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Determining Graduate Student Satisfaction with Remote Technologies

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ABSTRACT

In this paper we consider the factors that potentially relate to satisfaction and dissatisfaction with the Zoom software system. We collected data from a sample of MBA students at Bentley University, a business school in Eastern Massachusetts, United States. We find that perceived flexibility and convenience are among the major attributes of Zoom most positively related to student satisfaction with Zoom; and, perhaps not surprisingly, we found that the level of perceived reluctance to use or embrace Zoom by the professor related most negatively with student satisfaction (i.e., related most positively with student dissatisfaction.)

KEYWORDS: Zoom Video Communications, Remote technologies, Regression analysis, Factor analysis

INTRODUCTION

The advent of the digital age brought forth the implementation of cloud computing, as well as software and hardware applications into the classroom. Through these technologies, college and university campuses alike can streamline their teaching processes and introduce innovative new ways to mold the minds of today's promising students. Not only are these technologies suitable for 21st century teaching, but they also enable institutions of higher education to meet the needs of students, including those who are unable to attend class sessions due to unforeseen circumstances or time constraints.

This digital revolution ushered in the widespread use of remote technologies or video communications on college campuses. The propagation of remote technologies, such as Zoom Video Communications, enables students to attend classroom sessions remotely in the comfort their own homes or other distant locations. Zoom is a virtual meeting platform created by former Cisco employees who worked on the telepresence platform at Cisco. The Zoom software system is available via both free and commercial accounts. The only difference between the two variants is that a commercial account can host meetings of indefinite length; free account meetings are limited in duration to 45 minutes. The core of the Zoom system is the concept of a virtual room, which bears a unique room identification number (RID). Each Zoom account is granted one permanent RID as well as the ability to create any number of *ad hoc* meeting/rooms, which are created with a randomly generated RID. Once created, this meeting room can be entered by students and faculty at any time. Upon entry to a virtual space, participants have the option to share audio, video and desktop views with all other participants. The room owner/host has additional capabilities relating to participant management and meeting control (Moser and Smith, 2015).

A prominent feature of Zoom is its video webinar functionality. The number of participants that video webinars can cater into is scalable, ranging from 100 to 10,000 view-only attendees and 100 interactive video participants. With this feature, users can invite other participants to join the webinar, as a URL link is generated by the software that can be copied and posted to social media platforms and instant messengers. They can also invite them through email, which is done instantly through integrations with email clients and software. Zoom's cloud video conferencing capability contributes to the dynamic hosting of webinars. Such capability allows the viewing of both a panelists' screen and a presentation screen; this is referred to as a dual screen support system. It also has an HD video and HD voice with dynamic voice detection functionality. Another component of the video conferencing functionality of this software that enhances webinars is its dynamic screen-sharing. Users can share their entire desktop screen with their audience, an active window in their browser, or a whiteboard with illustrations and diagrams. Zoom's video webinar functionality improves remote access to webinars and content sharing, and thus facilitates the

broadcast of educational, corporate, or organizational discussions (https://reviews.financesonline.com/p/zoom/, November 2018)

Zoom video communications helps students to grasp information from their instructors through real-time audio, communication and video. In order to do so, students are required only to join a Zoom "meeting" and communicate via their respective webcams and audio technologies. Although these remote technologies bring convenience and flexibility, it remains unclear how satisfied graduate-level students are with the Zoom experience. We aim to ascertain the level of graduate-student satisfaction or dissatisfaction regarding remote technologies (e.g., Zoom), and how it impacts their engagement, time allocation and other notable aspects.

As a means to address our research question, we used secondary research from well-respected authors and organizations. For instance, Ismail Sahin and Mack Shelley (2008) are educators at Selcuk University and Iowa State University, respectively. Although their previous research piece was published in 2008, the researchers thoroughly analyzed the web-based learning environment, which is of great importance to today's students who develop and submit work online. Through their research, we obtained information regarding how student satisfaction can be reached with, and derived from, online learning environments. Further, through their research study, we developed an understanding about what aspects facilitate web-based learning satisfaction at the undergraduate level. Our secondary research also builds upon a study conducted by Deselnicu, Militaru and Pollifroni (2015). This research was based on a conceptual model regarding how digital technologies impact other notable elements, including: teaching and learning quality, student expectations, and university image (Deselnicu, Militaru & Pollifroni, 2015). In contrast to secondary research, we addressed the research question by conducting purposive survey sampling, where respondents were selected based on their graduate-level status at Bentley University - a business school located in Waltham, Massachusetts, U.S.A.

The purpose behind this study is to improve upon previous research by providing information regarding video conferencing technologies at the graduate level. For example, the secondary research studies above have drawn their conclusions from undergraduate students and unspecified campus technologies. On the other hand, our report will have a strict focus on *Zoom Video Communications*, as it is becoming more prominent within university and college campuses across the United States. According to the company, over 10,000 higher education institutions in the country are now using the Zoom service (Video Conferencing, Web Conferencing, 2018). Therefore, the rationale behind our research is to determine the satisfaction level of graduate students regarding the increasingly popular and favored remote conferencing platform. Another purpose of our study is to inform educators and institutions alike about Zoom, and educate them on whether it enhances or reduces the learning experience and satisfaction of graduate students. By doing so, these parties can gain insight into how the learning experience is affected by remote technologies, and understand how hybrid sessions (i.e., online and in-class) match-up to traditional in-person university courses. Essentially, this research provides timely information regarding the widespread use of Zoom, while also supplying sample data about how effective the service is in driving graduate-student satisfaction across U.S. institutions.

