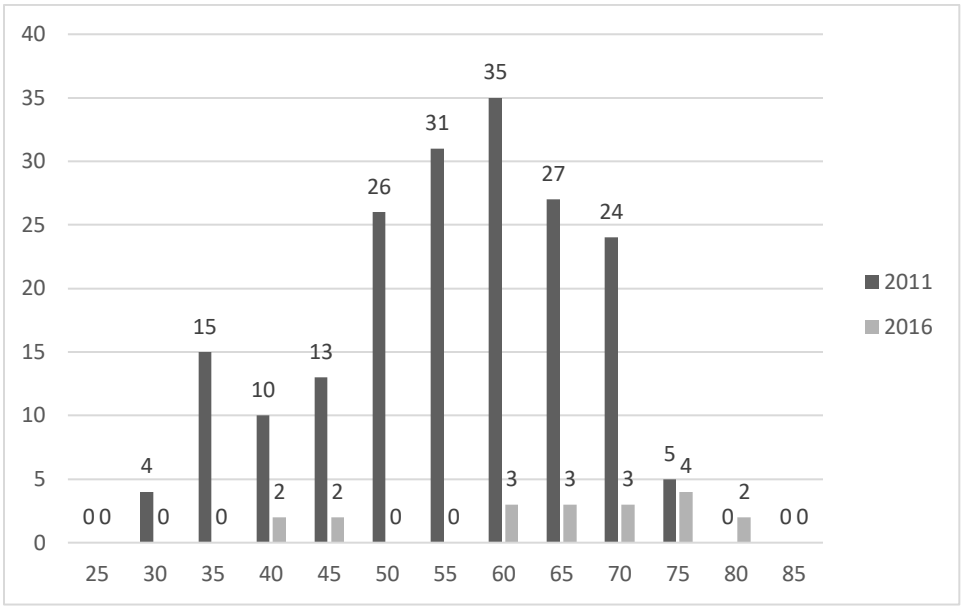
Respondents were asked to classify themselves into a category that best described them as an adjunct. This demographic question aligned with RQ2. If Parker's (1990) results were also seen here, then reason 3 (looking for full-time work) should score lower than the other reasons. With the new sample being (roughly) one-tenth (0.11) of the original, the new sample is roughly in line with the original one as seen in Table 1.

Table 1. RQ2. Reason for teaching adjunct

Reason for teaching adjunct		2011	2016
1	**I am a retired or semi-retired professor now teaching adjunct**	21	2
2	**I am a graduate student teaching somewhere other than my school of study**	0	1
3	**I am an adjunct hoping to receive a full-time teaching position within the next 24 months**	15	2
4	**I am teaching part-time in addition to my full-time job**	101	3
5	**I am an adjunct but not for any of the above reasons**	55	14

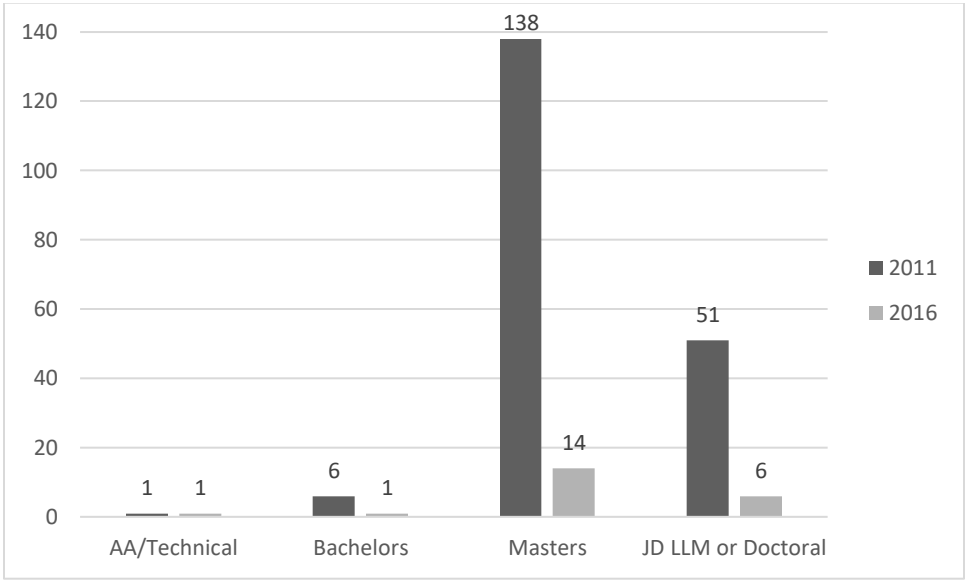
In both studies, the ages varied over four decades, with the larger sample from 2011 having an evident bell-shaped curve. With such a small sample in 2016, it is hard to determine if the newer sample has a similar age distribution as the original one. This is shown in Figure 1.

Figure 1. RQ3. Age



The level of highest academic degree (RQ5) was recorded using eight categories. These were combined into the four categories displayed in Figure 2. Again, the new sample results appear to be roughly similar in magnitude to the distribution from the first sample.

Figure 2. RQ5. Level of Degree



RQ6 looks to see if there are differences in gender. This demographic is the most unlike in the two different surveys. In 2011 there were almost three times more women responding. In 2016 there were almost three times more men responding (Table 2). Given the disproportionate number of women who seemingly left the adjunct field (or did not respond to the survey), further research is needed.

Table 2. RQ6. Gender

Gender		
	2011	**2016**
Female	136	6
Male	56	16

The last demographic we tested and report stems from RQ7 and looks at the area of academic study. We collected eleven different areas in business and then grouped these into four common business departments: Accounting/Legal, Economics/Finance, Management/Marketing/etc., and Information Systems. As no specific literature was found regarding specific levels of job satisfaction within specific disciplines, the researchers used previous literature showing one of the reasons adjuncts teach is for the money. Gara (1997) noted job satisfaction of business faculty was not largely based on salary. As noted previously (AACSB, 2019) salaries in business schools are largely driven by discipline. Knowing this relationship, we used the discipline as analogous to salary and proposed that we would not expect to find a relationship to job satisfaction based on the discipline (salary).

However, in a study of student evaluations of teaching (SET) (Lewis & McKinzie, 2019), findings indicated Marketing and Management receive the highest levels of SET. As praise has been shown as a factor in job satisfaction (e.g., Herzberg, Mausner, & Synderman, 1959), we presupposed that Marketing and Management adjuncts would also exhibit higher levels of job satisfaction. Using this logic, those teaching in quantitively based courses risk lower evaluations/praise (Uttl & Smibert, 2017) and might also have lower job satisfaction. The lack of knowledge in this area was again one of the primary drivers of this project.

The first two areas (Accounting/Legal; Economics/Finance) appear to be roughly similar in magnitude changes from 2011 to 2016, but the last two (Management/Marketing; Information Systems) clearly are not (Table 3). In fact, in Information Systems, all 13 of the original respondents answered the new survey and all but one was still teaching as an adjunct. With such a disparity in these two areas, further research is warranted.

Table 3. Academic Area

Academic Area		
	2011	**2016**
Accounting/Legal	32	3
Economics/Finance	29	3
Management/Marketing/etc.	118	3
Information Systems	13	13

Research Questions Statistical Results

This study is reporting on the composite Intrinsic and the composite Extrinsic results in 2011 and 2016. As part of this study, we are reporting both comparisons within the study-year between Intrinsic and Extrinsic results as well as cross-year comparisons of Intrinsic and Extrinsic results. There is knowledge in finding little to no statistical relationships which is what this study found. Each of the research questions and the results of statistical testing are presented in the following paragraphs in the same order they were previously addressed. A significance of 0.05 was used for all statistical tests.

RQ1: *Do business adjuncts at four-year universities indicate a larger Intrinsic than Extrinsic job satisfaction?* This is the one research question we can definitively answer. Whether we are looking at the data in 2011 or 2016, both studies showed a larger Intrinsic than Extrinsic motivation when compared using a t-test. This supports previous studies (Banachowski, 1996; Gara, 1997; Troumpoucis, 2004) that were not specific to 4-year business schools. Table 4's far-right column shows significance smaller than 0.001 showing that adjunct faculty in both years are more intrinsically motivated than extrinsically motivated.

RQ4: *Does overall job satisfaction of adjuncts decrease over time?* As we compared Intrinsic and Extrinsic results within the same survey, we also compared the 2011 results with the 2016 results using a t-test. If as Feldman and Turnely (2004) state those who become adjuncts only planning to be an adjunct for a short time experience increased frustration, then those in the 2016 study, having been teaching as an adjunct for more than 5 years, should have lower job satisfaction than those in 2011 because they are still teaching. Table 4's last row shows these significances at 0.002 and 0.011 showing that there are significantly lower Intrinsic and Extrinsic results in 2016.

Table 4. RQ1 and RQ4 statistical results

	mean		
	Intrinsic	**Extrinsic**	**RQ1 sig**
2011	5.257	4.589	0.000
2016	5.030	4.273	0.000
RQ4 sig	0.002	0.011	

RQ3: *Does age increase business adjuncts overall job satisfaction?* A linear regression model was used to see if job satisfaction increased with age. The significances were all above 0.35 showing no relationship of age and the Intrinsic, Extrinsic, or Combined model results for 2011 or 2016. Thus we were not able to support Gara's (1997) claim that those older than 36 had higher levels of job satisfaction nor could we support Feldman and Turnely's (2004) claim that younger adjunct faculty had more frustration.

RQ2, 5, 6, & 7: A factorial generalized linear model ANOVA was used to test research questions 2 (reason), 5 (level of degree), 6 (gender), and 7 (academic discipline). This was done for 2011 and 2016 as well as looking at Intrinsic and Extrinsic results. Although some combined variables

showed significance, the partial eta squared was very small. This is an indication of a sampling error leading to non-repeatability. Thus, we are reporting no significance found.

Finally, a One-way ANOVA was conducted for each of these factors (2, 5, 6, & 7). There were no significant results for the Intrinsic metric. However, for the Extrinsic, we did find two significant findings, one for RQ2 and one for RQ7 both in the 2011 data.

For RQ2: *Does one's reason for teaching as an adjunct of business affect their overall job satisfaction?* We expected based on Tuckman (1978) and Lacy and Sheehan (1997) that category 3 (hopeful full-timers) would be significantly lower than the other 4 categories; We did not find this to be true. We found that being retired had a higher Extrinsic score than teaching for "other" reasons. These differences were significant at the 0.041 p-value.

Table 5. RQ2. 2011 Extrinsic

	2011 Extrinsic Discipline		
	Lower CI	**Mean**	**Upper CI**
Cat 1 - retired	4.642	4.979	5.317
Cat 5 - other	3.960	4.267	4.574

For RQ7: *Does specific academic discipline affect the job satisfaction of business adjuncts?* We found that the academic area 3 (Marketing/Management/Supply Chain/etc.) showed a lower Extrinsic result (Intrinsic results were inconclusive) than academic area 4 (Information Systems) with a significance of 0.030. This finding was opposite of what we expected based on previous research (Herzberg, Mausner, & Synderman, 1959; Uttl & Smibert, 2017) but is in keeping with the salary structures found within the business discipline (AACSB, 2019). All that said, the one person who answered the survey in 2016 that was no longer teaching as an adjunct (replaced by a full-time faculty) was an IS faculty member. His composite satisfaction scores were lower than all others in 2016. The small samples in 2016 prevented statistical testing significance.

Table 6. RQ7. 2011 Extrinsic

	2011 Extrinsic Discipline		
	Lower CI	**Mean**	**Upper CI**
Cat 3 - Management/Marketing	4.198	4.396	4.594
Cat 4 - Information Systems	4.887	5.242	5.597

DISCUSSION

Analytical Results

Given previous literature which indicates that full-time faculty within the college of business demonstrate some of the highest levels of satisfaction on the campus (Gara, 1997) along with adjunct business faculty at community colleges (Parker, 1990), the assumption was made in the formation of this study that adjunct business faculty at four-year universities would also exhibit job satisfaction. As was expected by the researchers, the postulation that business adjuncts would

express job satisfaction held true (RQ1) and that, while still showing job satisfaction, the level did decrease over time (RQ4).

For RQ2 the only prior research uncovered indicated that those wanting a full-time position would have lower job satisfaction (frustration). We did not find this to be statistically supported but did find a different relationship (retired faculty have higher Extrinsic job satisfaction than others).

For RQ7 there was little prior research showing that there would be differences by academic area. We wanted to explore if salaries or praise might influence job satisfaction by department as quantitative teaching areas are paid more in business yet receive lower praise. We did find a larger Extrinsic response in the IS department than in Management/Marketing in 2011. This makes sense as IS faculty are often paid significantly more than Management/Marketing yet it is a little confounding as they receive less praise on SETs.

FUTURE STUDIES

From the sheer numbers of adjuncts being employed in colleges of business alone (National Center for Educational Statistics, 2017), it is clear that this demographic is critical for the success of these colleges. The main motivation for conducting this study was to explore the world of adjunct teaching from the idea that those who participate in it are satisfied with their positions and enjoy their line of work. The assumption was made in the development of the study that the population would express satisfaction with their positions and thus our goal was then to explore and identify demographics that might lead to a better understanding of what causes the specific population of adjuncts to be satisfied and thus to translate those findings into usable methods by which unsatisfied adjuncts might be positively motivated.

Moving forward in this line of research, many areas are ripe for further investigation and understanding.

There is something causing the Information Systems faculty who answered the survey in 2011 to all (100%) have answered it in 2016. Of those who answered the survey in 2016 all but one (an IS faculty) were still teaching as adjuncts five years later. This means 92% of IS faculty were still teaching five years later whereas less than three percent of Management/Marketing faculty even responded to the survey. The demographics themselves may be telling us that these Information Systems faculty are very satisfied with their positions as adjuncts. The other two academic areas had an approximate 10% response rate in 2016 (all still teaching as adjuncts). A specific point of interesting within future research to this area of the business college is what, if any, full-time positions Information System's adjuncts hold. For instance, seeing the job satisfaction of adjuncts who hold traditional full-time positions as opposed to those who work full-time as independent contractors or consultants could aid in seeing what aspects of the adjunct position work to compliment, or supplement, needs from the full-time position.

Within the results of this research, other surprising oddities were found, such as the disappearance of women from the 2011 study to the 2016 study. While data suggests that men are both more represented within the faculty and have higher pay scales than women (National Center for Education Statistics, 2019), no national trends would indicate that women would be so

underrepresented. In fact, research suggests that in business, women have increased their presence within the instructor and assistant professor ranks (Brown, 2016); however, because attempts were made to contact the 2011 participants regardless of their 2016 position, the disappearance of women is both interesting and disturbing.

Future research would benefit from comparative analysis with other academic fields. While the findings are interesting and do reveal certain aspects of business adjuncts, the findings are limited because it is not known if they are specific to this area or if they are in fact universally reflective of academia as a whole. To further appreciate the findings of this study, it should be replicated across other areas of academia. This exploration would be made even stronger by the addition of an exploration of workplace climate and the perception of value the adjunct feels from colleagues and supervisors.

While the current research did not find significance within many of the variables tested, other researchers using different and more detailed methodology might find significance. Using the hypothesis within this study, data could be more specifically collected in areas such as compensation and degree field to test for significant interactions. Also, future research could benefit from collecting longitudinal data at more frequent intervals as to not only show progression of data but more easily maintain relationships with the participants. Considerations should also be given to expanding the participant base to adjuncts who are currently teaching at the same universities as the original participants.

Beyond this study, exploration of a possible triangular relationship among overall satisfaction, compensation, and desire for employment should be made. Given again that none of the reasons for teaching as an adjunct proved to be a significant factor in predicting overall satisfaction, it must be assumed that other mitigating relationships are in place that created the overall satisfaction levels. With a more thorough exploration of compensation and desire for different employment, a balance point might be located in which adjunct teaching is looked upon as a rewarding career rather than an inadequately compensated venture.

Finally, exploration of the Job-Person Fit Theory would serve to better identify those who are actually capable of executing the job of being an adjunct and doing so with satisfaction. As discussed by Papp (2002), many individuals with graduate degrees become adjuncts simply because they do not know what else to do; however, evidence suggests that mismatches in education, skills, and job can have a profound effect on satisfaction (Allen & van der Velden, 2001). The assumption that all graduate degree holders are qualified, capable, and designed to teach on the college level must be abolished and more research into the psychological, sociological and technical abilities needed to be a successful and satisfied college-level educator need to be made so that those who lack the skills and the propensity to be satisfied with college-level teaching can be weeded out prior to their ever reaching the classroom, ultimately making adjunct teaching a career within itself.

CONCLUSION

This study yielded both confirmatory, not statistically supported, and new results in relation to previous research. It works to paint an understanding of the potential root cause of a satisfied

adjunct. Beyond knowing that this population is satisfied lies a bigger picture: adjuncts in the field of business are not just satisfied…they are very satisfied and satisfied in almost all areas of their job. As the results of the study indicate, time does lead to dissatisfaction and to negate the initial satisfaction with the job itself.

As academia relies more and more heavily on adjunct teachers, understanding and embracing this population of the campus is essential to providing the highest quality of education. The present study provides an initial step in understanding what causes satisfaction within the population of adjunct business faculty at four-year universities, demonstrating not only that this population is satisfied but also which demographics do and do not contribute to this level of satisfaction.

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REFERENCES

AACSB (2019). *2018-19 Staff Compensations and Demographics Survey: Executive Summary*. Retrieved from https://www.aacsb.edu/-/media/aacsb/publications/data-reports/global-salary-survey/201819%20staff%20compensation%20%20demographics%20survey%20executive%20summary.ashx?la=en&hash=A7B4598C50D58AFE0D96873396A93E14AE06BEE3

AAUP. (2018). *Background Facts on Contingent Faculty*. Washington, DC: American Association of University Professors. Retrieved from https://www.aaup.org/issues/contingency/background-facts

AAUP. (1993). *The Status of Non-Tenure-Track Faculty*. Retrieved from https://www.aaup.org/report/status-non-tenure-track-faculty

Allen, J., & Van der Velden, R. (2001). Educational mismatches versus skill mismatches: effects on wages, job satisfaction, and on-the-job search. *Oxford Economic Papers*, *53*(3), 434-452.

Banachowski, G. (1996). ERIC review--perspectives and perceptions: The use of part-time faculty in community colleges. *Community College Review*, *24*(2), 49.

Bedein, A. G., Ferris, G. R., & Kacmar, K. M. (1992). Age, tenure, and job satisfaction: A tale of two perspectives. *Journal of Vocational Behavior*, *40*(1), 33-48.

Benjamin, E. (2002). How over-reliance on contingent appointments diminishes faculty involvement in student learning. *Peer Review*, *5*(1), 4-10.

Benton, T. (2009). Graduate school in the humanities: Just don't go. *Chronicle of Higher Education*, *55*(21), A32-A34.

Boote, A. S. (1981). Reliability testing of psychographic scales: Five-point or seven-point? Anchored or labeled? *Journal of Advertising Research, 21*(5), 53-60.

Boyer, E., Altbach, P., & Whitelaw, M. J. (1994). *The Academic Profession: An International Perspective*. Princeton, New Jersey: Carnegie Foundation for the Advancement of Teaching.

Brandon, J. (2015, Nov. 17). 7 words Millennials never understand. *Inc*. Retrieved from https://www.inc.com/john-brandon/7-words-millennials-always-misunderstand.html

Brown, J. (2016, March 22). Women as Full-Time Business School Faculty – Does World Region Make a Difference? *AACSB*. Retrieved from https://aacsbblogs.typepad.com/dataandresearch/2016/03/women-as-full-time-business-school-faculty-does-world-region-make-a-difference.html

Bureau of Labor Statistics. (2015). *Earnings and employment rates by educational attainment*. Retrieved from http://www.bls.gov/emp/ep_chart_001.htm.

Carnegie Foundation for the Advancement of Teaching. (2010). Retrieved from http://classifications.carnegiefoundation.org/descriptions/basic.php

Carroll, J. (2017, March 10). Leaving the Adjunct Track. *Chronicle of Higher Education*, p. A55.

Chang, L. (1994). A psychometric evaluation of 4-Point and 6-Point Likert-type scales in relation to reliability and validity. *Applied Psychological Measurement, 18*(3), 205–215.

Chang, L. (1997). Dependability of anchoring labels of Likert-type scales. *Educational and Psychological Measurement, 57*(5), 800-807.

Clark, A., Oswald, A., & Warr, P. (1996). Is job satisfaction U-shaped in age?. *Journal of Occupational and Organizational Psychology, 69*(1), 57-81.

Converse, J. M. (2017). *Survey research in the United States: Roots and emergence 1890-1960*. Routledge.

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches, 4nd edition*. Thousand Oaks, CA: SAGE Publications.

Charlier, H. D., & Williams, M. R. (2011). The reliance on and demand for adjunct faculty members in America's rural, suburban, and urban community colleges. *Community College Review, 39*(2), 160–180.

Dawes, J. (2008). Do data characteristics change according to the number of scale points used? An experiment using 5-point, 7-point and 10-point scales. *International Journal of Market Research, 50*(1), 61-104.

Dedman, D., & Pearch, W. J. (2004). Perspectives on adjunct and other non-tenure faculty. *The Community College Enterprise, 10*(1), 23.

DeMato, D. S., & Curcio, C. C. (2004). Job satisfaction of elementary school counselors: A new look. *Professional School Counseling, 7*(4), 236-245.

Feldman, D. C., & Turnely, W. H. (2004). Contingent employment in academic careers: Relative deprivation among faculty. *Journal of Vocational Behavior, 64*(2), 284-307.

Finder, A. (2007, Nov. 20). Decline of the tenure track raises concerns. *New York Times, 20*. Retrieved from https://www.nytimes.com/2007/11/20/education/20adjunct.html

Frisbie, D. A., & Brandenburg, D. C. (1979). Equivalence of questionnaire items with varying response formats. *Journal of Educational Measurement, 16*, 43-48.

Fruscione, J. (2014, March 24). Moving up from the Inside?: Two adjuncts discuss career paths that are possible and others that are closed off. *Inside Higher Ed*. Retrieved from https://www.insidehighered.com/advice/2014/03/24/two-adjuncts-discuss-career-paths-are-open-and-closed-them

Garland, R. (1991). The midpoint on a rating scale: Is it desirable? *Marketing Bulletin, 2*, 66–70.

Gappa, J., & Leslie, D. (1993). *The invisible faculty: Improving the status of part-timers in higher education*. San Francisco: Jossey-Bass Publishers.

Gara, K. L. (1997). *Job satisfaction of business college faculty*. University of La Verne.

Glenn, G. (2016, May 17). Adjunct life difficult path to full-time employment. *WFAE90.7*. Retrieved from https://www.wfae.org/post/adjunct-life-difficult-path-full-time-employment

Haeber, J. (2007, Oct. 17). What is the origin of the word "Boss"? *CBS News*. Retrieved from https://www.cbsnews.com/news/what-is-the-origin-of-the-word-boss/

Hanson, P., Savitz, F., Savitz, R., & Rauscher, M. (2018). Adjunct professors' perception of their teaching effectiveness. *International Journal of Teaching & Learning in Higher Education, 30*(3), 423-432.

Hayes, W. (2003). *So You Want to be a College Professor?*. Lanham, MD: Scarecrow Press, Inc.

Herzberg, F., Mausner, B., & Synderman, B. (1959). *The Motivation to Work*. New York: Wiley.

Heuer, R. E., Cahalan, M., Fahimi, M., Curry-Tucker, J. L., Carley-Baxter, L., Curtin, T. R., ... & McLean, L. (2004). National Study of Postsecondary Faculty (NSOPF: 04) Field Test Methodology Report, 2004. Working Paper Series. NCES 2004-01. *US Department of Education*.

Jacobs, K., Perry, I. E., & MacGillvary, J. (2015). The high cost of low public wages. *UC Berkeley Center for Labor Research and Education*. Retrieved from http://laborcenter.berkeley.edu/the-high-public-cost-of-low-wages/

Jaschik, S. (2016, March 28). What you teach is what you earn. *Inside Higher Ed*. Retrieved from https://www.insidehighered.com/news/2016/03/28/study-finds-continued-large-gaps-faculty-salaries-based-discipline

Johns, R. (2005) One size doesn't fit all: Selecting response scales for attitude items, *Journal of Elections, Public Opinion and Parties, 15*(2), 237-264

Jovancic, N. (2018, Aug. 9). The Ultimate Guide to How to Create a Likert Scale Survey. Retrieved from https://blog.leadquizzes.com/the-ultimate-guide-on-how-to-create-a-likert-scale-survey/

Kezar, A., & Maxey, D. (June 2013). The changing academic workforce. *Trusteeship Magazine*. Retrieved from: http://agb.org/trusteeship/2013/5/changing-academic-workforce

Korkki, P. (2018, April 5). Adjunct professors step up their efforts to increase pay. *The New York Times*. Retrieved from https://www.nytimes.com/2018/04/05/education/learning/adjunct-professors.html

Krosnick, J. A., & Fabrigar, L. R. (1997). Designing rating scales for effective measurements in surveys. In L. Lyberg et al. (Eds). *Survey Measurement and process quality*. NY: John Wiley & Sons, Inc.

