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Using structural equation modeling to understand the determinants that drive instructors' use of online proctoring

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Highlights

- Using UTAUT with SEM on 158 HE instructors, the study shows performance expectancy is the strongest predictor of intention to use online proctoring.
- Effort expectancy does not significantly influence intention, while social influence matters only for instructors with little–moderate online teaching experience.
- Institutions should emphasize integrity benefits, provide clear implementation guidance, and address privacy/anxiety concerns—especially for novice online instructors.

Article Info: Research Article

Keywords: *online proctoring, academic integrity, online teaching, technology acceptance*

Abstract

Despite the increasing use of online proctoring, prior research has not fully explored the factors influencing instructors' adoption of these tools, nor clarified their role in promoting academic integrity. This study addresses these gaps by investigating instructors' perceptions of online proctoring to uncover factors that underpin decisions to adopt online proctoring as an academic integrity tool. Using the Unified Theory of Acceptance and Use of Technology framework to examine determinants that influence the intended use of online proctoring, an online survey was completed by 158 instructors at various higher education institutions. Using structural equation modeling, the study found that performance expectancy is the primary determinant of an instructor's intention to use online proctoring while effort expectancy has no significant impact. Interestingly, social influence also has a significant impact but only for instructors who have moderate to no online teaching experience. These findings suggest that institutions should focus on communicating the integrity benefits of online proctoring, provide clear guidelines for its implementation, and offer support for interpreting proctoring results. Additionally, institutions should address student privacy and anxiety concerns, especially when supporting novice online instructors. By tailoring policies and resources to these determinants, educators and institutions can make more informed decisions about the adoption and management of online proctoring.

1. Introduction

Research shows conflicting findings on whether cheating is more or less prevalent in online courses compared with on-ground courses. Some studies have argued that students are more willing to engage in unethical behaviors in online classes than in on-campus classes (Bedford et al., 2009, 2011; King et al., 2009; Lanier, 2006; LoSchiavo & Shatz, 2011; Nadelson, 2006). Students in a study by Verhoef and Coetser (2021) confirmed that a lack of monitoring during emergency remote instruction during the COVID-19 pandemic contributed to higher levels of academic dishonesty. Other researchers have found that the opportunity for academic dishonesty in online courses is about the same as in on-ground courses (Casey et al., 2018) and that online students are no more likely to engage in most forms of cheating than on-campus students (Grijalva et al., 2006; Harris et al., 2020).

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McNabb and Olmstead (2009) found that most faculty members' perceptions of cheating do not differ between online and on-campus classes, but when it does, faculty members view online courses as being more conducive for cheating to arise. These perceptions were confirmed by Alessio and Messinger (2021) with 81% of faculty and 83% of students believing it is easier to cheat online. Likewise, students have indicated that a lack of monitoring makes it easier to get away with cheating during exams (Bedford et al., 2011; Faucher & Caves, 2009).

When instructors are not physically in control of the testing environment, which is often the case with online exams, how can they be certain that their desired testing guidelines have been followed? Furthermore, is it appropriate to evaluate the performance of all students using a set of standards if there is a lack of monitoring of the testing environments to see if those standards are upheld?

Some studies suggest that online (remote) proctoring promotes academic integrity during exams (Bedford et al., 2011). Online proctoring allows students to take exams without commuting to a local proctoring facility through the use of Web conferencing and screen-capturing technologies. Wellman and Marcinkiewicz (2004) identify four key differences between proctored and unproctored exams: (1) proctored exams supervise student activities that may influence the exam integrity and reduce chances that students might collaborate without consent, (2) proctored exams provide time and place structure for the examination process, (3) proctored exams synchronize the examination environment with other students that may impose a degree of peer pressure or competition to perform, and (4) proctored exams give students the opportunity for intra-test feedback for technical troubleshooting and clarification of questions.

When a single online proctoring provider is used, proctors can enforce a set of testing guidelines (e.g., no calculators are permitted, no other people allowed in the testing area, etc.) across all testing instances, as the proctors share a common system for monitoring a courses' exams. Instructors also are provided with confirmation that their testing guidelines are enforced, as proctoring companies provide video recordings of the exam sessions that allow instructors to review the testing session. Online proctoring can be a reasonable integrity solution for online courses that typically have student populations that are diverse and geographically dispersed (Kitahara et al., 2011).

While some instructors want to ensure academic integrity in their courses, others do not believe it is their responsibility to monitor students and prevent cheating (Nelson, 2021). In addition, some instructors believe that the use of online proctoring introduces new issues of concern such as intrusions of students' privacy (Dunn et al., 2010; Rodchua et al., 2011). The California Community Colleges Online Education Initiative found that instructor buy-in was critical in their study of proctoring software (Schaffhauser, 2017). Research on the adoption of proctoring technology is limited. Raman et al. (2021) conducted a study on proctoring adoption by students during the COVID-19 pandemic using Roger's Diffusion of Innovation Theory (1995) as its theoretical foundation. They found relative advantage, compatibility, ease of use, trialability, and observability to be positively related to students' acceptance of proctoring. Bedford et al. (2009) used structural equation modeling to measure the perceived usefulness and the perceived ease of use of a remote proctoring service. The study found 48% of students were in favor of using it, 22% were not in favor of using it, and 30% were indifferent. Seventy percent of instructors were in favor of using it.

2. Theoretical Framework

Using constructs from the Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh et al., 2003) as a foundation, this research study aims to identify the variables that influence instructors' intention to use online proctoring as a deterrent for academic dishonesty. UTAUT evolved through a series of studies that empirically compared the explanatory power of different technology acceptance models. After a unified model was developed, it was empirically validated by Venkatesh et al. (2003) to confirm that it outperformed the eight earlier models by explaining up to 70% of the variance in the behavioral intention construct.

UTAUT recognizes three core constructs that determine a person's behavioral intention to use technology: (1) performance expectancy, (2) effort expectancy, and (3) social influence. Behavioral intention to use is

"an individual's intention to use a specific system" (Williams et al., 2015, p. 444), and serves as a determinant of actual behavior. Performance expectancy is "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh et al., 2003, p. 447). Effort expectancy is "the degree of ease associated with the use of the system" (Venkatesh et al., 2003, p. 450). Social influence is "the degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh et al., 2003, p. 451).

For this study, the following operationalized definitions are used. First, behavioral intention to use is whether the instructor plans to use online proctoring for exams in the future. Second, performance expectancy is the degree to which an instructor believes that using an online proctor for exams will help in assuring online academic integrity. Third, effort expectancy is the degree of ease associated with using an online proctor for exams as perceived by the instructor (e.g., the workload to convert or set up an exam). And, finally, social influence is the degree to which the instructor perceives that students believe they should use an online proctor for exams. The following hypotheses were tested:

H_1: Performance expectancy increases an instructor's behavioral intention to use online proctoring for exams in their online courses.
H_2: Effort expectancy increases an instructor's behavioral intention to use online proctoring for exams in their online courses.
H_3: Social influence increases an instructor's behavioral intention to use online proctoring for exams in their online courses.

In addition, online teaching experience (e.g., number of years teaching online) and faculty status (e.g., faculty rank) will be tested as moderating variables. H4(A, B, C) will test whether online teaching experience moderates the relationships between the three independent variables and intention to use online proctoring. H5(A, B, C) will test whether faculty status moderates the relationships between the three independent variables and intention to use online proctoring.