Our primary research question is:

What Aspects of Using Zoom Video Communications Drive or Reduce Graduate Student Satisfaction?

As previously mentioned, the overall strategy in addressing the research question was based on purposive survey sampling to obtain valuable insights from Bentley University graduate students. Further, we used respondent scales (e.g., "None at All" to "A Great Deal") to better determine the level of satisfaction derived from Zoom Video Communications. The survey also included questions about technology adeptness, and inquiries about a student's level of agreement or disagreement with Zoom-based statements (e.g., "I am Satisfied with the Speed of Zoom," "Zoom is Easy to Use," etc.). Lastly, we consider the three hypotheses:

- **H1:** *Perceived convenience and flexibility is not enough to drive graduate student satisfaction when using Zoom Video Communications*
- **H2:** *Student experience with other academic technological tools will increase satisfaction with Zoom Video Communications*
- **H3:** *An instructor's ability to use and teach with Zoom Video Communications will drive graduate student satisfaction with this technology*

LITERATURE REVIEW

Previous research provides insight into the use of technology at higher education institutions, and determines how they can create undergraduate student satisfaction. Sahin and Shelley wanted to determine what establishes a successful web-based learning environment and which variables lead to student satisfaction from campus technologies (Sahin & Shelley, 2008). Essentially, the main objective was to understand what factors predict student satisfaction from online learning technologies, services or applications.

Regarding data, the researchers reached their conclusions based on survey information gathered from undergraduate students at an Anatolian university in Turkey (Sahin & Shelley, 2008). The data obtained were comprised of 195 undergraduate respondents, and consisted of 60 percent males and 40 percent females. Further, the data obtained were based on four survey sections including: computer expertise, flexibility of distance education, usefulness of distance education, and distance education satisfaction. These sections not only provided insight into student satisfaction from classroom technologies, but they also allowed a better understanding how computer expertise may impact or affect these satisfaction levels.

Following the retrieval of this research data, the researchers addressed their study question by conducting a reliability analysis. The researchers used Structural Equation Modeling (SEM) to address their research question.

After the use of the analytical procedures mentioned above, the researchers concluded that: 1) students who perceive that they have a high level of computer knowledge think more positively about the flexibility of distance education, and 2) students' computer knowledge and perceptions (e.g., perceived usefulness and flexibility of distance education), should be classified as predictors of student satisfaction from classroom technologies (Sahin & Shelley, 2008). Essentially, the study determined that web-based learning satisfaction is achieved through computer knowledge and the perceived convenience and usefulness of distance education (e.g., remote technologies.)

Our secondary research also builds upon a study conducted by Deselnicu, Militaru and Pollifroni. Their research was based on a conceptual model regarding how digital technologies moderate the relationships between teaching and learning quality, student expectations and university image (Deselnicu, Militaru & Pollifroni, 2015). Generally, the research question was to identify how digital technologies facilitate student satisfaction at universities. However, identically to Sahin and Shelley's study, this research case focused solely on undergraduate students.

In terms of data, the researchers launched a questionnaire, and gathered 54 responses from undergraduate students at the Politehnica University of Bucharest. It was noted that the respondent population was comprised of 52 percent females and 48 percent males. Further, these respondents were undergraduates ranging from 21 to 23 years of age. Alongside this interviewee information, the data emphasized that 64 percent of these survey respondents used different types of academic-based technologies at the university. Therefore, through this university sample, it was implied that these survey respondents were technologically adept, and were able to reach satisfaction from classroom technologies (Deselnicu, Militaru & Pollifroni, 2015).

To make sense of the acquired data, the researchers then leveraged the use of two analytical procedures. Identically to Sahin and Shelley, Deselnicu, Militaru and Pollifroni used SEM (Structural Equation Modeling) procedures for data analysis. Through SEM, the researchers simultaneously evaluated all the variables and identified their potential relationships. After SEM modeling, the researchers then conducted a hierarchical regression analysis. According to the study, this analysis was used to, "Test the moderating effects of digital technologies…[it] was carried out separately with each variable…[and] the results…show positive and significant interaction…[between] digital technologies and student satisfaction," (Deselnicu, Militaru & Pollifroni, 2015).

Following the analytical stage of their research, Deselnicu, Militaru and Pollifroni made key findings regarding student satisfaction and classroom technologies. For example, the researchers discovered that digital technologies lead to greater education quality. However, student satisfaction and technology adoption were influenced by the perceived usefulness of software applications or service offerings (Deselnicu, Militaru & Pollifroni, 2015). Alongside this finding, the researchers determined that digital technologies have positive effects on student satisfaction. Yet, this satisfaction is greatly influenced by teaching, learning and a student's own expectations.

Although the previous research provides information regarding technology and student satisfaction, both of the studies have shortcomings or limitations that our research can contribute to. As mentioned previously in the "Introduction" section above, the two secondary research reports focus on the correlation between classroom technologies and *undergraduate student* satisfaction. Also, these research studies lack information regarding specific or particular classroom technologies such as video communication services. Thus, previous research gives generalizations about classroom technologies, and does not provide insight into what specific classroom software, hardware or service applications drive student satisfaction. Contrastingly, our research builds upon the foundation of these studies, and provides analysis regarding the widespread use of a specific video communication or remote technology service in today's educational environment. Not only will our research be timed to Zoom's widespread propagation, but it will also enable us to offer a perspective of graduate-level students regarding a modern or contemporary piece of classroom technology.

Consequently, it enables us to provide relevant findings regarding Zoom Video Communications, and inform educators and university campuses alike about its student satisfaction generation.