Krueger, N. (2005). Educators move forward after retirement: Work brings fulfillment. *Delta Kappa Gamma Bulletin, 71*(4), 29-36.

Lacy, F.J., & Sheehan, B.A. (1997). Job satisfaction among academic staff: An international perspective. *Higher Education, 34*, 305–322.

Leatherman, C. (1997). Reliance on lecturers said to produce "faceless departments." *Chronicle of Higher Education, 43*(29), A12-A13.

Lewis, V. J., & McKinzie, K. (2019). Impact of industry and teaching experience, course level, and department on student evaluations. *Quarterly Review of Business Disciplines*, *6*(1), 335-356.

Louis, D. (2009). Adjunct: Solutions for a mistreated majority. *Chronicle of Higher Education, 55*(39), A72.

Lu, C. Q., Siu, O. L., & Cooper, C. L. (2005). Managers' occupational stress in China: The role of self-efficacy. *Personality and Individual Differences, 38*(3), 569-578.

Lyons, R. E. (2007). Deepening our understanding of adjunct faculty. *Best practices for supporting adjunct faculty*, 1-12.

Mathieu, C., & Babiak, P. (2016). Corporate psychopathy and abusive supervision: Their influence on employees' job satisfaction and turnover intentions. *Personality and Individual Differences, 91*, 102-106.

Mathieu, C., Neumann, C. S., Hare, R. D., & Babiak, P. (2014). A dark side of leadership: Corporate psychopathy and its influence on employee well-being and job satisfaction. *Personality and Individual Differences, 59*, 83-88.

McClain, L. (2003). Working part-time by choice. *Chronicle of Higher Education*, *50*(6), C5.

McKelvie, S. J. (1978). Graphic rating scales-How many categories? *British Journal of Psychology, 69*, 185-202.

McGee, M. (2002). Hooked on higher education and other tales from adjunct faculty organizing. *Social Text*, *20*(1), 61-80.

Mueller, B., Mandernach, B. J., & Sanderson, K. (2013). Adjunct versus full-time faculty: Comparison of student outcomes in the online classroom. *Journal of Online Learning and Teaching*, *9*(3), 341.

National Center for Education Statistics (2019). *Characteristics of Postsecondary Faculty*. Retrieved from https://nces.ed.gov/programs/coe/indicator_csc.asp.

National Center for Education Statistics (2017). *Digest of Educational Statistics*. Retrieved from https://nces.ed.gov/programs/digest/2017menu_tables.asp.

Nagle, T. (2016). *Adjunct faculty job satisfaction in California Community Colleges: A narrative inquiry*. The University of Phoenix. Retrieved from https://pdfs.semanticscholar.org/bae8/c0dd2699be92a18fdbf7fa24ee7db37553f4.pdf

Ng, T. W. H., & Feldman, D. C. (2010). The relationships of age with job attitudes: A meta-analysis. *Personnel Psychology, 63*, 677-718.

O*Net: The Occupational Information Network (2019). Business teachers postsecondary. *U.S. Department of Labor*. Retrieved from https://www.onetonline.org/link/summary/25-1011.00

Pankin, R., & Weiss, C. (2011) Part-time faculty in higher education: A selected annotated bibliography. Retrieved from https://digitalcommons.providence.edu/cgi/

Papp, J. (2002). OPINION: Gleaning in academe: Personal decisions for adjuncts and graduate students. *College English*, *64*(6), 696.

Parker, B. L. (1990). *An investigation of the relationship between job satisfaction and vocational and avocational choice: A test of Holland's theory.* The University of Tulsa. *ProQuest Dissertations and Theses,* Retrieved from http://search.proquest.com/docview/303958912?accountid=4117

Peters, K., Jackson, D., Andrew, S., Halcomb, E. J., & Salamonson, Y. (2011). Burden versus benefit: Continuing nurse academics' experiences of working with sessional teachers. *Contemporary Nurse*, *38*(1-2), 35-44.

Rea, L. M., & Parker, R. A. (2005). *Designing & Conducting Survey Research: A Comprehensive Guide 3rd Edition*. San Francisco, CA: Jossey-Bass.

Ridge, A., & Ritt, E. (2017). Adjunct faculty as key stakeholders in distance education. *The Journal of Faculty Development, 31*(2), 57-62.

Riza, S. D., Ganzach, Y., & Liu, Y. (2018). Time and job satisfaction: A longitudinal study of the differential roles of age and tenure. *Journal of Management, 44*(7), 2558–2579.

Sabharwal, M., & Corley, E. A. (2009). Faculty job satisfaction across gender and discipline. *Social Science Journal*, *46*(3), 539-556.

Shamos, M. I. (2002). *Handbook of Academic Titles*. Retrieved from http://euro.ecom.cmu.edu/titles/titlebook.htm#Glossary%20of%20Titles

Shao, R. (2014, Oct. 23). Tenured professorships in decline nationwide, U. defies trend. *The Daily Princetonian.* Retrieved from http://www.dailyprincetonian.com/news/2014/10/tenured-professorships-in-decline-nationwide-u-defies-trend/

Somewhat [Def. 1]. (2019). *Oxford Learners Dictionary*. Retrieved from https://www.oxfordlearnersdictionaries.com/us/definition/english/somewhat

Stein, R. J. (Writer), & Kirland, M. (Director). (2004, Jan 25). Diatribe of a mad housewife [Television series episode]. In D. Mirkin (Producer), *The Simpson*s: 20th Century Fox Television.

Terpstra, D. E., & Honoree, A. L. (2004). Job satisfaction and pay satisfaction levels of university faculty by discipline type and by geographic region. *Education, 124* (3), 528-539.

Thompson, C. (2018, Sept. 9). The case for the six-point Likert scale. *Quantum Workplace*. Retrieved from https://www.quantumworkplace.com/future-of-work/the-case-for-the-six-point-likert-scale.

Troumpoucis, P. (2004). All things not being equal. *Community College Week, 16*(21), 6-8.

Truong, K. (2010). Survey of job satisfaction finds physical sciences among happiest fields. *The Chronical of Higher Education Online*. Retrieved from http://chronicle.com/article/Survey-of-Job-Satisfaction/66255/

Tuckman, H. P. (1978). Who is part-time in academe?. *AAUP Bulletin*, *64*(4), 305-315.

Uttl, B., & Smibert, D. (2017). Student evaluations of teaching: Teaching quantitative courses can be hazardous to one's career. *PeerJ., 5*, https://doi.org/10.7717/peerj.3299

Wallace, M. J., & Fay, C. H. (1983). *Compensation, theory and practice*. Boston: Kent Publishing Company.

Wallin, D. (2004). Valuing professional colleagues: Adjunct faculty in community and technical colleges. *Community College Journal of Research & Practice*, *28*(4), 373-391.

Watanabe, M. (2003). Part-time teaching: Benefitting as a part-time teacher. *Nature, 424*(6944), 110.

Weiss, D., Dawis, R., England, G., & Lofquist, L. (1967). Manual for the Minnesota Satisfaction Questionnaire. *Minnesota Studies in Vocational Rehabilitation, 46*.

What is a Likert scale? (2019). *SurveyMonkey.* Retrieved from https://www.surveymonkey.com/mp/likert-scale/

Wilson, R. (1998). For some adjunct faculty members, the tenure track holds little appeal. *Chronicle of Higher Education, 44*(46), A8.

Willits, F. K., Theodori, G. L., & Luloff, A. E. (2016). Another look at Likert scales. *Journal of Rural Social Sciences, 31*(3), 126.

Worrell, T. G., Skaggs, G. E., & Brown, M. B. (2006). School psychologists' job satisfaction: A 22-year perspective in the USA. *School Psychology International, 27*(2), 131-145.

Wood, L. M. (2019, July 12). Odds Are, Your Doctorate Will Not Prepare You for a Profession Outside Academe. *ChronicalVitae*. Retrieved from https://chroniclevitae.com/news/2223-odds-are-your-doctorate-will-not-prepare-you-for-a-profession-outside-academe

Wood, O. R. (1973). *An analysis of faculty motivation to work in the North Carolina Community College System*. North Carolina State University at Raleigh.

Wyles, B. A. (1998). Adjunct faculty in the community college: Realities and challenges. *New Directions for Higher Education, 104*, 89-93.

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GAMIFIED INFORMATION SYSTEMS AND USER ENGAGEMENT

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ABSTRACT

Gamification, the use of game design elements in non-game contexts (Deterding, Dixon, Khaled, & Nacke, 2011), is permeating various types of information systems (IS) and becoming an important way of engaging IS users. Despite the potential benefits of gamification, organizations often have difficulty sustaining user engagement with a gamified IS. This paper focuses on how a gamified IS can be designed to engage users and motivate them to continue system use. Drawing on the affordance theory, motivation theory, flow theories, and gamification research in the IS field, a theoretical model is developed to investigate the impacts of gamification on IS user engagement and continuance intention. The model proposes the positive effect of gamification affordances of a gamified IS on users' experience of cognitive absorption, the mediating effect of satisfaction of users' motivation needs on the relationship between gamification affordances and aesthetic experience, and the positive effects of cognitive absorption and aesthetic experience on users' continuance intention to use the gamified IS. By providing an understanding of how various game components improve users' experiences and foster their engagement with an IS, this paper will offer guidelines on how to appropriately design and implement gamification features to engage IS users over time.

Keywords: gamification, motivational needs, cognitive absorption, aesthetic experience, continuance intention

INTRODUCTION

In recent years, the study of gamification, the use of game design elements in nongame contexts to engage users (Deterding, Dixon, Khaled, & Nacke, 2011), has gained much attention in the IS field. Gamification is permeating many different types of information systems for existing business activities to make tasks more engaging for employees and consumers and to improve organizational outcomes (Kumar, 2013; Stanculescu, Bozzon, Sips, & Houben, 2016). For example, companies use points, badges, levels, trophies and virtual goods to reward employees when they reach milestones, take part in challenges, establish new goals, or win competitions in work-related activities, e.g., knowledge sharing, sales performance, idea competition, and training and education (Suh, Cheung, Ahuja, & Wagner, 2017). Customers also receive rewards from companies for sharing on social media, purchasing from partners and engaging in other loyalty activities (Liu, Santhanam, & Webster, 2017).

Gamified information systems (IS) incorporate game design elements into target information systems while retaining the target systems' instrumental functions (Liu et al., 2017). Despite the widespread belief in the potential benefits of gamification, some researchers have pointed out that it is difficult to maintain sustained user engagement with a gamified IS because the effects of game elements are often short-lived (Kankanhalli, Taher, Cavusoglu, & Kim, 2012; Nicholson, 2013;

Suh, 2015; Suh et al., 2017). As the novelty of game elements diminishes over time, many users of gamified IS discontinue their engagement with the system in a few months after their initial system use (Hamari & Koivisto, 2015; Patel, Asch & Volpp, 2015; Suh et al., 2017). Continuous post-adoption IS usage is critical for the long-term viability and eventual success of IS (Karahanna, Straub, & Chervany, 1999; Bhattacherjee, 2001; Thong, Hong, & Tam, 2006). On the one hand, the benefit or value of a gamified IS cannot be achieved without continued usage of the system; and on the other hand, failure to maintain users' continued usage of the gamified IS will lead to unrealized return on companies' investment in gamifying IS and loss of the opportunity to utilize emerging new technologies to engage users (Suh et al., 2017). Hence, it is crucial to understand the underlying mechanisms for successful gamification that promotes user engagement with a gamified IS and encourages user toward continued system use.

User engagement reflects the level of a user's motivational state of mind characterized by specific levels of cognitive, emotional and behavioral investment in certain interactions with an information system (Hollebeek, 2011). Thus, the fulfillment of motivational needs is central to fostering user engagement. Gamified IS that satisfies users' motivational needs not only attracts users but also makes users really want to use the system and cannot live without it (Zhang, 2008). This paper attempts to explore successful gamification characteristics in a gamified IS and their impacts on the fulfillment of IS users' motivational needs, their engagement with and continuance intention to use the system.

THEORETICAL BACKGROUND

User Engagement

User engagement combines behavioral, cognitive and affective responses when using information systems (O'Brien & Toms, 2008; Wiebe, Lamb, Hardy, & Sharek, 2014). It is characterized by specific levels of cognitive (Hollebeek, 2011; Laurel, 1993), affective (Hollebeek, 2011; Jacques, 1996; Jacques, Preece, & Carey, 1995; Jones, 1998), and behavioral (Kappelman, 1995; Hollebeek, 2011; Hutchins, Holland, & Norman, 1986) investment in specific interactions with an information system, which makes the user want to be there (Jones, 1998). User engagement occurs progressively from initial "users' assessment of, and interaction with, an information system, followed by deeper absorption with the system and behavioral outcomes" (Oh, Bellur, & Sundar, 2015, p3). Users become totally involved with the system, thereby experiencing a sense of heightened enjoyment, immersive concentration, and time distortion. It has been suggested that engaging interactions involve attention (Webster & Ho, 1997), intrinsic interest (Jacques, 1996; Webster & Ho, 1997), interactivity (Quesenbury, 2003), perceived control and choice (Jacques et al., 1995; Webster & Ho, 1997), functionality (Jacques et al., 1995), and motivation (Makkonen, 1997).

The gamification literature differentiates between deep engagement (Lowry, Gaskin, Twyman, Hammer, & Roberts, 2012; Santhanam, Liu, & Shen, 2016; Suh et al., 2017) and meaningful engagement (Li, Dey, & Forlizzi, 2011; Nicholson, 2013; Suh et al., 2017). Suh et al. (2017) propose the concepts of flow experience and aesthetic experience as ways to respectively conceptualize deep engagement and meaningful engagement with gamified IS. Flow experience (Csikszentmihalyi, 1990), which is referred to as the experience of optimal fulfillment and

engagement, originated from Csikszentmihalyi's work on optimal experience (Csikszentmihalyi, 1990). The flow concept has been widely referenced across a variety of fields, including human computer interaction. Berger, Schlager, Sportt and Hermann (2017) utilize the theory of flow to explain the immersive experience customers feel when participating in a gamified activity characterized by a high level of interactivity and optimal level of challenge.

Flow is a multi-dimensional construct consisting of intense concentration, a sense of being in control, loss of self-consciousness, and altered sense of time (Csikszentmihalyi, 1990). The experience of flow reflects the depth of user engagement (Suh et al., 2017). Extending the flow concept to describe user's holistic flow experience with the technology, Agarwal and Karahanna (2000) introduced the concept of cognitive absorption in IS research. Cognitive absorption is composed of five dimensions of temporal dissociation, focused immersion, heightened enjoyment, control, and curiosity (Agarwal & Karahanna, 2000). Temporal association refers to "the inability to register the passage of time while engaged in interaction"; focused immersion is "the experience of total engagement" in the interaction while ignoring other attentional demands; heightened enjoyment casptures "the pleasurable aspects of the interaction"; control represents "user's perception of being in charge of the interaction"; and curiosity refers to "the extent to which the experience arouses user's sensory and cognitive curiosity" (Agarwal & Karahanna, 2000).

In addition to deep engagement that involves a sense of heightened enjoyment, immersive concentration, and time distortion (Lowry et al., 2012; Santhanam et al., 2016), some researchers argue that a gamified IS should be designed to help users experience a sense of meaning by providing a means for users to explore and reflect on the information obtained from their interactive activities with the system (Li et al., 2011; Nicholson, 2013). The literature on meaning (Little, 1998; Little, Salemla-Aro, & Phillips, 2007; McGregor & Little, 1998) suggests that people derive meaning from the activities that are consistent with the core aspects of the self (e.g., beliefs, values, traits and competences). Activities are perceived to be meaningful when they facilitate progress toward personal goals (McGregor & Little, 1998). Therefore, meaningful engagement arises from the personal connection between a user and his/her IS use (Suh et al., 2017).

Suh et al. (2017) introduce the concept of aesthetic experience to capture the extent of meaningful engagement a user experience while interacting with a gamified IS. Aesthetic experience reflects a user's state of mind in which he or she understands the meaning of his or her interactions with an IS (Kaptelinin & Nardi, 2009; McCarthy & Wright, 2004). Aesthetic experience complements flow experience and enriches our understanding of user engagement with an IS. While flow experience is manifested by a temporary immersion at a specific moment, aesthetic experience involves a continuing process of experience development and a sense of fulfillment that lasts beyond the end of the experience (Suh et al., 2017).

Drawing on the existing literature on aesthetic experience, Suh at el. (2017) identify three dimensions of aesthetic experience that capture the extent to which a user feels that he or she is meaningfully engaged with a gamified IS: meaning, self-expansion, and active discovery. The dimension of meaning refers to the extent to which an individual comes to understand the meaning of an activity (Bronowski, 1978; Dewey, 1934; McCarthy & Wright, 2004). The dimension of self-expansion is related to self-growth (Beardsley, 1970; Berlyne, 1971; McCarthy & Wright, 2004). It is the extent to which one's sense of self has expanded by knowing things or broadening one's perspective (Bronowski, 1978; Dewey, 1934; Jennings, 2000). The dimension of active

discovery refers to the extent to which an individual feels he or she is actively seeking answers or resolutions to cognitive challenges in order to achieve his or her personal goals (Suh et al., 2017). Suh et al. (2017) argue that these three dimensions combine to create the overall extent to which a user feels aesthetic experience while interacting with a gamified IS, and that the absence of any one of these three dimensions will reduce, but not completely eliminate, the overall extent of aesthetic experience a user feels.

Motivational Needs

User engagement is founded on motivations (Hollebeek, 2011a, 2011b). Motivation is defined as "an inner state of arousal that provides energy needed to achieve goals" (Higgins & Scholer, 2009) or as "the reasons underlying behavior" (Guay, Talbot, Belleau, & Lawler, 2010). The design of gamification features in an IS may affect users' motivations, which in turn influences their investment of resources in the interaction with the system (i.e., IS user engagement). People engage in activities based on intrinsic motivation and extrinsic motivation (Deci & Ryan, 2002).

Intrinsic motivation refers to the internal motivational drive to perform a certain activity for the sake of the activity itself and the inherent pleasure and satisfaction derived from the activity (Deci, Koestner & Ryan, 1999). In contrast, extrinsic motivation refers to the state in which an individual performs an activity to gain external benefits (e.g., money, rewards, and etc.) rather than participating in the activity for its own sake (Deci & Ryan 2002). While the impact of extrinsic motivations on people's engagement in the activity can be quick and intense, they are conditional on the continuous provision of incentives (Deci & Ryan, 2002). By contrast, intrinsically motivated individuals continually experience enjoyment, energized focus and involvement by partaking in the activity regardless of external incentive contingencies (Chandler & Chen, 2015; Ryan, Rigby, & Przybylski, 2006). Therefore, intrinsic motivations have a long-term influence on individuals' engagement behaviors. For example, some companies invite their customers who receive points or badges for engaging with their websites (e.g., logging-in, commenting, sharing, uploading photos, entering sweepstakes, and etc.) to participate in competitions, where the customers accumulating the highest number of points or badges are rewarded with prizes. Since intrinsically motivated individuals enjoy the processes of competing against and socializing with each other rather than the receipt of prizes, whether winning or losing the contests will have little impact on their future engagement. On the contrary, individuals with extrinsic motives focus on winning the contests rather than the social process of competition. As a result, their future participation is dependent on the continuous receipt of prizes. Some researchers argue that engagement is driven by intrinsic motivations directed toward a particular object (Jacques et al., 1995; Rigby, 2015). Utilizing gamification merely as a mechanism for extrinsic rewards will adversely affect the long-term effect of intrinsic motivation on user engagement (Rigby, 2015). Receiving extrinsic rewards through a gamification process has been shown to weaken users' intrinsic motivation (Kim and Ahn, 2017). If the goal is to foster long-term user engagement, a solely reward-based gamification system that attempts to stimulate extrinsic motivations might be less effective, due to the risk of replacing long-lasting intrinsic rewards with unsustainable and ever-increasing needs for extrinsic incentives (Hamari, Koivisto, & Sarsa, 2014). Therefore, gamification should maintain a focus on fulfilling intrinsic motivations to engage users (Hofacker, Ruyter, Lurie, Manchanda, & Donaldson, 2016).

The self-determination theory suggests three basic intrinsic psychological needs of human being: the need for competence, the need for autonomy, and the need for social relatedness (Deci & Ryan, 1985; Ryan & Deci, 2002; Ryan, 1995). The need for competence refers to the desire to achieve efficiency and success while interacting with the environment (Rigby & Ryan, 2011; Vansteenkiste & Ryan, 2013; White, 1959). It is assumed that every human strives to feel competent, for example, to acquire the skills necessary to perform a task efficiently. The need for autonomy refers to the feeling of psychological freedom and the need to make self-determined choice in the initiation, regulation and performance of behavior on the basis of one's own values and interests without external pressure or enforcement (Deci & Ryan, 2012; Ryan & Deci, 2002; van den Broeck, Vansteenkiste, Witte, Soenens, & Lens, 2010; Vansteenkiste, Niemiec, & Soenens, 2010; Vansteenkiste, Williams, & Resnicow, 2012). The need for social relatedness refers to one's need to engage in interpersonal relationships and establish close emotional bonds, belonging and attachments with other people. It represents the basic desire of the individual to be emotionally connected and interpersonally integrated with the social environment (Baumeister & Leary, 1995; Deci & Ryan, 1985, 2000; Deci & Vansteenkiste, 2004).

Applying the rich intrinsic motivation concept from social psychology to the IS context, Li, Hsieh and Rai (2013) propose a comprehensive conceptualization of intrinsic motivational needs to explain IS usage behaviors in the IS post-adoption stage. They suggest that intrinsic motivation for IS usage consists of three core aspects: the motivational need for accomplishment, the motivational need to know, and the motivational need to experience stimulation (Vallerand, Blais, Briere, & Pelletier, 1989; Vallerand, Fortier, & Guay, 1997; Vallerand, Pelletier, Blais, Briere, Senecal, & Vallieres, 1992; 1993). Specifically, the motivational need for accomplishment is concerned with the pleasure and satisfaction individuals experience when trying to solve problems or accomplish something in IS usage (Li, Hsieh, & Rai, 2013; Nicholls, 1984; White, 1959). Although it is directed toward accomplishing certain end results, its focus is on the process of overcoming difficulties and achieving accomplishments when using IS (Vallerand, 1997). The motivational need to know relates to the enjoyment experienced when individuals are learning or exploring new things in IS usage (Berlyne, 1971; Brophy, 1987; Li, Hsieh, & Rai, 2013). The motivational need to experience stimulation pertains to the intense feeling of pleasure associated with IS usage (e.g., Csikszentmihalyi, 1978; Li, Hsieh, & Rai, 2013; Zuckerman, 1979). These three types of intrinsic motivational needs for IS usage are driven by individuals' innate intrinsic needs for competence, relatedness, and autonomy (Deci & Ryan, 2002; Li, Hsieh, & Rai, 2013; Vallerand, 1997). For instance, the motivational need for accomplishment arises from individuals' need to prove their competence in using IS and interact effectively and proficiently with IS (Kowal & Fortier, 2000). The motivational need to know is stimulated when individuals feel that learning or trying to understand new things in IS usage involves interpersonal relationships and interactions with others (e.g., coworkers, IS specialists, and etc.), providing them with a sense of belongingness and satisfying their need for social relatedness (Lee, Cheung, & Chen, 2005; Wegner, McDermott, & Snyder, 2002). The motivational need to experience stimulation is driven by individuals' need for autonomy, which enables them to freely explore and search for information and enjoy a variety of choices and experiences when interacting with IS (DeCharms, 1968; Steenkamp & Burgess, 2002).

