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***Understanding the Importance and Impact of Technology in an Accounting Setting: Work
Outcomes and Relationships with Clients***

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Spring 2020

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Introduction

This study will explore how technology positively or negatively impacts the accounting profession, and specifically, the impact on work outcomes (i.e. the effectiveness and efficiency of work) and relationships with clients. Technology is ever expanding, and while it is perceived to improve the quality of work, it is becoming more and more difficult to keep a personal touch on the audit or other accounting process. The perception is that most advances make accounting easier, more efficient, and more accurate, but what if there are negative impacts that are being overlooked? More research must be done in this area to determine what effects have followed. The focus of this study is to investigate how technology tools and platforms are changing the work of an accounting professional and the dynamic between the professional and the client. Data will be collected to learn what accounting and communication technologies are currently being used and how professionals believe they are impacting the outcome of their work. New, advanced technology is altering the role and responsibility of accountants and must be further analyzed to determine what the true effect may be. Additionally, retaining a personal connection with clients may improve relationships and allow the work process to go more smoothly, but it may impair the independence of the accountant, causing a biased opinion. Hence, how automating the accounting process affects the client-accountant relationship is unclear. Looking further into the true impact of technology will reveal whether or not it is for the best of the accounting practice.

Literature Review

How Technology is Impacting Accounting in a Professional Setting

Prior research has studied how advancing technology is changing the accounting world. Drew (2014) includes a discussion between three experts in the technology and accounting field

answering a variety of questions regarding this topic. Mainly focusing on cloud computing, the article touches on how this method may maximize productivity and security, expand business, and provide training opportunities.

Additionally, various accounting firms have published articles and thoughts on how technology and new analytical tools will change their firm. Roger O'Donnell, a partner at KPMG, discusses in O'Donnell (2017) the impact data and analytics have on the audit process. Examples include transaction testing, discovering trends between accounts, motivating audit staff to delve deeper into audits by understanding a company more, establishing a segregation of duties, and supply chain risks.

Beth Kaplan, a Managing Director at Deloitte, highlights in Kaplan (2018) the effects technology is having on three areas of accounting. First, the work is being changed with the increase in automation, cognitive, and other advanced technology. Second, the workforce is increasing as more contingent and gig workers, who work with short-term contracts rather than full- or part-time positions, appear. Third, the workplace is being restructured to better suit collaboration virtually and physically. In the future, everyone will be working alongside smart machines and technologies; as such, an alliance between the two is critical for success. Steps for success include redesigning the workforce and transforming the workplace, activating a digital component of the organization, and finding the perfect balance of human capital.

Drew (2019) discusses the opinions of an array of licensed CPAs on the integration and development of technology in the accounting profession. The article touches on subjects like: employees bringing their own devices to work, automating data entry, accounting software improvements and better integration with other programs, the role of social media, and firm

websites. Drew (2019) comes to the conclusion that advances in technology will change the role of CPAs, removing the data entry process and allowing for more advanced thought processes.

Along with overviews of the effect of technology on accounting, there are many resources that focus on a single program or branch. Liu, Wu & Xu (2019) stress the importance and prevalence of Blockchain, one of the most recent technological developments in accounting. Blockchain is a permanent, secured, digital ledger of transactions. It decreases the need for manual journal entries and reconciliation and has the potential to create new methods for handling accounting information. All of the Big 4 accounting firms have begun experimenting, developing, or investing in some form of Blockchain. For auditing, Blockchain could lower the waiting time between asking clients for documents, leaving more time for critical and analytical thinking. Overall, most research concludes that technology is changing the nature of accounting by providing more accurate and faster ways of doing essential tasks and is an imperative step for the future of the profession. Additionally, it is worth noting that all literature mentioned in this section is based on opinion rather than empirical evidence, hence the need for more research in this area.

Technology Changing the Role of Accountants

As technology is broadly changing the field of accounting, it is also changing the role of accountants. Advancing technology does not mean that human accountants are replaceable, just that they will be needed in new capacities than ever before. Lewin (2018) highlights how accounting is changing and new ways for accountants to adapt. There will be less “number crunching” and more of a focus on helping clients understand the results generated. As a result, accountants will become more like consultants and analysts. Overall, accountants will require

critical and strategic thinking skills as well suburb communication skills in order to cope with the changing profession.

Along the same lines, Alison Kay, an Ernst & Young (EY) Global Accounts Committee Chair, published an article on how humans are integral in the audit process and cannot be fully replaced by technology. Kay (2019) mentions how technology, specifically artificial intelligence (AI), has affected EY as a whole. Kay highlights three main points EY has learned since implementing AI: (1) even though jobs are changing, new jobs are being created for higher-level tasks rather than data entry, (2) AI is being used to improve audits, for example, by using drones for data collection, and (3) the next generation will learn to use technology at a higher level than today's auditors have ever managed. Overall, AI has been making a positive impact on the accounting profession and will not replace humans, just move them to more advanced areas requiring their expertise.

An article by Cieslak, Mason & Vetter (2019) features a round table with accounting professionals about how artificial intelligence will impact the role of CPAs. It states that AI and education will have the largest impact on the accounting profession in upcoming years. A big change necessary will be for CPAs to mold to continuous learning. There is a need to leverage technology in the workplace due to all of the use it provides in homes with items such as smartphones, smart TVs, smart tablets, Alexa, and Google Home devices. Cieslak, Mason & Vetter (2019) conclude that several things must be done to implement AI appropriately: everyone must consider the impact of technology (partners, seniors, staff, clients), roles have to be redefined to be more dynamic and outsource when necessary, processes have to be analyzed and understood to see where they need to be improved, and constant change along with required

training are also necessary. In the end, accountants have to understand not just the technology, but how people feel about it in order to reap the most benefits.

Along with the broad categories of technology such as cloud-computing, AI, and Blockchain, many individual products have been developed and are used in accounting firms to determine if they impact the quality of work generated. An article by Wolters Kluwer, Tax & Accounting US (2015) discusses their product, CCH Axcess, and how it will affect auditors. CCH Axcess creates an integrated audit approach for firms, with auditor judgement being the most important component for success. With this program, auditors will instead focus on value-added tasks, improving audit quality and boosting efficiency.

As technology transforms, new accounting reforms and regulations have arisen in response. For example, Vasarhelyi, Warren, Teeter & Titera (2014) discuss a new set of voluntary data specifications developed by the Assurance Services Executive Committee (ASEC), known as the Audit Data Standards (ADS). These were developed to reform the current audit process, and is done by mixing automated steps, manual connections, and professional auditor judgement. The authors stress that auditors are still the core component, and they must review, test, and develop the technological programs and applications in order to be the most effective and efficient in the field. Additionally, this article describes the steps that should be taken to automate the audit process. Overall, as technology evolves, it is changing the role and responsibility of accountants, but is not replacing them.

Impact of Technology on Effectiveness and Efficiency of Work

One of most popular topics in accounting currently is Big Data and the possibilities it has to offer. Cao, Chychyla & Stewart (2015) describe Big Data as being characterized by volume, velocity, and variety. Databases include so much information that it is often impossible to find

what one is looking for. This is where Big Data analytics comes into play. Big Data analytics is defined as the process of inspecting, cleaning, transforming, and modeling Big Data in order to find and portray useful information and patterns, as well as draft conclusions and back up decisions. Big Data analytical processes will make accounting tasks easier, but the question is whether or not it will be high quality work and if an accountant will be fully able to comprehend and apply the results generated.