Previous research fails to determine the level of student satisfaction from traditional class sessions, as opposed to those that offer classroom technologies (e.g., hybrid courses). As an example, the previous research did not take into account those who favor traditional learning environments due to better student-teacher relationships or other notable factors. In its place, the previous research had a one-dimensional focus concerning the research topic. For example, key findings from the previous research were strictly based on the correlation between classroom technologies and student satisfaction, while also determining how this fulfillment could be achieved. Thus, the findings did not acknowledge or make conclusions based on the respondent group that may prefer traditional class sessions. As a result, relevant conclusions about classroom technologies' inability to generate student satisfaction were excluded or omitted.

Conversely, our research will analyze Zoom Video Communications, and determine how the service both drives and fails to generate graduate student satisfaction. Our research provides this information by asking graduate respondents a series of questions relating to the level of agreement or disagreement regarding Zoom's perceived benefits and functionalities (e.g., "Zoom is easy to use," "Zoom has helpful features," etc.). The extent of these questions also touches base on Zoom's impact on student-professor relationships, participation, class-based collaboration and other notable factors. The research also inquires about technological adeptness when using an array of academic tools including, but not limited to, Zoom, SPSS, HTML, SAP, Tableau and the like. By inquiring about these tools, we can determine if one's technological expertise (or lack thereof) is a key driver of his or her satisfaction or dissatisfaction when using Zoom. Thus, our research will provide two respondent views based on the factors that drive satisfaction or dissatisfaction when using Zoom, a particular remote-based technology.

METHODOLOGY

In conducting the survey, we used a 5-point Likert scale to assess student skills with digital technologies. The previous research performed by Sahin and Shelley studied distance education tools, such as "e-mail messages, discussion boards, online assignment submissions, and online exams" (2008). For graduate students in particular, this does not represent the full extent of their use and exposure to digital technologies. Therefore, when fashioning a question for students' skill in digital technologies, we used more modern and advanced business technologies, such as statistical packages, digital visualization software, and programming languages [See a full list of tools in Exhibit A].

Sahin and Shelley used their survey to measure perceived flexibility, usefulness, and satisfaction with digital technologies (2008). With this in mind, we fashioned 5-point Likert-scale questions to assess flexibility, convenience and satisfaction. We also delved into the specifics of Zoom aspects with questions assessing speed, features and ease of use. Since we are studying MBA students, we also included questions related to group work, participation, and professors.

The survey was conducted by asking Bentley MBA students in two Information-Technology classes. The students were handed paper surveys in the classroom. The surveys were voluntary and anonymous, and the students were not incentivized to take them. Our sample consisted of 39 students, out of which 7 students had never used Zoom before and were excluded from further analysis. The excluded sample had, proportionally, fewer international students.

The respondents ranged in age from 22 to 31, with a mean age of 24.66. There were 14 males (44%) and 18 females (56%). The respondents were all graduate students with a range of concentrations, and nine were completing dual degrees (28%). There were 23 international students (72%) in our sample, and 15 students who currently lived within 10 miles of the university (47%).

We used the IBM Statistical Package for the Social Sciences (SPSS) to analyze the data collected, perform frequency analysis, case summaries, factor analysis, and linear regression.

RESULTS

We first organized the respondents using Zoom to see what experience our sample had with the program. Surprisingly, most of the Zoom users were in category 2 of Zoom use, or 1-3 times within the past month.

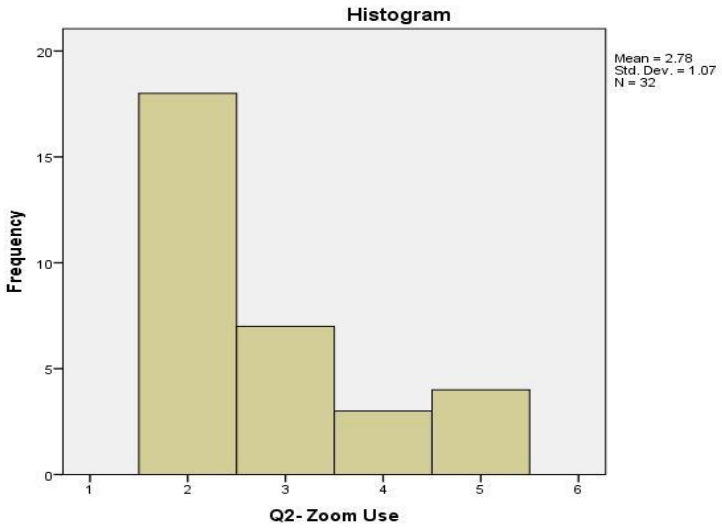

Figure 1- Zoom Use Frequency Analysis

Table 1- Zoom Use Frequency Analysis

Q2- Zoom Use

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	18	56.3	56.3	56.3
	3	7	21.9	21.9	78.1
	4	3	9.4	9.4	87.5
	5	4	12.5	12.5	100.0
	Total	32	100.0	100.0	

Due to this difference in use, the thought arises that there could be a big difference between the results from those who used it 1-3 times [2], 4-6 times [3], and more than 6 times [4&5].

Table 2- Case Summary of Tool Proficiency by Zoom Use

Case Summary of Tool Proficiency by Zoom Use

	Zoom Use in Past Month			
	1 to 3 times	4 to 6 times	More than 6 times	Total
	Mean	Mean	Mean	Mean
Microsoft Office	3.83	4.29	4.57	4.09
Remote technologies	2.89	3.43	4.29	3.31
Enterprise software	2.65	2.86	3.00	2.77
Digital	2.78	2.86	3.43	2.94
Survey	2.06	2.67	3.00	2.39

In Table 2, we analyzed a variety of skills with technology tools. We found that for Microsoft Office, remote technologies, enterprise software, digital visualization software, and survey applications, Zoom use increases with the skill level for these tools.