Gamification Affordance

Many IS researchers suggest that a gamified IS should be designed in such a way that its technological features create certain affordances that can engage users, thereby leading to IS continuance. The theory of affordance provides an analytical link between gamification features and user experiences (Van Vugt, Hoorn, Konijn, & de Bie Dimitriadou, 2006; Suh et al., 2017). An affordance is a combination of actual and perceived properties of a thing, primarily those that determine how the thing can be used (Norman, 1998). The gamification affordance refers to the set of actionable properties between gamification and users (Gibson, 1977; Suh et al., 2017). The central tenet of affordance theory is that specific technological functions or features alone do not determine technological capabilities, which instead exist as part of the relationships between users and technological artifacts in specific situations (Leonardi, 2011). In other words, the usability of technological features lies in what a technology affords and whether the affordances allow individuals to perform specific actions that may satisfy certain needs (Norman, 1998).

Some commonly implemented gamification components in an IS include points, levels, leaderboards, badges, and trophies. According to affordance theory, different users can use a technological feature of an IS in different ways; and an individual may achieve the same objective using different IS features (Suh et al., 2017). One person may consider achieving a higher level as a challenge to accomplish increasingly difficult tasks, thereby stimulating a sense of progress and achievement. However, another individual may regard levels as a kind of reward for his/her activities. Leaderboards illustrate game results by displaying participants' names in a descending order based on the number of points obtained by each participant. Some users may regard leaderboards as an opportunity to compete with others, whereas others may use leaderboards for goal setting or progress tracking. Hence, the gamification components provide ways to implement certain affordances within a gamified IS.

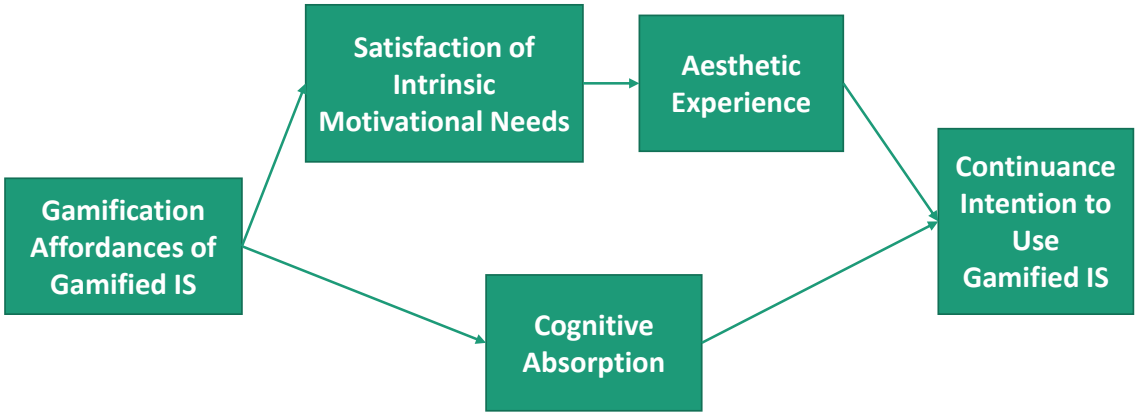
A gamified IS generally provide the following gamification affordances: feedback, education, challenges, rewards, competition, status, self-expression and cooperation (Suh et al., 2017; Weiser, Bucher, Cellina, & De Luca, 2015). Feedback includes the information on a user's current state, such as the currently performed behavior, within a gamified IS. Education provides users with the knowledge to achieve the intended target behaviors within a gamified IS. A challenge is something (e.g., a task or problem) difficult to achieve within a gamified IS. Rewards are things given to users as a payoff because of what they have achieved within a gamified IS. Competition involves comparing one's performance with those of others within a gamified IS. Status allows users to improve their standing by achieving predefined goals or reaching specific milestones within a gamified IS. Self-expression enables users to create unique identities of themselves within a gamified IS. Cooperation is the collaborative process whereby several parties work together to achieve something (e.g., the solution of a problem) within a gamified IS (Weiser et al., 2015).

THEORETICAL FRAMEWORK AND PROPOSITIONS

Drawing on the motivation theory, flow theories, affordance theory, and gamification research in the IS field, this paper proposes a theoretical framework of gamification affordances, user engagement and continuance intention of gamified IS (Figure 1). The framework employs the concepts of aesthetic experience and cognitive absorption to conceptualize user engagement and

highlights the mediating role of satisfying motivational needs in the relationship between gamification affordances and aesthetic experience, which reflects meaningful engagement.

Figure 1. Theoretical Framework of Gamification Affordances, User Engagement and Continuance Intention of Gamified IS



Gamification affordances (e.g., feedback, education, challenges, rewards, competition, status, self-expression and cooperation) provide a gameful experience that fosters the five dimensions of cognitive absorption — temporal dissociation, focused immersion, heightened enjoyment, control, and curiosity (Hammedi, Thomas, & Poncin, 2019). IT users are likely to experience cognitive absorption when they have clear goals, the technology is stimulating and responsive, and the task challenges and users' skills are both high (Csikszentmihalyi, 1997; Agarwal & Karahanna, 2000). Prompt feedbacks, clear rewards and goals, and challenges posed by competitors enable users to focus on the essentials of an activity (Przybylski, Rigby, & Ryan, 2010), leading to focused immersion in IS usage. The abilities to express a unique self and to cooperate with others increase the levels of perceived copresence with other participants (Suh et al., 2017), which in turn leads to an immersed focus on the given tasks and heightened enjoyment while using an IS (Kim, Suh, & Lee, 2013). Additionally, the self-expression affordance fosters a sense of freedom that encourages curiosity and time distortion (Malone, 1981). While the challenge affordance presents different levels of challenges to users, user education can offer advice on concrete tasks users should perform to meet the challenges and provide users with a sense of control over the situation that they encounter while using an IS. And the status affordance allows users to improve their levels by adjusting their skills to the levels of the given challenges (Suh et al., 2017). Accordingly, the following proposition is formulated.

> Proposition 1: The gamification affordances of a gamified IS will positively influence users' experience of cognitive absorption.

Previous IS studies have provided evidence that the experience of cognitive absorption with an IS reflects a state of total immersion, deep absorption and heightened enjoyment, which in turn leads to users' continuance intention with the system (Agarwal & Karahanna, 2000; Deng, Turner, Gehling, & Prince, 2010). In line with the evidence indicating the importance of cognitive absorption for IS continuance, gamification researchers suggest that flow experience (i.e., cognitive absorption) is an important psychological state in which a user is deeply engaged and

involved with a gamified IS, which increases a user's continuance intention (Hamari & Koivisto, 2015; Hamari, Shernoff, Rowe, Coller, Asbell-Clarke, & Edwards, 2016). Hence, the following proposition can be suggested.

> Proposition 2: The experience of cognitive absorption with a gamified IS will positively influence users' continuance intention to use the system.

While cognitive absorption reflects deep engagement, meaningful engagement is also required to establish meaningful connections between users' own needs and IS use (Nicholson, 2015). Gamification affordances may initially increase the depth of user engagement with and continuance intention to use a gamified IS. However, users may not continually use the system unless they feel that the system meaningfully engage them (Suh et al., 2017). In the context of IS usage, meaning refers to the personal connection between a user and the IS usage (Suh et al., 2017). Aesthetic experience characterizes a user's meaningful engagement with a gamified IS (Suh et al., 2017). It reflects a user's state of mind in which the user understands the meaning of his or her interactions with an IS (Bronowski, 1978; Dewey, 1934; McCarthy & Wright, 2004), experiences self-growth by knowing new things or broadening his or her perspective (self-expansion) in IS usage (Bronowski, 1978; Dewey, 1934; Jennings, 2000), and actively seeks resolutions to achieve his/her personal goals (actively discovery) in IS usage (Suh et al., 2017). Being an intrinsically motivated concept (Jacques et al., 1995; Rigby, 2015), meaningful user engagement with a gamified IS is founded on the fulfilment of intrinsic motivational needs for IS use, i.e., the motivational need for accomplishment, the motivational need to know, and the motivational need to experience stimulation. Accordingly, satisfying these motivational needs can lead to more meaningful user engagement by enabling users to feel a strong sense of accomplishment, greater self-fulfillment and self-expansion, and establish meaningful connection with IS use through active learning and exploration. Therefore, gamification affordances (i.e., feedback, education, challenges, competition, status, self-expression, cooperation, and rewards) can contribute to meaningful user engagement (i.e., aesthetic experience) with a gamified IS by satisfying users' intrinsic motivational needs, such as the motivational need for accomplishment, the motivational need to know, and the motivational need to experience stimulation.

Feedback can help develop user ability by providing suggestions on improvements and thus appeal to our need for accomplishment. Education provides knowledge or guides users through the process of acquiring new skills. Thus, education fulfills the need to know and the need for accomplishment. Challenges can stimulate achievements and act as a benchmark for evaluating individuals' performance. Thus, challenges appeal to our need for accomplishment. Competitions fulfill our need to know and need for accomplishment, because it enables users to learn from themselves and peers by comparing their performances with those of others and stimulate them to higher performance (Suh et al., 2017). The status affordance allows users to improve their standing or level by reaching certain milestones or achieving preset goals within a gamified IS (Stanculescu et al., 2015). It encourages users to set new goals and challenge harder tasks through which users feels the pleasure associated with achieving accomplishments (Suh et al., 2017), thus fulfilling our motivational need for accomplishment. The self-expression affordance allows users to create unique identities within a gamified IS (Suh et al., 2017). It enables users to enjoy the autonomy to shape their own identities and various choices to express their self that is distinct from that of others. Therefore, it appeals to our motivational need for stimulation. Cooperation is the

collaborative process during which several parties work together to achieve something (e.g., the solution of a problem) within a gamified IS (Weiser et al., 2015). Cooperation facilitates the fulfillment of our motivational need to know, because joint efforts of multiple parties toward a goal involves sharing information/knowledge and learning from each other. Rewards are anything given to users as a payoff when they complete predesigned tasks (Hamari et al., 2014). Although rewards may invoke a feeling of achievement and competence, people who experience pleasure from receiving rewards will over time need larger rewards to trigger the same amount of satisfaction (Frederick & Loewenstein, 1999). However, certain environments/contexts can lead people to internalize extrinsic rewards to boost their intrinsic motivation to perform tasks (Ryan & Deci, 2000a; 2000b). Previous motivation studies have shown that providing supports for autonomy, competence and relatedness promotes the internalization and integration of rewards (Ryan & Deci, 2000a; 2000b). In this sense, in order for the rewards affordance to appeal to our intrinsic motivational need for accomplishment, it must be combined with other gamification affordances that allow users to make choices (self-expression affordance), encourage strong relationship and collaboration (cooperation affordance), and provide positive feedbacks (feedback affordance) on good performance, promoting feelings of autonomy, relatedness and competence and encouraging the internalization of rewards for self-determined/intrinsic motivation.

Fulfilling users' intrinsic motivational needs for accomplishment, to know, and to experience stimulation enables users to experience the pleasure and satisfaction from accomplishment and learning when interacting with a gamified IS, feel a strong sense of self-progress and self-growth, and derive a meaning of their interactions with the system. These experiences create a form of meaningful engagement (i.e., aesthetic experience) with the gamified IS. Therefore, the following propositions are formulated.

> Proposition 3: The positive effects of gamification affordances on aesthetic experience with a gamified IS are mediated by the satisfaction of users' intrinsic motivational needs.
>
> Proposition 3a: The gamification affordances of a gamified IS will positively influence the satisfaction of users' intrinsic motivational needs.
>
> Proposition 3b: The satisfaction of users' intrinsic motivational needs will positively influence aesthetic experience with a gamified IS.

According to the theory of aesthetic experience (Dewey, 1934), people in a state of aesthetic experience with an activity or object tend to continuously engage with the activity or object because they feel their needs for self-growth or self-expansion are fulfilled (Jennings, 2000). Accordingly, Nardi (2010) suggests that aesthetic experience drives users to continuously engage with a technology. Therefore, it's reasonable to argue that aesthetic experience with a gamified IS serves as an antecedent of continuance intention to use the system, and the following proposition is formulated:

> Proposition 4: Aesthetic experience with a gamified IS will positively influence user's continuance intention to use the system.

CONCLUSIONS

This research proposes a theoretical framework of the impacts of gamification affordances on gamified IS user engagement and continuance intention. Drawing on the motivation theory, flow theories, affordance theory, and gamification research in the IS field, the framework adopts the concepts of cognitive absorption and aesthetic experience to represent deep and meaningful user engagement with a gamified IS. It posits the positive effect of gamification affordances on users' experience of cognitive absorption, the mediating effect of satisfaction of users' motivation needs on the relationship between gamification affordances and aesthetic experience, as well as the positive effects of cognitive absorption and aesthetic experience on continuance intention to use a gamified IS. Previous gamification research indicates the difficulty of maintaining user engagement with a gamified IS over time (Kankanhalli et al., 2012; Nicholson, 2013; Suh, 2015; Suh et al., 2017). This research contributes to the understanding of effective mechanism for successful gamification that stimulates and sustains user engagement with a gamified IS. While a gamified IS can initially engage users by invoking the experience of cognitive absorption (deep engagement), it however may not continually engage users unless users feel they are meaningfully engaged by the system that fulfills their intrinsic motivational needs and provides a sense of meaning, self-expansion, and active discovery (meaningful engagement). Therefore, to maintain a long-lasting user engagement with a gamified IS, the design of gamification features should favor such affordances that engage users through satisfying their intrinsic motivations. For example, the rewards affordance may initially attract individuals to use a gamified IS by facilitating focused immersion and heightened enjoyment and increasing the depth of their engagement with the system. However, in the meanwhile, extrinsically based rewards undermine users' intrinsic motives and merely promote short-lived user engagement that will diminish over time without continuous provision of ever-increasing rewards. Thus, designing and implementing rewards affordance to motivate and maintain long-term user engagement with a gamified IS requires combining the rewards affordance with other gamification affordances (such as the self-expression, feedback and cooperation affordances) that support users' intrinsic needs for autonomy, competence and relatedness, thus making rewards affordance intrinsically motivating through the internalization and integration of rewards. Stimulating users' intrinsic motivations also requires adapting gamification features to the distinct motivational needs of different users and ensuring goal congruence with all IS users. Hence, this paper also highlights the importance of adapting gamification affordances to IS users' motivation structures and provides guidance on how to design gamification elements to engage IS users taking into consideration of users' motivational and psychological needs.

REFERENCES

Agarwal, R., & Karahanna, E. (2000). Time flies when you're having fun: Cognitive absorption and beliefs about information technology usage. *MIS Quarterly*, *24*(4), 665-694.

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological bulletin*, *117*(3), 497-529.

Beardsley, M. C. (1970). *Aesthetic theory and educational theory*. Chicago, IL: University of Illinois Press,

Berlyne, D. (1971). *Aesthetics and psychobiology*. New York, NY: Appleton-Century-Crofts,

Berger, A., Schlager, T., Sprott, D. E., & Herrmann, A. (2017). Gamified interactions: whether, when, and how games facilitate self–brand connections. *Journal of the Academy of Marketing Science*, *46*(4), 652-673.

Bronowski, J. (1978). *The visionary eye*. Cambridge, MA: MIT Press.

Brophy, J. (1987). Socializing students' motivation to learn. In M. L. Maher, and D. A. Kleiber (Eds.), *Advances in motivation and achievements* (Vol. 5. pp. 181–210). Greenwich, CT: JAI Press.

Bhattacherjee, A. (2001). Understanding information systems continuance: an expectation-confirmation model. *MIS Quarterly*, *25*(3), 351–370.

Chandler, J., & Chen, S. (2015). Prosumer motivations in service experiences. *Journal of Service Theory and Practice*, *25*(2), 220-239.

Csikszentmihalyi, M. (1978). Intrinsic rewards and emergent motivation. In M. R. Lepper, and D. Greene (Eds.) *The hidden costs of reward* (pp. 205–216). Hillsdale, NJ: Lawrence Erlbaum Associates.

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York, NY: Harper & Row.

Csikszentmihalyi, M. (1997). *Finding flow: The psychology of engagement with everyday life*. New York, NY: Basic Books.

Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin*, *125*, 627-668.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Springer.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal Pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, *11*(4), 227-268.

Deci, E. L., & Ryan, R. M. (2002). *Handbook of self-determination research*. Rochester, NY: University of Rochester Press.

Deci, E. L., & Vansteenkiste, M. (2004). Self-determination theory and basic need satisfaction: Understanding human development in positive psychology. *Ricerche di Psicologia*, *27*(1), 23-40.

DeCharms, R. (1968). P*ersonal causation: The internal affective determinants of behavior*. New York, NY: Academic Press.

Deng, L., Turner, D. E., Gehling, R., & Prince, B. (2010). User experience, satisfaction, and continual usage intention of IT. *European Journal of Information Systems*, *19*(1), 60-75.

Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From Game Design Elements to Gamefulness: Defining "Gamification". In *Proceedings of the 15th International Academic MindTrek Conference on Envisioning Future Media Environments*, New York, NY: ACM Press, pp. 9-15.

Dewey, J. *Art as experience*. (1934). New York, NY: Berkeley Publishing.

Frederick, S., & Loewenstein, G. (1999). Hedonic adaptation. In D. Kahneman, E. Diener, and N. Schwarz (Eds.). *Well-being: The foundations of hedonic psychology*. New York, NY: Russell Sage Foundation.

Gibson, J. J. (1977). The theory of affordances. In R. E. Shaw, and J. Bransford (Eds.), *Perceiving, acting, and knowing*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Guay, F., Talbot, D., Belleau, L., & Lawler, J. (2010). *Motivation in the First and Second Grades of Elementary School: An Analysis Based on Gender and Socioeconomic Status*. Institut de la statistique du Québec.

Hamari, J., & Koivisto, J. (2014). Measuring flow in gamification: Dispositional flow scale-2. *Computers in Human Behavior*, *40*, 133–143.

Hamari, J., & Koivisto, J. (2015). Working out for likes: An empirical study on social influence in exercise gamification. *Computers in Human Behavior*, *50*, 333–347.

Hamari, J., Koivisto, J., & Sarsa, H. (2014). *Does gamification work?--a literature review of empirical studies on gamification*. Paper presented at the System Sciences (HICSS), 2014 47th Hawaii International Conference, Hawaii, US.

Hamari, J., Shernoff, D. J., Rowe, E., Coller, B., Asbell-Clarke, J., & Edwards, T. (2016). Challenging games help students learn: An empirical study on engagement, flow and immersion in game-based learning. *Computers in Human Behavior*, *54*, 170-179.

Hammedi, W., Thomas, L., & Poncin, I. (2019). Customer engagement: The role of gamification. In L. Hollebeek, and D. Sprott (Eds.). *Handbook of customer engagement research* (pp. 1-23). Cheltenham, UK: Edward Elgar Publishing.

Higgins, T. E., & Scholer, A. A. (2009). Engaging the consumer: The science and art of the value creation process. *Journal of Consumer Psychology*, *19*(2), 100-114.

Hofacker, C. F., Ruyter, K. D., Lurie, N. H., Manchanda, P., & Donaldson, J. (2016). Gamification and Mobile Marketing Effectiveness. *Journal of Interactive Marketing*, *34*, 25-36.

Hollebeek, L. D. (2011). Exploring customer brand engagement: definition and themes. *Journal of strategic Marketing*, *19*(7), 555-573.

Hutchins E. L., Holland J. D., & Norman, D. A. (1986). Direct manipulation interfaces. In D. A. Norman, and S. W. Draper (Eds.), *User centered system design: New perspectives on human-computer interaction* (pp. 339-352). Mahwah, NJ: Lawrence Erlbaum Associates.

Jacques, R. D. (1996). *The nature of engagement and its role in hypermedia evaluation and design*. (Unpublished doctoral dissertation), South Bank University, London.

Jacques, R., Preece, J., & Carey, T. (1995). Engagement as a design concept for multimedia. *Canadian Journal of Educational Communication*, *24*(1), 49–59.

Jennings, M. (2000). Theory and models for creating engaging and immersive ecommerce websites. In *Proceedings of the ACM SIGCPR conference on Computer Personnel Research*, Chicago, April 6–8, pp. 77–85.

Jones, M. G. (1998). *Creating engagement in computer-based learning environments. Paper presented at the ITForum*. Retrieved from http://itech1.coe.uga.edu/itforum/paper30/paper30.html

Kankanhalli, A., Taher, M., Cavusoglu, H., & Kim, S. H. (2012). Gamification: A new paradigm for online user engagement. In *Proceedings of International Conference on Information Systems*, Orlando, FL, December 16–19, pp. 1-10.

Kappelman, L. A. (1995). Measuring user involvement: A diffusion of innovation perspective. *Database Advances*, *26*(2/3), 65–86.

Kaptelinin, V., & Nardi, B. A. (2009). *Acting with technology: Activity theory and interaction*. Cambridge, MA: MIT Press,

Karahanna, E, Straub, D. W., & Chervany, N. L. (1999). Information technology adoption across time: a cross-sectional comparison of pre-adoption and post-adoption beliefs. *MIS Quarterly*, *23*(2), 183–213.

Kim, K., & Ahn, S. J. (2017). The role of gamification in enhancing intrinsic motivation to use a loyalty program. *Journal of Interactive Marketing*, *40*, 41-51.

Kim, H., Suh, K. S., & Lee, U. K. (2013). Effects of collaborative online shopping on shopping experience through social and relational perspectives. *Information and Management*, *50*(4), 169–180.

Kowal, J., & Fortier, M. S. (2000). Testing relationships from the hierarchical model of intrinsic and extrinsic motivation using flow as a motivational consequence. *Res. Quart. Exercise and Sport, 71*(2), 171–181.

Kumar, J. (2013). Gamification at work: Designing engaging business software. In A. Marcus (Ed.). *Design, User Experience, and Usability: Health, Learning, Playing, Cultural, and Cross-Cultural User Experience* (pp. 528-537). Berlin, Germany: Springer.

Laurel, B. (1993). *Computers as theatre*. Reading, MA: Addison-Wesley.

Lee, M. K. O., Cheung, C. M. K., & Chen, Z. (2005). Acceptance of Internet based learning medium: The role of extrinsic and intrinsic motivation. *Inform. Management*, *42*(8), 1095–1104.

Leonardi, P. M. (2011). When flexible routines meet flexible technologies: Affordance, constraint, and the imbrication of human and material agencies. *MIS Quarterly*, *35*(1), 147–167.

Li, I., Dey, A. K., & Forlizzi, J. (2011). Understanding my data, myself: Supporting self-reflection with UbiComp technologies. In *Proceedings of the 13th International Conference on Ubiquitous Computing*. Beijing, China, September 17–21, pp. 405–414.

Li, X., Hsieh, J. J. P., & Rai, A. (2013). Motivational differences across post-acceptance is usage behaviors. *Information Systems Research*, *24*(3), pp. 659–682,

Little, B. R. (1998). Personal project pursuit: Dimensions and dynamics of personal meaning. In P. T. P. Wong, and P. S. Fry (Eds.), *The human question for meaning: A handbook of psychological research and clinical applications* (pp. 193–212). Mahwah, NJ: Lawrence Erlbaum.

Little, B. R., Salemla-Aro, K., & Phillips, S. D. (2007). *Personal project pursuit: Goals, action and human flourishing*. Mahwah, NJ: Lawrence Erlbaum,

Liu, D. Santhanam, R, & Webster, J. (2017). Towards Meaningful Engagement: A Framework for Design and Research of Gamified Information Systems. *MIS Quarterly*, *41*(4), 1011-1034.

Lowry, P. B., Gaskin, J., Twyman, N., Hammer, B., & Roberts, T. (2012). Taking "fun and games" seriously: Proposing the hedonic-motivation system adoption model (HMSAM). *Journal of the Association for Information Systems*, *14*(11), 617–671.

Makkonen, P. (1997). Does collaborative hypertext support better engagement in learning the basics of informatics? *SIGCSE Bulletin*, *29*(3), 130–132.

Malone, T. W. (1981). Toward a theory of intrinsically motivating instruction. *Cognitive Science*, *5*(4), 333-369.

McCarthy, J., & Wright, P. (2004). *Technology as Experience*. Cambridge, MA: MIT Press.

McGregor, I., & Little, B. R. (1998). Personal projects, happiness, and meaning: On doing well and being yourself. *Journal of Personality and Social Psychology*, *74*(2), 494–512.

Nardi, B. (2010). *My Life as a Night Elf Priest: An Anthropological Account of World of Warcraft*. Ann Arbor, MI: University of Michigan Press.

Nicholls, J. G. (1984). Achievement motivation: Conceptions of ability, subjective experience, task choice, and performance. *Psych. Rev.*, *91*(3), 328–346.

Nicholson, S. (2013). Two paths to motivation through game design elements: Reward-based gamification and meaningful gamification. *Proceedings of iConference*, Fort Worth, TX, February 12–15, pp. 671–672.