Alles (2015) delves into how Big Data will not only change the audit profession, but also the world. It has been shown that in the past, auditors have lagged in learning and utilizing new technology. This means that Big Data and other advances will not be used to their full potential in early years. In order to be the most effective and efficient, technological advances must be incorporated early on and used the correct way. Furthermore, Alles (2015) states many benefits of adopting new technology, including being able to better forecast estimates, going concern, and fraud. Embracing Big Data analytics has the potential to improve the effectiveness and creditability of an auditor's work. It can also be a way to reduce the costs of an audit for both the audit firm and the client.

Byrnes, Moffitt & Warren (2015) discuss not only the positive changes Big Data will cause in accounting, but also argue that there are many limitations and risks associated with Big Data. These include being limited by an organization's "quantity, quality, and accessibility," meaning that just having the data processing capability does not mean that it will be used in the most effective way. Byrnes, Moffitt & Warren (2015) say the only way to combat these disadvantages is to properly prepare and teach accounting professionals how to use this technology, a concept that has been stressed several times thus far.

Appelbaum, Yang & Zhang (2015) focus on the gaps between the current undergraduate accounting curriculum as well as on-the-job training and the skills required for more automated and advanced procedures. Top issues include data consistency, data integrity, data identification, and data confidentiality. These are where technology may hinder accountants. Appelbaum, Yang & Zhang (2015) write that the key to using Big Data effectively is being able to determine a connection between derived data sets and understanding what is being outputted.

Along with Big Data analytics, another large category of technological developments in recent years is the use of Robotic Process Automation in accounting firms. The purpose of Robotic Process Automation (RPA) is to automate repetitive, manual business processes with the goal of improving the efficiency and effectiveness of operations. Many articles exist on this topic and most large accounting firms have implemented RPA in some way.

A study by Cooper, Holderness, Sorensen & Wood (2019) focuses on the perceived effect of RPA software on the public accounting industry. They surveyed employees from staff positions to directors of Big 4 accounting firms on how they perceive RPA to be affecting their jobs. The study found that firm leaders reported improved efficiency and effectiveness in business operations. The main areas of improvement included changing the work of employees, improving work-life balance, and creating new career opportunities in the accounting profession without lowering hiring opportunities. Although, lower-level employees believed that RPA would not have an effect on work-life balance. Overall, the surveyed leaders agreed that RPA tools are a valuable asset to the accounting industry and will increase efficiency, increase work satisfaction, and improve employment opportunities. In addition to these benefits, leaders also expressed the fear and anxiety employees have about using RPA. Employees fear RPA and other advanced technology will make their jobs harder, or even replace them. This is not the case. In

order for RPA to reach its full potential in accounting, all members of a firm must be knowledgeable about the programs and be able to see the benefits of RPA, coming to terms with a changing job environment.

In a similar case, Fernandez and Aman (2018) did a study on the impact of RPA on individuals and the organization. The study found that RPA has resulted in the reduction of work and replacement of humans with robots in some places, causing fear to employees, but in the end just making higher-level work the priority of accountants.

In the real world, RPA has not been widely applied and is used differently depending on the size of the firm and the types of services performed. Rozario and Vasarhelyi (2018) discuss how RPA is used in various accounting fields and in which areas it is the most useful. For example, tax activities have been automated using RPA software in preparing tax returns and calculating book-tax differences. RPA for auditing is still in its early stages due to intense regulations. With this in mind, RPA has the highest capability for automating tasks that do not require auditor judgement, such as calculations and processing documents and files.

Furthermore, at PricewaterhouseCoopers (PwC), Lee, Mahmood, Rencourt, Schofield & Torlone (2017) discuss the use of RPA at their firm and its potential in the fields of audit and tax. RPA is used at PwC for gathering relevant data, reviewing trial balances and converting data to tax-basis, preparing returns, accounting for taxes, and addressing tax inquiries. For audit, RPA can be used for developing an audit response strategy, gathering relevant data, and responding and closing the audit process. Although RPA can be used in these audit areas, PwC mentions that these processes have limited automation potential, while almost all tax procedures have high automation potential, highlighting the difficulty in finding appropriate ways to use RPA in the audit field.

As with anything, there are costs and benefits associated with use of technology in the accounting profession. But as literature suggests, the benefits far outweigh the costs and there is no reason to be afraid or resistant to technological change. Analytical, automation, and communication programs all can have a clear, positive impact on an accountant's ability to get work done under the right circumstances. In summary, technology has evolved the role of accountants and can greatly benefit the accountant and the client with the proper training. It is a common belief among professionals that in most settings, technology is improving the effectiveness and efficiency of their work and while their jobs are not in danger, they will adapt accordingly.

Relationship with Clients and Technology's Impact on the Client-Auditor Relationship

While little research that has gone into the area of technology impacting the relationship between clients and accountants, a few publications are quite valuable and informative. Sim and Vucetic (2018) delve into the role of auditors and how trust plays a role between auditors and their clients. The article takes a psychological approach, discussing the various models of trust and applies these concepts to the business world, exploring the need for trust in this industry. Additionally, Herda and Lavelle (2013) completed a study of over 200 auditors in two public accounting firms to research how the auditor-client relationship affects the quality of services the client receives. It was found that a higher level of commitment to the client resulted in more value-added services. Additionally, the auditor's perception of client fairness impacts the strength of the relationship between them. In the end, it is concluded that a stronger relationship will yield superior service to the client.

Coley (2019) touches on how the audit process will be changed by increasing technology. She touches on the impact it will have on the client-auditor relationship, concluding that they

would prefer to collaborate with an automated solution that both parties could easily access and input information. It would also allow auditors to be more confident in the data they receive and be able to spend less time chasing down clients and more time acting as a financial advisor, providing more value to the client.

While there are many benefits to using communication programs, there may also be drawbacks. Having the ability to contact a client with the push of a button could be problematic at times. With this in mind, there are publications stressing the drawbacks of using technology to foster a relationship with clients. Kida and Siewitz (2018) conducted an experiment to determine how different modes of communication affected the response generated from clients. They explored whether using email had negative effects on client responses rather than discussing through audio (calls) or visual (face-to-face) methods. By the end of the experiment, it was found that email did indeed have a detrimental effect on client responses, and that visual inquiries would result in a more cooperative answer, revealing more information than otherwise. Additionally, Drew (2014) touches on the concept of bring your own device or BYOD, and the insecurity of communication with clients through new and different communication methods. There may be risks associated with keeping a client's contact information on technology and sharing confidential business information over such programs.

Overall, technology is changing the audit process and the accounting field as a whole. There are new capabilities that have never before been possible and ways to streamline previously lengthy tasks. Although, I believe there may be an adverse effect to the accountant-client relationship. Research has shown that the final product of an audit or other accounting service will be more accurate and timelier with the help of technology but, there may also be negative effects on the relationship between clients and accountants in the long term.

Research Questions & Predictions

Previous literature has mostly provided opinions and expressed beliefs on how technology has changed the work of accounting professionals. My study is designed to empirically test these beliefs and opinions. Specifically, my study examines how different technology tools and platforms impact the work outcomes (i.e. efficiency and effectiveness) of accounting professionals and their relationships with clients. The survey will take into consideration the types of technology used, the accountant's knowledge of them, the degree to which efficiency and effectiveness is improved, and the degree to which they affected relationships with clients. The tools considered in this study fit into three categories: Accounting and Analytics, Robotic Process Automation, and Communication Technology Tools and Platforms. Accounting and Analytics softwares are used for analyzing and inputting accounting data and include well known programs such as Excel, QuickBooks, and CaseWare IDEA. RPA tools work to automate repetitive business processes with robots or artificial intelligence and include drones and softwares like UiPath. Finally, Communication tools allow accountants to contact clients virtually with convivence and include programs such as Skype and Zoom.