Table 3- Case Summaries for Aspects of Zoom

Case Summaries for Aspects of Zoom	Zoom Use in Past Month			
	1 to 3 times	4 to 6 times	More than 6 times	Total
	Mean	Mean	Mean	Mean
Speed	3.22	3.57	4.29	3.53
Ease of use	4.00	3.86	4.57	4.09
Features	3.44	3.57	4.71	3.75
Time allocation	3.06	3.29	4.29	3.38
Flexibility	3.94	4.29	5.00	4.23
Anxiety reduction	2.81	2.57	3.86	3.00
Professor perception of Zoom	2.67	3.71	3.86	3.16
Engagement	2.56	2.86	3.43	2.81
Learning	2.67	3.29	3.57	3.00
Professor relationships	2.00	2.43	3.71	2.47
Student relationships	2.33	3.14	3.43	2.75
Teamwork	2.78	3.29	3.14	2.97
Less attention during class participation	2.22	2.43	1.71	2.16
Less attention from professor	2.76	2.71	2.67	2.73
Lack of engagement	2.47	3.29	2.86	2.74
Difficulty understanding professor	2.24	2.57	2.29	2.32
Difficult in-class group work	2.47	2.86	2.57	2.58
Professor lack of knowledge	1.88	2.43	2.00	2.03

When looking at Table 3 and at aspects of Zoom engagement, we found that almost all of the aspects on this list increase as Zoom use increases. As Zoom use decreases, students tend to agree more that they get less attention from their professors. There is no apparent linear relationship between Zoom use and ease of use, anxiety reduction, teamwork, or any of the aspects in the last section of columns.