H_{4A}: Online teaching experience moderates the relationship between performance expectancy and behavioral intention to use online proctoring.
H_{4B}: Online teaching experience moderates the relationship between effort expectancy and behavioral intention to use online proctoring.
H_{4C}: Online teaching experience moderates the relationship between social influence and behavioral intention to use online proctoring.
H_{5A}: Faculty status moderates the relationship between performance expectancy and behavioral intention to use online proctoring.
H_{5B}: Faculty status moderates the relationship between effort expectancy and behavioral intention to use online proctoring.
H_{5C}: Faculty status moderates the relationship between social influence and behavioral intention to use online proctoring.

By analyzing whether moderating factors influence instructors' intention to use online proctoring, institutions can more easily identify subgroups of instructors that are more likely to use, or not use, online proctoring in their teaching. The full research model is shown in Figure 1.

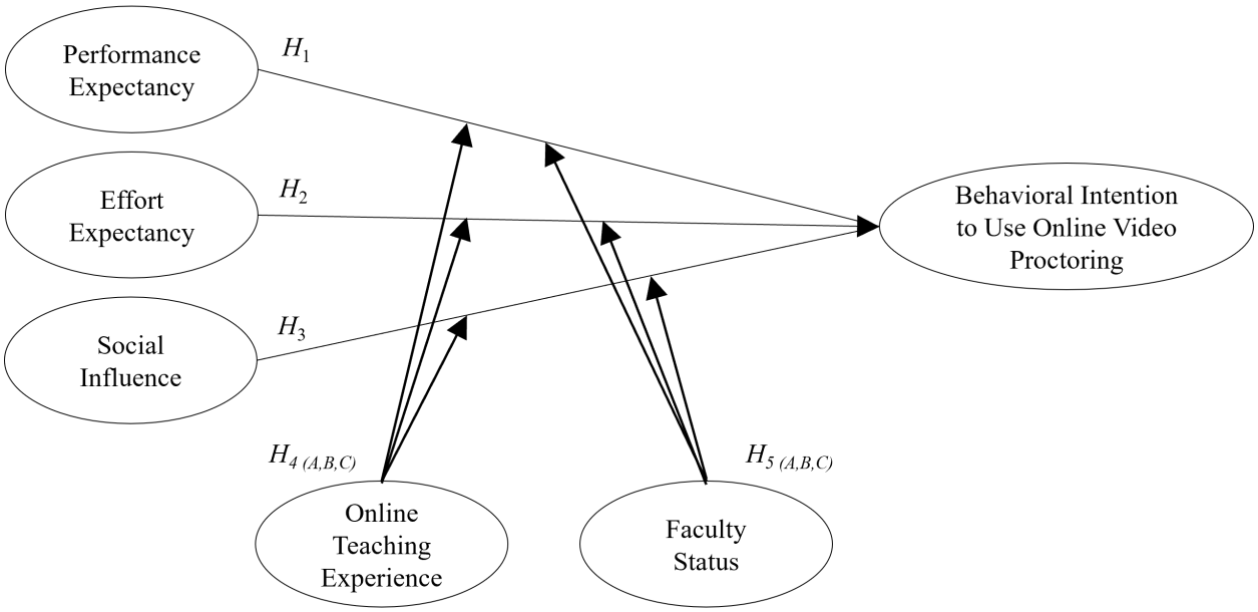

Figure 1. Research Model

3. Method

3.1. Survey Instrument

The research instrument took the form of an online survey consisting of 27 items that were presented in sections. After agreeing with the informed consent statement, respondents were asked a question about their higher education faculty status. Respondents indicating that they were not a higher education faculty member were exited from the survey. Respondents indicating that they were a higher education faculty member advanced to the next section of the survey that included five questions about their institution and online teaching experience.

The next section began with an operational definition of online proctoring: "Online proctoring can be used to monitor students taking examinations online. Online proctoring uses Internet connections and video cameras (webcams) to connect students with a human proctor in real-time." Respondents were asked to select their level of agreement or disagreement with 15 statements provided about online proctoring. The statements aligned to validated UTAUT items for the constructs included in this study. The wording of each item was modified to reflect online proctoring as the technology focus and higher education as the industry focus. The UTUAT items used an ordinal, 7-point Likert scale ranging from strongly disagree to strongly agree. The UTAUT items were presented to the respondents in a randomized order to reduce potential order effects.

Next, respondents were asked whether they had used online proctoring. Respondents selecting "No" advanced to the final section of the survey, whereas respondents selecting "Yes" received the two questions related to their use of online proctoring. The final section of the survey included an optional open-ended question. This question captured additional insight into respondents' perceptions about and experiences with online proctoring. The survey instrument can be found in Appendix A.

3.2. Sample/Participants

To solicit participation in the research study, a convenience sampling method was used to target instructors at higher education institutions. Professional connections in the online learning community were contacted via e-mail to encourage responses from a variety of higher education institutions to prevent the findings from being attributed to institutional factors. Some professional connections further distributed the survey information to others within their institution. In addition, an invitation to participate in the research study was posted to discussion boards and social media groups used by higher education professionals. An

invitation to participate was also posted on LinkedIn with several connections further sharing the post to their networks.

The survey was administered using Qualtrics and became available on September 29, 2022. Potential respondents were informed that the survey would take 10-15 min to complete. Completion of the survey was voluntary and identifiable information was not collected. Because colleagues at other institutions were sharing the survey invitation with others within their institution, the survey remained open until a week passed without any new responses. The survey was closed nearly eight weeks later on November 23, 2022.

A total of 191 individuals opened the Qualtrics survey. Since employment as a higher education instructor was the sampling criterion for inclusion in the research study, 11 individuals who indicated that they did not teach at an institution of higher education were exited from the survey. There were 18 incomplete responses that were removed from the analysis. Four responses were removed from the analysis due to possible respondent misconduct (e.g., respondents selected the same choice for all survey items). After data screening was complete, 158 completed surveys were received from higher education instructors. The minimum sample size needed for a structural equation model study having four latent variables and fifteen observed variables was calculated to be 116 to determine the model structure and 137 to detect a medium effect (Soper, 2022).

3.3. Respondent Profiles

A majority of the respondents (58.2%) were full-time instructors having tenure or on a tenure track. The next largest group of respondents were adjunct instructors (22.8%). Respondents represented a variety of ages with 41 to 50-year-olds being the age group most represented (33.5%). A little over half of the respondents (53.2%) were female. A majority of the respondents (75.9%) selected White/Caucasian as their ethnic background. Respondent demographics can be found in Table 1.

Table 1.

Respondent Demographics

Faculty Status	N	%
Full-time, tenured or tenure-track	92	58.2%
Full-time, non-tenure-track or other	28	17.7%
Adjunct or other part-time	36	22.8%
Emeritus	2	1.3%
Total	158	100%

Gender	N	%
Female	84	53.2%
Male	69	43.7%
Non-binary	2	1.3%
Prefer not to answer	3	1.9%
Total	158	100%

Age Range	N	%
30 & under	3	1.9%
31-40	40	25.3%
41-50	53	33.5%
51-60	47	29.7%
61-70	11	7.0%
Over 70	1	0.6%
Prefer not to answer	3	1.9%
Total	158	100%

Ethnic Background	N	%
Asian	17	10.8%
Black/African-American	4	2.5%
Hispanic/Latino	4	2.5%
Multiple	6	3.8%
White/Caucasian	120	75.9%
Other	1	0.6%
Prefer not to answer	6	3.8%
Total	158	100%

Respondents taught at various types of higher education institutions with public institutions being most represented (88.6%). Nearly half of the respondents (49.4%) taught at an institution having fewer than 5,000 students and another third (35.4%) taught at an institution having more than 15,000 students. Nearly all the respondents (96.8%) taught at an institution located in the United States with only five respondents indicating that their institution was located in a different country. Institution demographics can be found in Table 2.