Nicholson, S. (2015). A recipe for meaningful gamification. In T. Reiners, and L. C. Wood (Eds.), *Gamification: Education and business* (pp. 1-20). New York, NY: Springer.

Norman, D. A. (1998). *The invisible computer*. Cambridge, MA: MIT Press.

O'Brien, H. L., & Toms, E. G. (2008). What is user engagement? A conceptual framework for defining user engagement with technology. *Journal of the American Society for Information Science and Technology*, *59*(6), 938-955.

Oh, J., Bellur, S., & Sundar, S. S. (2015). Clicking, assessing, immersing and sharing: An empirical model of user engagement with interactive media. *Communication Research*, *21*, 1-27.

Patel, M. S., Asch, D. A., & Volpp, K. G. (2015). Wearable devices as facilitators, not drivers, of health behavior change. *JAMA*, *313*(5), 459–460.

Przybylski, A. K., Rigby, C. S., & Ryan, R. M. (2010). A motivational model of video game engagement. *Review of General Psychology*, *14*(2), 154–166.

Quesenbery, W. (2003). Dimensions of usability. In M. Albers, and B. Mazur (Eds.), *Content and complexity: Information design in technical communications* (pp. 81–102). Mahwah, NJ: Lawrence Erlbaum.

Rigby, S. C. (2015). *Gamification and motivation*. Cambridge: MIT press.

Ryan, R. M., & Deci, E. L. (2002). Overview of self-determination theory: An organismic dialectical perspective. In R. M. Ryan, and E. L. Deci (Eds.), *Handbook of self-determination research* (pp. 3-33). Rochester: University of Rochester Press.

Ryan, R. M., & Deci, E. L. (2000a). Self-determination theory and the facilitation of instrinsic motivation, social development, and well-being. *American Psychologist*, *55*(1), 68-78.

Ryan, R. M., & Deci, E. L. (2000b). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, *25*, 54-67.

Ryan, R. M. (1995). Psychological needs and the facilitation of integrative processes. *Journal of personality*, *63*(3), 397e427.

Ryan, R. M., Rigby, C. S., & Przybylski, A. K. (2006). The motivational pull of video games: A self-determination theory approach. *Motivation and Emotion, 30,* 347–364.

Rigby, C. S., & Ryan, R. M. (2011). *Glued to games: How video games draw us in and hold us spellbound*. Santa Barbara: Praeger.

Santhanam, R., Liu, D., & Shen, W. C. M. (2016). Research Note—Gamification of technology-mediated training: Not all competitions are the same. *Information Systems Research, 27*(2), 453–465.

Stanculescu, L. C., Bozzon, A., Sips, R. J., & Houben, G. J. (2016). Work and play: An experiment in enterprise gamification. In *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing (CSCW'16)*, San Francisco, CA, February 27–March 2, pp. 346-358.

Steenkamp. J-BEM, & Burgess, S. M. (2002). Optimum stimulation level and exploratory consumer behavior in an emerging consumer market. *Internat. J. Res. Marketing*, *19*(2), 131–150.

Suh, A. (2015). Applying design elements in the workplace. In *International Conference on Information Systems*. Fort Worth, TX, December 13–16, 2015, pp. 1-11.

Suh, A, Cheung, C. M. K., Ahuja, M., & Wagner, C. (2017). Gamification in the workplace: The central role of the aesthetic experience. *Journal of Management Information Systems*, *34*(1), 268-305.

Thong J. Y. L., Hong, S., & Tam, K. Y. (2006). The effects of post-adoption beliefs on the expectation-confirmation model for information technology continuance. *International Journal of Human-Computer Studies*, *64*, 799–810.

Vallerand, R. J. (1997). Toward a hierarchical model of intrinsic and extrinsic motivation. In M. P. Zanna (Ed.), *Advances in Experimental Social Psychology* (pp. 271–360). New York, NY: Academic Press.

Vallerand, R. J., Blais, M. R., Briere, N. M., & Pelletier, L. G. (1989). Construction and validation of the academic motivation scale. *Canadian Journal of Behavioral Sciences 21*(3), 323–349.

Vallerand, R. J., Fortier, M. S., & Guay, F (1997). Self-determination and persistence in a real-life setting: Toward a motivational model of high school dropout. *J. Personality Soc. Psych.*, *72*(5), 1161–1176.

Vallerand, R. J., Pelletier, L. G., Blais, M. R., Briere, N. M., Senecal, C, & Vallieres, E. F. (1992). The academic motivation scale: A measure of intrinsic, extrinsic, and amotivation in education. *Ed. Psych. Measurement*, *52*(4), 1003–1009.

Vallerand, R. J., Pelletier, L. G., Blais, M. R., Briere, N. M., Senecal, C., & Vallieres, E. F. (1993). On the assessment of intrinsic, extrinsic, and amotivation in education: Evidence on the concurrent and construct validity of the academic motivation scale. *Ed. Psych. Measurement*, *53*(1), 159–172.

van den Broeck, A., Vansteenkiste, M., Witte, H., Soenens, B., & Lens, W. (2010). Capturing autonomy, competence, and relatedness at work: Construction and initial validation of the Work-related Basic Need Satisfaction scale. *Journal of Occupational and Organizational Psychology*, *83*(4), 981-1002.

Van Vugt, H. C., Hoorn, J. F., Konijn, E. A., & de Bie Dimitriadou, A. (2006). Affective affordances: Improving interface character engagement through interaction. *International Journal of Human-Computer Studies*, *64*(9), 874–888.

Vansteenkiste, M., Niemiec, C. P., & Soenens, B. (2010). The development of the five mini-theories of self-determination theory: An historical overview, emerging trends, and future directions. In T. C. Urdan, and S. A. Karabenick (Eds.), *The decade ahead: Theoretical perspectives on motivation and achievement (advances in motivation and achievement* (Vol. 16 A, pp. 105-165). London: Emerald Group Publishing Limited.

Vansteenkiste, M., & Ryan, R. M. (2013). On psychological growth and vulnerability: Basic psychological need satisfaction and need frustration as a unifying principle. *Journal of Psychotherapy Integration*, 23(3), 263-280.

Vansteenkiste, M., Williams, G. C., & Resnicow, K. (2012). Toward systematic integration between self-determination theory and motivational interviewing as examples of top-down and bottom-up intervention development: Autonomy or volition as a fundamental theoretical principle. *International Journal of Behavioral Nutrition and Physical Activity*, *9*(23). Retrieved from http://dx.doi.org/10.1186/1479-5868-9-23.

Webster, J., & Ho, H. (1997). Audience engagement in multimedia presentations. *The DATA BASE for Advances in Information Systems*, *28*(2), 63–77.

Wegner, E, McDermott, R, & Snyder, W. (2002). *Cultivating communities of practice. A guide to managing knowledge*. Cambridge, MA: Harvard University Press.

Weiser, P., Bucher, D., Cellina, F., & De Luca, V. (2015, September). *A taxonomy of motivational affordances for meaningful gamified and persuasive technologies*. Paper Presented at the 3rd International Conference on ICT for Sustainability (ICT4S), Copenhagen, Denmark

White, R. W. (1959). Motivation reconsidered: The concept of competence. *Psychological review*, *66*(5), 297-333.

Wiebe, E. N., Lamb, A., Hardy, M., & Sharek, D. (2014). Measuring engagement in video game-based environments: Investigation of the user engagement scale. *Computers in Human Behavior*, *32*, 123-132.

Zhang, P. (2008). Motivational affordances: Fundamental reasons for ICT design and use, *Communications of the ACM*, 51(11), 145-147.

Zuckerman, M. (1979). *Sensation-seeking: Beyond the optimal level of arousal*. Hillsdale, NJ: Lawrence Erlbaum Associates.

EXTENDING THE TECHNOLOGY ACCEPTANCE MODEL TO ADOPTING ECG WEARABLE AUTHENTICATION DEVICES

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ABSTRACT

The availability, affordability and pervasiveness of mobile and wearable devices is at an all-time high. At the same time, the increasing magnitude of security breaches, including sophisticated hacking methods, ransomware, malware and phishing attacks, have reached alarming levels. In most incidents, personally identifiable information is compromised, such as login credentials, credit card and healthcare records (Armerding, 2018; Berghel, 2017; Bonner, 2012). This study details how the workplace perceptions (i.e. within corporations and business establishments) of wearable ECG-based authentication will ultimately impact how readily a new form of mobile technology will be adopted. The framework of this research is based on extending the Technology Acceptance Model in order to define and evaluate whether such devices will be accepted and used to the extent possible to prevent fraudulent activities by validating identity and authorizing access. This research uses a theoretical model that was developed and tested against empirical data collected using a survey instrument. A measurement model was established using structural equation modelling with partial least squares to validate the model's hypotheses. Findings of this research confirmed the hypotheses suggesting that the Technology Acceptance Model indeed offers a suitable, robust and predictive framework for the acceptance of ECG-based wearable authentication devices in the workplace.

Keywords: Wearables, ECG-authentication, Technology Acceptance Model, Structural Equation Modelling, Partial Least Squares

INTRODUCTION

As technology becomes more ubiquitous in almost every aspect of daily activities, there will be an expectation for technology to always be available, all of the time. For this to occur, a technology ecosystem needs to be designed so that it is easily accessible, easily portable, always on and secure. Such a system must also employ a robust security framework for access control, by identifying the fundamentals through which the right individual is granted access to the right resources for the right reasons and at the right time. Although many wearable devices and smartphones today boast ease of use, affordability and availability factors, their ultimate implementation and usage does not necessarily achieve its goals without a careful study of the workplace ramifications of interacting with those devices.

This is especially important when an organization is faced with investing in a new technology platform while weighing upfront costs, life cycle maintenance costs and user adoption costs. Consider, for example, why certain wearable devices succeed or fail in a social setting. It is not necessarily the cost factor or ease of use for such device, but rather how technology adoption is affected by user behavior that requires unfamiliar actions. For instance, Bluetooth headsets are

often used as a hands-free alternative when making mobile phone calls. That device is socially acceptable even though its usage makes users appear to talk to themselves - that is, acting outside of normal behavior (Rico & Brewster, 2010). The acceptance of Bluetooth headsets as well as other wearable devices will be driven by their social acceptance. In this study, the focus is on the workplace, where ECG-wearable authentication is mandated by the employer. When usage is voluntary (as in social settings), understanding the acceptance of a wearable device is largely dependent on how acceptable the resulting behavior is, based on prevailing cultural and social norms (Campbell, 2007). Therefore, an early identification of acceptance of use parameters should precede the deployment of a wearable authentication device in order to classify the workplace acceptability guidelines between the user, the wearable device and the environment in which such a device will be deployed.

LITERATURE REVIEW & FOUNDATIONAL ELEMENTS

The use of ECG biometrics has a clear impact on employees, their access to workplace facilities, corporate systems and employer-provided services. Implementation of an ECG biometric security systems is often associated with financial as well as other non-tangible benefits including robust access controls, thwarting of potential hackers or defending against exploitations of software vulnerabilities. Technology in the workplace is often viewed in a positive light as most software or hardware implementations are touted as advances that will lead to significant efficiencies, improved output and enhanced competitiveness. However, as many organizations are faced with rapid innovation life cycles and changing marketplace conditions, there is a tendency to adopt technology applications and platforms without a thorough assessment of productivity and long-term profitability (Abrahamson, 1991). This often results in the adoption of technologies that may not add value to the organization yet require significant upfront investments and costly maintenance or patching procedures.

Human Behavior towards New Technology

Social research into the drivers of public attitudes towards new technology adoption vary greatly, due in part to the segmentation of end users: there are those who are supportive of technologically innovations and there are those who are concerned about the same innovations (Cormick, 2014). Studies in the area of human behavior towards new technology can be attributed to research uncovered by frameworks such as Theory of Information Integration, Theory of Diffusion of Innovation, the Theory of Reasoned Action and the Theory of Planned Behavior. Although these theories have been instrumental in predicting behavioral types and modalities, they were not as successful in predicting the resulting behavior as it relates to technology adoption patterns. This gave rise to the development of the Technology Acceptance Model and its numerous extensions.

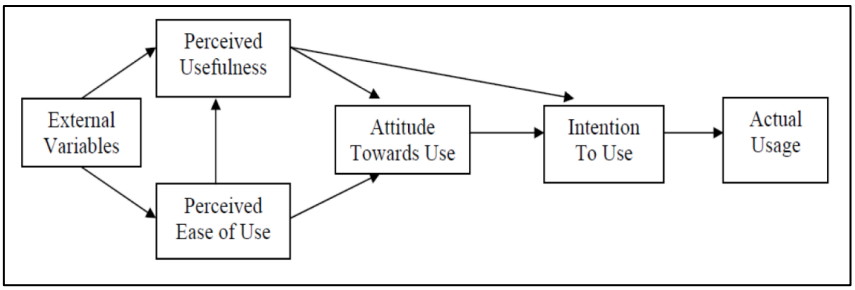
The Technology Acceptance Model

The Technology Acceptance Model (TAM) was specifically developed to predict acceptance of new technology in the workplace. The Technology Acceptance Model builds on previously discussed theories (Davis, 1989; Venkatesh & Davis, 2000). TAM is an adaptation of the Theory of Reasoned Action, in that it posits that beliefs determine behavioral intentions, and thus behavior;

TAM also follows the Diffusion of Innovation adoption curve, where acceptance reaches critical mass when the majority adopts the technology.

TAM interconnects with the Theory of Planned Behavior through the subjective norm and perceived behavioral control which also impact behavior. A significant departure, however, is that the Technology Acceptance Model accounts for the fact that in organizational settings, the adoption of technology is not determined solely by the user's beliefs, but rather by a combination of behavioral intentions to use the technology, the perceived usefulness of the technology and the ease of use of that technology. In addition, the Technology Acceptance Model considers technology usage in the workplace as compulsory and mandated by the employer. Hence, workers use technology and technology applications because it is a required of them and needed to complete activities or improve performance. Figure 1 shows TAM after its initial release (Davis, et al. 1989, Lai, 2017). TAM focuses research on what influences a user's decision to accept technology with factors such as:

Figure 1. Technology Acceptance Model (TAM) (Davis, et al. 1989)



The Technology Acceptance Model has been continuously studied in the field of wearables and used in evidence-based research by which factors such as perceived usefulness, behavioral intention, attitude, perceived ease of use, and experience, amongst others, successfully validated TAM in explaining new technology adoption. Examples includes: wearable smart clothing for cardiac health monitoring (Lin, et al. 2018), wearable fitness devices used to track physical activity (Lunney, et al. 2016), and wearable solar-powered smart apparel, where TAM was extended into research to determine the acceptance of apparel design attributes (Hwang, et al. 2016).

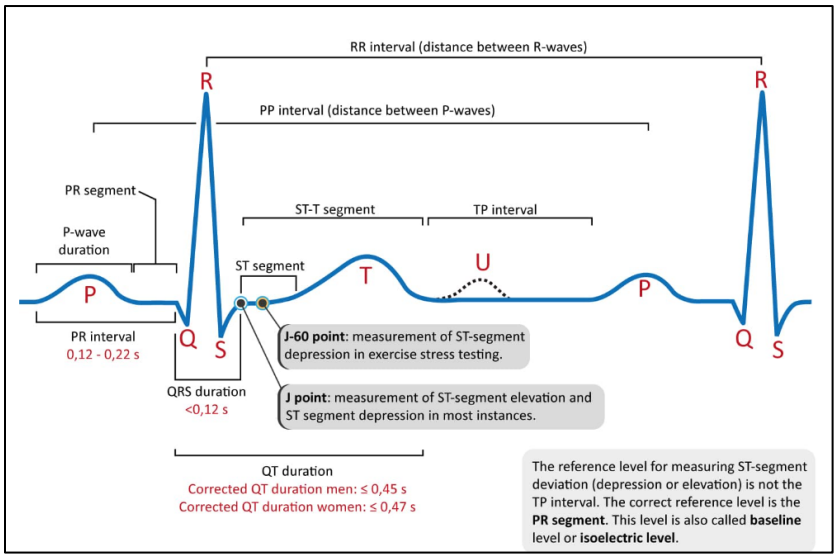
The Human Heart, The Electrocardiogram & ECG Authentication

The human heart beats approximately 100,000 times a day pumping blood throughout the body. Oxygen-poor blood is received into the right atrium then sent into the right ventricle (Cleveland Clinic, 2018; Gordan, et al. 2015), which in turn pumps the oxygen-poor blood to the lungs. The left atrium receives oxygen-rich blood from the lungs and pumps it to the left ventricle, which in turn pumps the oxygen-rich blood to the body. As the heart beats, an electrical impulse or wave traverses the heart muscle causing it to contract and pump blood into the circulatory system throughout the body. This electrical activity is referred to as depolarization. Repolarization occurs when the heart muscle relaxes. The record obtained from the electrical activity of depolarization and repolarization of the heart muscle is called an electrocardiogram or ECG (Niebauer, 2004).

ECG Waveforms

During an ECG test, the heartbeat produces several deflections or waveforms. A wave travels through the heart with each beat. The P-Wave is first generated, followed by the next wave, the QRS-Complex. The final wave, the T-Wave is recorded as the ventricles return to a resting state. The common waveforms are shown in Figure 2 (Hammad, et al. 2018; ECG Interpretation, 2018).

Figure 2. ECG common waveforms (Hammad, et al. 2018)



For a trained healthcare professional, the ECG provides a significant insight into the patient's cardiac health - by measuring the time intervals between the waves described previously, a physician can identify the duration associated with how long the full electrical wave took to pass through the patient's heart; this typically aids the physician in determining whether such duration is regular or irregular.

The Case for Human Authentication with ECG

Biometrics refer to the automatic identification of individuals based on physiognomies that are attributed to their behavioral or physiological traits. Biometric security measures are used in a variety of applications in order to authenticate a user and authorize access to physical or logical domains. Some of the frequently used biometric methodologies are those associated with iris or retinal scans, voice pattern recognition, fingerprints, facial recognition, gait analysis, key stroke analysis and palm print. Research conducted in the past 10 years has pointed to the uniqueness of the electrocardiogram signal as a primary component of a new form of authentication and the experimental results showed that the rate of correct identification was 96% (Nemirko & Lugovaya, 2005). Existing research on ECG biometrics is typically driven by the classification algorithms which are founded on the features extracted from the ECG signals (Wang, et al. 2006). Electrocardiograms are an effective representation of a noninvasive authentication method. Each individual has an ECG *signature* that is unique, universal and reflects the individual's liveness. Such signature provides a robust barrier against forgery (Jung & Lee, 2017) albeit signature irregularities may exist due to the individual's cardiac health and heart condition.

The QRS Complex and its Role in ECG Authentication

The proposition to use ECG as a form of personal identification dates back to 1977 (Forsen, et al. 1977) while the first study on the ECG usage for biometrics was conducted (Biel, et al. 1999) utilizing the 12-leads ECG recordings procedure with a sample of 20 volunteers. Additional research followed (Carreiras, et al. 2014) which quantified the significance of the characteristics in the usage of ECG recordings as a basis of authentication. Further meta-research and comparative analyses were also conducted to provide prominence to ECG as a form of identification (Odinaka, et al. 2012; Nasri & El-Khatib, 2009, Lee, et al. 2018). Most ECG biometric studies focused on he recorded signals from the leads which are attributed to specific waveform deflections, namely P, Q, R, S, T. The unique properties of these waves - such as wave amplitude, temporal properties (time/distance intervals) and morphological differences (structure, angles, form) - as well as the uniqueness of their combinations, such as the QRS Complex provided sufficient information for accurate subject recognition. The QRS complex is the most noticeable feature in the electrocardiogram signal; hence, its detection is critical for ECG signal analysis towards authentication. The QRS template matching approach, using a wavelength of 100ms, was successfully deployed in user identification (Krasteva, et al. 2018). During the normal depolarization of the heart ventricles, the QRS complex is 80 to 120 ms in duration.

Because the QRS complex's amplitude, temporal properties and morphological characteristics are unique for each individual, it can be reliably used in subject identification. This is primarily due to the clinical significance of the QRS complex, which provides healthcare professionals with distinctive patient data that is not available in other waveform deflections. Namely, the QRS complex is useful in biomedical signal processing when diagnosing cardiac arrhythmias, myocardial infarctions, ventricular hypertrophy and coronary artery disease. Furthermore, the QRS complex has been proven to be stable against heart rate variability, thus adding to the convenience of its usage in a biometric framework (Mai, et al. 2011). A subject verification accuracy of 99.52% was attained in an ECG biometric study of 184 individuals with mobile sensors using a two-stage classifier (Tan & Perkowski, 2017). Another study arrived at a subject verification accuracy of 96% when using QRS complexes extracted from the ECG in a group of 90 individuals over a period of six months, also using a two-stage classifier, processed by Principal Component Analysis and classified using Linear Discriminant Analysis and a Majority Vote Classifier (Nemirko & Lugovaya, 2005). A near 100% verification accuracy was achieved (Shen, et al. 2002) in a group of 20 individuals while using a two stage classifier of Template Matching and Decision-based Neural Networks.

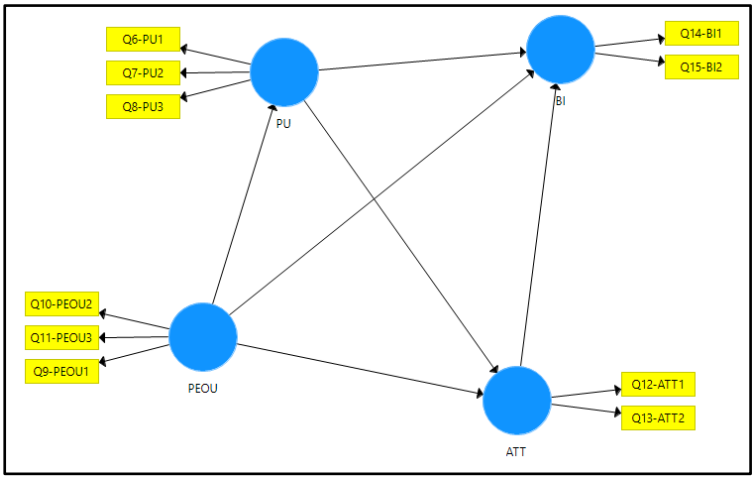
Structural Equation Modeling - The Research Model

Structural Equation Modeling represents a second-generation multivariate data analysis methodology, which will be used in conjunction with Partial Least Squares to establish and test the path model for this research. SEM is often used in social sciences, psychometric assessments and behavioral sciences to test single or multi-order causal models (Haenlein & Kaplan, 2004). SEM is suitable for research that is exploratory in nature, where latent (unobservable) constructs are frequently used. In addition to latent constructs or variables, the research model also features observable indicators that are associated with their corresponding constructs. Observable indicators can be directly measured. SEM is often associated with two models, the inner model

and the outer model (Wong, 2013). This model (called TAM-ECG) is rendered in SmartPLS3 (Figure 3):

- Structural/Inner Model: specifies relationship between independent and dependent latent variables (the path coefficients are inner model parameter estimates)
- Measurement/Outer Model: specifies relationship between latent variables and their observed indicators (the weights and loadings are outer model parameter estimates)

Figure 3. The TAM-ECG Model



In SEM, a variable is either exogenous or endogenous. An exogenous variable has path arrows pointing from it and is also referred to as an independent variable; an endogenous variable has at least one path arrow leading to it and is also referred to as a dependent variable. Models can include both dependent and independent variables. The ECG-Wearable Authentication model used in this study is based on the Technology Acceptance Model's constructs. The constructs are PU-Perceived Usefulness, PEOU-Perceived Ease of Use, ATT-Attitude and BI-Behavioral Intent. Constructs are displayed in circles and indicators are displayed in rectangles. The corresponding indicators are explained in Table 1 (Q1-Q6 were used for demographic classification).

Table 1. TAM-ECG Constructs and Indicators

PU		
	Q6-PU1	Using ECG wearable authentication at work will increase my productivity.
	Q7-PU2	Using ECG wearable authentication at work will enhance my effectiveness.
	Q8-PU3	Using ECG wearable authentication at work will improve overall performance.
PEOU		
	Q9-PEOU1	Learning to use ECG wearable authentication would be easy.
	Q10-PEOU2	The use of ECG wearable authentication is clear and understandable.
	Q10-PEOU3	Overall, using ECG wearable authentication would not require a lot of mental effort.
ATT		
	Q11-ATT1	Using ECG wearable authentication in the workplace is a good idea.
	Q12-ATT2	I am generally positive towards the use of ECG wearable authentication in the workplace.
BI		
	Q13-BI1	I intend to use ECG wearable authentication if offered by my employer.
	Q14-BI2	I expect that I would use ECG wearable authentication in the future.