Table 4- Correlation Analysis between Zoom Aspects, Use and Satisfaction

		Q2-Zoom Use	Q3-A	Q3-B	Q3-C	Q3-D	Q3-E	Q3-F	Q3-G	Q3-H	Q3-I	Q3-J	Q3-K	Q3-L	Q3-M	Q3-N	Q3-O	Q3-P	Q3-Q	Q3-R	Q3-S	Q4-Satisfaction
Correlation	Q2-Zoom Use	1.000	.531	.435	-.272	.328	.335	.374	.585	.198	.342	.361	-.054	.265	.400	.144	-.048	.532	.036	.037	.330	.409
	Q3-A	.531	1.000	.531	-.099	.498	.695	.692	.785	.151	.384	.282	.102	.386	.383	-.068	-.112	.236	.138	-.012	.618	.466
	Q3-B	.435	.531	1.000	-.225	.307	.406	.436	.501	.552	.365	.539	.119	.195	.647	.351	-.218	.528	.195	-.191	.287	.666
	Q3-C	-.272	-.099	-.225	1.000	-.005	-.250	-.272	-.108	-.216	-.444	-.395	.018	.475	-.127	.133	.265	-.284	.190	.130	.178	-.144
	Q3-D	.328	.498	.307	-.005	1.000	.352	.373	.470	.116	.368	.347	.077	.378	.516	-.069	.285	.197	.140	.104	.438	.316
	Q3-E	.335	.695	.406	-.250	.352	1.000	.814	.458	.250	.344	.448	.295	.109	.163	-.164	.007	.260	.125	-.213	.556	.266
	Q3-F	.374	.692	.436	-.272	.373	.814	1.000	.530	.168	.560	.420	.169	.190	.267	-.185	-.085	.313	.076	-.079	.479	.396
	Q3-G	.585	.785	.501	-.108	.470	.458	.530	1.000	.152	.514	.356	-.045	.270	.539	.099	.086	.436	.158	.128	.441	.461
	Q3-H	.198	.151	.552	-.216	.116	.250	.168	.152	1.000	.349	.528	.038	.086	.329	.107	-.092	.574	-.101	-.431	.098	.490
	Q3-I	.342	.384	.365	-.444	.368	.344	.560	.514	.349	1.000	.447	-.178	.027	.406	-.018	-.075	.495	-.238	-.085	.127	.345
	Q3-J	.361	.282	.539	-.395	.347	.448	.420	.356	.528	.447	1.000	.250	-.097	.665	.143	.029	.627	.182	-.287	.169	.682
	Q3-K	-.054	.102	.119	.018	.077	.295	.169	-.045	.038	-.178	.250	1.000	.247	.210	.347	.187	-.019	.362	-.078	.307	.096
	Q3-L	.265	.386	.195	.475	.378	.109	.190	.270	.086	.027	-.097	.247	1.000	.138	.109	-.079	.150	.151	-.108	.659	.248
	Q3-M	.400	.383	.647	-.127	.516	.163	.267	.539	.329	.406	.665	.210	.138	1.000	.488	.077	.524	.243	-.146	.158	.605
	Q3-N	.144	-.068	.351	.133	-.069	-.164	-.185	.099	.107	-.018	.143	.347	.109	.488	1.000	.165	.303	.347	-.073	-.120	.095
	Q3-O	-.048	-.112	-.218	.265	.285	.007	-.085	.086	-.092	-.075	.029	.187	-.079	.077	.165	1.000	.099	.083	.526	-.062	-.222
	Q3-P	.532	.236	.528	-.284	.197	.260	.313	.436	.574	.495	.627	-.019	.150	.524	.303	.099	1.000	-.103	-.242	.217	.628
	Q3-Q	.036	.138	.195	.190	.140	.125	.076	.158	-.101	-.238	.182	.362	.151	.243	.347	.083	-.103	1.000	.066	.241	.101
	Q3-R	.037	-.012	-.191	.130	.104	-.213	-.079	.128	-.431	-.085	-.287	-.078	-.108	-.146	-.073	.526	-.242	.066	1.000	-.050	-.157
	Q3-S	.330	.618	.287	.178	.438	.556	.479	.441	.098	.127	.169	.307	.659	.158	-.120	-.062	.217	.241	-.050	1.000	.292
	Q4-Satisfaction	.409	.466	.666	-.144	.316	.266	.396	.461	.490	.345	.682	.096	.248	.605	.095	-.222	.628	.101	-.157	.292	1.000
Sig. (1-tailed)	Q2-Zoom Use		.002	.009	.077	.041	.038	.023	.000	.152	.035	.027	.390	.082	.016	.227	.402	.001	.427	.425	.040	.014
	Q3-A	.002		.002	.305	.003	.000	.000	.000	.217	.020	.069	.300	.019	.020	.362	.282	.108	.238	.476	.000	.005
	Q3-B	.009	.002		.121	.052	.014	.009	.003	.001	.026	.001	.269	.155	.000	.031	.128	.002	.156	.160	.066	.000
	Q3-C	.077	.305	.121		.490	.095	.076	.288	.130	.008	.017	.463	.005	.256	.247	.082	.068	.161	.250	.178	.228
	Q3-D	.041	.003	.052	.490		.031	.023	.005	.274	.025	.033	.346	.022	.002	.360	.067	.153	.235	.295	.009	.047
	Q3-E	.038	.000	.014	.095	.031		.000	.006	.096	.034	.007	.060	.287	.199	.197	.485	.086	.259	.134	.001	.082
	Q3-F	.023	.000	.009	.076	.023	.000		.002	.192	.001	.012	.191	.161	.080	.168	.331	.049	.347	.342	.004	.017
	Q3-G	.000	.000	.003	.288	.005	.006	.002		.216	.002	.029	.407	.079	.001	.305	.329	.009	.206	.254	.008	.006
	Q3-H	.152	.217	.001	.130	.274	.096	.192	.216		.032	.002	.423	.329	.040	.290	.318	.001	.301	.010	.306	.004
	Q3-I	.035	.020	.026	.008	.025	.034	.001	.002	.032		.008	.178	.444	.014	.463	.350	.003	.106	.331	.256	.033
	Q3-J	.027	.069	.001	.017	.033	.007	.012	.029	.002	.008		.095	.309	.000	.230	.441	.000	.172	.066	.190	.000
	Q3-K	.390	.300	.269	.463	.346	.060	.191	.407	.423	.178	.095		.098	.137	.032	.166	.462	.027	.344	.053	.311
	Q3-L	.082	.019	.155	.005	.022	.287	.161	.079	.329	.444	.309	.098		.238	.287	.341	.219	.218	.288	.000	.098
	Q3-M	.016	.020	.000	.256	.002	.199	.080	.001	.040	.014	.000	.137	.238		.004	.345	.002	.102	.225	.206	.000
	Q3-N	.227	.362	.031	.247	.360	.197	.168	.305	.290	.463	.230	.032	.287	.004		.196	.055	.032	.353	.268	.312
	Q3-O	.402	.282	.128	.082	.067	.485	.331	.329	.318	.350	.441	.166	.341	.345	.196		.304	.335	.002	.374	.123
	Q3-P	.001	.108	.002	.068	.153	.086	.049	.009	.001	.003	.000	.462	.219	.002	.055	.304		.298	.103	.129	.000
	Q3-Q	.427	.238	.156	.161	.235	.259	.347	.206	.301	.106	.172	.027	.218	.102	.032	.335	.298		.366	.104	.301
	Q3-R	.425	.476	.160	.250	.295	.134	.342	.254	.010	.331	.066	.344	.288	.225	.353	.002	.103	.366		.399	.209
	Q3-S	.040	.000	.066	.178	.009	.001	.004	.008	.306	.256	.190	.053	.000	.206	.268	.374	.129	.104	.399		.062
	Q4-Satisfaction	.014	.005	.000	.228	.047	.082	.017	.006	.004	.033	.000	.311	.098	.000	.312	.123	.000	.301	.209	.062	

Our correlation analysis revealed significant relationships between the professor relationship [A, $p < 0.001$] and time allocation [E, $p < 0.001$], learning [F, $p < 0.001$], and student relationships [G, $p < 0.001$]. Also notable are correlations of time allocation [E] with learning [F, $p < 0.001$], positive perception of Zoom by professors [M] with speed [B, $p < 0.001$] and flexibility [J, $p < 0.001$], and features [P] with flexibility [J, $p < 0.001$]. Satisfaction was highly correlated with speed [B, $p < 0.001$], flexibility [J, $p < 0.001$], professor perception [M, $p < 0.001$], and features [P, $p < 0.001$].