Table 2.

Institution Demographics

Institution Type	N	%
Public	140	88.6%
Private, non-profit	15	9.5%
Private, for-profit	2	1.3%
Multiple	1	0.6%
Total	158	100%

Institution Size	N	%
Fewer than 5,000	78	49.4%
Between 5,000-15,000	24	15.2%
More than 15,000	56	35.4%
Total	158	100%

Institution Location	N	%
United States	153	96.8%
Canada	2	1.3%
Pakistan	1	0.6%
Australia	1	0.6%
Multiple	1	0.6%
Total	158	100%

A majority of the respondents indicated that they had significant experience teaching online (60.8%) with nearly all of the remaining respondents indicating that they had moderate experience teaching online (36.7%). When asked how many online courses they had taught, instructors selecting significant experience indicated that they had taught between 2 and 150 course sections online with a median of 16.5 course sections. Instructors selecting moderate experience indicated that they had taught between one and 45 course sections online with a median of five course sections. Instructors selecting little or no experience indicated that they had taught between 0 and 4 online course sections with a median of 2 course sections. Exactly one-third (33.3%) or 53 of the respondents had experience using online proctoring in their courses. Of those instructors, 71.7% made the choice to use online proctoring while the remainder were required to use online proctoring. Details on online teaching and proctoring experience can be found in Table 3.

Table 3.

Online Teaching Experience and Proctoring Experience

Online Teaching Experience	N	%
Significant experience	96	60.8%
Moderate experience	58	36.7%
Little or no experience	4	2.5%
Total	158	100%

Online Proctoring Experience	N	%
Yes	53	33.3%
No	105	66.5%
Total	158	100%

Proctoring Decision-Maker	N	%
Instructor	38	71.7%
Other faculty, staff, or administrator	15	28.3%
Total	53	100%

3.4. Data Analysis

Data gathered from the Qualtrics survey was imported into Excel, SPSS 28.0, and SPSS AMOS statistical software for structural equation modeling. Confirmatory factor analysis was computed using SPSS AMOS to test the measurement model. Model-fit measures were used to assess the proposed model's overall goodness of fit, and factor loadings for each item were obtained. Construct reliability was assessed using Cronbach's alpha (α) coefficient and composite reliability to check the reliability of the UTAUT scales measuring each construct. The average variance extracted (AVE) was calculated to assess the convergent validity of the measurement model. The Heterotrait-Monotrait (HTMT) ratio of correlations was calculated to assess discriminant validity. Finally, a normality assessment was conducted before advancing to structural equation modeling to test the research model and hypotheses.

The fit of the measurement model was assessed using several fit indices: relative chi-square ($\chi 2/df$), the goodness of fit index (GFI), the comparative fit index (CFI), the Tucker-Lewis Index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). Measurement model fit indices are reported alongside structural model fit values. Reliability and validity of constructs were assessed using Cronbach's alpha, composite reliability, average variance extracted (AVE), and the Heterotrait-Monotrait (HTMT) ratio.

To examine group differences in survey constructs (e.g., performance expectancy, effort expectancy, social influence, behavioral intention), one-way analysis of variance (ANOVA) was performed. Test statistics, degrees of freedom, and significance criteria ($p < .05$) are reported in the Results section. Structural equation modeling was used to test the hypothesized relationships among UTAUT constructs. The SEM analysis employed maximum likelihood estimation. Model specification included four latent variables (performance expectancy, effort expectancy, social influence, behavioral intention) and fifteen observed variables.

3.5. Analysis of the Measurement Model

Modification indices of the proposed measurement model suggested that the fit of the model could be strengthened by adding covariance to some indicators within constructs to reduce the unexplained common variance between the indicators. Covariance was added to the residuals of PE1 and PE3 and the residuals of SI1 and SI3. The model with the covariance added can be found in Figure 2.