Specific Research Questions:

- **How much do technology tools improve the *efficiency and effectiveness* of the accountant?**
- **How much do technology tools affect the relationship with clients?**

Predictions:

I expect that most accounting technologies improve the efficiency and effectiveness of an accounting professional's ability to complete accounting tasks. However, I also expect that communication softwares may have negative effects on relationships with clients.

Methodology

Primary data collection in the form of a survey is used. An online survey using the software Qualtrics was distributed to professionals in the accounting field. The subjects included auditors, tax accountants, and corporate accountants. The survey was created with the collaboration of two UNH students, Megan Elwell and Catherine Francis, and two Associate Professors at UNH, Le Emily Xu, Ph.D. and Linda Ragland, Ph.D.

The survey generates quantitative data. The data is analyzed in terms of the correlation between types of software and the effect on the work outcomes of accounting professionals and their relationships with clients. Additionally, Qualtrics has analysis techniques in place that allow efficient examination of the survey results. In addition to the information generated on Qualtrics, Excel and a software analysis program, Tableau, are used to analyze the data and create tables, graphs, and charts to illustrate our findings. Both univariate and multivariate analysis are used to analyze the data. Descriptive statistics are presented for univariate analysis. Tables, graphs, and charts present the results of multivariate analyses, illustrating how variables are associated with each other. These can be found in the Exhibits.

Results

The final survey was sent in early January to 185 unique email addresses of the alumni of the Master of Science in Accounting program at the University of New Hampshire. An additional follow-up email was also sent soon after. There were 34 responses recorded at the end of January, with the survey running for almost a full month, for a total response rate of 18%. The population mainly consisted of professionals working in public accounting, for a total of 25 subjects or 74% of the population, with only 9 subjects, or 26% of the population, in the private sector. Exhibits 1 and 2 illustrate the breakdown of the subjects' demographic information,

including firm size, job position, job field experience, age, and length working for their current employer. This information is used later on to determine if these variables affect the responses for determining the efficiency and effectiveness of accounting technology.

First, we looked at which accounting fields the subjects had experience working in. For the public sector, almost all had experience in audit/assurance, followed by consulting/advisory and then tax. Nine subjects recorded experience in two or more fields, hence the higher percentages for each field. Additionally, one subject had experience in outsourced internal audit and another one in accounting/bookkeeping. For the private sector, all subjects had experience in financial accounting, with lower ratios in the other three fields of governmental, managerial, and non-profit accounting. Almost all subjects had experience in two or more fields in the private sector, with only two subjects listing their experience to be confined solely to financial accounting. Refer to Exhibit 1.

Exhibit 2 presents additional information on the subjects. Of the public accountants, most worked at regional firms, making up 44% of the population, followed by Big 4, Big 10, other national firms, and lastly, with the smallest percent, small firms. Firm size was not applicable for the private sector. In the public sector, positions varied from Associate/Staff, Senior, and Manager. Most subjects were Senior level, at 60% of the population, followed by Associate/Staff and then Manager. No other positions were reported. The private sector varied from 33% Senior Accountants, 44% Managers, and at 11% each, only one Financial Auditor and one Financial Analyst. Work experience varied from three months to eight years, with most working in accounting for more than three years. The most subjects, by far, were in the 25-29 age group followed by the 20-24 group, with only three responses in other categories. Overall for both

sectors, most subjects were in their twenties in senior-level roles with three or more years of experience in the accounting profession.

The survey required applicants to rate their knowledge of and experience with a variety of technological softwares and tools that may be used in the accounting field. The software platforms inquired of were separated into three categories: Accounting and Analytics, Robotic Process Automation, and Communication Technology Tools and Platforms. Accounting and Analytics softwares included Alteryx, Blockchain, CaseWare IDEA, Excel, Power BI, QuickBooks, Tableau, and Xero. RPA tools included Automation Anywhere, Drones, MindBridge AI, and UiPath. Lastly, Communication technology tools included Google Suite, Skype, and Zoom. Furthermore, each category also had an “other” section for subjects to mention any additional platforms excluded from the survey. These “other” responses may suggest what lesser-known programs could be beneficial to the accounting field.

As the survey results show, later questions had a lower response rate than earlier ones. Many questions were left blank, and for analysis purposes, we assumed blank answers to be omitted and did not use them in our interpretation. After the survey results were collected and adjusted for blank responses, the visualization software Tableau, along with Excel, was utilized to display the data. The data was analyzed according to the three types of technology platforms in order to determine how each one affected the profession.

Data Analysis & Interpretation

The data was analyzed upon four metrics: familiarity with the program, the degree to which accountants use it in their career (job applicability), how much it improves their efficiency to do their job, and how much it improves their effectiveness to do their job. While our primary focus was on efficiency and effectiveness, we used the familiarity and job applicability ratings to

determine how correlated these factors were to each other. Responses were measured on a scale of 0 to 10, in which 0 to 3 is low, 4 to 7 is medium, and 8 to 10 is high for each attribute.

Additionally, the communication softwares had a supplementary section which asked subjects the degree to which each program appears to affect their relationship with clients on a scale of negative to positive effect. For this question, responses were measured on a separate scale, in which 0 to 4 is negative effect, 5 is no effect, and 6 to 10 is positive effect.

Accounting and Analytics Technology Tools and Platforms

The survey results revealed that subjects were most knowledgeable about the Accounting and Analytics programs. Subjects were most familiar with Excel, CaseWare IDEA, and QuickBooks. They were least familiar with Blockchain, Power BI, and Xero. Excel, by far, was the most widely used and understood software program for accountants. The average familiarity was high at an 8.11 out of 10. Additionally, when asked how much the subjects use Excel as part of their job, the average was 9.59 out of 10. CaseWare IDEA and QuickBooks each had an average of 5.25 and 3.38 familiarity and 4.67 and 3.06 job applicability, respectively. The other Accounting and Analytics programs had low average ratings for both metrics. Interestingly, the highest responses in this category, ratings of 8 through 10, came from subjects who were in the public sector. This may suggest public accountants have more experience working with these softwares than private accountants, implying they are used more in the public field or that this field is better suited for their capabilities. Refer to Exhibit 3 for familiarity and Exhibit 4 for job applicability.

This section of the survey had the largest number of “other” responses, and most also had high familiarity, effectiveness, and efficiency ratings. These responses were from three subjects, listing two additional resources each. These included CCH Axcess, GL Analyzer, Oracle,

Bloomberg BNA, and FloQast. CCH Axcess is a modular, cloud-based program for tax preparation and audit programs, which is discussed often in existing literature. GL Analyzer is an EY-specific audit analytics platform. Oracle is another cloud-based application. Bloomberg BNA is a program with accounting research and software applications for the areas of tax, financial accounting, payroll, and fixed and leased assets. Lastly, FloQast is a management software for month-end procedures, primarily used by the private sector.