Table 5- Component Matrix for Zoom Aspects, Use and Satisfaction

Component Matrix[a]

	Component					
	1	2	3	4	5	6
Q2- Zoom Use	.647	.020	-.075	.204	-.241	-.250
Q3- A	.764	.366	-.313	-.032	-.028	-.211
Q3- B	.775	-.161	.226	-.110	-.069	-.217
Q3- C	-.287	.610	.322	-.126	-.383	.212
Q3- D	.572	.358	-.052	.293	-.058	.258
Q3- E	.665	.193	-.370	-.178	.461	.107
Q3- F	.714	.151	-.431	-.057	.294	-.005
Q3- G	.753	.228	-.132	.311	-.161	-.232
Q3- H	.514	-.466	.168	-.235	-.108	.389
Q3- I	.615	-.313	-.318	.267	-.077	.091
Q3- J	.728	-.354	.212	.045	.305	.156
Q3- K	.195	.327	.434	-.272	.575	.157
Q3- L	.339	.595	.121	-.355	-.484	.178
Q3- M	.711	-.108	.465	.214	-.039	-.093
Q3- N	.163	-.037	.814	.085	-.018	-.225
Q3- O	-.069	.321	.267	.680	.214	.490
Q3- P	.688	-.372	.202	.125	-.209	.238
Q3- Q	.166	.422	.476	-.095	.342	-.375
Q3- R	-.207	.400	-.069	.721	.012	-.124
Q3- S	.552	.599	-.155	-.312	-.066	.139
Q4- Satisfaction	.747	-.184	.168	-.097	-.183	-.022

Extraction Method: Principal Component Analysis.

a. 6 components extracted.

We then performed a factor analysis with all of the aspects, along with Zoom use and satisfaction with Zoom. For our first component matrix (Table 5), the groups were disproportionate in their relationships with one another, so we decided to rotate the component matrix. This resulted in more even groups [See Table 6].

Table 6- Rotated Component Matrix for Zoom Aspects, Use and Satisfaction

Rotated Component Matrix[a]

	Component					
	1	2	3	4	5	6
Q2- Zoom Use	.230	.714	.151	-.014	.038	-.010
Q3- A	.057	.649	.619	.058	.213	-.075
Q3- B	.550	.533	.163	.283	.010	-.221
Q3- C	-.236	-.162	-.263	.133	.752	.182
Q3- D	.217	.390	.373	-.010	.280	.444
Q3- E	.192	.156	.894	.096	-.037	-.016
Q3- F	.170	.362	.803	-.012	-.057	-.025
Q3- G	.149	.809	.320	.040	.094	.150
Q3- H	.831	-.023	.086	-.101	.038	-.132
Q3- I	.435	.457	.295	-.342	-.229	.092
Q3- J	.739	.199	.316	.235	-.269	.082
Q3- K	.153	-.303	.358	.697	.129	.125
Q3- L	.094	.202	.146	.069	.892	-.072
Q3- M	.584	.526	-.017	.386	-.016	.153
Q3- N	.297	.179	-.439	.655	.034	.071
Q3- O	.003	-.110	-.033	.112	.033	.949
Q3- P	.793	.356	.021	-.070	-.002	.094
Q3- Q	-.144	.137	.093	.802	.094	.002
Q3- R	-.508	.279	-.122	-.013	-.078	.621
Q3- S	.061	.239	.607	.111	.605	-.033
Q4- Satisfaction	.621	.459	.145	.105	.103	-.151

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 9 iterations.

Based on high-loading variables, we will title factor (labeled "Components" in Table 6) 1, "Satisfaction indicators," and factor 2 we will call "Use indicators." These show some of the variables that relate to satisfaction (ease of use, features, flexibility) and use of Zoom (student relationships, professor relationships, speed) as highly loading variables.

The highly-loading variables in factor 3 seem to be most related to studying and doing well in the course, so we titled this "Optimized studies." Factor 4, on the other hand, appears to have high-loading variables that suggest that students have a worse experience with Zoom; we have appropriately called this factor "Bad fit."

Factor 5 is very surprising, because it combines a seemingly bad aspect (getting called on less by the professor) with a good one (reduced anxiety). It could be that getting called on by the professor is not always seen as a good thing for students. We have named this factor "Shy."

Factor 6 shows a relationship between understanding what the professor is saying and how well the professor can use Zoom. We called this factor "Professorial Zoom involvement."

Regression 1: Time Allocation

Table 7- Linear Regression for Time Allocation

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.357[a]	.127	.098	.816	.127	4.379	1	30	.045

a. Predictors: (Constant), Q3- E

b. Dependent Variable: Q4- Satisfaction

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.914	1	2.914	4.379	.045[b]
	Residual	19.961	30	.665		
	Total	22.875	31			

a. Dependent Variable: Q4- Satisfaction

b. Predictors: (Constant), Q3- E

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.010	.410		7.344	.000
	Q3- E	.238	.114	.357	2.093	.045

a. Dependent Variable: Q4- Satisfaction

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	3.25	4.20	3.81	.307	32
Residual	-1.485	1.752	.000	.802	32
Std. Predicted Value	-1.843	1.261	.000	1.000	32
Std. Residual	-1.821	2.148	.000	.984	32

a. Dependent Variable: Q4- Satisfaction

The regression results in Table 7 show a significant relationship between the time allocation aspect and satisfaction with Zoom, with a significance of $p < 0.05$. The correlation is moderate [R-squared=0.127].

Regression 2: Flexibility

Table 8- Linear Regression for Flexibility

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.727[a]	.528	.512	.590	.528	32.501	1	29	.000

a. Predictors: (Constant), Q3- J

b. Dependent Variable: Q4- Satisfaction

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11.319	1	11.319	32.501	.000[b]
	Residual	10.100	29	.348		
	Total	21.419	30			

a. Dependent Variable: Q4- Satisfaction

b. Predictors: (Constant), Q3- J

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.450	.421		3.442	.002
	Q3- J	.550	.096	.727	5.701	.000

a. Dependent Variable: Q4- Satisfaction

The regression results in Table 8 show a very significant relationship between the flexibility aspect and satisfaction with Zoom, with a significance of $p < 0.01$ (.000 to 3 digits). The correlation is relatively high [R-squared=0.528].

