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AN EXAMINATION OF STUDENTS' ATTITUDES AND PERCEPTIONS TOWARDS INCORPORATING COMPUTER ASSISTED AUDIT TECHNIQUES IN AN UNDERGRADUATE AUDITING COURSE

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ABSTRACT

The use of Computer Assisted Audit Techniques (CAATs) in the form of generalized audit software (GAS) for increasing both the efficiency and effectiveness of audits has been well recognized. With this recognition, changes have been made to the auditing curriculums of many business schools by devoting substantial time and resources towards integrating audit software. Despite these developments, the relevance and usefulness of these tools from the students' perspective has not been fully examined, which is imperative for appropriately designing not only the content, but also the extent of the treatment of CAATs in undergraduate audit curriculums. This paper attempts to fill this gap by examining students' perceptions and attitudes towards CAATs following the successful integration of a module on generalized audit software in the undergraduate auditing curriculum of an AACSB accredited business school. A survey instrument was utilized for this purpose, and analyzed by Paired Sample T-tests and One Sample T-Tests. The implications of a number of statistically significant perceptions are discussed in the paper that provide new insights into the perceived value of incorporating CAATs into the curriculum, which ultimately has a bearing on both curriculum development and instructional pedagogy.

JEL: M42, M15, C88

KEYWORDS: Perception, Attitude, Generalized Audit Software, Computer-Assisted Audit Techniques, Audit Command Language (ACL), Auditing Curriculum

INTRODUCTION

The effectiveness of computer aided audit techniques (CAATs) in the conduct of audits has been widely recognized by both regulatory bodies and the audit profession (Kuruppu, 2012; Weidenmier and Ramamoorti, 2006; Debreceny et al., 2005;). This has consequently led to the establishment of a number of new certification programs from both CAAT vendors and professional associations such as the International Certified CAATs Practitioner (ICCP) qualification by the International Computer Auditing Education Association (ICAEA). These developments have led to changes in both the curriculum and the methods of teaching auditing courses. An increasing number of business schools now actively promote the integration of audit software into the auditing curriculum, which is seen as a skill in high demand by employers (Kuruppu, 2012; Weidenmier and Ramamoorti, 2006).

While knowledge of CAATs is a sought-after quality of new accounting graduates, research is specifically needed to uncover whether students actually benefit from learning about CAATs *within* the auditing curriculum, and what specific facets of the course structure and instructional pedagogy can be improved upon and how. The main objective of this paper is therefore to investigate the attitude and perception of students towards CAATs following its implementation in an undergraduate auditing course. This objective

is achieved by administering a survey instrument to examine the student participants' attitudes and perceptions towards CAATs in the auditing curriculum. Some of the themes addressed by the survey include an assessment of whether there is a statistically significant difference in students' perceptions towards CAATs prior to and after completing the module, whether learning about CAATs is useful for conducting an audit, the perceived value of incorporating the module in all topics of the auditing curriculum, and whether undertaking the module is expected to increase employment prospects, amongst others. This paper will be of interest to accounting academics in appreciating and applying the more effective means and methods of integrating audit software into the curriculum, from the context of the key aspects pedagogy which students consider to be important.

The remainder of the paper is structured as follows. The next section reviews the extant literature in the area and the objective of this paper. This is followed by section three, which details the research methodology. This is followed by a discussion of the survey results, with section four concluding the paper with a summary of the main findings and opportunities for further research.

BACKGROUND AND LITERATURE REVIEW

Audit firms operate in an increasingly competitive environment. There is considerable interest in how a quality audit can be conducted both effectively and efficiently. In this context, computer based audit methods is recognized as an effective way of enabling audits to be conducted cost effectively (Bourke, 2010; IIARF, 2009). For instance, audit software based techniques can be used to verify depreciation charges of all fixed assets instead of relying on sampling to assess a relatively smaller portion of the assets in the fixed assets register. In a similar vein, thousands of accounts receivables customers can be easily checked for negative balances in a few seconds, when such extensive examination will not be possible using traditional audit methods. This consequently allows audits to completed in less time. A number of audit software exists that is widely used by audit firms, which includes ACL™ and IDEA® (Brennan, 2008; IIARF, 2009; Lanza, 1998). With the increasing use of audit software, employees with the requisite skills is in high demand. Thus, audit firms also increasingly invest in training employees in utilizing these techniques (Debreceby et al., 2005; Weidenmier and Ramamoorti, 2006).