In terms of improving the efficiency of employees, the Accounting and Analytics technology tools scored relatively moderate on average. The average efficiency for these softwares was 4.51 out of 10, or medium. See Exhibit 5. Despite this average overall rating, Excel had the highest recorded responses out of all technology tools inquired of. There were twenty responses rating its efficiency at a full 10 out of 10, and overall twenty-eight high responses or 82% of the population. This is not a surprise as Excel is one of the most widely taught programs to accounting students. CaseWare IDEA, Alteryx, and QuickBooks had the second, third, and fourth highest efficiency ratings for Accounting and Analytics and were all also in the top nine most efficient programs included in the survey. Refer to Exhibit 6 for ranking. All other platforms had significantly lower efficiency ratings. The average for the remaining softwares was 3.48 out of 10, or a modest to medium rating of efficiency.

Interestingly, the efficiency for “other” categories had the highest ratings next to Excel, ranging from scores of 7 to 10 out of 10. The platforms rated 10 out of 10 to improve efficiency were CCH Axcess, GL Analyzer, Oracle, and FloQast. Although each was only rated by a single subject, these platforms may be worth investigating further to see if other accounting firms should be applying them.

For effectiveness, Excel again had the highest ratings. There were nineteen 10 out of 10 ratings, for a total of 82% high responses. The second most effective program overall was CaseWare IDEA with a total of 38% high responses. Refer to Exhibit 7 for ranking. All other platforms had lower ratings, varying from a few high responses, more medium responses, and mainly low responses. The average of all platforms excluding Excel was 3.94 out of 10, another low to medium rating. This suggests accountants believe these softwares to improve their effectiveness slightly, but do not have as great an impact as other platforms, like Excel, might. Additionally, the “other” platforms CCH Axcess and GL Analyzer both had high effectiveness ratings, enforcing what was already discussed about their applicability. Refer to Exhibits 8 and 9 for the exact number of low, medium, and high responses.

Robotic Process Automation Technology Tools and Platforms

For Robotic Process Automation (RPA) technology tools and platforms, subjects did not have extensive familiarity with any of the programs. Despite their potential usefulness, they did not rank high in any of the metrics we surveyed. The highest single familiarity rating was an 8 out of 10 for UiPath, with an overall 2.40 average, with the remaining program ratings being a 6 out of 10 or below with extremely low averages. The most frequent rating was 0 for every category. Refer to Exhibits 3 and 4.

There was only one additional response categorized under “other,” which was EY Automation, a firm-specific automation tool. It was said to improve efficiency by 2 out of 10 and effectiveness by 1 out of 10, but overall did not impact the work of the accountant significantly.

For efficiency, the ratings were the lowest for this category of technology. Most types were given a rating of 0, but a few outliers of 4, 5, and 10 raised the overall average to 1.77 out of 10. Drones and MindBridge AI scored the worst, with mainly 0 ratings. UiPath scored the

highest with an average 4.00 out of 10, followed by Automation Anywhere with an average 2.86 out of 10. Although, when ranked according to the number of high responses, UiPath and Automation Anywhere both scored in the top nine of all technology surveyed, featured in Exhibit 6. UiPath, in specific, scored the third highest in efficiency with 33% high responses. Refer to Exhibit 10 for the number of low, medium, and high responses for each RPA software.

Likewise, effectiveness was rated mostly low for all RPA tools, with only 23% of responses rating it high or medium. The average for the effectiveness of all RPA tools was 1.47 out of 10, even lower than its efficiency rating. Again, Drones and MindBridge AI scored the lowest, and UiPath scored the highest with a 3.33 out of 10 average followed by Automation Anywhere with a 3.00 out of 10 average. Refer to Exhibit 11 for the number of low, medium, and high responses for each RPA software.

As the results show, most subjects surveyed had limited knowledge and experience with RPA technology. The only programs that had a true effect on efficiency and effectiveness were UiPath and Automation Anywhere. Even so, the effect was lower than most of the other programs featured in the survey as the number of recorded responses for this category was lowest of all, ranging from four to seven responses per technology type. As previous literature hypothesizes, this may be due to the fact that RPA technology is still in its early stages and most of the potential benefits are not occurring in accounting firms yet. This survey revealed that despite countless reports and claims about the importance of RPA systems and its capabilities, their effect is not currently being observed by accountants.

Communication Technology Tools and Platforms

Lastly, we will discuss the results generated from the survey about Communication technology. The Communication softwares had the highest ratings for familiarity, job

applicability, efficiency, and effectiveness, on average. All ratings were above 5, scoring in the medium to high range on average, much higher than the other categories. Refer to Exhibit 5. Subjects were most familiar with Skype, followed by Google Suite and Zoom. Skype had an average familiarity rating of 7.26 out of 10 and job applicability of 7.87 out of 10. The other softwares had mid-range averages in each of the attributes. See Exhibits 3 and 4.

Due to only listing three tools in the survey, a variety of additional tools were submitted in the “other” category for this section. These additional Communication tools consisted of Microsoft Teams, Jabber, and Dropbox. Microsoft Teams is a video calling and chat service, similar to Zoom and Google Suite. Jabber is a lesser-known messaging and video calling collaboration service operated by Cisco. Lastly, Dropbox is a cloud-based storage platform with the ability to share documents and other files with team members to make collaboration easier. Out of the three, Microsoft Teams had the highest frequency and familiarity, with three responses and a 9 out of 10, an extremely high average.

Communication technology had the highest average efficiency ratings, all being in the medium range. Efficiency was highest for the “other” responses, mainly due to a single high response. Microsoft Teams scored the highest and was listed the most at three times. Otherwise, Skype had the highest efficiency at an average of 6.90, with 52% high responses, Google Suite following with 4.36 and 27% high responses, and finally Zoom with 4.23 out of 10 and 23% high responses. Additionally, all three platforms ranked in the top programs to improve efficiency, with Skype being second overall. Refer to Exhibit 6.

The effectiveness of Communication platforms also had the highest average rating of all categories investigated at 5.19 out of 10. Refer to Exhibit 5. Effectiveness is overall medium for Communication softwares, Skype having the highest average at 6.00, followed by Zoom at 4.60,

and lastly Google Suite at 4.00 out of 10. Again, all platforms ranked in the topmost effective programs. Refer to Exhibit 7. Overall, it can be concluded the Communication softwares all improve the efficiency and effectiveness of accountants, if only just to a medium amount. In particular, Skype had the largest impact on the efficiency and effectiveness of accountants out of the Communication programs. Refer to Exhibits 12 and 13 for the number of high, medium, and low responses for each Communication technology type.

Additionally, subjects were asked how Communication softwares affect their relationship with clients. The responses were as follows: 42% positive effect, 36% no effect, 22% negative effect. Out of all types, Skype had the most positive ratings at 8, followed by Zoom and Google Suite with 6 and 5, respectively. It can be concluded that these Communication softwares have a positive perceived effect on relationships with clients, or at the very least no effect, due to the close rankings of positive effect and no effect at 42% and 36% of the population. Refer to Exhibits 14, 15, and 16.

Conclusion

Summary of Results

The results generated from our survey reveal which technology platforms have the greatest impact and effect on an accountant's profession and work ethic. On average, accounting professionals believe that Communication softwares improve their efficiency and effectiveness the most, with Accounting and Analytics just behind. Although, it must be considered that due to having the fewest listed programs, at three, in the Communication section, they may have a higher average. Most Accounting and Analytics programs had high averages that were offset by some of the lesser known programs such as Xero and Blockchain, in turn lowering the overall average and skewing the data. For a single program, Excel by far had the highest ratings overall,

and can be thought of as the most impactful accounting software to date. Along with Excel, CaseWare IDEA, Alteryx, and QuickBooks were some of highest rated tools to improve efficiency and effectiveness featured in this study. Refer to Exhibits 6 and 7.

