Moving Back on Ground From Online: Tool Persistence

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The COVID-19 Pandemic forced educators across the country into online classes and, for many, using unfamiliar online tools for the first time. This research paper focuses on business professors and their acceptance of many online tools during and after the pandemic. Using the Technology Acceptance Model (TAM) created by Davis (1989), this paper examines Perceived Usefulness and Perceived Ease of Use along with Attitude Towards Use and Intention to Use. This study will help determine not only usage of these new technological tools during the pandemic but also the adoption of these tools by business professors once they returned to the classroom again. The results of this study confirm usage of TAM, examine one-way teaching that has changed due to the pandemic and discusses further potential studies.

Keywords: technology acceptance model, teaching online, COVID-19 pandemic, online teaching tools, business pedagogy

INTRODUCTION

In March 2020, Universities en masse moved online to help combat the spread of COVID-19. Professors used to teaching face-to-face suddenly were thrust into online learning. The 2020-2021 school year brought a combination of hybrid, face-to-face, and online teaching styles. The Chronicle of Higher Education and Inside Higher Ed published countless articles advising professors on best serving students remotely. Universities conducted constant training to help their historically face-to-face only professors go online and meet with success.

Starting in the 2021-2022 school year COVID-19 was still present, but most universities resumed on-campus learning. While a lot of ink has been spilled on how to move a face-to-face course into the online world (e.g. Bennett, McCarty, & Carter, 2011), this was the first time professors presented the issue in reverse. Professors could simply revert back to their old methods, or they could take some of the new tools they learned back into their face-to-face classrooms. This study looks at evidence of what teaching tools professors decided to keep once back face-to-face and reviews comments about why they chose to keep the tools in use. Additionally, it demonstrates how the Technology Acceptance Model can be used in circumstances of re-adoption rather than the initial adoption of a technology.

LITERATURE REVIEW

Online Tools in the Classroom

Teaching is rarely just in a classroom anymore. Face-to-face teachers use a variety of online resources to supplement the face-to-face experience. Boozer and Simon (2020b) showed how the use of online learning tools, like Connect and MindTrap, improves grades but should not be a large part of coursework. In another study by the same team, Boozer and Simon (2020a) found that students in Finance courses believed that online learning management systems helped improve the effectiveness of homework assignments but failed to improve learning outcomes.

In 2019, McCarthy et al. showed that online and hybrid students using "My Accounting Lab" did significantly better than traditional students. But going back to Boozer and Simon (2020b), the researchers concluded this was the result of My Accounting Lab status as a supplement rather than an integral part of the course. Lohmann et al. (2019) found the use of online business simulations can be used for successful team-based learning and improve student satisfaction.

Ahmed and Mesonovich (2019) demonstrated that publisher-based learning management systems, like Connect, improved student learning outcomes. Krentler and Willis-Flurry (2005) examined the use of online discussion boards and demonstrated how they support student learning.

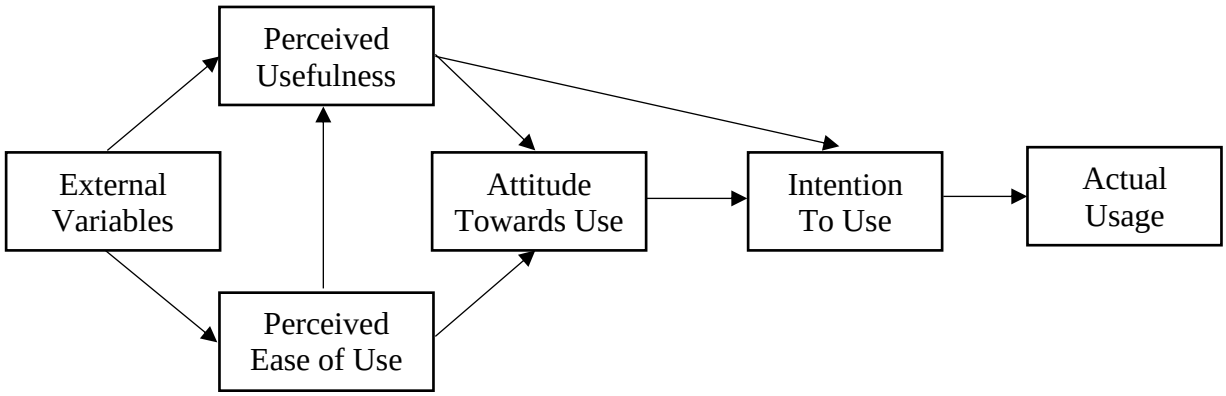
But not all researchers have found benefits. Lee et al., (2010) and Hahn et al., (2013) could not find a difference in learning outcomes in their studies using online learning tools, but did support that a baseline of computer literacy is needed to make online learning successful. Hernandez-Julian and Peters (2012) found students were more likely to complete homework in an online setting, but did not find any improvement in test scores as a result. Spivey and McMillian (2014) compared online versus on ground testing in an introductory finance class and found no difference in study habits or scores when using the technology.