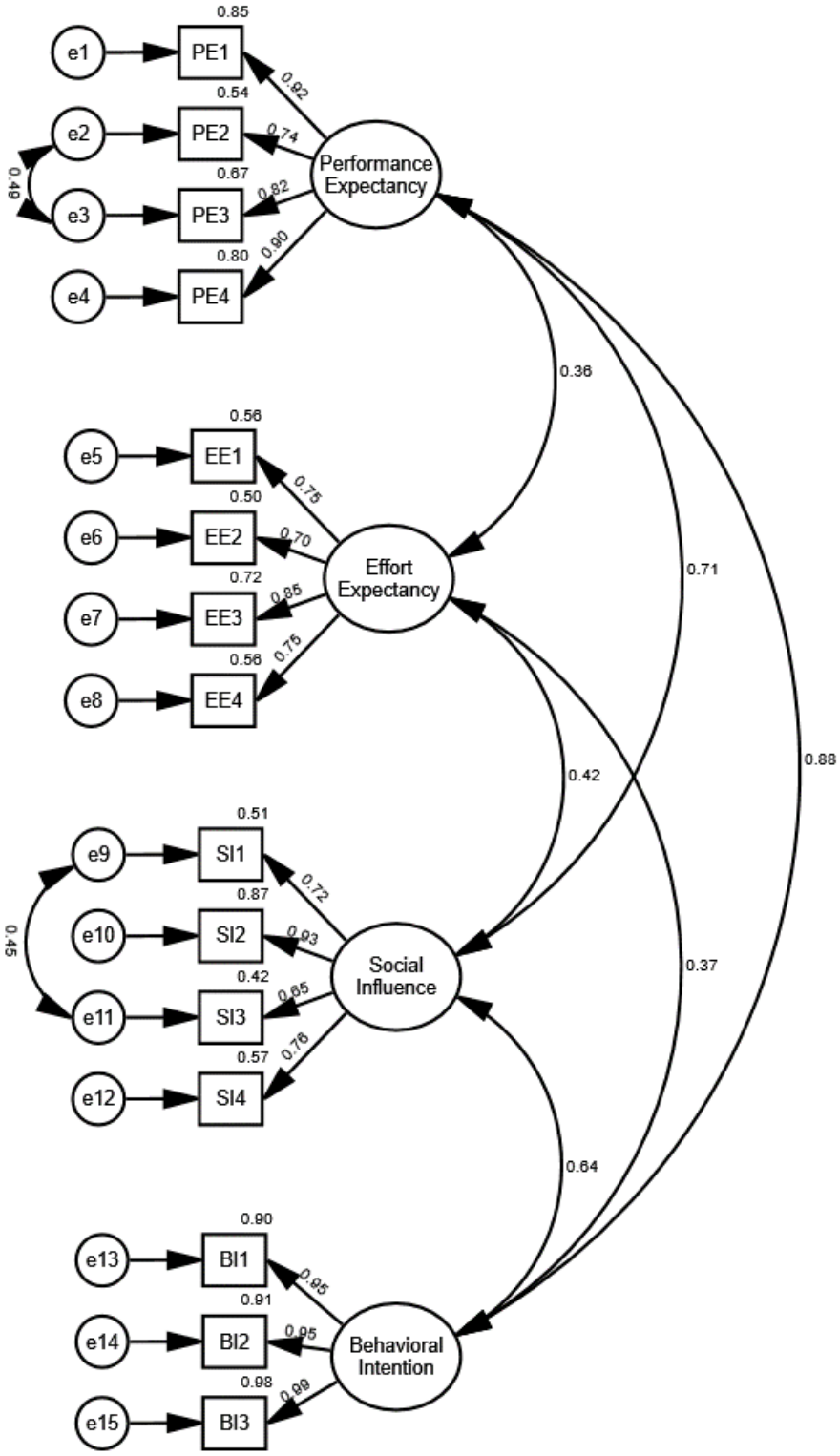

Figure 2. Measurement Model with Covariance Added to Residuals

Factor Loadings. Standardized factor loadings were obtained from the revised measurement model for each measure using confirmatory factor analysis. The standardized factor loadings of the model ranged from .648 to .990, as shown in Table 4. Having standardized factor loadings over 0.7 is desired to provide value in explaining their unobserved construct (Vinzi et al., 2010). All factor loadings were above the desired threshold with the exception of SI3 which had a factor loading of .648. Nevertheless, SI3 was retained as a factor due to its residual covariance with SI1's residual.

Table 4.

Factor Loadings of the Revised Measurement Model

Latent Variable	Measurement Variable	Factor Loading
Performance Expectancy	PE1	.924
	PE2	.738
	PE3	.817
	PE4	.896
Effort Expectancy	EE1	.746
	EE2	.704
	EE3	.848
	EE4	.746
Social Influence	SI1	.717
	SI2	.934
	SI3	.648
	SI4	.756
Behavioral Intention	BI1	.949
	BI2	.954
	BI3	.990

Construct Reliability and Convergent Validity. Construct reliability was assessed using Cronbach's alpha (α) and composite reliability to assess the internal consistency of the constructs. The Cronbach's alpha (α) for each scale ranged from .842 to .975, as shown in Table 5. Since all Cronbach's alpha (α) values were greater than the desired .70 threshold, the UTAUT items had relatively high internal consistency (Hair et al., 2012). The composite reliabilities ranged from .847 to .976 sufficiently surpassing the desired .70 threshold (Hair et al., 2012). None of the scales would have resulted in a stronger Cronbach's alpha (α) or composite reliability if an item was removed from a scale; thus, all items were retained. Convergent validity was assessed using the average variance extracted. Since the AVE values for each construct is greater than 0.50, convergent validity existed in the data (Bagozzi & Yi, 1988).

Table 5.

Construct Reliability & Convergent Validity Statistics of Survey Items

Scale	Number of Items	Cronbach's Alpha (α)	Composite Reliability	Average Variance Extracted
Performance Expectancy	4	.919	.910	.717
Effort Expectancy	4	.842	.847	.582
Social Influence	4	.867	.852	.594
Behavioral Intention	3	.975	.976	.930

Discriminant Validity. Discriminant validity was assessed using the Heterotrait-Monotrait (HTMT) Ratio. HTMT values ranged from .351 to .858. Since HTMT values for each pairing of constructs were below 0.90, there were no concerns about discriminant validity in the data (Henseler et al., 2015). Table 6 displays the HTMT ratios for each pairing of constructs.

Table 6.

Divergent Validity of Constructs Items

Construct Pairing	HTMT
Performance Expectancy-Effort Expectancy	.351
Performance Expectancy-Social Influence	.680
Performance Expectancy-Behavioral Intention	.858
Effort Expectancy-Social Influence	.406
Effort Expectancy-Behavioral Intention	.367
Social Influence-Behavioral Intention	.618

Invariance Across Groups. Hypotheses 4 and 5 required comparisons of groups of respondents, one based on online teaching experience and one based on faculty status. Configural invariance tests and metric invariance tests of the measurement model were conducted to confirm that the measurement models were similar across the different groups of respondents.

The first across-group comparison was based on online teaching experience. Due to the low number of respondents indicating that they had minimal or no online teaching experience (n=4), that group was combined with the respondents having moderate experience (n=58) and compared against the group of respondents having significant experience (n=96). The unconstrained measurement model indicated that the model fit is similar across groups, with only the GFI fit index being slightly below the recommended value.

The second across-group comparison was based on faculty status. Due to the low number of respondents indicating that they were emeritus faculty (n=2), that group was combined with the respondents indicating that they were adjunct or other part-time faculty (n=36) and compared against the group of respondents who were full-time tenured or tenure-track (n=92) and full-time non-tenured-track or other full-time faculty (n=28). The unconstrained measurement model indicates that the model fit is similar across groups, with only the GFI fit index (.786) being below the recommended value of .900 (Hair et al., 2012).

The metric invariance test resulted in *p*-values that were insignificant with online teaching experience having a *p*-value of 0.744 and faculty status having a *p*-value of *p*=0.895. Since neither of these *p*-values was significant, the results suggested that the data were invariant across the groups.

Normality Assessment. Before testing the structural model, a normality assessment was conducted. When using structural equation modeling, skewness values between -3 and +3 kurtosis values between -10 and +10 are acceptable for assessing the normality of the data (Brown, 2015). The absolute value of skewness was less than 0.63 for all items and the absolute value of kurtosis was less than 1.44 for all items.

4. Results

4.1. Survey Results

SPSS was used to calculate the descriptive statistics of the survey data obtained. Respondents' responses for each 7-point Likert scale item were transposed into a composite variable to determine each respondent's overall score for each construct (e.g., PE_overall, EE_overall). The composite variable for each construct was averaged across all respondents to determine the construct mean and standard deviation. The mean and standard deviations of all of the constructs and items can be found in Table 7.

Table 7.

Mean and Standard Deviation of the Constructs and Survey Items

Constructs and Items	Mean	SD
Performance Expectancy (PE)	3.70	1.762
PE1	3.78	2.152
PE2	3.78	1.884
PE3	3.59	1.876
PE4	3.63	1.933
Effort Expectancy (EE)	5.02	1.286
EE1	4.82	1.554
EE2	4.89	1.715
EE3	4.87	1.583
EE4	5.51	1.372
Social Influence (SI)	3.21	1.268
SI1	2.91	1.478
SI2	3.63	1.554
SI3	2.65	1.510
SI4	3.66	1.458
Behavioral Intention (BI)	3.27	2.042
BI1	3.17	2.060
BI2	3.42	2.127
BI3	3.23	2.087

Table 8 provides the descriptive statistics of the different constructs based on participant demographics, specifically faculty status, gender, age range, and ethnic background. The mean values were derived from a 7-point Likert scale with 1 being “strongly disagree” and 7 being “strongly agree.” ANOVA found significant group differences between full-time instructors and adjunct instructors for performance expectancy ($F_{1,\ 156}$=7.041, p=0.009) and social influence ($F_{1,\ 156}$=3.999, p=0.047). Significant group differences were realized between respondents based on gender for performance expectancy ($F_{1,\ 151}$=5.670, p=0.019), social influence ($F_{1,\ 151}$=5.736, p=0.018), and behavioral intention to use ($F_{1,\ 151}$=3.953, p=0.049). Respondents identifying as white/Caucasian and those who identified with another race also had significantly different mean values for social influence ($F_{1,\ 150}$=6.350, p=0.013) and behavioral intention to use online proctoring ($F_{1,\ 150}$=10.952, p<0.001).

Table 8.