Compared to the high performance of the other two categories, RPA did not fare as well. RPA technology had the lowest ratings overall, which may suggest they are not as fully utilized as the other categories. This section had the most ratings of 0 and had the fewest ratings in the high range. It can be concluded that RPA technology may not be as helpful to the accounting field as was previously thought or that, perhaps, the accounting profession has not fully explored the potential of these tools. RPA is currently being used primarily in the tax field and has yet to expand in depth to auditing. Many large firms have started using RPA technology in tax, including Deloitte, PwC, KPMG, and Grant Thornton. RPA is being used for tasks such as data extraction, running reports, calculating adjustments, tax provision, and transaction taxes. Overall, RPA is the most useful for repetitive, straight-forward tasks, hence why is now more applicable to tax rather than other forms of accounting that require more professional judgement and involve opinionated matters. This could explain why RPA tools scored so poorly in improving the efficiency and effectiveness of accountants' ability to complete tasks.

Interestingly, 92% of the subjects working in public accounting had audit or assurance experience, with only 28% having expertise in tax and 37.5% in consulting. Therefore, the results generated in this survey apply mainly to audit and assurance and may not extend to other accounting fields. This is a limitation of the study and must be kept in mind for future analyses. As prior research suggests, audit is not as accepting of RPA tools as tax or consulting, so this may also explain the low ratings of its efficiency and effectiveness.

Overall, the most impactful programs were Excel, as mentioned previously, and Skype. These also happen to be the tools that accounting graduates are most familiar with and require the least amount of training when in the field. This may suggest that making aspiring accountants learn how to use newer platforms in undergraduate classes may improve their effectiveness and efficiency once they are working in an accounting position.

We can conclude from our testing that technology does not have a negative effect on the relationship between professionals and their clients. It is more likely that it will have a positive effect, or at the very least, a neutral effect. This means that technology is not harmful and can be an extremely useful and convenient tool to contact and converse with clients.

Overall, technology has greatly impacted the accounting profession and improved the effectiveness and efficiency of accounting professionals. Although, some types of software have more applicability and precedence than others. In order to fully take advantage of technology, accountants must be made more knowledgeable of lesser-known platforms and programs that could improve their work even more. New softwares must be adopted early on in order to reap the most benefits. Additionally, there must be training at all levels, from staff to partner, in order to ensure everyone is able to utilize these resources to their full capabilities. In the end, it is clear that when professionals are more familiar with technology, they will be able to work more efficiently and effectively. Therefore, by training accountants on how to use new softwares and programs, they will be able to produce higher-quality work, greatly benefiting the firm and its clients.

Further Research

As this study illustrated, there are various areas in which technology can be more impactful and additional questions can be raised related to this field. Questions such as:

- *Is Excel truly the most effective and efficient software, or it is simply the most widely used and well-known one?*
 - *Do other types of technology have the same opportunity if applied differently, with additional training?*
- *Does Robotic Process Automation have a role in the accounting field? Is there a way to make these softwares improve the efficiency and effectiveness of the user?*
 - *Are there ways to make RPA more applicable to the audit field?*
- *How can Communication tools be used to improve relationships with clients to a greater degree than what has already been observed while also mitigating negative effects?*

These questions can only be answered through real-world application. The survey results reveal that accountants do believe that technology has a somewhat positive impact on their relationship with clients. Technology can make communication easier between the accountant and the client, but it may also lower the trust between parties and appear less personal. It seems that accountants are aware of the effects of both, as most of the subjects answered “positive” or “no effect.” Even so, it is clear few accountants believe technology has a negative impact on this relationship, as shown by the minimal 22% negative ratings. We must also keep in mind that in most cases, Communication technology is used to supplement other face-to-face meetings, so the true impact of replacing these meetings completely with a virtual equivalent is unknown. In the end, this study has revealed which types of technology are most useful to accountants, and highlights which areas, primarily audit, require more focus in order to utilize advancing technology to its full potential.

In light of recent events, business collaboration technology tools have become more essential than ever before. In March 2020, the United States issued a quarantine in reaction to the

COVID-19 or coronavirus pandemic. Accountants must now work from home and rely on technology to complete their assignments and contact team members and clients. The Big 4 accounting firms and accounting organizations such as the American Institute of Certified Public Accountants (AICPA) and Financial Accounting Standards Board (FASB) have all acknowledged the impact of COVID-19 and have resources available for clients and employees. For example, in *Coronavirus Audit and Accounting Resources* (2020), the AICPA has posted various articles, videos, and podcasts surrounding this topic and ways the accounting field has been impacted and how professionals can cope. Delalilo (2020) also discusses several ways to improve accounting processes during this crisis: transitioning into the cloud, automating work processes, and changing to cloud-based, outsourced accounting options. Additionally, in article from *Accounting Today*, Arrowsmith (2020) discusses the changes accounting firms are undergoing as the severity of the coronavirus increases. Firms are requiring employees to work remotely from home, with the assistance of communication technology to stay in contact and continue to conduct meetings with clients. There has been a huge increase in the use of videoconferencing tools over the last few months. Without technology such as Skype, Zoom, and Google Suite, accounting would be nearly impossible and extremely dangerous in this climate. Accountants would not be able to communicate with one another or with clients, making the job of auditing, tax, or consulting extremely difficult. Overall, having technology to complete accounting tasks has never before been so crucial, and only a few decades ago continuing work under these conditions would have been impossible. It is in times like these that we really begin to appreciate what we have and are grateful for the technological innovations that are within arm's reach.

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Exhibits

Exhibit 1: Subject Accounting Field Experience

Experience in:	Public (n=25)	Private (n=9)
Audit/Assurance	92.00%	
Tax	28.00%	
Consulting/Advisory	37.50%	
Financial Accounting		100.00%
Governmental Accounting		11.11%
Non-profit Accounting		33.33%
Managerial Accounting		22.22%

Exhibit 1: Features the percentage of subjects that have experience in a variety of accounting industries. Each ratio is based on the number of “yes” responses to each experience field. Due to subjects having experience in more than one industry, the total percentages do not add to 100%.

Exhibit 2: Subject Demographic Information

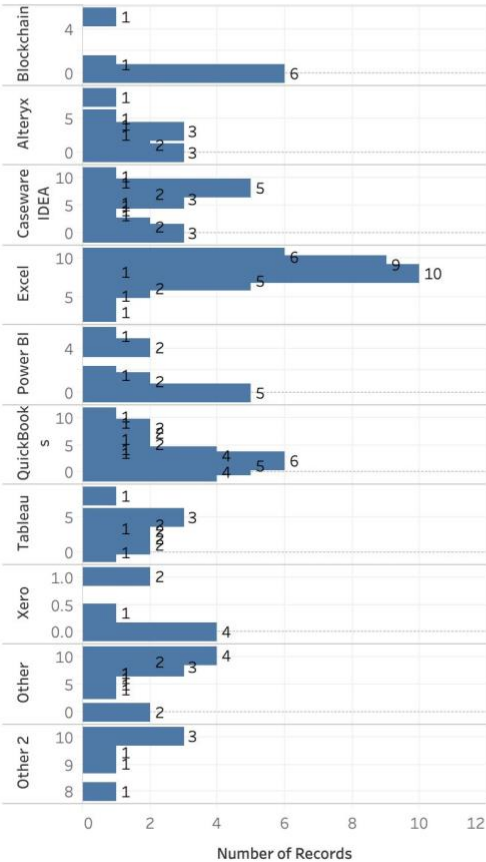
Firm Size	% of Public Population	Entire Population	
Big 4	20%	Age	% of Population
Big 10	16%	20-24	26.47%
Other national firms	12%	25-29	64.71%
Regional	44%	30-34	5.88%
Small	8%	35-39	0%
Job Position	% of Public Population	40-45	0%
Associate/Staff	32%	45-49	0%
Senior	60%	50-54	2.94%
Manager	8%	Work Length	% of Population
Job Position	% of Private Population	Less than a year	9.68%
Senior Accountant	33%	More than a year	19.35%
Financial Auditor	11%	More that 3 years	45.16%
Financial Analyst	11%	More than 5 years	16.13%
Manager	44%	More than 8 years	9.68%

Exhibit 2: Features a variety of demographic information about the survey subjects.