With such mixed reviews, we argue that the evidence-based research did not create a compelling need for professors to adopt online tools pre-COVID.

The Technology Acceptance Model (TAM)

The Technology Acceptance Model (Davis, 1989; Venkatesh et al., 2003; Venkatesh & Bala, 2008; Venkatesh & Davis, 1996) is a widely used model to predict individual adoption and use of new technologies within their jobs. TAM has been studied extensively over the past several decades and has its orgins rooted in the psychological theory of reasoned action and the theory of planned behavior (Marangunić & Granic, 2015). As seen in Figure 1, the Technology Acceptance Model starts with External Variables.

FIGURE 1
TECHNOLOGY ACCEPTANCE MODEL (TAM)



(Davis et al., 1989)

As Hubona and Whisenand (1995) noted, the model does not specify which external variables influence perceived usefulness and ease of use. As a result, there are times when they are found insignificant, and other times they are found significant, depending on the case. In our case, the primary external variable was the COVID-19 Pandemic, which we assume would significantly increase the perceived usefulness of online education tools, changing the attitude towards use, and eventually leading to actual usage.

Perceived Ease of Use refers to the degree to which users believe using a particular technology will be effortless and straightforward (Davis, 1989). This construct can play a role in determining users' attitudes and intentions towards adopting a new technology. Studies by Venkatesh and Davis (1996) have shown that perceived ease of use significantly influences users' attitudes, with users being more inclined to adopt a technology when they perceive it as easy to use.

Perceived Usefulness refers to the extent to which users believe that technology will enhance their performance and productivity (Davis, 1989). Empirical research by Venkatesh and Davis (1996) supports the significant impact of perceived usefulness on technology adoption. When users perceive technology as highly useful, they are more likely to develop positive attitudes towards it and, consequently, show a greater intention to use it. Venkatesh and Bala's study (2008) showed that perceived usefulness is the greatest predictor of adoption. This leads us to our first hypothesis:

H1: *Professors, recognizing the usefulness of online course tools in the Pandemic, rapidly adopted new internet-based tools to deliver their courses.*

We believe that professors will continue to use online tools once back face-to-face, as they have overcome the initial pain of adoption after receiving positive student reviews. This is supported by the small amount of material showing virtual tools in the face-to-face classroom. For instance, Chiang et al., (2014) and Akçayır et al., (2016) used the Cognitive Theory of Multimedia Learning (CTML) to demonstrate that including video assignments (a common online learning tool) to supplement face to face learning will improve learning outcomes.

Koeber (2005) lends additional support by showing that students report higher levels of personal involvement and active engagement with course materials when multimedia presentations and course websites are added to face-to-face teaching. These findings lead us to believe that students will be positively inclined to want to keep these technological updates in face-to-face courses.

H2: *Professors, having adopted online course tools, will continue to use them once back on ground.*

To measure this continued acceptance of online tools, despite a change in venue, we intend to use to the Technology Acceptance Model explained above. This leads us to our final hypothesis:

H3: *The same factors that help determine initial adoption will also support continued adoption when circumstances change, such that the technology acceptance model will predict continued use in the on ground classroom.*

METHODOLOGY

A Qualtrics survey was sent to business-focused professors both via email and QR codes distributed at two business-related conferences. After collecting data from March 2022 to November 2022, the long survey had 85 responses. 27 surveys were started, but incomplete, 12 responses were out of scope as the participant did not return to a face-to-face classroom setting, leaving us with 46 useable responses.