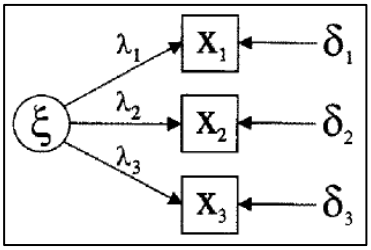
Structural Equation Modeling with Partial Least Squares

There are two leading approaches to SEM: Covariance-based SEM (CB-SEM), focuses strictly on confirmatory theory testing where outcomes are presented either to confirm or reject theories through testing of hypothesis. Characteristics of CB-SEM include large sample sizes and normally distributed data; Partial Least Squares (PLS-SEM), focuses on the analysis of variance, exploration and prediction. PLS is useful in predictive analyses; it is advantageous for structural equation modeling in applied research projects (Bacon, 1999) as well as in information systems research (Urbach & Ahlemann, 2010) especially when: research is exploratory and little is known or established about the relationships that exist among the model's construct or variables. And, the sample size is small, often featuring limited number of participants or it is inherently cost-prohibitive to recruit a very large sample size. PLS uses least square regression estimation to build a model where data fitting is essential for multi-variate scenarios. Unlike multiple regression, PLS features latent variables or constructs which can be measured with error, making PLS more robust in measurement uncertainty (Minitab, 2019; Urbach & Ahlemann, 2010).

Building the Model: Reflective versus Formative

As noted previously, PLS is better suited for theory development rather than theory testing. When building the model, two types are commonly seen: reflective and formative. In this study, the reflective model will be used. The reflective model defines a direct causal relationship between the constructs and their measures. The arrows start from the construct and terminate at the associated indicators. This model is shown in Figure 4 (Edwards, & Bagozzi, 2000) and its equation is: $X_i = \lambda_i\xi + \delta_i$. In this equation, Xi represents the indicators (observable), ξ is the construct (unobservable), δi represents the random measurement errors, and λi represents factor loadings.

Figure 4. The Reflective Model (Edwards & Bagozzi, 2000)



Study Hypotheses

The Technology Acceptance Model can predict both the behavioral intent to use the technology as well as its actual use. This study defines five hypotheses for the various effects of perceived usefulness, perceived ease of use, attitude, behavioral intent, subjective norm, perceived risk and experience. The collection of these hypotheses is defined in Table 2 as:

Table 2. TAM-ECG Hypotheses (WA=Wearable Authentication)

H1	Perceived ease of use is positively correlated with attitude towards using ECG WA
H2	Perceived ease of use is positively correlated with perceived usefulness of ECG WA
H3	Perceived usefulness is positively correlated with attitude towards using ECG Wearable WA
H4	Perceived usefulness is positively correlated with behavioral intention to use ECG WA
H5	Attitude towards ECG WA is positively correlated with behavioral intention to use ECG WA

METHODOLOGY, EXPERIMENTAL VALIDATION & FIELD STUDY RESULTS

The survey instrument used a Likert scale to rank and classify data. A Likert-type scale assumes that the strength/intensity of user reactions is linear, i.e. on a continuum from strongly agree to strongly disagree and makes the assumption that attitudes can be measured. Moreover, and after obtaining IRB approval, the survey was administered via Qualtrics, where several techniques were employed during this stage in an effort to detect data outliers, reduce errors and increase data reliability. This included features such as answer timings to prevent rapid responses, mandatory responses to prevent bypassing of questions, and techniques to detect suspicious response patterns such as straight lining, diagonal lining and alternative lining. In addition, G*Power was used to perform statistical power analysis as well as sample size analysis prior to embarking on PLS-SEM calculations. In order to calculate the statistical power R^2, the coefficient of determination is set at 0.25 (R^2 assesses the ability of a model to predict or explain an outcome in the linear regression setting, where the variance in a dependent variable is predicted or explained by independent variables in the models). This results in a statistical power of 95.45% with a minimal sample size of 42. With 87 observations the PLS-SEM algorithm is calculated. The algorithm focuses on the prediction of hypothesized relationships that explain the variance between endogenous variables, exogenous variables and all dependent indicators (Akter, et al. 2011; Hair, et al. 2017; Hair, et al. 2011). The TAM-ECG Model is reflective; within this model PEOU, is considered a single item exogenous construct, BI is endogenous, PU and ATT are hybrids. Within SmartPLS, the algorithm utilizes an iterative estimation of latent variable scores which is repeated until convergence is reached, or the maximum number of iterations has been exhausted. The Path Weighting Scheme is selected as it provides the highest R^2 value for endogenous latent variables (Henseler, et al. 2009; Hair, et al. 2017). PLS-SEM algorithms use standardized data for indicators with a mean of 0 and a variance of +1. A maximum of 300 iterations is selected. The TAM-ECG model now reflects the calculations performed by SmartPLS shown in Figure 5. The numbers in the circles represent the coefficient of determination, R^2 for latent variables and how they are explained by the other latent variables; numbers on the arrows represent standardized path coefficients which explain how strong the effect of one variable is on another variable.

Path Coefficients & Significance

In Table 3, the path coefficients for the constructs of the TAM-ECG model are summarized.

Table 3. Path Coefficients for TAM-ECG Model

	ATT	BI	PEOU	PU
ATT	0.000	0.617 (61.70%)	0.000	0.000
BI	0.000	0.000	0.000	0.000
PEOU	0.218 (21.8%)	0.199 (19.90%)	0.000	0.547 (54.70%)
PU	0.673 (67.30%)	0.097 (9.70%)	0.000	0.000

- The inner model reflects that ATT has the strongest effect on BI (61.7%) followed by PEOU (19.9%) then by PU (9.7%).
- The inner model also reflects that PU has the strongest effect on ATT (63.7%) followed by PEOU (21.8%).
- The inner model further reflects that PEOU has a strong effect on PU (54.7%).

The above findings indicate that the following hypothesized path relationships are statistically significant and are predictors of their corresponding variable: ATT →BI, PEOU →ATT, PEOU→BI, PEOU→PU, PU→ATT. Conversely, the hypothesized path relationship PU→BI is not statistically significant given its standardized path coefficient of 0.097 which is less than 0.1. Therefore PU does not directly predict BI. However, given the proximity of the PU→BI to the standardized path coefficient of 0.1, the relationship strength is borderline at best and may serve as a weak predictor.

Endogenous Variables Variance - Coefficient of Determination

When attempting to determine the goodness-of fit, R^2 and R^2-Adjusted can be considered. R^2 measures the proportion of variation in dependent variables as explained by independent variables for a linear regression model. When the model changes due to the introduction of new variables (i.e. when the model is expanded), Adjusted R^2 is a more suitable measure as it adjusts the statistics based on the increase or decrease in the number of independent variables within the same model. (Ohtani & Tanizaki, 2004). Therefore, Adjusted R^2 should take precedence, although in this research's model, the values of Adjusted R^2 and R^2 are interchangeable (as shown in Table 4):

Table 4. Values of R Square and R Square Adjusted

	R^2	R^2 Adjusted
ATT	0.661	0.653
BI	0.689	0.678
PU	0.299	0.291

- The coefficient of determination for ATT latent variable is 0.661 indicating that the remaining two latent variables PU and PEOU strongly explain 66.1% of variance in ATT.
- The coefficient of determination for BI endogenous latent variable is 0.689 indicating that ATT, PU and PEOU strongly explain 68.9% of the variance in BI.
- The coefficient of determination for PU latent variable is 0.299 indicating that the remaining latent variable moderately explains 29.9% of the variance in PU.

Outer Indicator Loadings & Indicator Reliability

The loadings visible for the indicators help define the correlations between the latent variables and those indicators in the outer model (the model in this study is a reflective model; in formative models, the outer weights are considered instead). Measurement loadings can vary between 0 and 1; they are the standardized path weights connecting the variable to its indicators. The loadings should be significant; the larger the value, the more reliable the measurement model. High outer loadings for constructs typically imply that their associated indicators have much in common and thus are statistically significant. The size of the outer loading is also commonly known as indicator reliability. For a well-fitting reflective model, path loadings should be greater than 0.70 (Wong,

2013). Indicator loadings greater than 0.40 and less than 0.70 are typically removed from the model in order to improve composite reliability.

A sufficient condition is that the outer loadings should be at least 0.708. Indicator reliability may be interpreted as the square of the measurement loading: thus, 0.708^2 = .501 - where the latent variable should explain a significant part of each indicator's variance (i.e. it should account for at least half of the variance in each indicator, or 50%) and that variance is typically larger than the measurement error variance. In Table 5, all indicator loadings are greater than 0.708 and thus none are removed from the study. A loading value of 0.70 is the level at which the variance in the indicator is strongly attributed to its indicators and is also the level at which explained variance is greater than the error variance.

Table 5. Indicator loadings for TAM-ECG Model

	ATT	BI	PEOU	PU
Q6-PU1				0.953 (95.3%)
Q7-PU2				0.949 (94.4%)
Q8-PU3				0.928 (92.8%)
Q9-PEOU1			0.801 (80.1%)	
Q10-PEOU2			0.817 (81.7%)	
Q11-PEOU3			0.761 (76.1%)	
Q12-ATT1	0.966 (96.6%)			
Q13-ATT2	0.962 (96.2%)			
Q14-BI1		0.909 (90.9%)		
Q15-BI2		0.912 (91.2%)		

Construct Internal Consistency Reliability & Validity

All of the indicators have individual indicator reliability values that are much larger than the preferred level of 0.7 (or 0.708). Cronbach's Alpha is used to measure internal consistency reliability and is computed by correlating the score for each latent construct with the total score for each indicator and then comparing that to the variance for all individual latent construct scores. Table 6 displays Cronbach's Alpha values > 0.6; therefore, high levels of internal consistency reliability have been demonstrated among all four reflective latent variables.

Table 6. Internal consistency reliability & validity summary for TAM-ECG model

	Cronbach's Alpha	Composite Reliability
ATT	0.924	0.963
BI	0.793	0.906
PEOU	0.706	0.836
PU	0.938	0.960

Although Cronbach's coefficient Alpha is a widely used approach to estimate the reliability of tests and scales, Composite Reliability can also be used as a measure of the overall dependability of the latent variables (Bagozzi & Yi, 1988; Hair, et al. 2012). In Table 6, Cronbach's Alpha and Composite Reliability results are displayed. Although the average composite reliability value (.91625 or approximately 92%) exceeded the average corresponding coefficient Alpha value (.0.84025 or approximately 84%), the difference would chiefly be inconsequential for large number of survey responses or in practical applications such as meta-analysis. Finally, in Table 6,

all values are shown greater than 0.7; therefore, high levels of internal consistency reliability are present within the model and among all four latent variables. Composite reliability should be 0.7 or higher. If it is an exploratory research, 0.6 or higher is acceptable (Bagozzi & Yi, 1988).

Average Variance Extracted & Convergent Validity

Convergent validity is the degree of confidence that a construct is well measured by its indicators. Convergent validity is based on the Average Variance Extracted (AVE) values in the model which measures the amount of variance that is captured by a construct in relation to the amount of variance due to measurement error. Table 7 provides the AVE calculations:

Table 7. Average Variance Extracted in TAM-ECG model

	Average Variance Extracted
ATT	0.929
BI	0.829
PEOU	0.630
PU	0.890

In this model, the AVE values of ATT, BI, PEOU and PU exceed the required minimum level of 0.50. Thus, the AVE for all constructs indicates a high level of convergent validity. An AVE of greater than 0.50 indicates that the validity of both the constructs and their indicators is high (Raines-Eudy, 2000).

Discriminant Validity - Cross Loadings

For variance-based structural equation modeling, such as partial least squares, Discriminant Validity (or divergent validity) is a test which determines that constructs with no relationship in the model, are actually unrelated. When analyzing relationships between latent variables, discriminant validity can be evaluated by using Cross-Loading of indicators and related constructs, as well as Fornell & Larcker Criterion (Henseler, et al. 2015; Hamid, et al. 2017).The Cross Loadings for the model can be found in Table 8. The factor loading indicators for each assigned construct have to be higher than all loadings of other constructs. For example, the indicator Q6-PU1 has the highest value for the loading for its corresponding construct PU (0.953), while all cross-loadings for the same indicator with the remaining constructs are lower (respective values of 0.755 for ATT, 0.700 for BI and 0.541 for PEOU).

Table 8. Cross Loadings values in TAM-ECG model

	ATT	BI	PEOU	PU
Q6-PU1	0.755	0.700	0.533	**0.953**
Q7-PU2	0.755	0.673	0.541	**0.949**
Q8-PU3	0.733	0.587	0.471	**0.928**
Q9-PEOU1	0.495	0.448	**0.801**	0.406
Q10-PEOU2	0.476	0.529	**0.817**	0.508
Q11-PEOU3	0.424	0.480	**0.761**	0.379
Q12-ATT1	**0.966**	0.799	0.596	0.783
Q13-ATT2	**0.962**	0.762	0.532	0.743
Q14-BI1	0.754	**0.909**	0.482	0.637
Q15-BI2	0.722	**0.912**	0.634	0.627

By examining Table 8, overall cross loadings provide evidence for the model's discriminant validity (note the values in gray shading and bold typeface as higher than the remaining loadings).

Fornell-Larcker Criterion

An additional criterion is to assess discriminant validity with the Fornell-Lacker criterion (Fornell & Larcker, 1981). This method uses the square root of the average variance extracted (AVE) for each construct which should have a value larger than the correlations of the remaining latent constructs in the model. Table 9 details the Fornell-Larcker findings; for example, for the latent construct BI, its criterion of 0.910 ($\sqrt{0.829}$) is greater than the remaining criteria found in that column for constructs ATT (0.000), PEOU (0.613) and PU (0.694), and also greater than criteria found in that row in association with ATT (0.810), PEOU (0.000), and PU (0.000). By examining Table 9, the Fornell-Larcker Criterion provides evidence for the model's discriminant validity (note the values in gray shading and bold typeface as higher than the remaining loadings).

Table 9. Fornell-Larcker Criterion values for the TAM-ECG model

	ATT	BI	PEOU	PU
ATT	**0.964**	0.000	0.000	0.000
BI	0.810	**0.910**	0.000	0.000
PEOU	0.586	0.613	**0.794**	0.000
PU	0.792	0.694	0.547	**0.943**

Collinearity Statistics

Multicollinearity refers to high (or very high) intercorrelations among the independent variables (Kock, 2015). If present, the statistical inferences are adversely impacted and may not be reliable. During a collinearity test, the exogenous latent variables are checked for potential inter-associations with other independent variables. This may occur if the indicators of latent variables are highly correlated to each other resulting in large changes in the estimated regression coefficients when a latent variable is added or removed from the model. In PLS-SEM, Multicollinearity can be detected by calculating the tolerance and its reciprocal, called Variance Inflation Factor (VIF). If the value of tolerance is lower than 0.2 or 0.1 and, simultaneously, the value of VIF is greater than 5, then the multicollinearity is problematic (Gareth, et al. 2017). General multicollinearity guidelines are:

- VIF = 1 (Not correlated)
- 1 < VIF < 5 (Moderately correlated)
- VIF >=5 (Highly correlated)

Table 10 displays the Inner VIF values which are less than 5.

Table 10. Variance Inflation Factor (VIF) values for indicators in the TAM-ECG model

	ATT	BI	PEOU	PU
ATT	0.000	2.951	0.000	0.000
BI	0.000	0.000	0.000	0.000
PEOU	1.427	1.567	0.000	1.000
PU	1.427	2.764	0.000	0.000

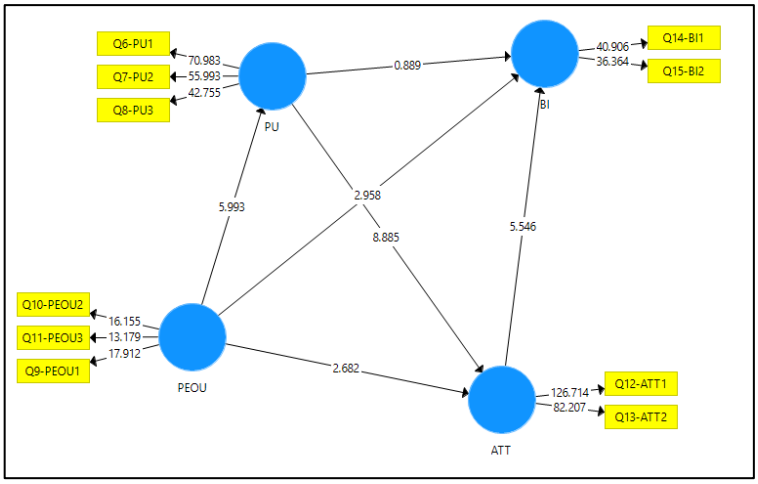
As detailed in this section's findings, all of the model's evaluation criteria have been met, thus providing support for the model's validity, consistency and reliability. Although these findings would suffice, checking the model's Structural Path Significance using bootstrapping would be a logical next step.

Structural Path Significance with Bootstrapping for TAM-ECG

As path coefficients in PLS-SEM do not assume a normal, chi-squared goodness of fit, or other known distribution, Bootstrapping is used as a nonparametric procedure that tests the statistical significance of various PLS-SEM results such as Cronbach's Alpha, R^2 values, path coefficients, F^2 and composite reliability. In bootstrapping, subsamples are randomly drawn (with replacement) from the original data set. Each subsample is then used to estimate the model with each sample returned to the sampling data set before the next sample is drawn. This process is iterative and repeated with a significantly large data set of random subsamples, approximately 5,000. The ultimate goal is to conduct significance testing of PLS-SEM estimates for the model, either pertaining to reflective indicator loadings or formative indicator weights.

The Bootstrap results approximate the normality of data; bootstrapping derives standard errors for the estimated results and generates p-statistics and t-statistics for significance testing of both the inner and outer models. (Davison & Hinkley, 1997; Efron & Tibshirani, 1993). In bootstrapping, the test statistic follows a t-distribution to determine whether the path coefficients of the inner model are significant or not (Stephens, et al. 2014). When the size of the resulting empirical t-value is higher than 1.96, the path coefficient is significant at a significance level of 5% ($\alpha = 0.05$; two-tailed test). The critical t-value is 1.65 for a significance level of 10%, and 2.58 for a significance level of 1% ($\alpha = 0.01$; two-tailed test and $\alpha = 0.10$; two-tailed test, respectively) (Hair, et al. 2017). The TAM-ECG model is re-calculated and displayed in Figure 6.

Figure 6. TAM-ECG after bootstrapping



Path Coefficients after Bootstrapping

Figure 7 summarizes the path coefficient calculation results after bootstrapping has been completed (with 5000 samples).

Figure 7. Path Coefficients after bootstrapping

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
ATT -> BI	0.617	0.619	0.111	5.546	0.000
PEOU -> ATT	0.218	0.224	0.081	2.682	0.007
PEOU -> BI	0.199	0.201	0.067	2.958	0.003
PEOU -> PU	0.547	0.552	0.091	5.993	0.000
PU -> ATT	0.673	0.668	0.076	8.885	0.000
PU -> BI	0.097	0.093	0.109	0.889	0.374

Using a two-tailed t-test with a significance level of 5%, the path coefficient will be significant if the t-statistic is greater than 1.96. From Figure 7, the only relationship that is determined to be insignificant is PU -> BI with a value of 0.889. All other path coefficients in the inner model are statistically significant. SmartPLS 3 also provides calculations of probability values (p-values). The p-value, is the probability of finding the observed results when the null hypothesis (H_0) of a question is true. P is also described in terms of rejecting, erroneously, H_0 when it is actually true. Selecting a significance level of 5% implies that the p-value must be less than 5% (0.05) in order to render the relationship significant. Conventionally, the 5%, 1% and 0.1% ($P < 0.05$, 0.01 and 0.001) significance levels have been used. For this study, as in most social science research studies, a p-value < 0.05 can be referred to as statistically significant, whereas a p-value < 0.001 can be referred to as statistically highly significant.

Outer Loadings after Bootstrapping

Figure 8 displays the calculations for Outer Loadings where all of the t-statistics are larger than 1.96 indicating that the outer model loadings are highly significant.

Figure 8. Outer Loadings after bootstrapping including t-statistics

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Q10-PEOU2 <- PEOU	0.817	0.816	0.051	16.155	0.000
Q11-PEOU3 <- PEOU	0.761	0.760	0.058	13.179	0.000
Q12-ATT1 <- ATT	0.966	0.966	0.008	126.714	0.000
Q13-ATT2 <- ATT	0.962	0.961	0.012	82.207	0.000
Q14-BI1 <- BI	0.909	0.909	0.022	40.906	0.000
Q15-BI2 <- BI	0.912	0.910	0.025	36.364	0.000
Q6-PU1 <- PU	0.953	0.953	0.013	70.983	0.000
Q7-PU2 <- PU	0.949	0.949	0.017	55.993	0.000
Q8-PU3 <- PU	0.928	0.927	0.022	42.755	0.000
Q9-PEOU1 <- PEOU	0.801	0.800	0.045	17.912	0.000

f^2 - Effect Size

In addition to evaluating the R^2 values for endogenous constructs, the effect size of each path in the structural equation is also evaluated by using Cohen's f^2 (Cohen, 1992). The effect size measures whether an independent LV has a substantial impact on a dependent LV. Effect sizes augment null hypothesis significance testing (e.g. p-values) by offering a measure of practical significance as related to the magnitude of the effect; they are independent of sample size. The formula is commonly presented as $f^2 = R^2/(1 - R^2)$, where results are shown in Figure 9:

- small effect: between 0.020 and 0.150
- medium effect: between 0.150 and 0.350
- large effect: greater than 0.350

Figure 9. Effect size with t-statistics

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
ATT -> BI	0.415	0.472	0.244	1.701	0.089
PEOU -> ATT	0.098	0.118	0.080	1.227	0.220
PEOU -> BI	0.081	0.097	0.067	1.217	0.224
PEOU -> PU	0.427	0.489	0.236	1.811	0.070
PU -> ATT	0.937	0.985	0.379	2.474	0.013
PU -> BI	0.011	0.025	0.035	0.312	0.755

For example, ATT→BI effect size is 0.415, which indicates the presence of a large effect. Similarly, PU →ATT results in a large effect size of 0.937. In both cases, the independent LV has a substantial impact on a dependent LV. By contrast, a small effect is present within PEOU →ATT (0.098), PEOU →BI (0.081), and PU →BI (0.011). Effect size is an important determinant that clearly identifies whether the relationships between the variables in the models are significant or not. Effect sizes are also an important supplement to null hypothesis significance testing (p-values) because they are independent of sample size.

TAM-ECG RESULTS SUMMARY

In the previous section, several procedures were employed to validate the TAM-ECG model and its corresponding five hypotheses, H1 through H5. A summary of these findings is detailed below:

- Path Coefficients: The following hypothesized path relationships are statistically significant and are predictors of their corresponding variable: ATT →BI, PEOU →ATT, PEOU→BI, PEOU→PU, PU→ATT at 63.7%, 61.7%, 54.7%, 21.8% and 19.9%. PU→BI was the only relationship not be found statistically significant at 9.7%; however, due to its close proximity to the standardized path coefficient of 10%, it can serve as a weak predictor.
- Coefficient of Determination (R2): PU and PEOU strongly explain more than 66.1% of variance in ATT leading to strong statistical predictors in the corresponding relationships. Similarly, PU, PEOU and ATT strongly explain more than 68.9% of variance in BI and serve as strong predicators of the relationships. ATT, PEOU and BI moderately explain 29.9% of the variance in PU.
- Indicator Loadings: All indicator loadings for ATT, BI, PEOU and PU exceeded the cutoff of 70% demonstrating that the variance in the relationships of the constructs are strongly attributed to their corresponding indicators.
- Cronbach's Alpha: When measuring the internal consistency reliability, Cronbach's Alpha value for all constructs exceeded 60% reflecting a high level of internal consistency within the model and validating the hypotheses.
- Composite Reliability: The composite reliability values for the relationships in the TAM-ECG model exceeded 70% confirming the strong relationships between the constructs and validating the hypotheses.
- Average Value Extracted: All values exceeded the required minimum level of 50% reflecting convergent validity with the model and corresponding hypotheses.
- Discriminant Validity: Overall cross loadings were higher than 75% for the constructs within the TAM-ECG model. This provides evidence of the model's discriminant validity, thus validating the hypotheses.
- Fornell-Larcker Criterion: Further evidence confirming the hypotheses was found through calculating the Fornell-Larcker Criterion, leading to highest value for each construct in its relations with the remaining constructs. The lowest value was 79.4% for PEOU and the highest was 96.5% for ATT.
- Collinearity Statistics (VIF): Further evidence that validates the hypotheses was found in VIF calculations where all values were less than 5, with the highest for PU (1,2,3) at 4.818 and the lowest for PEOU (1,2,3) at 1.331.
- Path Coefficients after Bootstrapping: t-values of larger than 1.96, at p-values less than 0.01 indicating high statistical significance were found after bootstrapping for all but one relationship. The PU→BI relationship was statistically insignificant.
- Outer Loadings after Bootstrapping: t-values of larger than 1.96 for all outer loadings signifying that the loadings were highly significant, leading to validation of the hypotheses as well, after bootstrapping.