Regression 3: Favorable Perception by Professor

Table 9- Linear Regression for Favorable Perception by Professor

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.609[a]	.371	.350	.692	.371	17.721	1	30	.000

a. Predictors: (Constant), Q3- M

b. Dependent Variable: Q4- Satisfaction

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.495	1	8.495	17.721	.000[b]
	Residual	14.380	30	.479		
	Total	22.875	31			

a. Dependent Variable: Q4- Satisfaction

b. Predictors: (Constant), Q3- M

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.397	.358		6.697	.000
	Q3- M	.449	.107	.609	4.210	.000

a. Dependent Variable: Q4- Satisfaction

The regression results in Table 9 show a very significant relationship between a favorable perception of Zoom by the professor and satisfaction with Zoom, with a significance of p < 0.01 (.000 to 3 digits). The correlation is again relatively high [R-squared=0.371], which is in line with previous research.

Regression 4: Professor Lack of Skill with Zoom

Table 10- Linear Regression for Professor Lack of Skill with Zoom

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.139[a]	.019	-.015	.879	.019	.569	1	29	.457

a. Predictors: (Constant), Q3- R

b. Dependent Variable: Q4- Satisfaction

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.439	1	.439	.569	.457[b]
	Residual	22.399	29	.772		
	Total	22.839	30			

a. Dependent Variable: Q4- Satisfaction

b. Predictors: (Constant), Q3- R

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.041	.349		11.585	.000
	Q3- R	-.115	.153	-.139	-.754	.457

a. Dependent Variable: Q4- Satisfaction

The regression results in Table 10 indicate, statistically, no relationship between the professor's lack of skill with Zoom and satisfaction with Zoom, p = .457. The R-square value is, correspondingly, also very low, indicating that little variability in Zoom satisfaction is explained by Professor's lack of skill. This is contrary to findings of previous research which show that satisfaction is typically related to teaching techniques with the technology. Professor ability to use the technology should be related – one would think!! - to their teaching techniques, so in this case either the ability has no effect on teaching techniques or teaching techniques in general do not affect satisfaction as much as was thought.

We performed linear regressions relating all of the tools with student satisfaction with Zoom. None of the tools significantly impacted satisfaction at the 5% significance level.

DISCUSSION

Contrary to previous studies in this field, our study tries to find variables that create student satisfaction or dissatisfaction. With the help of factor analysis, we were able to capture all the variables in 6 factors:

1. "Satisfaction indicators" includes variables that relate to satisfaction with Zoom
2. "Use indicators" includes variables that relate to use of Zoom
3. "Optimized studies" includes variables relating to excelling in the course
4. "Bad fit" relates to the students that were unable to fully realize the benefits of Zoom
5. "Shy" includes variables hinting to the introvert nature of the student
6. "Professor Zoom Involvement" includes variables relating to the professors' clarity in delivery and ease of use in using Zoom

In Factor 1, which is labeled as "Satisfaction Indicators," the following aspects were linked to higher satisfaction with Zoom:

- Q3-B: I am satisfied with the speed of Zoom
- Q3-H: Zoom is easy to use

- Q3-J: Zoom increases my flexibility
- Q3-M: Zoom is perceived favorably by most of my professors
- Q3-P: Zoom has helpful features

Factor 1 also linked the aspect below to increased dissatisfaction with Zoom:

- Q3-R: My professor does not know how to use Zoom

Additionally, we found that one negatively-charged group was prevalent in our study. Through factor analysis, we determined this factor to be Factor 4 and labeled it "Bad fit." Although the variables loading highly on this factor were not variables of satisfaction, they should still be noted as part of a particular factor that Zoom technologies may not want to target in the future. Further research should study the members of this particular factor to determine why they feel this way. The following factors are a part of "Bad fit":

- Q3-K: I get called on less by the professor when I use Zoom
- Q3-N: I don't feel as engaged in the course when I use Zoom
- Q3-Q: In-class group work is more difficult when I use Zoom

Analysis of the Hypotheses

H1: *Perceived convenience and flexibility is not enough to drive graduate student satisfaction when using Zoom Video Communications*

Based on the regression analyses, we can infer a very significant relationship between the flexibility and satisfaction with Zoom. The high correlation makes logical sense as previous research found the same results. We can assume from the regression that if a particular platform (in this case Zoom) gives students some extra flexibility, it directly drives satisfaction with respect to use of that particular platform. The regression analysis between the convenience/time allocation and satisfaction has a very moderate correlation. Thus, we can assume that time allocation is a factor in satisfaction, but we cannot definitively express without further research whether convenience has any direct effect on a student being satisfied if he/she is offered a platform which is more convenient, and offers the excess freedom of being able to allocate his/her time in a more personalized way. Convenience and the additional freedom to allocate time in a personalized manner is one of the key value propositions of using distant learning technologies and thus, even though this is in alignment with our original hypothesis that perceived convenience is not enough to drive student satisfaction, we recommend further research with a different learning strategy to better understand how offering additional convenience has an impact on learning and satisfaction.

H2: *Student experience with other academic technological tools will increase satisfaction with Zoom Video Communications*

The rationale behind this hypothesis was that students who have previous experience with using other academic tools like SPSS, Tableau, SAP and are comfortable using technology and other such platforms would find it easier to adapt to use Zoom and eventually find value in Zoom. This, theoretically, would eventually drive satisfaction. But, unfortunately after using and interpreting the regression analysis to check our hypothesis, we found that there is not a significant relationship between previous experience with all of the technologies and student satisfaction with Zoom. In retrospect, the results do make sense. Although measuring skill with these particular tools is meant to reflect some sort of technological prowess, the tools in question cannot really be compared directly with Zoom, as they address altogether different issues. Tools like Skype and Google Hangouts, which are more directly related to the features of Zoom, could have been used to understand a student's comfort and experience and would likely have been able to generate more insights. This is another recommendation which should be considered in future research relating to this field or product.