In each response, participants were asked about 13 online tools and their use in the classroom. If the participant marked that they adopted the tool during the pandemic, they were asked to complete additional information about the tool, including its perceived usefulness, ease of use, and attitude towards to the tool. Due to an error in the Qualtrics survey, some early participants who adopted the tool pre-pandemic were not given the opportunity to respond in the same way. This resulted in 143 useable quantitative data

points for adopted tools during the pandemic. All participants were also able to explain qualitatively why they chose to refrain from using, adopting, retaining, or dropping a tool.

Using the TAM Model as a Lens for Technology Retention

The researchers were unable to find a model for technology retention in new circumstances and chose instead to view the movement from online back to on ground class teaching as a re-newed chance for technology adoption, pointing to us to the Technology Acceptance Model (Davis, 1989). Using the 143 responses and the validated Technology Acceptance Model survey questions from Davis (1989), we were able to generate the Ease of Use, Usefulness, Attitude Towards Technology, Intent to Adopt, and Actual Usage of Technology adopted during the pandemic. Two questions were reverse coded and reliability tests were ran. Each set of survey questions were measured for reliability of measuring the factor, and all factors were found reliable with a Cronbach's alpha exceeding 0.70 as prescribed by Cronbach (1951). "Each factor, with the exception of Ease of Use to final adoption, was found to be a statistically significant predictor of the subsequent factors. As mentioned, one factor, Ease of Use, was not statistically significantly related to the item's actual (second) adoption. This is consistent with other studies of the TAM model including Chau (1996). Despite this minor flaw, we chose to continue with the TAM model because of the statistically significant connection to Actual Usage, Attitude Towards Use and Intent to Use. Additionally, we note the participants were not in an initial adoption of a tool, but rather were reflecting on tools they were already very familiar with and deployed, as a result, the Ease of Use data is skewed to higher rankings.". The average ease of use score for the 5.36 on 7 point scale with a standard deviation of 1.2.

RESULTS

TABLE 1
DESCRIPTIVE STATISTICS OF TOOL USAGE

	Does Not Use	Adopted Before Pandemic	Adopted During Pandemic and Dropped	Adopted During Pandemic and Retained
All Tools	226	210	64	87
Percentage	*38.50%*	*35.80%*	*10.90%*	*14.80%*
Retention Rate				*57.60%*
Video Conferencing (Ex Zoom)	6	9	8	22
Percentage	*13.30%*	*20.00%*	*17.80%*	*48.90%*
				73.30%
Learning Management System	4	39	0	1
Percentage	*9.10%*	*88.60%*	*0.00%*	*2.30%*
				100.00%
Online Testing	8	25	5	7
Percentage	*17.80%*	*55.60%*	*11.10%*	*15.60%*
				58.30%
Discussion Boards	14	19	9	3
Percentage	*31.10%*	*42.20%*	*20.00%*	*6.70%*
				25.00%

Online Simulations	29	14	0	2
Percentage	*64.40%*	*31.10%*	*0.00%*	*4.40%*
				100.00%
Pre-recorded Lectures	15	14	5	10
Percentage	*34.10%*	*31.80%*	*11.40%*	*22.70%*
				66.70%
Pre-Recorded Assignments	30	4	3	8
Percentage	*66.70%*	*8.90%*	*6.70%*	*17.80%*
				72.70%
YouTube	18	23	2	2
Percentage	*40.00%*	*51.10%*	*4.40%*	*4.40%*
				50.00%
Online Homework	23	17	0	5
Percentage	*51.10%*	*37.80%*	*0.00%*	*11.10%*
				100.00%
Student-based Recordings	30	6	7	2
Percentage	*66.70%*	*13.30%*	*15.60%*	*4.40%*
				22.20%
Survey Tools	22	18	7	2
Percentage	*44.90%*	*36.70%*	*14.30%*	*4.10%*
				22.20%
Online Office Hours	12	8	10	15
Percentage	*26.70%*	*17.80%*	*22.20%*	*33.30%*
				60.00%
Asynchronous Classes	15	14	8	8
Percentage	*33.30%*	*31.10%*	*17.80%*	*17.80%*
				50.00%

According to our survey, 41.8% of all online tools surveyed were adopted during the pandemic. More than half of adoptions for Video Conferencing, Pre-recorded Lectures, Pre-Recorded Assignments, Student-based Recordings, Online Office Hours, and Asynchronous Classes were made during the pandemic. On the flip side, only 1 respondent adopted a Learning Management System during the pandemic, only 12.5% of online simulation users adopted the practice during the pandemic and 14.8% of participants who use YouTube started in the pandemic.