In summary, the above compilation of results validates the hypotheses proposed as H1, H2, H3 and H5, with H4 as inconclusive for the TAM-ECG model, as detailed below:

- H1: Perceived ease of use is positively correlated with attitude towards using ECG Wearable Authentication - Confirmed.
- H2: Perceived ease of use is positively correlated with perceived usefulness of ECG Wearable Authentication - Confirmed.
- H3: Perceived usefulness is positively correlated with attitude towards using ECG Wearable Authentication - Confirmed.
- H4: Perceived usefulness is positively correlated with behavioral intention to use ECG Wearable Authentication - Inconclusive but borderline acceptable.
- H5: Attitude towards ECG Wearable Authentication is positively correlated with behavioral intention to use ECG Wearable Authentication - Confirmed.

CONCLUSIONS

Although this study had a limited population size, the questions posed were answered; the factors influencing user acceptance of ECG-wearable authentication were identified and the proposed hypotheses were largely confirmed suggesting that the Technology Acceptance Model can be used as a predictive framework for the acceptance of ECG-based wearable authentication devices in the workplace. While the findings of this study have identified the key factors which impact the adoption of ECG biometrics, one of the five hypotheses proved to be inconclusive: Perceived Usefulness could not be positively correlated with behavioral intention to use ECG Wearable Authentication due to low construct reliability and indicator loadings. However, due to the anticipated convergence of wearable devices and biometric capabilities, it is reasonable to predict that perceived usefulness may no longer serve as a strong predictor of behavioral intent because many platforms such as smartphones, smart watches and smart garments will offer advanced biometrics integration beyond the traditional fingerprint or voice authentication, and likely to include built-in support for ECG authentication. Areas of further research can include extending the TAM model into additional factors such as perceived risk, experience and subjective norm.

REFERENCES

Abrahamson, E. (1991). Managerial Fads and Fashions: The Diffusion and Rejection of Innovations. *The Academy of Management Review, 16*(3), 586-612.

Akter, S., D'Ambra, J., & Ray, P. (2011). An evaluation of PLS based complex models: the roles of power analysis, predictive relevance and GoF index. *Proceedings of the 17th Americas Conference on Information Systems (AMCIS2011)* (pp. 1-7). Detroit, USA: Association for Information Systems.

Armerding, T. (2018). The 18 biggest data breaches of the 21st century. CSO. Available from: https://www.csoonline.com/article/2130877/the-biggest-data-breaches-of-the-21st-century.html Accessed, February 2019.

Ashley E. A., & Niebauer J. (2004). Cardiology Explained. London: Remedica; Chapter 3, Conquering the ECG.

Bacon, L. D. (1999). Using LISREL and PLS to Measure Customer Satisfaction, *Sawtooth Software Conference Proceedings*, La Jolla, California, Feb 2-5, 4-6.

Bagozzi, R. P., & Philipps, L. W. (1982). Representing and testing organizational theories: A holistic construal. *Administrative Science Quarterly*, 27, 465.

Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science*, 16(1), 74–94.

Berghel, H. (2017). Equifax and the Latest Round of Identity Theft Roulette. *Computer*, vol. 50, no. 12, pp. 72-76, December 2017.

Biel L., Pettersson O., Philipson L., & Wide P. (1999). ECG analysis: a new approach in human identification. *Proceedings of the 16th IEEE instrumentation and measurement technology conference*, 1999 IMTC/99, vol 1., p. 557–61.

Bonner. L. (2012). Cyber Risk*: How the 2011 Sony Data Breach and the Need for Cyber Risk Insurance Policies Should Direct the Federal Response to Rising Data Breaches*, 40 Wash. U. J. L. & Pol'y257.

Campbell, S. (2007). Perceptions of Mobile Phone Use in Public Settings: A Cross-Cultural Comparison*. Proceedings of the International Journal of Communication,* 1, 738-757).

Carreiras C, Lourenço A, Fred A, Ferreira R. (2014). ECG signals for biometric applications: are we there yet? *ICINCO 2014—Proceedings of the 11th international conference on informatics in control, automation and robotics*, 765–72.

Cleveland Clinic. (2017). How Does the Blood Flow Through Your Heart. Retrieved from: https://my.clevelandclinic.org/health/articles/17060-how-does-the-blood-flow-through-your-heart. Accessed August 2018). Accessed March 2018.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155-159.

Cormick, Craig. (2014). Social research into public attitudes towards new technologies. *Journal für Verbraucherschutz und Lebensmittelsicherheit*, *9*, 39-45.

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, *3*(3), 319-339.

Davis, F. D., Bogozzi, R., P., & Warshaw, P., R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, 35, 982-1003.

Davis, F. D., & Venkatesh, V. (1996). A critical assessment of potential measurement biases in the Technology Acceptance Model: Three experiments. *International Journal of Human-Computer Studies, 45*, 19-45.

Davis, F. D., & Warshaw, P. R. (1992). Extrinsic and Intrinsic Motivation to Use Computers in the Workplace. *Journal of Applied Social Psychology, 22*(14), 1111-1132.

Davison, C. & Hinkley, D. (1997). Bootstrap Methods and Their Application. *Journal of the American Statistical Association*. 94. 10.2307/1271471.

ECG Interpretation: Characteristics of the normal ECG. (2018). (https://ecgwaves.com/ecg-normal-p-wave-qrs-complex-st-segment-t-wave-j-point/. Accessed, April 2018.

Edwards, J. R., & Bagozzi, R. P. (2000). On the nature and direction of relationships between constructs and measures. *Psychological methods*, *5*(2), 160-164.

Efron, B., & Tibshirani, R. J. (1993). An Introduction to the Bootstrap, Chapman Hall: New York.

Fornell, C., & Larcker, D. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research, 18*(1), 39-50.

Forsen , G. E., Nelson, M. R., & Staron, R. J. J. (1977). *Personal attributes authentication techniques*.

Gordan, R., Gwathmey, J. K., & Xie, L. H. (2015). Autonomic and endocrine control of cardiovascular function. *World journal of cardiology*, *7*(4), 204-14.

Haenlein, M., & Kaplan, A. M. (2004). A beginner's guide to partial least squares (PLS) analysis. *Understanding Statistics*, 3, 284-286.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM), Second Edition. Thousand Oaks, CA: Sage.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory & Practice*, *19*(2), 140-147.

Hair, J. F., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the Academy of Marketing Science*, *40*(3), 414-433.

Hair, J. F., Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). Partial Least Squares Structural Equation Modeling (PLS-SEM): An Emerging Tool for Business Research. *European Business Review*, *26*, 106-110.

Hamid, M., Sami, W., & Sidek, M. (2017). Discriminant Validity Assessment: Use of Fornell & Larcker criterion versus HTMT Criterion. *Journal of Physics: Conference Series*.

Hammad, M., & Maher, A., Wang, K., Jiang, F., & Amrani, M. (2018). Detection of Abnormal Heart Conditions Based on Characteristics of ECG Signals. *Measurement*, *125*, 634-644.

Henseler, J., & Sarstedt, M. (2013). Goodness-of-Fit Indices for Partial Least Squares Path Modeling, *Computational Statistics*, *28*(2), 565-580.

Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. *Advances in International Marketing*, *20*, 277–320.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A New Criterion for Assessing Discriminant Validity in Variance-based Structural Equation Modeling, *Journal of the Academy of Marketing Science*, *43*(1), 115-135.

Hwang, C., Chung, T.-L., & Sanders, E. A. (2016). Attitudes and Purchase Intentions for Smart Clothing: Examining U.S. Consumers' Functional, Expressive, and Aesthetic Needs for Solar-Powered Clothing. *Clothing and Textiles Research Journal*, *34*(3), 207–222.

Jung, W-H & Lee, S-G. (2017). ECG Identification Based on Non-Fiducial Feature Extraction Using Window Removal Method. *Applied Sciences*, *7*(11), 1205.

James, G., Witten, D., Hastie, T., & Tibshirani, R. (2017). An Introduction to Statistical Learning (8th ed.). New York, NY. Springer.

Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of e-Collaboration*, *11*, 1-10.

Krasteva, V., Jekova, I., & Schmid, R. (2018). Perspectives of human verification via binary QRS template matching of single-lead and 12-lead electrocardiogram. *PloS one*, *13*(5).

Lai, P C. (2017). The Literature Review Of Technology Adoption Models And Theories For The Novelty Technology. *Journal of Information Systems and Technology Management*, *14*, 21-38.

Lee, W., Kim, S., & Kim, D. (2018). Individual Biometric Identification Using Multi-Cycle Electrocardiographic Waveform Patterns. *Sensors 18*(4), 1005.

Lin, W-Y, Ke, H-L., Chou, W-C., Chang, P-C., & Tsai, T-H., & Lee, M-Y. (2018). Realization and Technology Acceptance Test of a Wearable Cardiac Health Monitoring and Early Warning System with Multi-Channel MCGs and ECG, *Sensors*, *18*, 3538.

Lunney, A., Cunningham, N., & Eastin, M. (2016). Wearable fitness technology: A structural investigation into acceptance and perceived fitness outcomes. *Computers in Human Behavior*, *65*, 114-120.

Mai, V., Khalil, I., & Meli, C. (2011) ECG biometric using multilayer perceptron and radial basis function neural networks. *Conf Proc IEEE Eng Med Biol Soc*., 2745-8.

Minitab. What is partial least squares regression? Retrieved from https://support.minitab.com/en-us/minitab/18/help-and-how-to/modeling-statistics/regression/supporting-topics/partial-least-squares-regression/what-is-partial-least-squares-regression/. Accessed January 2019.

Nasri, B, G., & M, El-Khatib, K. (2009). Using ECG as a measure in biometric identification systems. *Science and technology for humanity (TIC-STH), 2009 IEEE Toronto international conference*, p. 28–33.

Nemirko A. P., & Lugovaya T. S. (2005). Biometric human identification based on electrocardiogram. *Proc. XIIth Russian Conference on Mathematical Methods of Pattern Recognition*, Moscow, MAKS Press, 387-390.

Odinaka, I., Lai, P-H., Kaplan A. D., O'Sullivan, J. A., Sirevaag, E. J., Rohrbaugh, J. W. (2012). ECG biometric recognition: a comparative analysis. *IEEE Trans Inf Forensics Secur*, *7*(6), 1812–24.

Ohtani, K., & Tanizaki, H. (2004). Exact Distributions of R2 and Adjusted R2 in a Linear Regression Model with Multivariate t Error Terms. *Journal of the Japan Statistical Society*, *34*(1), 101-109.

Raines-Eudy, R. (2000) Using Structural Equation Modeling to Test for Differential Reliability and Validity: An Empirical Demonstration, *Structural Equation Modeling: A Multidisciplinary Journal*, *7*(1), 124-14.

Rico, J., & Brewster, S. (2010). Usable Gestures for Mobile Interfaces: Evaluating social acceptability. *Proceedings of the CHI'10* 887 – 896.

Shen, T. W., Tompkins, W. J. & Hu, Y. H. (2002). One-lead ECG for identity verification. *Proc. of the 2nd Joint Conference of the IEEE Engineering in Medicine and Biology Society and the Biomedical Engineering Society*, *1*, pp. 62-63, Accessed March 2019.

Stephens, M., Carver, R., & McCormack, D. (2014). From Data to Decision-Making: Using Simulation and Resampling Methods to Teach Inferential Concepts. *Proceedings of the 9th International Conference on Teaching Statistics*, 1-4.

Tan, R., & Perkowski, M. (2017). Toward Improving Electrocardiogram (ECG) Biometric Verification using Mobile Sensors: A Two-Stage Classifier Approach. *Sensors* (Basel, Switzerland), *17*(2), 410.

Urbach, N., & Ahlemann, F. (2010). Structural Equation Modeling in Information Systems Research Using Partial Least Squares, *Journal of Information Technology Theory and Application (JITTA)*, *11*(2), article 2.

Venkatesh, V., & Davis, F. D. (2000). A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. *Management Science*, *46*(2), 186-204.

Wang, Y., Plataniotis, K. N., & Hatzinakos, D. (2006). Integrating analytic and appearance attributes for human identification from ECG signals. In *Biometrics Symposium: Special Session on Research at the Biometric Consortium Conference* (pp. 1-6). IEEE.

Wong, K. (2013). Partial least square structural equation modeling (PLS-SEM) techniques using SmartPLS. *Marketing Bulletin*, *24*, 1-32.

CONCEPTION OF A HOLISTIC AND LONG-TERM PERFORMANCE MANAGEMENT: FIVE PART DISCIPLINES AS SYSTEMATIZING FRAMEWORK

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ABSTRACT

Many companies practice performance management in the framework of a heterogeneous, grown mix of numerous separate decisions, instruments, processes and systems and not in terms of a strategically and systematically planned management system.

Due to the inefficiency of the above-mentioned performance management style, a holistic and integrated approach is a key factor. Performance management must be able to meet central objectives and requirements and set the groundwork for long-term corporate success.

This article presents a central approach of the conception of holistic and long-term performance management. The five equal part disciplines are illustrated and demonstrate the issue and composition complexity of a performance management due to their characteristics and combination. The objective of this article is to display and communicate the performance management issue and its context through an easily comprehensible system without following a general recipe.

Keywords: holistic, corporate performance, management, project management

INTRODUCTION: THE STARTING SITUATION IN COMPANIES

Companies operate their individual performance management through a variety of management concepts, separate instruments, tools, processes and systems. Oftentimes, the mix of applied instruments is not strategically or systematically planned but have grown historically out of many separate decisions within the different departments.

For example, the company uses a balanced scorecard for its strategy implementation regarding production, “Continual Improvement Processes” (CIP) are developed and optimized. Administration and sales processes are documented via the method of event-oriented process chains (EPC). Another example would be that in the area of finance and controlling, the company uses different Business Intelligence (BI) systems for its planning and reporting purpose, however the sales department has established its own consolidation solution on another technology basis.

These examples clearly show that due to historic separate decisions, a professional, methodical, organizational and technological integration is difficult for companies. Interfaces, coordination and validation efforts are huge. In management reporting, if there is an integrated one at all, a hodgepodge of data and information from entirely different systems with different professional and methodical background appears to be without any objective or strategic relation. This leads to delayed management decisions because a variety of queries and clarifications are necessary until the required transparency for the decision is achieved. Alternatively, there is the risk of

making the wrong decisions or informing the management about critical circumstances and facts too late due to this information basis.

Jetter (2004) stated that in general, a consistent master plan, that unites the different methods and instruments as a harmonic and optimized whole, is missing. Oftentimes, separate and isolated operating components of performance management might be established but the objective is to connect these components in a way that each information can be used towards the management of diverse performance areas as well as for a useful overall corporate control throughout all company levels.

REQUIREMENTS OF A HOLISTIC PERFORMANCE MANAGEMENT

Much academic work, many essays and lectures of managers at conferences start with discussing the challenges arising from the increasing complexity, dynamics and volatility of economic events. As a result, the changes in the market and competitive environment are the focal point. Analyzing the facts and its deriving consequences is certainly interesting and worth further regard.

In this article, what consequences these challenges have on internal performance management will be discussed. In summary, internal performance management has to adapt to market changes. A separate conception, e.g. targeted towards separate company functionalities or processes, appears to be unreasonable due to the increase of interdependencies between other functionalities and business units and beyond. Using instruments separately holds the danger of everyone optimizing their sub-area or sub-process but doesn't automatically secure the success of the overall process. Roth and Behme (1997) stated that in extreme cases this can even lead to a suboptimum on the entire company level.

Just like integration and end-to-end process thinking predominates on process level, an integration as well as harmonization should also occur on management level. Oftentimes this is not the case in the existing corporate praxis. A department or silo thinking in isolated applications dominates. Often similar functionalities, such as finance and controlling, encounter difficulties to work on a consistent controlling concept or to utilize consistent controlling concepts and tools. This takes place despite the many advantages, such as that many interfaces and validation steps would become no longer necessary if a consistent master data management existed. Controlling processes could be organized more efficiently. While efficiency is top priority in product development processes, this clear prioritization in the conception of controlling processes is not always the case. Departments which are responsible for the management process build in media breaks in their own controlling process. This is where, as a last step, management reporting utilizes tools such as Excel or PowerPoint. Data is sometimes kept redundant in order to adapt numbers. Also, many management meetings are exclusively carried out via PowerPoint.

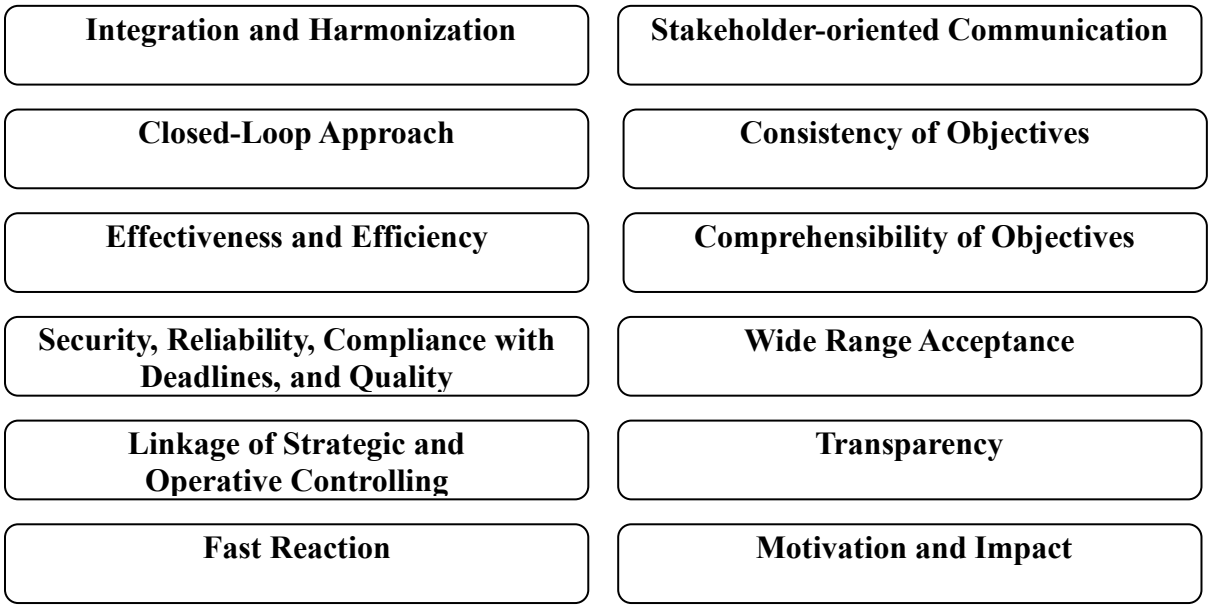
This results in consequences of the speed in which conclusions are made from operative processes and data. Unnecessary coordination and validation steps as well as manual adaptations of numbers require valuable reaction time, especially because the fast reaction to market changes is regarded as a critical success factor. Furthermore, interfaces, manual process steps and employ-

ees' room for interpretation imply risks for the security, reliability, compliance with deadlines and quality of information.

Until now, the controlling process has only been regarded bottom-up. However, a top-down view is crucial for target-oriented performance management. Orientation effectiveness regarding separate operative activities can only be ensured if a controlling process is established and oriented towards company objectives and strategies. Therefore, a linkage of strategic and target-oriented company management with an operative, process-driven controlling system is necessary. Concepts, objectives and strategies that have been generated through market observation or innovative ideas as part of the strategy development process for example, can only unfold their effect when the strategy implementation process runs successfully. Therefore, a consistent controlling concept is indispensable, making the performance requirements of all company levels transparent. However, transparency alone is insufficient. Via stakeholder-oriented communication, the comprehensibility of objectives for all employees needs to be ensured. For this, it is important to pay attention to the consistency of objectives. Oftentimes, inconsistencies between vertical and horizontal controlling (beyond different areas) are noticed. Conflicts of objectives between line, project and process management need to be avoided because they reduce or endanger the acceptancy of the objectives on operative management level and of the employees.

Only if the acceptance of performance requirements has been established in the wide range of the company, can one assume that performance management is established throughout the company. When all members of the organization provide their potential and energy for the overall objective, the company's success should be ensured long-term. The figure below displays the requirements of a holistic performance management.

Figure 1. Overview of the Requirements of a Holistic Performance Management



APPROACH TOWARDS A SYSTEMIZING FRAMEWORK

Meeting all requirements might be experienced as an unreachable ideal state or even magic. Certainly, both are not the case. After the long-term study by Joyce, Nohria, and Robertson (2003) the "4+2 Formula" has proven to be a successful approach in order to achieve sustainable company development. Strategy development, strategy implementation, culture optimization and structure optimization are called out to be compulsory relevant management processes. Talent, improvisation, and management optimization as well as fusions and cooperation are regarded as partially optional. Depending on the situation, two of the just mentioned areas need to be taken into account in the overall controlling concept. In order to be successful in the long run, companies should integrate a mix of these six different areas into holistic performance management.

By bringing these insights of the 4+2 Formula together with the objectives and requirements derived from the areas of issues mentioned before, an overall logic can be developed as a performance management approach. This logic tries to regard the complex issue of performance management from different perspectives, which will be covered as part disciplines.

In total, this approach differs in five central part disciplines, which are outlined and explained in the following.

First Part Discipline: Management of Companies and Business Units

Performance management regards managing the company as a whole (in its totality) as well as in its part areas (business units) to control its organizational units on different aggregation levels. This part discipline is called management of companies, respectively business units.

Second Part Discipline: Management of Processes

The value adding of a company from process perspective and controlling in terms of performance management is just as important and interesting. This part discipline breaks through and adds on the organizational view and affects the process level. It is called management of processes.

Third Part Discipline: Management of Projects

Projects have an increasing share on the value adding of companies. Most of the time, projects are drivers for innovation and advancement within and of companies. Additionally they follow an entirely different hierarchical logic, due to mostly bypassing established principles and responsibilities in the operational and organizational structure. This part discipline of performance management applies to project, program and portfolio management and is called management of projects.

Fourth Part Discipline: Management of Employees

Another, very important success factor for a performance management is the actual initiators of value adding - the employees. They are crucial for the company's success due to their willing-

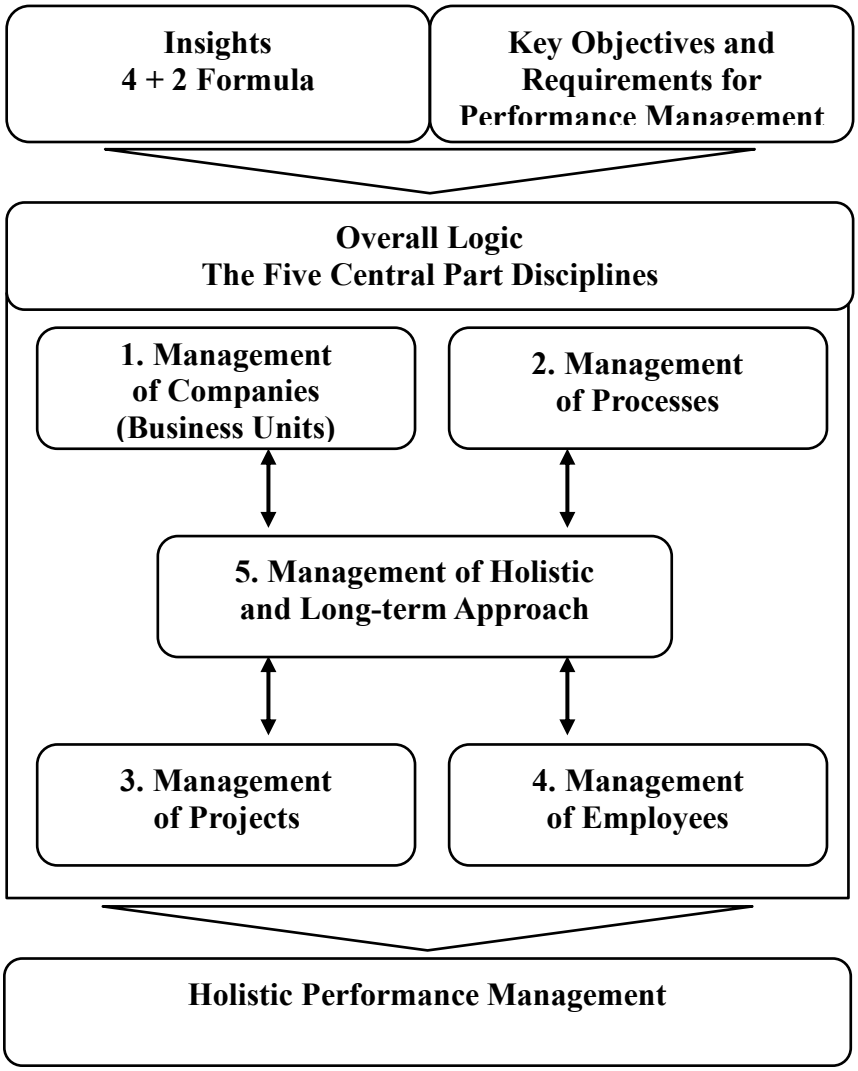
ness to introduce their experience and productivity. This part discipline involves the management of employees.