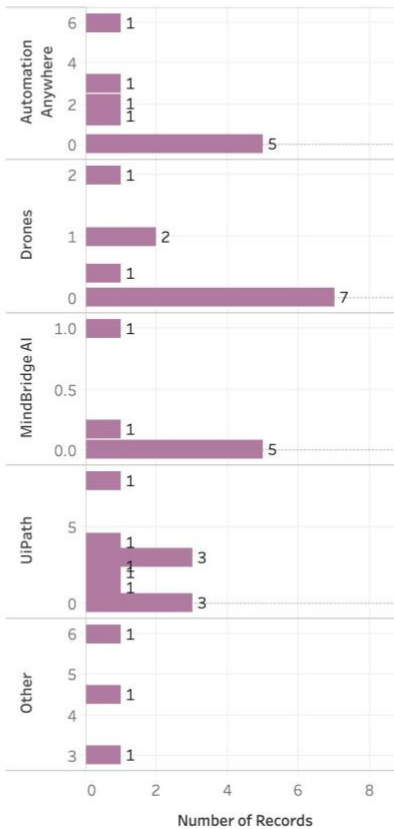
Exhibit 3: Familiarity with Technology Tools/Platforms

Familiarity

Accounting & Analytics Familiarity



Robotic Process Automation Familiarity



Communication Familiarity

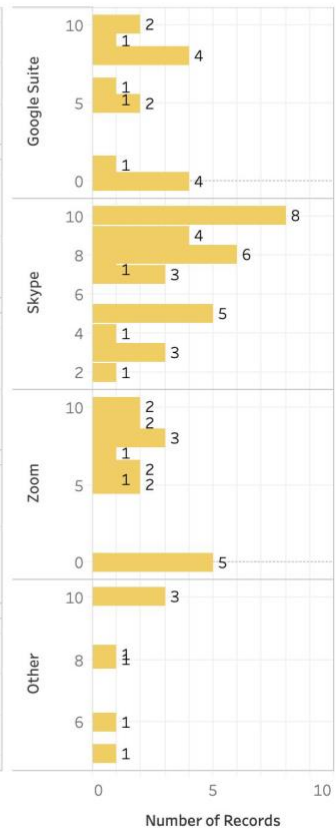
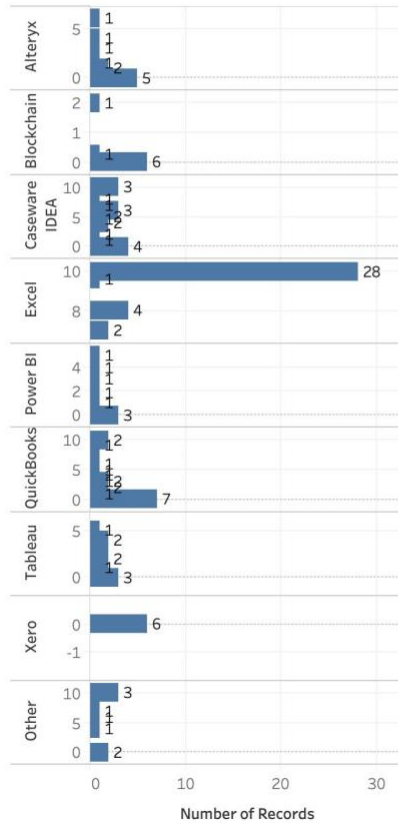


Exhibit 3: Documents how subjects rated various types of technology in terms of how familiar they were with the program. They were rated on a scale of 0 to 10. Provides a comparison between Accounting & Analytics, RPA, and Communication technology types.

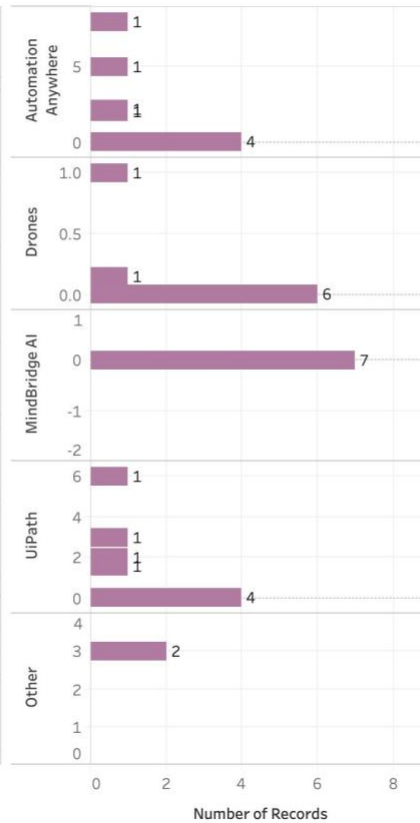
Exhibit 4: Job Applicability of Technology Tools/Platforms

Job Applicability

Accounting & Analytics Job Applicability



Robotic Process Automation Job Applicability



Communication Job Applicability

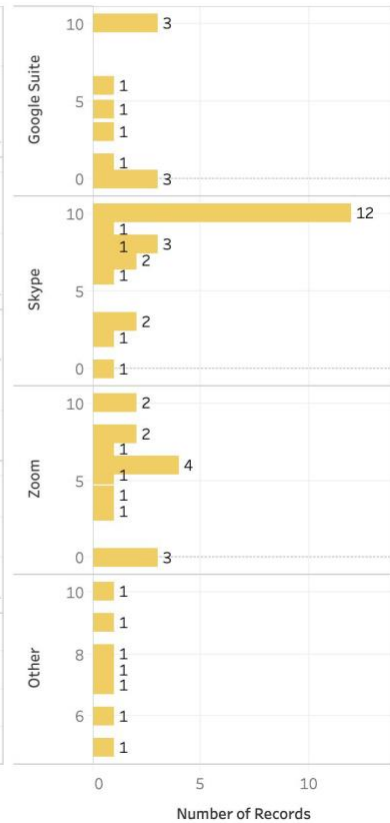


Exhibit 4: Documents how subjects rated various types of technology in terms of how much they used each type in their job. They were rated on a scale of 0 to 10. Provides a comparison between Accounting & Analytics, RPA, and Communication technology types.