Additionally, some online tools have remained unpopular. 64.4% of participants do not use simulations. 66.7% of respondents do not use Pre-recorded Assignments or Student-based Recordings. While some tools were overwhelmingly popular during the pandemic, 91.9% of respondents use a Learning Management System, 86.7% used Video Conferencing and 73.3% held Online Office Hours.

Overall, 151 tools were adopted during the pandemic, 210 were already adopted entering the pandemic and 226 were never adopted. This suggests that 41.8% of the time tools were adopted were during the pandemic, suggesting that the pandemic was a strong catalyst for adopting online tools. H1 is supported.

We defined retention rates as the percentage of individuals who adopted the use of the technology during the pandemic and continued to use the tools once they were back on ground. Overall, retention rates were mixed. 57.6% of participants who adopted an online tool during the pandemic continued to use the tool once back on the ground. While somewhat skewed by small adoption rates, 100% of the people who adopted a Learning Management System, Online Simulations, and Online Homework continued to use

them when they returned to the physical classroom. 73.3% of participants who adopted Zoom during the pandemic continue to use it. The retention rates drop to around half for Online Testing, Pre-recorded Lectures, YouTube usages, Online Office Hours, and Asynchronous Classes. Discussion Boards, Survey Tools and Student-based Recordings were the three tools where most adopters dropped their use once back on ground, with retention rates of 25%, 22.2% and 22.2%, respectively.

If we consider all adoptions, not just pandemic adoptions, we can see once the adoption is made, it tends to be fairly sticky. Only 67 of 361 tools adopted (either pre- or during pandemic) were discontinued when back on ground – a rate of 18.56%. Consequently, we believe H2 is supported.

Finally, we hypothesized that the relationship between Perceived Usefulness and Re-Adoption would be mediated by Attitudes Towards Use and Intention to Use. Specifically, individuals with higher levels of Perceived Usefulness would have higher levels of Re-Adoption (i.e., a positive relationship), and that stronger/higher levels of Attitudes Towards Use and Intention to Use would be associated with higher levels of Re-Adoption (i.e., a positive relationship) in line with the Technology Acceptance Model. We first used Baron and Kenny's (1986) causal steps to examine these relationships. In the first model, we examined the direct effect ($F(26) = 4.97$, $p = 0.04$, $R^2 = 0.16$). Here Perceived Usefulness was positively and significantly related to Re-Adoption ($b = 0.40$, $p < 0.05$). In our second model, we examined the first part of the indirect effect ($F(26) = 29.79$, $p = .00$; $R^2 = 0.53$) here Perceived Usefulness was positively and significantly related to Attitudes Towards Use ($b = 0.74$, $p < 0.001$). In our third model, we examined the second part of the indirect effort ($F(26) = 22.59$, $p = 0.00$, $R^2 = 0.44$) here Perceived Usefulness was positively and significantly related to Intention to Use ($b = 0.93$, $p < 0.001$). In our fourth model, Attitudes Towards Use was examined as a predictor of Re-Adoption ($F(27) = 12.83$, $p = 0.001$; $R^2 = 0.30$). Here, Attitudes Towards Use was positively and significantly related to Re-Adoption ($b = 0.57$, $p = 0.001$), the second part of the indirect effect. In our fifth model, Intention to Use was examined as a predictor of Re-Adoption ($F(28) = 5.44$, $p < 0.05$, $R^2 = 0.13$). Here Intention to Use was positively and significantly related to Re-Adoption. In addition, we ran the PROCESS Procedure in SPSS to test the mediation of Attitudes Towards Use and Intention to Use on the relationship between Perceived Useful and Re-Adoption. The model summary was significant ($p = 0.02$). Thus, based on the causal steps approach along with PROCESS Procedure, we can conclude that Attitudes Towards Use and Intention to Use mediates the relationship between Perceived Useful and Re-Adoption, supporting H3.