Fifth Part Discipline: Management of Holistic and Long-term Approach

Content wise the four above described part disciplines would cover all perspectives of performance management. However, one crucial aspect of performance management is missing: Integrating the perspectives into one holistic view. A performance management should be built long-term and be sustainable to unfold its effect. That is why the fifth part discipline is called management of holistic and long-term approach. This part discipline has a special status which will be covered next.

The overall logic in the figure below visualizes the approach towards a holistic and long-term performance management consisting of five-part disciplines.

Figure 2. Overall Logic for a Holistic and Long-term Performance Management



Demand and intention of this overall compilation is not to design a solely and generally valid concept for holistic performance management. Moreover, this approach displays how the complexity of issues and organization of performance management can be put together and can derive from different part disciplines. There is no preference of one or another discipline but an equal consideration of all part disciplines in terms of a holistic performance management explanation and design approach.

The objective is to easily communicate the overall issue in all its perspectives, connections and hierarchies within the company and beyond. A generally valid recipe doesn't exist in order to solve all issues within performance management. Roth (2013) stated that within this approach, groundwork for a company individual, company-wide set-up of a holistic performance management can be established. In the following, the single areas of activities and toolset of the separate part disciplines are presented, and the logical structure is explained overall.

PART DISCIPLINES OF A HOLISTIC AND LONG-TERM PERFORMANCE MANAGEMENT

First Part Discipline: Management of Companies and Business Units

Oftentimes, the steering of companies or business units is also called Corporate Performance Management (CPM). One may find many definitions for CPM in literature. In this article, it involves the provision of data, methods and tools to holistically support the management processes planning, steering and controlling. Business Intelligence (BI) supports these tasks. The term business intelligence also has a wide range of interpretations. Some authors like Chamoni and Gluchowski (2010) have a rather narrow understanding by focusing on analyses of BI only, others like Baars and Kemper (2008) also link the processes of data acquisition, data processing, and data management. Within this publication, BI implies the structured way of collecting and analyzing internal and external company data with the objective of generating crucial steering information to support the management and management decisions at best.

The main task of this part discipline is to significantly support the process of developing, implementing and steering strategies. The basis for the strategy development is to collect, interpret, and crucially prepare relevant market and competitor information in a target-oriented and reliable way to be able to make the strategic gap or direction of the management transparent and arguable. Crucial to a successful implementation of a strategy is mainly that the objectives appear motivating and that precise actions can be derived.

The linkage of operational and strategic management steering creates an entrepreneurial objective for performance management, which makes the contribution of business units (such as divisions, functions, departments, teams, and so on) as well as actions taken, transparent. In order to support the targeting orientation and operational measurements, key indicator systems are often used. They need to be designed in a way to meet the demands of different levels and addressees and they need to be reconciled within an overall picture, to consistently contribute to performance management. To foster the acceptance and the focus on performance of everybody involved, key figures need to be comprehensible and capable of being directly influenced.

Business intelligence solutions are supposed to provide a meaningful and efficient support of these management tasks. The BI market is a market that has strongly grown for many years, as Business Intelligence applies to more and more areas within companies. BI trends with buzzwords such as Big Data, Predictive Analysis, Software as a Service (SaaS), Self-service-BI etc., intensify the demand of companies. For many of them it is getting increasingly challenging to build an integrated architecture for corporate performance management out of the many decentral and historically grown BI island solutions. Only if the functional, methodical and technical linkage of these "data-silos" is successful, can a significant contribution to the holistic performance management approach be achieved.

With a BI strategy, conditions are set to effectively establish a useful BI within an organization. It is advisable to focus technologically on one reference architecture or platform, particularly to make the running effort cost-effective.

Having defined the strategic direction of Business Intelligence, it is time to functionally, methodically and technical-efficiently organize the implementation of BI within the company. One has to define, where which BI competence should be established from an organizational point of view and how the interaction of these BI competencies throughout the entire lifecycle (project, run, etc.) takes place. Its objective is to increase the efficiency with BI and to enlarge the benefit of using BI for business departments, controlling, research and development, operation, and management.

Oehler (2006) stated that for performance management, planning is of particular significance, because planning sets up the general objectives and the conditions for measuring the achievement of the objectives. Since planning had to adjust a lot to the dynamics and volatility of the markets during the past years, it is of importance that the planning processes and systems are on the one hand very flexible and on the other hand highly functionally and technically integrated. Through a consistent and integrated planning process, essential conditions for performance management become formed.

Second Part Discipline: Management of Processes

In addition to the perspective focus on organizational units, the second discipline centers on the management of processes.

BPM targets a process-oriented organization of a company and contains the design, documentation and improvement of processes with regard to effectiveness and efficiency. The value adding for the customer is to be optimized. With the increase of effectiveness and efficiency of the processes, the increase of quality of the products and services, the reduction of delivery times, and the lowering of costs, higher customer satisfaction can be achieved in the end as well as corporate performance enhancement.

Due to the dynamics of the markets, successful companies increasingly concentrate on consistent processes, since they are the basis for a higher agility. Consistent processes also support strategy implementation since they increase the transparency for all parties involved. Only if processes get clear and palpable are they comparable to each other. They can be discussed (everybody has

the same picture and speaks the same language) and they can be standardized. Preconditions are obviously a homogeneous notation, process modelling and process management rules.

The advantage of processes are that they give early indications of the achievement of the objectives. That is why they are of high interest for performance management. Through a process-oriented performance management the information gap between the strategic and operational level is compensated for and the time gap between a business transaction and possible required countermeasure is shortened. Especially in times of volatile markets, when time slots for reactions shorten, up-to-date and real-time information is essential to make business decisions. Companies which recognize process bottlenecks early and react very quickly to market changes do have competitive advantages.

Through an ongoing Business Activity Monitoring (BAM), it is not only possible to optimize business chances, but also to improve the business model itself continuously and in a target-oriented way. To increase the performance of the organization, a closed-loop-model should be built up by continuously monitoring and controlling the process activity. With a Key Performance Indicator (KPI) based continuous improvement process optimization potentials can be uncovered and realized (Hoffmann 2002). This transparency generates the informational basis to weigh whether outsourcing of a whole process or parts of the process may be of advantage.

Third Part Discipline: Management of Projects

Projects, in a simplified way the temporary collaboration of different experts to achieve a common objective, become more and more important. Back in the days projects were more or less an exception, however, today they are a standardized organizational instrument for adding value, company advancement (organizational development, IT development, method development, etc.) or innovation (process, product development, etc.). Companies want to use this special condition to increase their performance internally because people with different professional backgrounds can work together on one interdisciplinary task.

Unfortunately, many projects do not reach their targets. The Standish Group stated in the Chaos Study (2013), that almost 70% of IT projects aren't reaching their targets. Twenty percent of them fail or are cancelled whereas 50% miss the objectives (time, quality [result concerning content], costs).

With a structured project, program and portfolio management companies try to generate successful projects that can be reproduced in order to improve the potentials of increasing performance.

On project level, the application of suitable steering methods is meant to ensure operative excellence (projects reach the desired results in time and quality within the predefined means).

On program level the focus lies on the overview of the project landscape including interfaces and dependencies as well as the steering capability of the program besides considering operative excellence.

On portfolio level the circle towards strategic management is completed. The value added of projects and programs of the company strategy is made transparent. The project application process and project prioritization (cost/benefit inspection) is especially important because a relation to the company objectives is established and through resource allocation a course setting for the future company direction is undertaken.

Next to a variety of challenges in project, program, and portfolio management, the following critical success factors have been emphasized for an effective and efficient performance management: updating of the business case throughout the entire project period, dealing with changes in the passage of time, the human factor and its need for communication, creation of PM communities with the objective of sharing best practices and documentation of knowledge building (Lehner 2009).

Fourth Part Discipline: Management of Employees

An important, oftentimes neglected discipline in terms of performance management regards employee management. The significance of human capital is reflected in motivation, guidance, and development of the company's top performers. The productivity of the company depends substantially on the employees' willingness to perform. Bruch and Vogel (2009) stated that only because of the commitment of the employees does a company have the power and energy to move target-oriented and be successful long-term. This circumstance within performance management is oftentimes forgotten despite the fact that it is obvious that humans are not machines that can perform independently from their environment and situation.

Motivation and guidance of employees are key factors. A high willingness to perform is achievable when the personal interests of the employees are regarded and cherishing guidance is lived. Top performers expect on the one hand to have freedom in their task fulfillment and be supported in their individual performance and on the other hand to encounter secure and stable general conditions.

Especially in times of change this becomes evident when performance management is introduced that mixes up accustomed processes and structures. These changes can generate fear and frustration of employees and destroy valuable energy. This energy could be used in terms of performance management in an optimum case. At this point instinctive feeling in a form of change management is demanded.

The challenge of performance management is to steer change processes proactively.

Fifth Part Discipline: Management of Holistic and Long-term Approach

As mentioned before, the separate management methods are only part disciplines of a performance management. Only the interaction of these part disciplines in one integrated management system, which has to ensure a continuous operationalization of the strategy, can unfold its effect.

This is why the part discipline management of holistic and long-term approach offers the possibility to unite the different views. Now the task is to compose the part disciplines into one company-individual integrated management concept by establishing it sustainably.

For a holistic performance management, a professional, methodical, technical as well as procedural integration of methods and instruments is needed. Only in this way can the entire management process be supported by strategy development, planning, agreement to objectives, steering, decision finding and implementation.

It is important to link the entire steering and controlling process, from establishing objectives and strategies to breaking down operative entities, processes, programs or projects with bottom-up driven processes such as the continuous improvement and corresponding data collecting and data refinement. Ideally, a company collects market development data, competitor and client data continuously, for example by monitoring social media and other platforms. The data has to be analyzed and interpreted promptly regarding relevancy and objective relation as well as preparation for management on the right levels for the right addressees in order to matter for decision making processes. When the management decision has been made, the measurement implementation process needs to be supported by adequate monitoring (Gladen 2011).

Roth (2012) determined that a management cockpit helps to develop a holistic steering understanding on all levels by creating transparency and therefore makes a significant contribution as a centralized communication, collaboration and monitoring platform for holistic performance management. Next to integration, the continuous improvement process should be initiated sustainably in terms of long-term management.

In order to be successful long-term, it is important to document competitive knowledge about clients, products and processes that are crucial to success and make it available to the relevant employees. A structured knowledge management supports increasing the productivity of companies long-term (North 2011).

A long-term-oriented performance management requires active management of valuing employees and calls for responsible actions by companies overall. The principles of sustainability can be well transmitted to performance management in order to have a long-term performance management effect.

CONCLUSION

In this article it is clearly indicated that there is no single overall management method and no overall comprehension of performance management. Moreover, the interaction of all management disciplines that are crucial to success in terms of an integrative management system is important where all actors and parties involved pull the same strings even though they have a different focus and view. However, it is critical to success, that a company-individual adaptation including a holistic background of experience is planned, composed and interlinked.

This way, management cockpits make a significant contribution by generating a transparency and communication platform for a holistic performance management as integration level, even

when the general, professional, methodical, procedural and technical integration has not been completed or reached.

REFERENCES

Baars, H. & Kemper, H. (2008). *Business Intelligence.* Wiesbaden: Vieweg.

Bruch, H. & Vogel, B. (2009). *Organisationale Energie*. Wiesbaden: Gabler.

Chamoni, P. & Gluchowski, P. (Ed.) (2010). *Analytische Informationssysteme – Business Intelligence-Technologien und Anwendungen*. Berlin: Springer.

Chaos Study. (2013). *Standish Group*. Retrieved from http://www.gobookee.org/standish-group-chaos-report-2013/

Gladen, W. (2011). *Performance Measurement. Controlling mit Kennzahlen*. Wiesbaden: Gabler.

Hoffmann, O. (2002). *Performance Management.* Bern: Haupt-Verlag

Jetter, W. (2004). *Performance Management.* Stuttgart: Schaeffer-Poeschel.

Joyce, W., Nohria, N. & Roberson, B. (2003). What really works. *Harvard Business Review* (pp. 43-52).

Lehner, F. (2009). *Wissensmanagement. Grundlagen, Methoden und techn. Unterstützung.* Munich: Carl-Hanser-Verlag

North, K. (2011). *Wissensorientierte Unternehmensführung: Wertschöpfung durch Wissen,* Wiesbaden: Gabler

Oehler, K. (2006). *Corporate Performance Management mit Business Intelligence Werkzeugen.* Munich: Hanser.

Roth, A. & Behme, W. (1997). *Organisation und Steuerung von dezentralen Unternehmenseinheiten.* Wiesbaden: Gabler.

Roth, A. (2012). *Unternehmenssteuerung und-reporting mit Management-Cockpits.* In A. Klein, *Reporting and Business Intelligence* (pp. 92 – 104). Munich: Haufe-Lexware.

Roth, A. (2013). *Ganzheitliches Performance Management*. Munich: Haufe.

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THE IMPACT OF SOCIAL MEDIA ON NAME RECOGNITION IN THE 2020 DEMOCRATIC PRIMARIES

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ABSTRACT

This study explores the impact of social media (Facebook and Twitter) on the name recognition of political candidates, using the 2020 Democratic primaries in the U.S. as a case study. The main objectives of this study were to: (1) identify the way(s) Americans use social media to engage in politics; (2) determine how users see political posts on social media; (3) test users' digital literacy by asking if they knew why they saw these posts; and (4) explore whether these social media posts have any impact on a user's opinion of a political candidate. A national survey was conducted using mixed-mode IVR/online methodology to ask American social media users questions about the four Democratic candidates who were polling highest at the time of the survey (March 2019). The findings indicate a relationship between social media posts about a political candidate and that candidate's level of name recognition. The results of this study provide useful contributions to the emerging field of digital literacy research. Particularly, this study offers insight into Americans' confidence levels in identifying political posts from political advertisements and their knowledge about how and why they see political posts in their social media feeds.

Keywords: digital literacy, social media algorithms, election campaigns, social media advertising

INTRODUCTION

Research has shown that while Americans are increasingly using social media platforms like Facebook and Twitter to engage in political issues and election campaigns, the majority of Americans still do not use social media for these purposes. However, with the growing sophistication of algorithms and micro-targeted advertising, even social media users who do not follow politics on social media may see political campaign posts and advertising in their news feeds. This paper explores who is seeing political posts on social media and what, if any, impacts these posts have on their opinions. It uses the upcoming 2020 Democratic primaries as a case study to determine which social media users are seeing posts and ads from candidates in their social media feeds, and the impact this has on the candidate's name recognition and favorability. It builds off of and compares findings from the Pew Research Center's 2016 study entitled "The Political Environment on Social Media" and explores the implications these findings have for political campaigns, digital literacy, and democracy.

LITERATURE REVIEW

Social media permeates the lives of Americans — according to the Pew Research Center (2018a), approximately 69% of Americans have at least one social media profile. This literature review will explore how the connection between social media and politics has been studied in the past, as well

as some of the risks and threats that have emerged as the result of social media's largely unregulated existence.

Social Media and Politics

With the ability for users to generate content freely, social media platforms are home to a wide range of topics and discussions, from popular media to breaking news to political debates. In 2016, the Pew Research Center conducted a key study, "The Political Environment on Social Media," to explore how Americans were engaging in politics on social media platforms. Two types of engagement emerged: active engagement, where users are participating via comments, posts, and discussions, and passive engagement, where users are simply following other accounts that are actively engaged. As social media platforms have grown, additional features have been added that complicate this engagement, such as algorithms and advertising that push content onto users' feeds regardless of whether or not they chose to follow that content.

Though the majority of survey respondents encountered political posts on social media platforms, Pew's study found that nearly seven-in-ten participants indicated that they hardly ever (30%) or never (38%) used platforms like Facebook and Twitter to engage in politics. Nearly twice as many social media users said that they were "worn out" by the amount of political content they see in their feeds (37%) as the number that said they like seeing lots of political information on social media (20%). These findings raise questions about whether social media users see political content in their feeds even if they do not want to, and what, if any, impact this has on a user's feelings about political issues or candidates. The Pew study did find that one-in-five participants had changed their minds about a political candidate or a social issue because of material they encountered on social media, and a slight majority (54%) felt that social media could help people learn what political candidates are like very or somewhat well. About a quarter of social media users said that they followed political figures online.

Social media has become an appealing and easily accessible resource for researchers on a variety of topics, as it offers a "real-time, readily available data source with which to introspect the behavior of society at large" (Huberty, 2013, p. 1). Particularly in politics, social media platforms like Twitter have become a popular medium for forecasting offline political behavior using visible online behavior. As an information-push medium, Huberty argues, tweets promise an unvarnished, unstructured look into individuals' political attitudes. However, social media as a research source is still a relatively new area of study, and while open social media platforms like Twitter offer researchers an appealing opportunity to easily collect data from a large sample size, the representativeness of these types of platforms remains in question.

In a study conducted by Huberty (2013) on multi-cycle forecasting of Congressional elections on Twitter, the findings showed that Twitter sentiment might correlate with political polling, but still offered weak predictive power for actual election outcomes. One reason for this is the demographic differences between the Twitter user base and the American voter population. Pew's research found that while 88% of 18-29 year-olds use some form of social media, that share falls to 78% among those aged 30-49, 64% for ages 50-64, and only 37% for Americans 65 and older (Pew Research Center, 2018a). As indicated in Pew's findings above, even the majority of Americans that are on social media do not use the platforms to engage in politics. Therefore, while social

media is still home to robust political discussions and sentiment, the audience is not necessarily representative of the entire voting population.

Social Media Advertising and Algorithms

Despite the representation issues, the affordability of social media and the vast amounts of personal data these platforms collect has given social media an important role in the circulation of ideas about public policy and politics. Before studying the use of social media in political discussion, it is important to understand what social media is and how it works. Wooley and Howard (2016) identify three key components of social media. First is the information infrastructure, which refers to platforms like Facebook, Twitter, and Instagram that are used to produce and distribute content. Second is the content itself, which takes the digital form of personal messages, news and ideas that become cultural products. The third is the people, organizations and industries that produce and consume these platforms and content. It is the existence of these three components together that makes social media the powerful tool that it is today.

According to the definition above, social media platforms would not be successful if people didn't engage with the content on them. Even though social media platforms are free for the end-user, it is this engagement that allows social media companies like Facebook to profit. "Engaging," in the context of social media, means interacting with content – whether through views, likes, comments, sharing, or saving posts. Kim (2017) writes that the longer a user stays engaged, the more exposure advertisements receive, and thus the more revenue the social media companies generate. Therefore, to make money, social media companies need to understand what a user wants to see on their platform. They do this by using algorithms to comb through the enormous amounts of data generated through social media users' actions and identify what will be of interest to the end-user. On social media platforms like Twitter and Facebook, content and featured posts that appear in users' feeds are run by dedicated algorithms that are either tailored to a user's past digital behavior (likes, comments, post engagement) or to an advertiser's needs, who pay large sums of money to be featured (Unver, 2017).

The power of algorithms and advertising on social media, Unver (2017) argues, puts technology companies at the center of political information-seeking and agenda-setting, two fundamental processes of democracy. Thanks to algorithms, political messaging that users "like" and engage with, including political figures they support, leads to the appearance of similar figures and messages online. Unver writes that this then leads to self-generated and algorithmically supported "filter bubbles." Since social media users are so bombarded with information overload, they often rely on heuristics, sharing what like-minded friends share without paying too much attention to the source of the content or the intentions behind it. These filter bubbles can lead to certain risks that are outlined in the next section of this literature review.

With respect to how social media users feel about their data being used, a Pew Research Center study (2018b) found that across age groups, social media users were comfortable with their data being used for some purposes, like recommending events or shopping deals, but were wary of it being used for political messaging. A substantial majority of users felt that it was not acceptable for social media platforms to use their data to deliver messages from political campaigns, with 31% saying this was not acceptable at all. Despite this, political candidates widely make use of

social media platforms and their advertising capabilities, which allows them to target their advertising to potential voters. According to a congressional hearing of Facebook, presidential candidates Donald Trump and Hillary Clinton spent a total of $81 million on Facebook advertising alone leading up to the 2016 election (Wagner, 2017).

Broockman and Green (2014) argue that social media offers an ideal venue for political advertising because it is a cost-effective persuasion tactic, given the ads' very low price and the ability to target by demographics. The demographic characteristics available on websites like Facebook are also present in voter files, campaign finance reports, and many other publicly available registers of individuals, forming a bridge between the targeting of online advertising and public lists. As the use of social media advertising increases in political campaigns, so too do the risks that are associated with it.

Risks

The impact of this use of social media on offline political engagement and action is still debated. A literature review conducted by Shah et al. in 2007 highlighted the two different arguments that have existed since the birth of the Internet. On one side, there is research that suggests that information uses of the Internet can encourage community involvement and participation at levels that rival traditional newspapers and media, while the other side contends that traditional mass media still plays a much more important role in democratic citizenship. These arguments relate back to the demographic statistics mentioned above. While social media is becoming increasingly popular amongst all age groups, older demographics are less likely to be on the platforms, and those that are using the platforms do not necessarily do so to engage in politics. In that sense, traditional media and the face-to-face connection remains an important part of America's political landscape.

Still, the increased use of social media by candidates and voters alike has highlighted the potential risks of using these unregulated platforms to engage in politics. Shah et al. found in their research that social media users tended to craft an "information environment" (referred to as "filter bubbles" by Unver, 2017) on the Internet that reflected their own political predispositions. As early as 2007, these authors were cautioning that this could potentially lead to less political tolerance and ultimately increased polarization – issues that gained the attention of the public during the 2016 U.S. Presidential election campaign.

Since 2016, the risks of social media and its algorithms and advertising have been widely publicized with news stories about Russian interference in the 2016 presidential election campaign and the significant data breach by Cambridge Analytica, who used Facebook data to target campaign ads. A term that has become popularized as a result of these events is "fake news." Like Shah (2007) and Unver (2017), Alcott and Gentzkow (2017) argue that the growth of online news in the early 2000s created an excess diversity of viewpoints that made it easier for like-minded citizens to form "echo chambers" where they would be insulated from contrary perspectives. Now, the authors write, the focus of concern has shifted to social media, where content can be relayed among users with no significant third-party filtering, fact-checking, or editorial judgment. This method of content-sharing leads to the creation and dissemination of what is now known as "fake news."

"Fake news" has become so common that the World Economic Forum recently identified the rapid spread of misinformation online as among the top ten perils to society (Howard et al. 2017). Specifically, on social media, the spread of fake news is aided by something called "bots." Howard et al. define bots as pieces of software that perform simple, repetitive tasks. These tasks can be legitimate, like delivering news and information, or malicious, like spamming, harassment, and hate speech. Bots on social media can rapidly deploy messages, replicate themselves, and pass as human users. Howard et al. studied the use of fake political posts and bots during the 2016 election campaign, finding that U.S. Twitter users shared conspiracy or fake content the same amount (20%) as they shared professional news. Notably, they also found that the number of links to Russian news stories, unverified links to WikiLeaks pages, or junk news was greater than the number of links to professional researched and published news. Many of the swing states getting highly concentrated doses of polarizing content were also among those with a large number of votes in the Electoral College, suggesting that bots specifically targeted them to influence election results.