Exhibit 5: Average Rating for Each Category of Technology Tools/Platforms

(All ratings are out of 10)

Type of Technology Tools/Platforms:	Familiarity	Job Applicability	Improves Efficiency	Improves Effectiveness
Accounting & Analytics	4.15	3.20	4.51	4.34
Robotic Process Automation (RPA)	1.77	1.37	1.77	1.47
Communication	6.49	6.26	5.73	5.19

Exhibit 6: Degree to Which Technology Improves Accountants' Efficiency

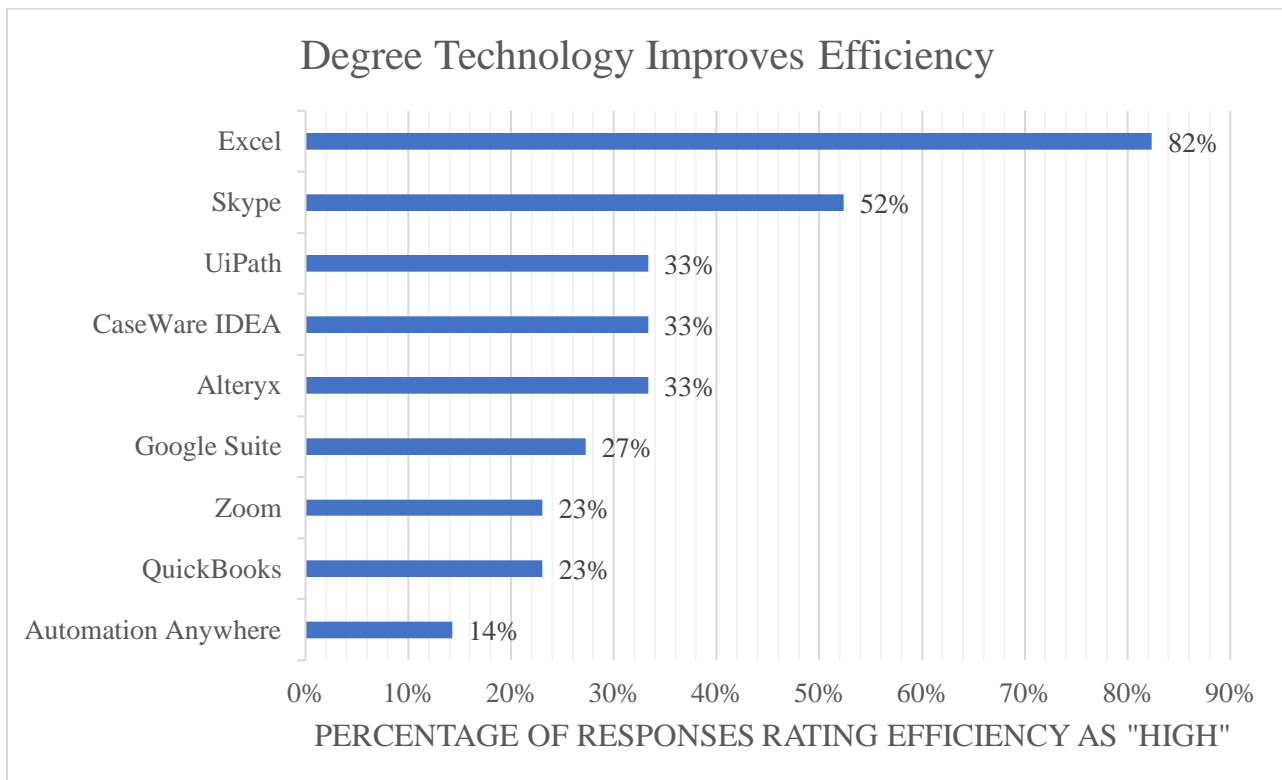


Exhibit 6: Features the top nine percentages of "high" ratings, or 8 - 10 out of 10, for efficiency out of all technology types surveyed.

Exhibit 7: Degree to Which Technology Improves Accountants' Effectiveness

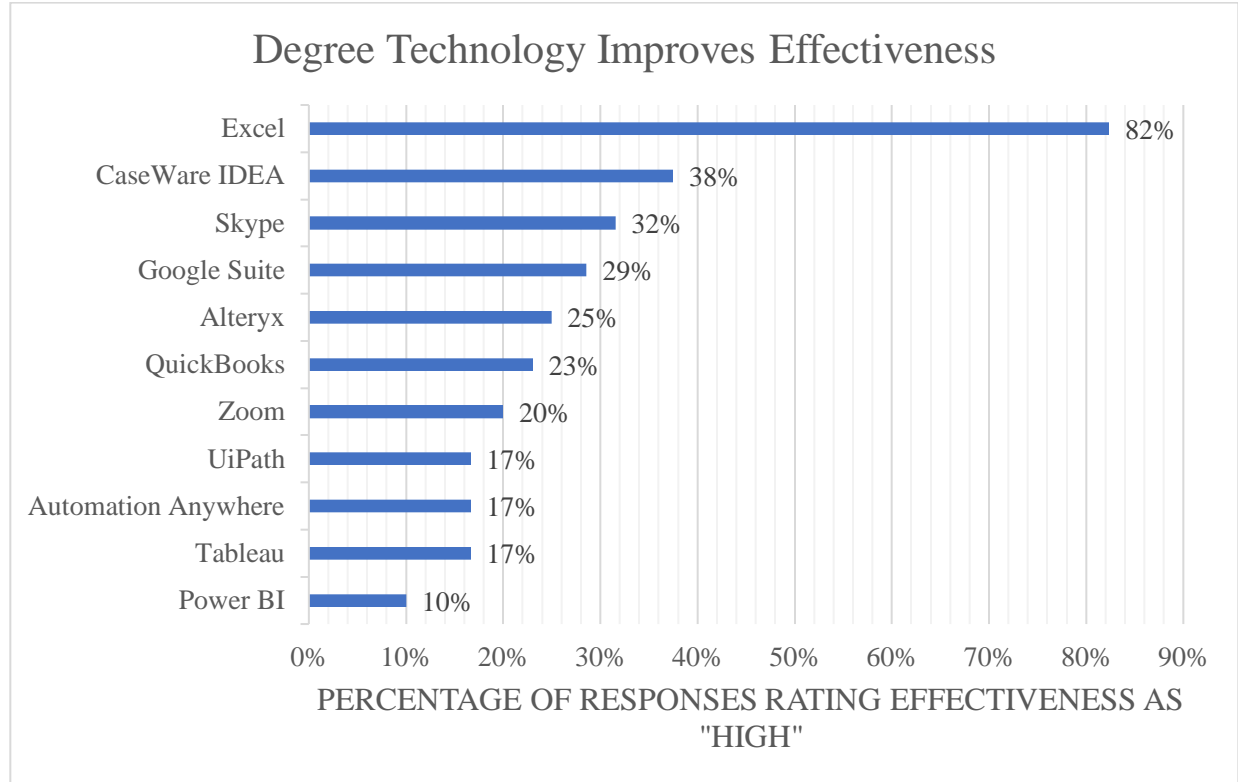


Exhibit 7: Features the top eleven percentages of “high” ratings, or 8 - 10 out of 10, for effectiveness out of all technology types surveyed.

Detailed Data - Total Responses for Efficiency & Effectiveness

(Responses are scored out of 10, in which 0 - 3 is low, 4 - 7 is medium, and 8 - 10 is high)

Exhibit 8: Efficiency Rating for Accounting & Analytics Software

Response Rating:	Excel	QuickBooks	Alteryx	CaseWare IDEA	Tableau	Power BI	Blockchain	Xero
High	28	3	2	6	0	0	0	0
Medium	6	5	2	8	2	2	0	0
Low	0	5	2	4	5	4	5	4
Total Responses	34	13	6	18	7	6	5	4

Exhibit 9: Effectiveness Rating for Accounting & Analytics Software

Response Rating:	Excel	QuickBooks	Alteryx	CaseWare IDEA	Tableau	Power BI	Blockchain	Xero
High	28	3	2	6	1	1	0	0
Medium	6	4	1	5	2	1	0	0
Low	0	6	5	5	3	8	4	4
Total Responses	34	13	8	16	6	10	4	4

Exhibits 8 and 9: Features the number of high, medium, and low responses as well as the number of total responses for the efficiency and effectiveness of Accounting & Analytics Software.