Despite the increasing prevalence of the use of generalized audit software, there is a scarcity of new graduates entering the audit workforce with the requisite audit software skills (O'Donnell and Moore, 2005; Kuruppu, 2012). Consequently, there is a well-recognized demand for accounting graduates who are proficient in computer assisted audit techniques (Kuruppu, 2012; Weidenmier and Herron, 2004; Sharifi, 2004). This shortage has led some audit firms to even cross-train current employees in information technology (Debreceny et al., 2005; O'Donnell and Moore, 2005; Baker, 2009).

It is imperative in the context of these developments that CAATs skills are imparted to accounting graduates to meet the needs of employers (Weidenmier and Herron, 2004; Sharifi, 2004; O'Donnell and Moore, 2005). Business schools on their part need to take the initiative by modifying and updating the auditing curriculums appropriately, perhaps through a comprehensive e-learning strategy. Students can be coached utilizing audit software led by the instructor, or by self-contained modules that can be completed at the students own pace (Kuruppu, 2012; OECD, 2005; Clark and Mayer, 2007). Bates (2009) supports this view of e-learning since it facilitates the development of critical skills and capabilities necessary for an occupation by integrating IT into the course.

A number of popular auditing textbooks already facilitates the incorporation of audit software into the curriculum, by including material on CAATs within the text. For instance, the internationally available textbooks by Arens, Messier, Rittenburg and Louwers all incorporate material on audit software into the text, and also provides an educational version of either IDEA or ACL that can be installed on any Windows based computer. These resources together with appropriate coverage in the audit curriculum can also enable

students to attain the newly established professional certifications such as International Certified CAATs Practitioner, ACL™ Certified Data Analyst (ACDA), Certified IDEA™ Data Analyst (CIDA) and Jacksoft Certified CAATs Practitioner (JCCP).

Despite recognizing the necessity of educating business students on the use of CAATs, which is a key skill demanded by employers, only a limited number of studies have examined appropriate pedagogies for including CAATs in the auditing curriculum (O'Donnell and Moore, 2005; IIARF, 2009). Most studies are limited to suggesting possible exercises that can enable audit software to be introduced to students. For instance, Gelinas et al., (2001) reported a series of exercises based on a case study. While the exercises are inherently a useful start for an instructor teaching the use of audit software for the first time, the real-world facets of pedagogy that can enhance its delivery in the classroom is overlooked. A similar study by Nieschwietz et al., (2002) presented a number of assignments covering the main accounting cycles using generalized audit software. The use of sampling was also covered in this paper.

Since these initial studies, Weidnmier and Herron (2004) has compared the ACL and IDEA generalized audit software and reported observations from both students and instructors. The latter study analyzed the software manuals of both programs, and used it as a foundation to suggest how the software can be introduced into the classroom. However, these was little by way of reference to the pedagogy of introducing the software. Moreover, Weidnmier and Herron (2004) did not advance any specific audit software based exercises or cases that can help integrate the software as part of the auditing curriculum. These studies were improved upon and extended by (Kuruppu, 2012), who outlined a comprehensive pedagogy that has been successfully implemented in the auditing curriculum of an AACSB accredited business school. This study was wide-ranging with the module delivered-over three weeks of a fifteen-week semester.

It becomes evident from the above literature review that an increasing number business schools have attempted to integrate CAATs into the auditing curriculum, recognizing that knowledge of audit software is a key attribute desired by accounting employers. Despite the relatively small number of studies that focused on disseminating pedagogies for incorporating audit software into the curriculum, questions still remain unanswered concerning whether students actually benefit from learning about CAATS *within* the auditing curriculum, and what specific facets of the course structure and instructional pedagogy can be improved upon and how. These are critical questions that needs to be answered, given the importance that employers place on knowledge of CAATs in auditing. The methodology followed to answer these questions is detailed in the next.

METHODOLOGY

This section outlines and describes the two distinct stages of this research. Firstly, the pedagogy followed to implement the CAATs module in the Advanced Auditing course at UAE University is presented. This is followed by a description of the survey questionnaire employed to ascertain students' perceptions and attitudes towards the module and the utilized statistical methods used to analyze the data.