Mean and Standard Deviation of the Constructs by Participant Demographics

Constructs		PE	EE	SI	BI
	N	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Faculty Status					
FT, tenured or tenure-track	92	3.91 (1.747)	4.94 (1.280)	3.27 (1.230)	3.37 (2.080)
FT, non-tenure-track or other	28	3.86 (1.876)	5.16 (1.304)	3.50 (1.326)	3.56 (2.279)
Adjunct, PT, or Emeritus	38	3.05 (1.590)	5.12 (1.305)	2.86 (1.273)	2.83 (1.724)
Gender					
Female	84	3.39 (1.753)	4.95 (1.225)	2.98 (1.210)	2.95 (1.919)
Male	69	4.05 (1.637)	5.05 (1.331)	3.45 (1.244)	3.59 (2.092)
Non-binary	2	3.88 (4.066)	6.00 (0.000)	2.75 (1.414)	4.00 (4.242)
Prefer not to answer	3	3.67 (2.900)	5.67 (2.309)	4.50 (2.222)	4.56 (2.341)
Age Range					
30 & under	5	3.17 (2.566)	4.58 (1.233)	1.58 (0.144)	3.67 (3.055)
31-40	40	3.60 (1.978)	4.63 (1.272)	3.11 (1.461)	3.13 (2.055)
41-50	53	3.36 (1.578)	5.10 (1.250)	3.01 (1.157)	3.11 (2.036)
51-60	47	4.22 (1.717)	5.29 (1.215)	3.48 (1.069)	3.57 (2.097)
61-70	11	3.48 (1.460)	4.84 (1.455)	3.48 (1.311)	2.67 (1.552)
Over 70	1	4.50 (-------)	5.25 (-------)	3.75 (-------)	5.00 (-------)
Prefer not to answer	3	3.67 (2.898)	5.67 (2.309)	4.50 (2.220)	4.56 (2.341)
Ethnic Background					
Asian	17	4.90 (1.658)	5.12 (1.139)	3.96 (1.232)	5.10 (1.866)
Black/African-American	4	4.38 (1.164)	5.88 (1.164)	2.50 (0.989)	3.58 (1.316)
Hispanic/Latino	4	4.00 (2.483)	5.00 (1.826)	4.31 (1.887)	3.83 (2.186)
Multiple	6	3.38 (1.191)	4.50 (0.837)	2.92 (1.033)	3.11 (1.440)
White/Caucasian	120	3.50 (1.731)	5.00 (1.283)	3.12 (1.197)	2.96 (1.968)
Other	1	2.50 (-------)	3.25 (-------)	2.50 (-------)	1.00 (-------)
Prefer not to answer	6	4.13 (2.114)	5.38 (1.829)	3.17 (2.029)	4.44 (2.177)

Table 9 provides the descriptive statistics of the different constructs based on institution demographics, specifically institution type, institution size, and institution location. There were no significant differences between groups for these constructs.

Table 9.

Mean and Standard Deviation of the Constructs by Institution Demographics

Constructs		PE	EE	SI	BI
	N	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Institution Type					
Public	140	3.76 (1.790)	5.01 (1.293)	3.24 (1.237)	3.32 (2.082)
Private, non-profit	15	3.18 (1.557)	5.20 (1.354)	3.07 (1.510)	3.00 (1.768)
Private, for-profit	2	3.13 (1.590)	4.50 (0.354)	3.13 (1.590)	3.17 (1.178)
Multiple	1	3.00 (-------)	5.50 (-------)	1.00 (-------)	1.00 (-------)
Institution Size					
Fewer than 5,000	78	3.77 (1.652)	4.86 (1.283)	3.38 (1.159)	3.35 (1.873)
Between 5,000-15,000	24	4.05 (1.806)	5.14 (1.198)	2.93 (0.948)	3.46 (2.224)
More than 15,000	56	3.43 (1.883)	5.21 (1.317)	3.09 (1.497)	3.10 (2.205)
Institution Location					
United States	153	3.70 (1.759)	5.01 (1.298)	3.22 (1.261)	3.30 (2.038)
Canada	2	2.63 (0.530)	5.63 (1.237)	3.50 (1.424)	1.33 (0.471)
Pakistan	1	7.00 (-------)	6.00 (-------)	4.75 (-------)	6.33 (-------)
Australia	1	2.00 (-------)	4.75 (-------)	2.00 (-------)	2.33 (-------)
Multiple	1	3.00 (-------)	5.50 (-------)	1.00 (-------)	1.00 (-------)

Table 10 provides the descriptive statistics of the different constructs according to instructors' online teaching experience, instructors' online proctoring experience, and the proctoring decision-maker for those who have experience using an online proctor. The means of all of the constructs were significantly different based on prior online proctoring experience: performance expectancy ($F_{1, 156}$=25.293, p<0.001), effort expectancy ($F_{1, 156}$=24.662, p<0.001), social influence ($F_{1, 156}$=16.408, p<0.001), and behavioral intention to use online proctoring ($F_{1, 156}$=40.812, p<0.001).

Table 10.

Mean and Standard Deviation of the Constructs by Online Teaching Experience and Proctoring Experience

Constructs		PE	EE	SI	BI
	N	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Online Teaching Experience					
Significant experience	96	3.58 (1.675)	5.04 (1.312)	3.19 (1.173)	3.22 (2.075)
Moderate to no experience	62	3.87 (1.890)	5.00 (1.254)	3.24 (1.413)	3.36 (2.003)
Online Proctoring Experience					
Yes	53	4.62 (1.605)	5.69 (1.289)	3.76 (1.244)	4.58 (2.141)
No	105	3.23 (1.657)	4.69 (1.150)	2.93 (1.193)	2.62 (1.642)
Proctoring Decision-Maker					
Instructor	38	4.86 (1.514)	5.69 (1.225)	3.97 (1.170)	4.95 (2.118)
Other	15	4.02 (1.723)	5.67 (1.484)	3.23 (1.311)	3.64 (1.982)

4.2. Analysis of the Structural Model

Structural equation modeling was conducted using SPSS AMOS to assess the relationships among the constructs. Overall, the model had good fit. The fit indices for the structural model can be found in Table 11. The full structural model can be found in Figure 3. The squared multiple correlation (R^2) was 0.769 for behavioral intention to use online proctoring. This suggests that 76.9% of the variance in behavioral intention to use online proctoring can be accounted for by participant performance expectancy, effort expectancy, and social influence.

Table 11.