Finally, we asked in open text boxes, why professors chose to retain the tools they adopted when back on ground. Table 2 shows the consolidated commentary and top reasons given by participants.

Our participants retained the online tools for several predictable reasons, most of which were student centric. The reasons spilt into three major categories. Many were retained because they added convenience for students and teachers alike – such as online office hours and zoom links for classroom session. Second, they enhanced the classroom experience with applications or experiential learning, such as simulations. Finally, they served as an alternative, when student or professor needed to miss a class session, like the asynchronous classes. Interestingly enough (and in line with our results for H3), no participant decided to keep using a product simply because it was 'easy to use', but rather focused on the tool's usability in the classroom and outside of it.

TABLE 2
REASONS FOR RETAINING ONLINE TOOLS

Teaching Tool	Top Reasons to Retain	Teaching Tool	Top Reasons to Retain
Zoom	Convenience for students and myself	Pre-recorded Assignments	Simplifies course preparation
	Allows commuter students to participate in extenuating circumstances		Students who missed class can learn about the assignment
	Students not being able to attend class for various reasons (illness, athletics)		Saves time
Online Testing	Convenience for students	YouTube	Varies the mode of explanation/demonstration
	Saves class time		Access to a lot of content on YouTube
Discussion Boards	Keeps the topic/content top of mind with the student throughout the week		Enhances the class environment
	Encourages student interaction outside of class	Online Homework	Convenience for students
Simulations	Promotes critical thinking		Immediate feedback and multiple attempts
	Flexible time for students		Efficiency and grading time savings
	Provides application of the material	Student Recordings	Students can evaluate their performance
Prerecorded Lectures	Easy to make up missed face-to-face sessions		Helps students identify areas for improvement
	Allows for flipping the classroom	Survey	Convenient for collecting feedback from students
	Students can review videos at their convenience		Captures data for research
Asynchronous Class	Flexibility	Online Office Hours	Convenience for students
	Covers missing classes		Accommodates distance students
	Accommodates hybrid course design		

DISCUSSION

The Technology Acceptance Model (TAM) is a widely accepted framework that explains users' acceptance and adoption of technology. It consists of two key factors: usefulness and ease of use. Both factors play a crucial role in users' decision-making during the initial adoption phase. Users assess the perceived usefulness of the technology in terms of its potential benefits and advantages in achieving their goals. Simultaneously, they consider the ease of use, evaluating how easily they can learn and operate the

technology. In this context, both usefulness and ease of use are highly relevant as professors are introduced to a new technology.

However, in the case of professors continuing to use a technology in a new setting, such as the transition from online teaching during the pandemic to traditional classroom settings, the familiarity and experience with the technology increase. Consequently, the ease of use becomes universally high, resulting in reduced variation in user perceptions. In this scenario, ease of use is no longer a statistically relevant factor for technology adoption. Instead, the focus shifts to usability, encompassing factors like interface design, efficiency, effectiveness, and satisfaction with the technology's performance in the new context. This shift implies that a modified TAM model can be effectively applied to understand re-adoption behavior, where usability becomes the primary factor influencing continued technology usage in a different setting.

The COVID-19 Pandemic presented unprecedented challenges for university professors as they were suddenly required to shift their teaching methods and move their classes online. This sudden transition necessitated the rapid adoption of various technologies to ensure the continuity of education and create a conducive learning environment for students. Professors had to quickly familiarize themselves with platforms like Zoom, which enabled remote communication and video conferencing, facilitating real-time interaction and engagement with students. Video Conferencing became an essential tool for conducting virtual lectures, office hours, and even recorded sessions, ensuring that students could continue their learning journey despite physical distance.

Another significant challenge faced by professors was the need to adapt their assessment methods to an online format. Online homework platforms became crucial for delivering assignments, quizzes, and exams, allowing students to practice and demonstrate their understanding of the course material. These platforms often offered instant feedback and grading, allowing professors to monitor student progress and address any misconceptions or areas of improvement. Additionally, asynchronous engagement tools, such as discussion boards and pre-recorded lectures, played a vital role in maintaining student participation and promoting active learning without face-to-face interactions. These technologies facilitated ongoing communication, collaboration, and knowledge exchange among students, compensating for the lack of in-person classroom dynamics.