An exploration of bots on social media shows that they run rampant on platforms like Twitter. Wooley and Howard (2016) found that bots makeup nearly 50% of all online traffic and account for a significant portion of active users on the most popular social media platforms. On Twitter, for instance, approximately 30 million active accounts are bot-driven, mimicking human users and producing copious amounts of information onto the platforms. These authors argue that the pervasive use of these human-software hybrids, and the obscure and often discriminatory nature of the algorithms behind them, threaten to undermine the political potential of social media systems. However, Wooley and Howard (2016) note, for bots to be successful, they must have a significant amount of social, temporal, and monetary capital behind them. Research has shown that monetizing engagement – such as likes, comments and retweets – tends to be most successful with emotionally-charged, extreme content. Trolls leverage this by producing such content, whether or not it has merit or facts behind it. What bots do, Unver (2017) writes, is increase troll effects exponentially, bombarding users with larger volumes of fake or manipulated content. As this is still a relatively new risk to the field of social media study, more research is needed to determine the influence of bots and how they can be prevented.

Digital Literacy

The growing use of social media to engage in political discussions and for politicians to use as a campaign platform showcases the increasing need for digital media literacy. Koltay (2011) defines media literacy as "the ability to access the media, to understand and to critically evaluate different aspects of the media and media content and to create communications in a variety of contexts" (p. 213). The study of media literacy emerged decades ago with the rise of print and televised advertising, and much of the literature, including that definition, is from the late 1990s. Media literacy education has made its way into the schools but primarily targets children and youth. The rise of fake news and false advertising, as discussed in the previous section of this literature review, has ignited a growing demand for better digital literacy in both children and adults alike. Digital literacy is defined by Cornell University (2015) as the ability to find, evaluate, utilize, share, and create content using information technologies and the Internet. These technologies include but are not limited to social media platforms such as Facebook and Twitter.

The proliferation of fake news, data breaches, and election interference online highlights the importance of understanding the state of digital literacy in America and the impact that social media features like algorithms and advertising may be inadvertently or intentionally having on potential voters. This study contributes to the field of digital literacy research by exploring the use of political posts and advertisements about political candidates, how social media users see this content, and whether or not social media users recognize where the content they're seeing is coming from. This study builds off of Pew's "The Political Environment on Social Media" report to determine whether more people are now using social media to engage in politics, and how many people are following political candidates on these platforms.

In terms of digital literacy research, this is a relatively new field, and ways to study it effectively are still being explored. The use of online surveys is becoming increasingly popular in survey research due to its low cost and ease of use for researchers, but Chang and Vowles (2013) argue that online surveying, as with many other methods, has the disadvantage of selection/sampling bias. Since frequent Internet users are likely very different than infrequent or non-users, some potential respondents might not be reachable via the Internet. Therefore, they write, online surveys are typically more appropriate for experienced Internet users and tend to capture younger populations. On the other hand, traditional Interactive Voice Recognition (IVR) survey methods tend to capture older populations, as IVR callers are only able to reach landlines. An imperfect solution to this dilemma has emerged: mixed-mode research that uses a combination of IVR and online surveys to reach a broader population. This survey uses this mixed-mode methodology, and the outcomes of reaching different age groups are discussed below. Based on the findings outlined in this literature review, three research questions were designed for this study.

RESEARCH QUESTIONS

RQ1: Do Facebook and Twitter users who do not use these platforms to engage in politics still see political content on their social media feeds?

RQ2: Are social media users who use Facebook and Twitter to engage in politics more likely to be able to recognize the source of the political content they are seeing?

RQ3: Does seeing political content on Facebook and Twitter about specific candidates have any effect on the candidate's name recognition?

METHODOLOGY

This research was conducted through a national survey using a mixed-mode methodology via Interactive Voice Recognition and Amazon Turk. The survey was designed for participants who use at least one of the two most common social media platforms: Facebook and Twitter. These two platforms were selected based on Pew's 2016 study, which found that an identical share of Facebook users and Twitter users reported that they frequently encountered political posts and engaged in political discussions among the people in their networks.

The survey was distributed to a national audience through Emerson Polling and was analyzed using SPSS software. The survey instrument was broken up into three sections. The first asked questions about political engagement and social media use, building off of the Pew Research Center's 2016

survey. The definition of political engagement used in this survey was intentionally kept open to be inclusive. The second section asked questions about Democratic candidates and whether survey respondents saw posts about them on social media, and the third section contained a series of demographic questions. The Democratic candidates were selected based on the four candidates polling the highest at the time of the study, March 15-17, 2019, using the aggregate polling site RealClearPolitics.

The total sample size of this poll was 470 participants, with a margin of error of 4.5%. The full sample was weighted by age, gender, and education to make it more representative of the U.S. population, with parameters created using the 2017 American Community 5-Year Survey. The mode was also weighted to have 50% IVR respondents and 50% online. To target social media users, the survey included a screening question that determined that 63% of participants were active on Facebook and/or Twitter, and 37% were not. The majority of the analysis was conducted using the sub-sample of social media users, which consisted of 297 participants with a margin of error of 5.7%.

When comparing age to the screening question, the statistically significant results $\chi 2$ (3, N = 470) = 122.675 p = .000. showed that almost 70% of those who did not use Facebook and Twitter were aged 55 years or older. The sub-sample of this survey, therefore, skewed towards a younger demographic, and also had more female participants than males. The demographic makeup of the full sample and the sub-sample of social media users is below.

Table 1: Demographic Makeup of Samples

Demographic	**Weighted Sample**	**Weighted Sub-Sample**
Gender		
Male	49%	43%
Female	51%	57%
Party		
Democrat	33%	36%
Republican	36%	32%
Independent	28%	29%
Unregistered / Unable to vote	3%	3%
Race / Ethnicity		
Hispanic / Latino	13%	10%

White	72%	76%
Black	5%	6%
Asian	4%	5%
Other / Multiple Races	5%	3%
Age		
18 - 34	30%	39%
35 - 54	33%	43%
55 - 74	29%	16%
75+	8%	2%
Education		
High school or less	39%	33%
Some college	29%	30%
College graduate	20%	26%
Postgraduate	12%	11%

ANALYSIS

In addition to the three research questions posed for this study, the results of this survey offer interesting insights into the political engagement of Americans. Of the 37% of participants who did not use Facebook or Twitter and were therefore screened out of the main analysis, a vast majority appeared to be politically engaged. 93% voted in the last presidential election, and 88% are at least somewhat likely to vote in 2020. Of the sub-sample of those who did use social media, a smaller majority (80%) voted in the 2016 election, but the same percentage (88%) are planning on voting in 2020. As 39% of the sub-sample were aged 18-34, it is possible that some participants were not eligible to vote in 2016.

Looking at the social media users in the sub-sample, it appears that there is an increase in political engagement on social media compared to Pew's research study in 2016.

Table 2. How often do you use [Facebook or Twitter] to engage in politics or political discussions?

Often	72 (25%)
Occasionally	86 (29%)
Rarely	83 (28%)
Never	48 (16%)
Not sure	6 (2%)

This study found that more than half (54%) of social media users used Facebook or Twitter to engage in politics at least occasionally. In 2016, Pew found that 30% of social media users rarely used social media to 'comment, discuss, or post about politics or government'; these results show a similar number of 28% who rarely use social media to engage in politics. However, compared to Pew's 38% of participants who said they never used social media to engage, this study found only 16% who never did. Therefore, it does appear that using social media to engage in politics is becoming increasingly popular.

Pew's study also found that about 1 in 4 participants followed a political candidate online. In this study, an average of 17% of participants followed at least one of the politicians asked about in the survey. The four Democratic candidates had an average of 12% of participants following them, while President Trump had 29%.

RQ1**:** Do Facebook and Twitter users who *do not* use these platforms to engage in politics still see political content in their social media feeds?

Table 3. Political Posts

	See often	See occasionally	See rarely	Never see
Engage often	46 (64%)	22 (30%)	4 (5%)	0 (0%)
Engage occasionally	43 (51%)	25 (29%)	17 (19%)	0 (0%)
Engage rarely	41 (49%)	29 (35%)	11 (13%)	2 (2%)
Never engage	15 (31%)	24 (49%)	2 (5%)	7 (15%)
Not sure	2 (35%)	1 (8%)	2 (25%)	0 (0%)

As noted above, the results found that a slight majority of participants use social media to engage in politics often or occasionally. However, a significant majority of participants (84%) said that they see political posts in their social media feeds often (50%) or occasionally (34%). Almost half of those who said they rarely use social media to engage in politics said that they still often see political posts on their feed, and 35% said they see them occasionally. For those who said they never used social media to engage in politics, 31% said they saw political posts often, while half said they saw them occasionally. This relationship between the level of engagement and amount of posts seen was found to be statistically significant $\chi 2$ (16, N = 297) = 98.547 p = .000.

Table 4: Political Ads

	See often	See occasionally	See rarely	Never see
Engage often	22 (31%)	27 (38%)	18 (25%)	3 (4%)
Engage occasionally	15 (17%)	42 (49%)	21 (25%)	5 (6%)
Engage rarely	18 (22%)	40 (48%)	15 (18%)	8 (10%)
Never engage	10 (20%)	18 (37%)	14 (29%)	7 (14%)
Not sure	13 (47%)	1 (20%)	0 (0%)	2 (25%)

Additionally, a majority (67%) of participants also saw political ads in their feeds, though less often and more occasionally. However, those who do not use social media to engage in politics are seeing political ads less than they see political posts. Only 22% of those who rarely engage and 20% who never engage said they often see political ads in their feeds. A larger number, 49% of those who rarely engage and 37% who never engage, said they saw ads occasionally.

RQ2: Are those who use Facebook and Twitter to engage in politics more likely to be able to recognize the source of the political content they see?

In terms of digital literacy, some questions were included in the survey to allow respondents to self-identify their level of digital literacy. In particular, they were asked how confident they were about their ability to differentiate political posts from political ads. The results showed that 44% of participants felt that they were very confident, and 49% were somewhat confident. Only 7% said they were not very confident or not confident.

Table 5: How confident do you feel about your ability to recognize the difference between a political post on social media and a political advertisement on social media?

	Very confident	Somewhat confident	Not very confident	Not confident
Engage often	40 (56%)	30 (42%)	2 (2%)	0
Engage occasionally	30 (35%)	47 (55%)	9 (11%)	0
Engage rarely	33 (40%)	44 (53%)	5 (7%)	0
Never engage	21 (44%)	23 (48%)	2 (4%)	2 (5%)
Not sure	5 (81%)	1 (7%)	1 (12%)	0

There was no significant difference between the level of engagement in politics on social media and the participants' confidence level in recognizing political posts versus political ads, though only those who engaged in politics often had a majority of participants say that they were very confident. There was also no significant difference found between different demographics. The results indicated that males were more like to say that they were very confident as opposed to somewhat, as were Republicans and Independents. There was an even distribution of confidence across education levels and age levels, though the age group 55-74 were more likely to say they were "somewhat confident" as opposed to "very confident."

In addition to self-identifying, there were a few other results that can help shed some light on digital literacy levels. For example, an average of 10% of respondents said that they were "not sure" whether or not they saw posts about a candidate, and an average of 5% of participants were "not sure" about the source of the posts they saw. Consistently, participants were the most confident about whether or not they followed a candidate on social media, and the least confident about whether or not they saw a sponsored ad.

RQ3: Does seeing content on Facebook and Twitter about political candidates have any impact on those candidates' name recognition?

Table 6: Overall, do you feel your experience with seeing political posts on social media has had any effect on your favorability of the candidates?

Significant effect	34 (12%)
Minor effect	114 (39%)
Neutral or not sure	87 (29%)
No effect	61 (21%)

As with digital literacy, this survey asked participants to self-identify whether or not they felt that seeing political content on their social media feeds had any effect on their favorability of political candidates. The results showed that a small majority (51%) felt that it did, with 39% saying it had a minor effect and 12% saying it had a significant effect. In this question, the age demographic was found to be statistically significant $\chi 2$ (9, N = 294) = 31.147 p = .000. The majority of older people ages 55 and up were either neutral or not sure about political posts' impact on the favorability of candidates. In contrast, 52% of 18-34 year-olds and 57% of 34-54 year-olds felt it had at least a minor effect. Party registration was also statistically significant $\chi 2$ (9, N = 295) = 41.054p = .000. Democrats were almost twice as likely to feel that political posts had a significant effect on their favorability compared to Republicans and Independents (18% vs. 8%).

Table 7: 2020 Democratic Primaries

Social Media	**Name Recognition**	**Favorability**
1. Bernie Sanders (67%)	Bernie Sanders (98%)	Joe Biden (59%)
2. Elizabeth Warren (55%)	Joe Biden (97%)	Bernie Sanders (51%)
3. Joe Biden (43%)	Elizabeth Warren (88%)	Elizabeth Warren (40%)
4. Kamala Harris (39%)	Kamala Harris (73%)	Kamala Harris (35%)

In terms of the four Democratic candidates used as a case study, the results largely aligned with what was showing in the polls at the time. Kamala Harris had the lowest percentage (38%) of participants seeing posts about her on social media, and also had the lowest name recognition at 28% of respondents selecting "never heard of." Bernie Sanders ranked highest on the social media question at 67%, but participants are divided on his favorability. Even though Joe Biden had a much lower social media score (43%), his favorability was eight points higher than Bernie Sanders. Overall, there appeared to be a correlation between social media posts and name recognition, except for Joe Biden. This anomaly is discussed in the next section of this paper.

The name recognition results appeared in line with the average poll results at the time of the study. Interestingly, it appears that Bernie Sanders is campaigning most heavily on social media, with 30% of respondents seeing sponsored posts about him, compared to 20% for Elizabeth Warren and Kamala Harris. Joe Biden had not launched his campaign at the time of this study, though 16% of participants still said they saw a sponsored ad about him.

Participants were also asked the same questions about President Trump. The results found that 17% of participants who voted for him in 2016 indicated they had an unfavorable opinion of him now, as did 81% of those who voted for 'someone else' and 64% who did not vote. 31% of Trump voters do not follow him on social media. These results were found to be statistically significant $\chi 2$ (9, N = 297) = 55.225 p = .000.

DISCUSSION

In comparison to Pew's 2016 study, these results indicate that the use of social media platforms to engage in politics continues to be on the rise. A higher majority of participants in this survey used social media to engage in politics often or occasionally, compared to the study done by Pew. While the average percentage of participants following a politician on social media was lower, this is not a direct comparison because this study only asked about specific candidates and President Trump, rather than politicians as a whole.

The findings for RQ1 shows that those who do not use social media to engage in politics still see political posts in their feeds. This finding is important to note because, as discussed in the literature review, nearly twice as many social media users are worn out by the amount of political content they see in their feeds as those who like seeing lots of political information (Pew Research Center, 2016). The survey results also showed that the majority of social media users saw political ads in their feed, even if they did not use the platforms to engage in politics. However, those who were not engaged were more likely to see posts than advertisements, a finding that can be explained by the research done on algorithms and advertising. Ads are primarily driven by algorithms and set by advertisers who have a target audience in mind, while posts come from several organic sources. Future studies in this area could dive deeper into the sources of these organic posts. For example, a post could appear in a person's social media feed because a friend posted it or a news organization posted a story, but also because a friend liked or comment on a post, and the algorithm pushed that content into the viewer's feed.

Based on the findings of RQ2, it appears that Americans are fairly digitally literate when it comes to recognizing posts on social media versus ads on social media. However, although the majority of participants said that they were very confident in their ability to recognize posts from ads, this was the answer that had the least confidence when asked how they saw a post. Joe Biden had almost the same percentage of people saying they had seen political ads about him even though his campaign had not launched at the time of this survey. Surprisingly, there were no differences across age or education levels in terms of social media literacy. However, it is important to note that these findings relied heavily on self-reporting, and further testing is needed to confirm. The need for accurate research into digital literacy issues is discussed in the Limitations and Considerations section. It is also worth noting that participants may have learned the difference

between posts and advertisements on social media through other means aside from political engagement, such as shopping online.

Lastly, the case study used for RQ3 provides some insight into the current 2020 Democratic primary race. Based on the survey results, the candidates were ranked from highest to lowest in terms of the number of participants who saw posts about them on social media, the number of participants who recognized their name, and which candidate had the highest favorability amongst participants. Consistently, Kamala Harris was in the last place, followed by Elizabeth Warren, except for social media posts. Elizabeth Warren scored higher than Joe Biden when it came to social media posts but had lower name recognition and favorability.
Joe Biden ranked in the first or second place for both favorability and name recognition but ranked third for social media posts. At the time of the survey, he had not yet announced his candidacy and was therefore not campaigning or receiving the same media attention that other candidates were receiving. He would also not have been running political ads at the time of the survey. His high favorability and name recognition, therefore, likely came from his previous position as Vice President of the United States. It would be important to take both external context and current media coverage into account when studying social media prevalence during election campaigns.

In terms of favorability, the results are consistent with the polls except for Kamala Harris, who was polling better than Elizabeth Warren but had significantly lower name recognition. While Kamala Harris had the lowest scores, there was only a three-point difference in her favorability/unfavorability ranking compared to Elizabeth Warren's eight points. These results suggest that social media could be used as a relatively accurate gauge for broader political polling, but considerations need to be taken into account. These limitations and considerations are discussed in the next section of this paper.

LIMITATIONS AND CONSIDERATIONS

Several limitations in this survey should be taken into consideration when studying this topic in the future.

First, the mixed-mode IVR/online model was used to reach a wide range of age demographics. The majority (70%) of those aged 55 and up were screened out of the survey because they did not use social media platforms. However, we know from the Pew Research Center that 64% of 50-64 year-olds and 37% of those 65+ are using social media. While the age groups and social media platforms varied slightly from this survey's focus, it is clear that there is an older generation of social media users that were not reached through this survey. For the field of digital literacy, reaching the older generations is especially important because, unlike younger generations, they did not grow up with the Internet and may need additional education and training to reduce the risks described in this paper. It is also worth noting that of the 37% of respondents who were screened out of this survey because they were not on social media, the vast majority were still politically engaged. This highlights the potential value of a mixed-mode methodology of online and telephone to reach the broadest possible range of ages, however imperfect the methodology may be.

Second, additional research could be conducted into how social media users see posts in their feeds. This survey asked about three circumstances: whether they followed the candidate, whether a person they followed posted about that candidate, and whether they saw a social media advertisement about that candidate. The second category could be further expanded to include: whether a news organization posted a story about that candidate, whether a person they followed shared (or retweeted on Twitter) someone else's post about that candidate, whether a person they followed simply 'liked' a post about that candidate and the like showed up in their feed, etc. As social media platforms become more robust and feature-heavy, more considerations will need to be made to determine how social media posts get seen.

Further experiments could be conducted to determine whether people are confident with recognizing an ad compared to a post. This becomes increasingly complicated with social media algorithms that push not only posts that people write or share but also posts that people like, comment on, or a friend of a friend shared. While it appears from these results that the vast majority of social media users feel at least somewhat confident in their digital literacy skills, the spread of fake news and false information discussed in the literature review suggests otherwise. In addition, this survey is largely missing the perspectives of a significant age demographic who has grown up in a world without the Internet and thus may be naturally less digitally literate than younger generations.

Lastly, these findings illuminate some of the limitations of using social media for political purposes in general. Although political engagement on social media is on the rise, there remains a subset of the population that either does not use social media at all or does not use it to engage in politics. Likely, this population falls into the group mentioned by Shah et al. (2007), who still prefer to engage through traditional media or face-to-face interaction. For political candidates, they would be wise to integrate social media into their existing, on-the-ground campaign strategy to ensure the broadest possible reach of the voter population. For social media users, the risks associated with political campaigning and advertising online highlight the growing need for digital literacy education and training across all demographics.

CONCLUSION

It is clear that social media has the potential to provide researchers with a vast amount of potentially useful data, and that the Internet has opened up the field of survey research to make it more affordable and accessible for many. With the use of social media for political engagement purposes on the rise, the opportunities for this field of research are abundant. However, more work needs to be done to ensure survey samples are representative of the general population, and that all demographics are being adequately reached.

For political candidates, it does appear that the prevalence of candidates on social media platforms has some impact on name recognition and that the favorability of social media users is generally reflective of the national polls. However, some key findings should be noted by political candidates as they explore their strategies for social media use. First, the majority of social media users see political posts and advertisements in their feeds regardless of interest. Second, a slight majority of users feel that seeing political posts about candidates has at least a minor effect on their favorability of candidates. And third, Pew found that a significant majority of people do not want social media

platforms to use their data to deliver messages from political campaigns. Therefore, social media offers up enticing opportunities for political campaigns, but these opportunities must be explored carefully and strategically.

Lastly, it is clear from the literature review that digital literacy is more important than ever. To achieve digital literacy, we must expand media literacy education beyond the schools and make an effort to educate the older generations who are using Internet technologies, including social media, but have not grown up in the digital age. With the prevalence of fake news and the ongoing attempts to use social media to influence elections, knowing how and why we see the posts that we see in our social media feeds is imperative for any generation.

REFERENCES

"The Political Environment on Social Media" Pew Research Center, Washington, D.C. (October 2016). Retrieved from https://www.pewinternet.org/2016/10/25/the-political-environment-on-social-media/

"Social Media Use in 2018" Pew Research Center, Washington, D.C. (March 1, 2018a). Retrieved from https://www.pewinternet.org/2018/03/01/social-media-use-in-2018/

"Public Attitudes Toward Computer Algorithms" Pew Research Center, Washington, D.C. (November 16 2018b). Retrieved from http://www.pewinternet.org/2018/11/16/public-attitudes-toward-computer-algorithms/

Allcott, H., & Gentzkow, M. (2017). Social Media and Fake News in the 2016 Election. *Journal of Economic Perspectives, 31*(2), 211-236. doi:10.1257/jep.31.2.211

Broockman, D. E., & Green, D. P. (2013). Do Online Advertisements Increase Political Candidates' Name Recognition or Favorability? Evidence from Randomized Field Experiments. *Political Behavior,36*(2), 263-289. doi:10.1007/s11109-013-9239-z

Chang, T. Z. D., & Vowles, N. (2013). Strategies for improving data reliability for online surveys: A case study. *International Journal of Electronic Commerce Studies, 4*(1), 121-130.

Howard, P. N., Kollanyi, B., Bradshaw, S., & Neudert, L. M. (2018). Social media, news and political information during the US election: Was polarizing content concentrated in swing states? *arXiv preprint arXiv:1802.03573*.

Huberty, M. E. (2013). Multi-cycle forecasting of congressional elections with social media. *Proceedings of the 2nd Workshop on Politics, Elections and Data - PLEAD 13*. doi:10.1145/2508436.2508439

Kim, S. A. (2017). Social Media Algorithms: Why You See What You See. *The Georgetown Law Technology Review*, (1), 147. Retrieved from http://proxy.emerson.edu/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=edsgao&AN=edsgcl.531045670&site=eds-live

Koltay, T. (2011). The media and the literacies: Media literacy, information literacy, digital literacy. *Media, Culture & Society*, *33*(2), 211-221.

Mcneill, L. S. (2018). "My friend posted it and that's good enough for me!": Source Perception in Online Information Sharing. *The Journal of American Folklore,131*(522), 493. doi:10.5406/jamerfolk.131.522.0493

Murthy, D., Powell, A. B., Tinati, R., Anstead, N., Carr, L., Halford, S. J., & Weal, M. (2016). Automation, algorithms, and politics| Bots and political influence: A sociotechnical investigation of social network capital. *International Journal of Communication*, *10*, 20.

Shah, D. V., Cho, J., Eveland, W. P., & Kwak, N. (2005). Information and Expression in a Digital Age. *Communication Research,32*(5), 531-565. doi:10.1177/0093650205279209

Shah, D. V., Cho, J., Nah, S., Gotlieb, M. R., Hwang, H., Lee, N., . . . Mcleod, D. M. (2007). Campaign Ads, Online Messaging, and Participation: Extending the Communication Mediation Model. *Journal of Communication,57*(4), 676-703. doi:10.1111/j.1460-2466.2007.00363.x

Unver, H. A. (2017). Digital Challenges to Democracy: Politics of Automation, Attention, and Engagement. Journal of International Affairs, 71(1), 127-146.

Wagner, K. (2017, November 01). Donald Trump and Hillary Clinton spent $81 million on Facebook ads before last year's election. Retrieved from https://www.recode.net/2017/11/1/16593066/trump-clinton-facebook-advertising-money-election-president-russia

Williams, C. B., & Gulati, G. J. (2012). Social networks in political campaigns: Facebook and the congressional elections of 2006 and 2008. *New Media & Society,15*(1), 52-71. doi:10.1177/1461444812457332

Woolley, S. C., & Howard, P. N. (2016). Political communication, computational propaganda, and autonomous agents: Introduction. *International Journal of Communication*, *10*.

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