Fit Indices of the Measurement and Structural Model

Fit Index	Measurement Model	Structural Model	Recommended Value	Source
χ^2/df	1.947	1.250	<5.0	Marsh & Hocevar (1985)
GFI	.875	.921	>.90	Hair et al. (2012)
CFI	.961	.990	>.90	Bentler & Bonett (1980)
TLI	.952	.987	>.90	Bentler & Bonett (1980)
RMSEA	.007	.040	<.08	Hu & Bentler (1998)
SRMR	.053	.051	<.09	MacCallum et al. (1996)

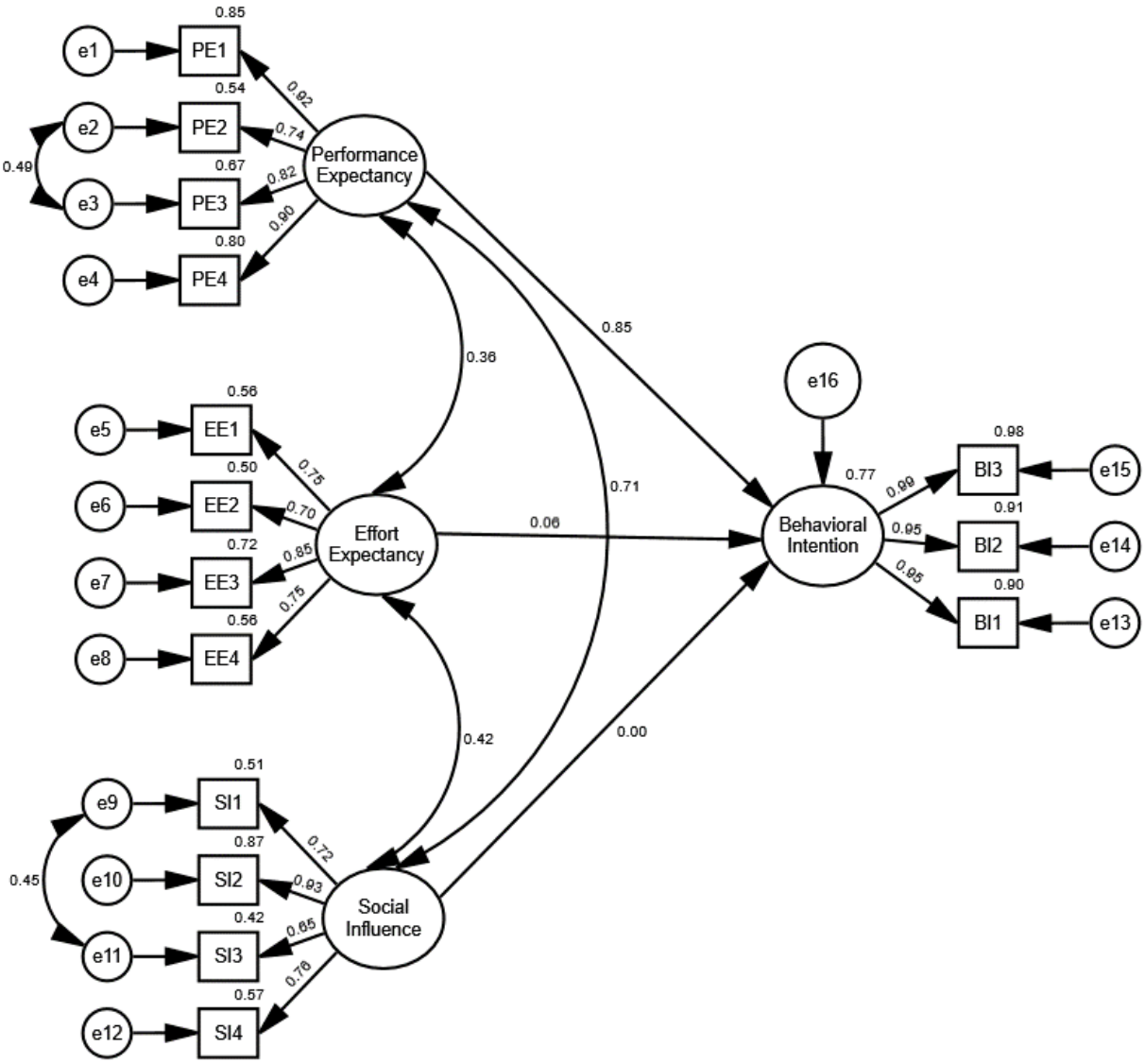

Figure 3. Structural Model

4.3. Testing of Hypotheses

The results of H_1 revealed that an instructor's performance expectancy significantly impacted their behavioral intention to use online proctoring (β=0.851, t=8.724, p<0.001). However, H_2 and H_3 were not supported (H_2: β=0.061, t=1.124, p=0.261; H_3: β=0.004, t=0.051, p=0.959).

For H_4, the relationship path between each of the independent variables and behavioral intention to use online proctoring were constrained to be equal across the two online teaching experience groups. Only part H_{4C} was found to be significant. The constrained model had a χ^2 difference of 0.664 for H_{4A} (p=0.415), 0.490 for H_{4B} (p=0.484), and 10.115 for H_{4C} (p=0.001). While the relationship between social influence and behavioral intention to use online proctoring is insignificant for respondents with substantive experience (β=0.192, t=1.951, p=0.051), the relationship was significant for respondents with moderate to no experience (β=-0.278, t=-2.650, p=0.008). Having moderate to no online teaching experience was found to have a negative impact on the relationship between social influence and behavioral intention to use online proctoring. Thus, H_{4C} was supported.

To test H_5, the relationship path between each of the independent variables and behavioral intention to use online proctoring were constrained to be equal across the three faculty status groups: full-time tenure or tenure-track faculty, full-time non-tenure track or other full-time faculty, and adjunct or other part-time and

emeritus faculty. H_5 was found to be not significant. The constrained model had a χ^2 difference of 1.323 for H_{5A} (p=0.516), 0.562 for H_{5B} (p=0.755), and 0.018 for H_{5C} (p=0.991).

5. Discussion

The result of H_1 found strong support for the relationship between performance expectancy and an instructor's behavioral intention to use online proctoring for exams in their online courses in the future. Instructors were more likely to use online proctoring if they believed it would improve academic integrity. Instructors' expectations of online proctoring's role in ensuring academic integrity were confirmed in the qualitative feedback. For example, instructors stated, "there is value added in ensuring the integrity of student evaluations" and that this "ensures students are not cheating." This finding highlights the importance of promoting the potential benefits of online proctoring in improving academic integrity to increase possible usage, but there is also a need to highlight alternatives. While some instructors believed the use of online proctoring could help to ensure academic integrity during exams, several instructors preferred alternative strategies for administering exams and alternative types of assessments to maintain academic integrity.

The results of H_2 found that effort expectancy did not have a significant impact on an instructor's behavioral intention to use online proctoring. Instructors were not more likely to use online proctoring if they believed it would be easier to implement. The qualitative results were mixed on whether online proctoring improved the amount of effort spent administering exams or whether online proctoring caused additional effort to administer exams. Some instructors indicated that proctoring reduced their workloads by relieving them of proctoring-related duties. Other instructors indicated that learning how to use proctoring was challenging and that the time involved in learning and setting up proctored exams "was complicated" and added to their workloads. Instructors also had to manage a high number of situations where the proctor indicated that a student was possibly cheating but upon review of the video recording, there was no clear evidence that cheating had occurred. Reviewing these "false positives" added to the workload of instructors.

H_3 tested whether social influence, or the degree to which the instructor perceives that students believe they should use an online proctor for exams, influenced an instructor's intention to use online proctoring. H_3 was not supported, as social influence did not increase instructors' intention to use online proctoring. Instructors were not more likely to use online proctoring if their students wanted it. Despite the insignificant results, some instructors indicated in the qualitative comments that students had a positive influence on their desire to use online proctoring as it empowered students by giving them increased time availability for testing, reduced the need to travel to an in-person proctoring location, and added credibility to the testing process. For other instructors, students decreased their desire to use online proctoring by raising privacy, anxiety, and cost concerns with using online proctoring. Instructor comments such as "I had some push back from students about privacy" and "[students'] negative sentiments towards online proctoring" reflect how students influenced the instructor's decision not to use online proctoring.