This study highlights the resilience and adaptability of university professors during a challenging time. Despite the unexpected shift to online teaching, they rose to the occasion and explored multiple types of technologies to deliver quality educational programs. The rapid adoption of tools like video conferencing, online homework platforms, and asynchronous engagement methods allowed professors to create engaging learning experiences and maintain student involvement during a tumultuous period. Their efforts in leveraging technology to overcome the challenges of remote teaching demonstrate their commitment to providing students with a continuous and effective learning environment, even in the face of adversity.

By the Fall of 2021, most universities had managed to bring a significant number of classrooms back to in-person instruction. Professors were presented with the opportunity to revert to their pre-pandemic teaching methods. However, it became evident that many professors, like their students, had embraced and learned new, effective techniques for engaging students online. They recognized the value of the tools they had adopted during the pandemic and chose to retain them.

While not all professors continued using every tool, a considerable number discovered that the new methods they had employed were convenient and student-focused. These tools provided flexibility, allowing students to learn at their own pace and access materials remotely. The retained tools helped facilitate effective communication, fostered active learning, and continued to support both students and professors. Moreover, they offered innovative methods of review and assessment, enabling professors to gauge student understanding and progress in diverse ways.

It is important to note that professors did not blindly cling to the newly adopted tools. They were discerning in their approach and recognized that certain traditional methods, such as face-to-face discussions, could be more effective than their online counterparts. When faced with situations where alternatives yielded better outcomes, professors were not hesitant to revert to old methods and abandon tools that proved to be less than optimal. This adaptability and willingness to prioritize student learning

outcomes ensured that the retained tools enhanced teaching and learning experiences in a post-pandemic landscape.

LIMITATIONS

One limitation of this study is the lack of detailed exploration regarding how professors utilized each tool. While we examined the adoption and retention rates of various online tools, we did not delve into how professors incorporated these tools into their teaching practices. For example, we were unable to determine whether professors who had already adopted a learning management system pre-pandemic expanded their usage or implemented different functionalities within the system during the online teaching period. Understanding the nuances of tool usage and the extent to which existing tools were leveraged during the pandemic would provide valuable insights into the adaptability and effectiveness of these tools in different teaching contexts.

Another limitation pertains to the lack of comprehensive investigation into why some professors decided to discontinue the use of certain tools. Although we observed a drop in retention rates for discussion boards, survey tools, and student-based recordings, we did not explore the underlying reasons behind this discontinuation. Future studies should investigate the factors influencing the decision to drop specific tools and whether professors experienced challenges or perceived limitations that led to their abandonment. Understanding these reasons can inform the design and implementation of online tools in a way that better aligns with professors' needs and preferences.

FUTURE RESEARCH

Future studies could conduct qualitative research, such as interviews or focus groups, to address the aforementioned limitations to gain deeper insights into professors' experiences and perspectives. These studies could explore the specific strategies and pedagogical approaches employed by professors when utilizing different tools during the pandemic and back on ground. Additionally, investigating the reasons behind tool discontinuation could shed light on the challenges and considerations that influenced professors' decision-making processes. Furthermore, examining how professors modified their use of online tools upon returning to in-person instruction would provide a comprehensive understanding of the dynamic nature of tool utilization and its impact on teaching practices.

Moreover, conducting comparative studies between different institutions or departments, considering factors such as teaching style, discipline, and student demographics, could provide a more comprehensive understanding of the adoption and retention of online tools. Such studies could uncover the contextual factors that influence tool usage patterns and shed light on the effectiveness of specific tools in specific settings. By exploring these avenues, future research can enhance our understanding of the complexities surrounding adopting and utilizing online tools in higher education and inform the design of effective technology integration strategies.

CONCLUSION

This study sheds light on the rapid adoption and retention of online tools by university professors during the COVID-19 Pandemic. It showed that the well-known technology acceptance model, with some adaptation, could be used for reviewing re-adoption in different circumstances. It reveals that professors rose to the challenge of transitioning to online teaching and explored various technologies to create a conducive learning environment. The findings demonstrate that the pandemic served as a catalyst for adopting online tools, with a significant proportion of tool adoptions occurring during this period. While not all tools were universally retained, many professors found new, convenient, and student-focused methods of delivering course material that provided flexibility and continued to support student learning.

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