H3: *An instructor's ability to use and teach with Zoom Video Communications will drive graduate student satisfaction with this technology*

We have divided our regression analysis into two parts to support the above hypothesis. First, we tried to understand the relative impact of a professor's favorable perception toward use of such technologies on student satisfaction. In simple terms, how does the professor having a favorable perception toward use of this technology have any impact on student satisfaction toward this product? Second, we tried to understand the relationship between the professor's technological skillset, and therefore his/her comfort with using this technology, and the satisfaction of the student with this technology. With the help of factor analysis, we were able to put both these variables under the same factor 6, named "Professor Zoom Involvement," supporting that there is a relationship between these two variables. Based on regression analysis, we could interpret a significant relationship between the professors' favorable perception and student satisfaction. A high correlation would imply that if a professor is open to acceptance of this technology and welcomes such use in the class, then he/she would automatically drive a certain satisfaction among the students to use the particular technology. However, to our surprise, in our second regression

analysis we found a very weak (not even close to significant with = .05) relationship between the skillset of the professor and its impact on student satisfaction. This result is very much contrary to previous research which acknowledges this relation. We would therefore recommend a larger sample size for future research to support or negate this finding. We also recommend further research about the relationship between the professor's skillset and their opinion of Zoom. Our assumption was that if a professor cannot use the technology efficiently and to his/her advantage, then it definitely should impact student satisfaction. This assumption was not demonstrated and the result is not aligned with our hypothesis.

LIMITATIONS & DIRECTIONS FOR FUTURE RESEARCH

One major limitation in our research is the relatively small sample size. Also, we studied only MBA students in our sample, which may have limited the diversity of our sample, while on the positive side, narrowed the focus of our research. Results may vary across different fields of study and it would be interesting to see the differences we find among other fields. Additionally, not all MBA students have courses which expose them to use of Zoom, so this variable may also differ across fields of study. Additionally, some of the Likert-scale questions that we asked were on an inverted scale, with positive opinions on the left and negative opinions on the right. We are not certain if this may have distorted our data. Therefore, it may have been better to consistently place these questions on a scale with the most positive opinions/answers on the right.

For future research we recommend using a diverse set of samples from different programs, perhaps the majority of whom have already used Zoom. We also suggest including a question that indicates the likelihood of the student who has used Zoom to recommend its use to a friend. Open ended questions with textboxes asking why or why not the student would recommend the use of Zoom to a student and what additional factors drive him/her to use Zoom again should be considered in future research questionnaires. This can give a great deal of qualitative insight which can help derive a more informed conclusion, although, depending on the circumstances, could drive down response rate. Future research should also study correlations between a student being international and his/her use and satisfaction with such technologies. Distance and owning a car should possibly also be studied in terms of its impact on frequency of use of Zoom.

SUMMARY AND CONCLUSIONS

Regarding the study's key or main objective, we set out to determine the level of graduate student satisfaction and dissatisfaction when using Zoom Video Communications and its functionalities.

As a means to obtain the relevant information for this research study, we conducted data collection through purposive sampling. This sampling method not only allowed us to gather relevant information, but it also enabled us to sample specifically-graduate-level students at Bentley University. After survey distribution and collection, we leveraged the use of factor analysis and linear regression methods using SPSS software. By doing so, we were able to identify relevant relationships between the specified survey questions through factor analysis, while linear regression determined more specifics, and whether or not individual independent variables appropriately predicted an outcome.

After data interpretation, we can conclude that graduate student satisfaction with Zoom Video Communications is generated from the flexibility of the product. Therefore, in order to continue its widespread propagation on college and university campuses alike, educators (and marketers!!) should highlight the flexibility benefits of this service, as our research supports the notion that this variable is a key driver of graduate-student satisfaction. As a secondary driver, it was also determined that convenience leads to graduate-student satisfaction regarding the service. However, through our research, we can determine that dissatisfaction occurs regarding Zoom Video Communications when the instructor expressed reluctance to use the service, or his or her negative perceptions of the technology showed.

We recommend that in promoting its service, Zoom Technologies focus on building a positive relationship with professors. In addition, when promoting it to students they should stress the flexibility and convenience of the product. Professors who wish to use Zoom in classrooms should maintain an open and positive attitude towards the product in order to maximize student satisfaction with Zoom. In conclusion, key methods to reduce dissatisfaction regarding Zoom Video Communications is based on students' perceived flexibility and convenience of Zoom and an instructor's acceptance, openness, and his or her positive perception regarding the technology.

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EXHIBIT A- A *Portion* of the Survey Questionnaire Used for Study – Tools and Frequency of Use

1. 1.) How adept do you consider yourself with the following tools?

	Far above average	Somewhat above average	Average	Somewhat below average	Far below average
Microsoft Office	o	o	o	o	o
Remote technologies (ex: Zoom)	o	o	o	o	o
Statistical packages (ex: SPSS)	o	o	o	o	o
Web/software development (ex: HTML)	o	o	o	o	o
Enterprise software (ex: SAP)	o	o	o	o	o
Digital visualization software (ex: Tableau)	o	o	o	o	o
Survey applications (ex: Qualtrics)	o	o	o	o	o
Programming languages (ex: Java)	o	o	o	o	o

2.) How many times have you used Zoom in the past month?

	10 or more times	7 to 9 times	4 to 6 times	1 to 3 times	Never
	○	○	○	○	○