In the original UTAUT model, gender, age, experience, and voluntariness of use moderated the relationships that existed between the three independent variables (i.e., performance expectancy, effort expectancy, and social influence) and the dependent variable, behavioral intention to use. Results of H_4 found that an instructor's level of online teaching experience did not moderate the relationship between performance expectancy and intention to use (H_{4A}) or the relationship between effort expectancy and intention to use (H_{4B}), but it did moderate the relationship between social influence and an instructor's intention to use online proctoring (H_{4c}). Social influence was a significant factor for predicting behavioral intention to use online proctoring for instructors new to teaching online. One explanation could be that newer online instructors were more influenced by their students' preferences due to their own unfamiliarity with the pedagogy and technology used when teaching online. However, as online instructors gained experience and became more familiar with pedagogical and technological options, it is plausible that they became less influenced by their students' preferences.

Results of H_5 found that faculty status did not moderate the relationships between the three independent variables and intention to use. The relationships did not vary based on full-time vs. part-time instructor or

tenured/tenure-track vs. non-tenure-track status. With the exception of online teaching experience, none of these variables moderated the relationships. Tests of gender, age, and voluntariness of use were also conducted, but did not uncover any moderation between the independent and dependent variables.

Table 12 summarizes the key findings and implications. This study confirms that performance expectancy is a predictor of a technology user's behavioral intention to use; however, this study did not find the other independent variables in the UTAUT model to be significant. One explanation may be that the online proctoring use decisions by instructors has wide-reaching implications beyond their own user experience. Instructor decisions to use or not use online proctoring not only influences the instructors' course experiences as well as their students' learning experience and satisfaction with their course. Despite the strong relationship between performance expectancy and behavioral intention to use, concerns raised in the qualitative findings about student privacy, discrimination, and accessibility may be influencing the decision of some instructors to choose not to use online proctoring. The severity of these concerns may contribute in part to the insignificant results found for some of the hypotheses.

Table 12.

Summary of Findings and Implications

Finding	Implication
1. Performance expectance is a strong determinant in predicting intention to use online proctoring.	• Institutions could promote online proctoring's usefulness in detecting and deterring academic dishonesty. • Institutional policies or guidelines for the use of online proctoring could be created. • Institutions could investigate where online proctoring improved learning outcomes and the academic performance of students. • Institutions could provide recommendations on when and how to use online proctoring to improve academic integrity. • Institutions could promote increased online proctoring convenience for instructors and students. • Institutions could promote alternative means of administering exams for those who have legal, ethical, or social concerns. • Institutions could promote alternative types of assessments to fulfill desired learning outcomes.
2. Effort expectancy is not significant in influencing the intention to use online proctoring.	• Training workshops, job aids, and technical support may be helpful for some instructors but may not increase the use of online proctoring. • Institutions could invest in additional resources and assistance to help instructors review and interpret proctoring exam flags. • Institutions could provide instructors with resources for how to handle violations of integrity.
3. With the exception of less experienced online instructors, the social influence of students does not influence instructors' intention to use online proctoring.	• Institutions could inform more novice online instructors with resources to understand the advantages and disadvantages of using online proctoring. • Institutions could provide opportunities to discuss and share experiences with peers. • Whenever possible, institutions could provide instructors with options to choose options that work for them, their students, and their course. • Instructors could cultivate an environment of integrity among students.

5.1. Implications for Institutions

Much of the research on online proctoring has compared exam performance outcome measures between students who were proctored and students who were not proctored during an exam (Hollister & Berenson, 2009; Wuthisatian, 2020); Yates & Beaudrie, 2009). The present research is one of the first to look at instructors' experiences and perceptions of online proctoring and how these experiences and perceptions

influence their intention to use online proctoring in the future. This study also adds to the UTAUT literature that recognizes performance expectancy, effort expectancy, and social influence as the core constructs that determine a person's behavioral intention to use a technology.

While online proctoring can be used to improve academic integrity, it is important for institutions and instructors to carefully consider its benefits and drawbacks, as well as alternative strategies for maintaining academic integrity. Additionally, it is important to recognize the challenges that instructors and students may face when using online proctoring and to address these challenges.

To encourage more instructors to adopt online proctoring, institutions should emphasize performance expectancy as a key factor when promoting online proctoring to instructors. Institutions should clearly communicate the potential benefits of online proctoring, such as improved academic integrity and increased convenience for some instructors and students. Institutions may want to consider initiatives that promote online proctoring's usefulness in detecting and deterring academic dishonesty while providing recommendations on when and how to use online proctoring to improve academic integrity. Institutions should also emphasize examples where online proctoring helped improve learning outcomes and the academic performance of students.

Even though a university may promote the potential benefits of online proctoring in an attempt to increase usage, instructors in this study raised valid concerns in the qualitative comments about the use of online proctoring. As such, a holistic approach to improving academic integrity through strong instructional design is needed. Institutions should promote alternative means of administering exams and alternative types of assessment to fulfill desired learning outcomes. Institutions should provide instructors with options to choose what works best for them to balance the need for academic integrity while giving students choices that fit their individual needs and comfort. This approach should include suggestions on which type of online proctoring can best serve their needs and goals for academic integrity by balancing some of the concerns raised.

Since social influence was a factor for instructors with little to moderate online teaching experience, institutions should make resources and support easily available to instructors who have limited online teaching experience. Less experienced online instructors would benefit from an opportunity to discuss and share their experiences with online proctoring and receive recommendations from their peers who could provide context to novice instructors to help them better respond to recommendations arising from students

Instructors raised legal, ethical, and social concerns related to the use of online proctoring. Institutional units, committees, and leaders overseeing educational policy, academic integrity, and technology-related decision making should work together to create institutional policies vetted by legal counsel. Institutions must be proactive in ensuring that the use of online proctoring aligns with their institutional values and the changing legal landscape. Institutional policies should strive to find a balance between ensuring academic integrity and promoting a positive experience for students and instructors. Since there are strong use cases for online proctoring, these policies should include flexibility whenever possible.

5.2. Implications for Instructors

This study found that instructors' intention to use online proctoring is primarily influenced by their belief in its effectiveness for promoting academic integrity, rather than by ease of use or student influence. Therefore, instructors considering online proctoring should focus on evaluating its potential to uphold integrity in their specific teaching context. Additionally, qualitative responses indicated that instructors often face challenges interpreting proctoring results and managing flagged incidents, highlighting the need for targeted training and support. Since social influence was only significant for less experienced online instructors, and often in a negative direction due to student concerns, institutions should provide resources that help instructors address student anxiety and privacy issues when implementing online proctoring.

Another implication of this research is that not all exams need proctoring as other strategies can be used to promote integrity. Instructors should cultivate an environment of integrity among their students regardless whether or not instructors chose to use online proctoring. Students should be taught what academic integrity

means and why it is essential to their studies. Students could be asked to sign an honor code at the beginning of each course or before each exam confirming that they will abide by the integrity policy. However, student awareness of academic integrity alone will not reduce misconduct (Amigud & Lancaster, 2019).

Instructors of online courses should develop familiarity with students, as familiarity may lessen a student's willingness to cheat. Practices like regular video Web chats with students not only strengthen familiarity, it creates a visual record of the student that can be used if identity is later questioned (Newton, 2015). In addition, having a dialogue with students will provide instructors with insight into their knowledge level of the content (Rowe, 2004).