Exhibit 10: Efficiency Rating for Robotic Process Automation Software

Response Rating:	Drones	Automation Anywhere	MindBridge AI	UiPath
High	0	1	0	2
Medium	0	2	0	1
Low	4	4	4	3
Total Responses	4	7	4	6

Exhibit 11: Effectiveness Rating for Robotic Process Automation Software

Response Rating:	Drones	Automation Anywhere	MindBridge AI	UiPath
High	0	1	0	1
Medium	0	1	0	2
Low	4	4	4	3
Total Responses	4	6	4	6

Exhibits 10 and 11: Features the number of high, medium, and low responses as well as the number of total responses for the efficiency and effectiveness of RPA Software.

Exhibit 12: Efficiency Rating for Communication Software

Response Rating:	Skype	Zoom	Google Suite
High	11	3	3
Medium	5	4	3
Low	5	6	5
Total Responses	21	13	11

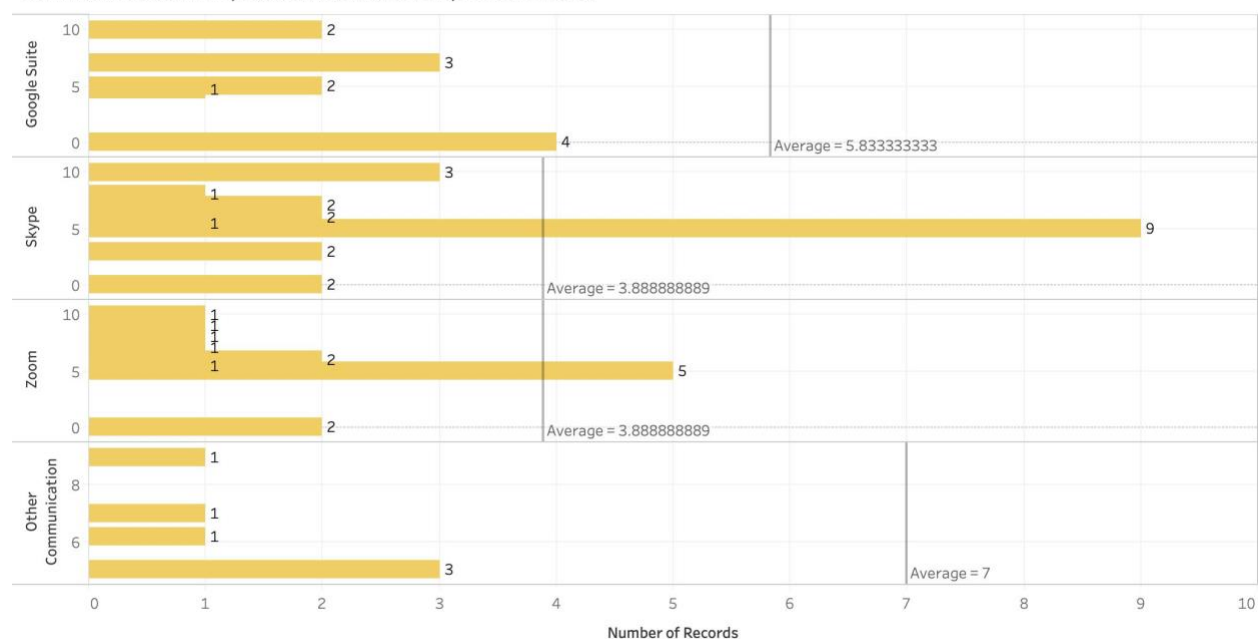
Exhibit 13: Effectiveness Rating for Communication Software

Response Rating:	Skype	Zoom	Google Suite
High	6	2	2
Medium	9	4	1
Low	4	4	4
Total Responses	19	10	7

Exhibits 12 and 13: Features the number of high, medium, and low responses as well as the number of total responses for the efficiency and effectiveness of Communication Software.

Exhibit 14: Communication – Impact on Relationship with Client

Communication Impact on Relationship with Client



The plots of sum of Number of Records for Relationship - Google Suite, Relationship - Skype, Relationship- Zoom and Relationship - Other Communication.

Exhibit 14: Documents how subjects rated various types of Communication technology to have a perceived effect on their relationship with clients. Each was rated on a scale of 0 to 10. 0 - 4 is “negative effect,” 5 is “no effect,” and 6 - 10 is “positive effect.” The averages for each software (Google Suite, Skype, Zoom, and “other”) are illustrated in the graph as well.

Exhibit 15: Perceived Effect of Technology on Client Relationship

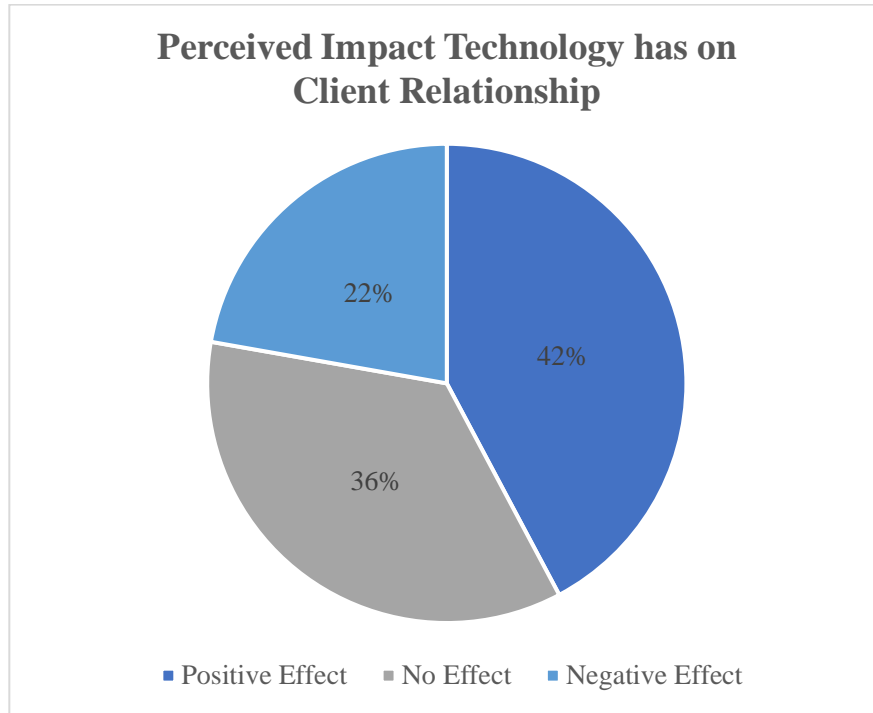


Exhibit 15: Illustrates the percentage of responses rating the effect negative, non-existent, or positive.

Exhibit 16: Perceived Effect of Technology on Client Relationship

	Skype	Zoom	Google Suite
Positive Effect	8	6	5
No Effect	9	5	2
Negative Effect	4	2	4
Total Responses	21	13	11

Exhibit 16: Features the number of recorded responses for technology having negative effect, no effect, and positive effect on the client-accountant relationship.