Instructors should also encourage integrity by developing assessments that remove cheating opportunities and by using methods of detecting academic misconduct that discourages students from cheating. In addition, instructors could aim to reduce the pressure of exams on students as a means to improve integrity. Providing students with flexibility on when exams are completed can help students who turn to cheating because of unexpected circumstances or limitations that potentially inhibit their success, such as when they are unable to find childcare. At the same time, it will not help students who lack the self-discipline or motivation needed to succeed (Amigud & Lancaster, 2019).

When online proctoring is used as part of the academic integrity solution, instructors should take the initiative to help reduce students' technology-driven anxiety. Instructors can create a practice quiz that provides students with a chance to test their computer system and experience the testing process before the actual exam (Medina & Castleberry, 2016). Instructors should also establish a process to be followed in the event of an access issue (Medina & Castleberry, 2016).

5.3. Limitations

Despite the contributions of this research, there are some limitations. First, the scope of this research is limited as it only focused on the use of online proctoring in higher education institutions. This will reduce the applicability of findings to K-12 educational institutions and other educational settings that may rely on or are considering employing online proctoring. Furthermore, this study combined online proctoring needs across academic levels, subject areas, and institution types. Instructors' perceptions of the importance of academic integrity for undergraduate-level coursework may be different from the perspectives of instructors who use online proctoring for graduate-level standardized exams (e.g., licensure). In addition, community colleges were not listed as distinct from other public institutions as an institution type. Perspectives between community college instructors and instructors at other public institutions may vary.

Another limitation of this study is the sampling approach. Since this was one of the first studies on instructor perceptions of online proctoring, a convenience sampling approach was selected. Since the sample was not obtained randomly, there is a risk of self-selection bias (Fraenkel et al., 2012). Instructors having familiarity with or stronger opinions about online proctoring may be overrepresented in the sample. The high representation of instructors having significant online teaching experience supports any later contention that instructors having exposure to online teaching and online proctoring may have been more likely to complete the survey. There was also a large percentage of respondents who indicated that they were White/Caucasian (75.9%). Research using other sampling methods can help mitigate any biases or overrepresentations that resulted from this sampling plan.

Still another limitation of this study is that it used an attitude survey instrument to gather data. While much less expensive and time-consuming than behavioral observations, attitude surveys measure the respondent's self-reported data. Worthen et al. (1998) identify three limitations with self-reported attitude scales: it assumes that respondents know what their attitudes are, it assumes that respondents are willing to reveal their attitudes and that attitudes predict actual behaviors, and it assumes that respondents remember prior events accurately. This research did not include a reverse-worded survey item. Several reverse-worded survey items could have helped confirm whether the four participants who were removed from the analyses for possible respondent misconduct should indeed have been removed or retained.

5.4. Future Research

The results of this study suggest that performance expectancy is the primary predictor of behavioral intention to use online proctoring. Further exploring the relationship between all three independent variables and instructors' intention to use online proctoring would be valuable in confirming that performance expectancy is the primary driver of intention to use and that social influence and effort effectiveness have a minor impact. For replication studies, a few suggestions are made. First, researchers should include community colleges as an additional institution type to see if there are differences in perspectives between community college instructors and instructors at other institutions. Second, one or more survey items to capture the levels taught by the instructor should be captured to see if there are differences in perspectives based on teaching undergraduate students, graduate students, or both. Third, at least one Likert-scale survey item should be reverse worded to help with identifying possible negligence, error patterns, or misconduct in responding among respondents. Fourth, it would be useful to ask instructors about their prior experience with submitting academic misconduct cases. Knowing whether instructors have ever submitted an academic misconduct case or whether they regularly submit academic misconduct cases could help in better understanding perceptions of the role of online proctoring in ensuring academic integrity. This insight could also help guide professional development programming for an institution by identifying whether programming should emphasize the importance of academic integrity. It could also assist in determining how to navigate the process for reporting academic integrity violations and whether programming should emphasize the use of academic integrity detection tools. Lastly, more qualitative studies using interviews and focus groups could be beneficial in capturing instructors' perceptions.

The results of this study also found that online teaching experience moderates the relationship between social influence and behavioral intention to use online proctoring. Further research could examine the extent to which online teaching experience affects instructors' perceptions of the benefits and challenges associated with online proctoring. Online teaching experience could also be examined with regard to other aspects of online academic integrity, such as the use of alternative strategies for administering exams and alternative types of assessments.

The results of the study indicated that online proctoring could be a burden for students. The experiences of students who are required to use online proctoring could be researched, as well as the impact that online proctoring had on student engagement, learning, and satisfaction. With student test anxiety being a concern raised by some instructors, research could be conducted on student anxiety levels with different types of online proctoring to determine if the type of proctoring employed impacts their anxiety and comfort levels. Academic integrity policies and practices at different institutions could also be studied to better understand how the use of online proctoring is integrated in diverse ways and how different institutions address the legal, ethical, and social concerns raised.

Lastly, the data for this research study was gathered in the fall of 2022, after the *Ogletree v. Cleveland State University* raised concerns with online proctoring but before the rise of artificial intelligence tools like ChatGPT that can generate entire essays within minutes based on submitted prompts (McMurtrie, 2023; Mintz, 2023; Mitrano, 2023). Replication studies would be useful to determine whether instructor perceptions about online proctoring have changed with the pervasive technological changes that have unfolded during just the past couple of years and the raised awareness of the ethical, social, and legal issues surrounding online forms of education and training brought by an increasingly AI intensive world.

Disclosure Statement

The authors report there are no competing interests to declare.

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Appendix A

Survey Instrument

Higher Education Faculty Status, Institution, and Online Teaching Experience

Question	Response Options
What is your higher education faculty status?	Full-time, tenured or tenure-track faculty member Full-time, non-tenure-track or other full-time faculty member Emeritus faculty member Adjunct or other part-time faculty member Not a higher education faculty member
At what type of institution do you teach?	Public Private, non-profit Private, for-profit Other (type response in box)
How many students attend your college or university?	Fewer than 5,000 Between 5,000-15,000 More than 15,000
In what country is your college or university located?	United States Other (type response in box)
How much online teaching experience do you have?	Little or no experience Moderate experience Significant experience
Approximately how many online classes have you taught?	1 2 3 4 5 6 Other (type response in box)

UTAUT Items (Adapted from Venkatesh et al., 2003)

Construct	Survey Item (#)
Performance expectancy (PE)	I would find an online proctor to be useful in my courses (PE1) Using an online proctor would enable me to accomplish tasks more quickly (PE2) Using an online proctor would increase my productivity (PE3) If I used an online proctor, I could improve my courses (PE4)
Effort expectancy (EE)	Setting up online proctoring would be clear and understandable (EE1) It would be easy for me to use online proctoring for my courses (EE2) I would find online proctoring easy to use (EE3) Learning to use online proctoring for my courses would be easy for me (EE4)

Social influence (SI)	My students think that I should use online proctoring (SI1) My students would support the use of online proctoring in my courses (SI2) My students have encouraged the use of online proctoring (SI3) In general, students at my institution support the use of online proctoring (SI4)
Behavioral intention (BI)	I intend to use online proctoring in the future (BI1) I plan to use online proctoring in the future (BI2) I predict I will use online proctoring in the future (BI3)

Use of Online Proctoring

Question	Response Options
Have you used online proctoring in any of your courses?	Yes No
Who made the choice for you to use online proctoring in your courses?	I made the choice to use online proctoring Other faculty, staff, or administrators required me to use online proctoring Other (type response in box)

Additional Thoughts

Question	Response Option
Provide any additional thoughts about or experiences with using online proctoring that you would like to share.	Open ended text box