The accounting baccalaureate at UAE University follows a typical U.S. program, and is AACSB accredited. There are three streams available to accounting students: Financial Accounting, Management Accounting and a General Specialization. Principles of Auditing is a required major course for students in each of the streams, while Advanced Auditing is an elective with the principles level course being the prerequisite. Most of the students who complete Principles of Auditing also take Advanced Auditing prior to graduation. The number of students in each semester ranges from about forty to sixty students. Each of the students in the class is provided with a laptop running Microsoft Windows and all lecture rooms are WiFi enabled. A typical class timeslot is for 75 minutes and meets two times per week. CAATs as a generalized audit software tool is the opening module in the Advanced Auditing course outline. Students coming into this class do not have any prior experience or proficiency with audit software. Appendix B systematically

presents the pedagogy followed to present the module together with pertinent teaching notes. The course profile given to students on the first day of class has three weeks allocated to this topic, which comprise twenty percent of the final grade. Together with the course outline, a survey questionnaire is also given to the students to examine their attributes and perceptions about CAATs *before* commencing the module. A similar questionnaire with additional questions are given at the *conclusion* of the three weeks allocated to the module to ascertain changes in perceptions. The survey was administered in the semester commencing Spring 2010, and utilized Likert item statements on a 1 to 5 scale, with 1 standing for 'Strongly agree' to 5 standing for 'Strongly disagree'.

An extract of the survey instrument is given in Appendix A, which details the specific attitudes and perceptions assessed. The survey was ultimately completed by 113 students across three semesters, comprising of the *entire population* of students undertaking Advanced Auditing, yielding a hundred percent response rate. The population of students across the three semesters were homogenous, which is essential for the statistical analysis.

A number of statistical methods are available to analyze Likert item surveys. Among these, the *t test* and *Mann-Whitney-Wilcoxon* test are commonly used to analyze Likert type survey instruments (Frost, 2016; Carifio and Perla, 2008). Although there is some debate as to whether Likert item data should be investigated by means of parametric or nonparametric procedures, it has been shown that both methods have similar power with the t-test also being robust to violations of the normality assumption as long as the sample size exceeds twenty (De Winter and Dodou, 2010; Frost, 2016). This makes the t-test well suited to the analysis of the Likert items in the current study, where the entire population of students participated. Accordingly, the *paired sample t-test* is used to analyze differences in students' perceptions *before* and *after* takings the CAATs module. In addition, directional *one sample t-tests* are used to determine the statistical significance of perceptions from the mean value of the Likert item scale of three. Scale items less than three indicates agreement with the particular Likert statement, while scores above three indicate perceptions that show disagreement with the given statement. The statistical tests were run in *Minitab*® and reconfirmed with *RStudio*®.

RESULTS AND DISCUSSION

The attributes of the survey participants show that the majority are female (60.2%), while only 39.8% of the students are male. In addition, 85% of them did not have any prior auditing exposure, with only 15% indicating auditing related work experience. Prior to taking the CAATs module, 93% of the students did not have an awareness of generalized audit software such as ACL or IDEA, whereas 7% of the students indicated they were aware of such tools.

The first key questions in the survey instrument examined whether students thought that CAATS in the form of generalized audit software were useful for conducting an audit. An analysis of the change in perceptions of students *before* undertaking the module and *after* undertaking the module indicate that there is a statistically significant difference. The difference in the *before* mean perception (3.540) and *after* mean perception (2.460) is significant with a p-value of 0.000. This favors the alternative hypothesis that the mean difference between the before and after effects is *not* zero, and is shown by the Paired T-test in Table 1. Students after completing the module more strongly agreed on the usefulness of generalized audit software for conducting an audit compared to before embarking on the module. This indicates that undertaking the module had a statistically significant effect on students' perception about the usefulness of audit software for conducting an audit.

Table 1: Paired T-Test for Generalized Audit Software Usefulness for Conducting an Audit

	N	Mean	StDev	Mean
useful.7a	113	3.540	1.150	0.108
useful.7b	113	2.460	1.210	0.114
Difference	113	1.080	1.728	0.163
95% CI for mean difference: (0.758, 1.402)				
T-Test of mean difference = 0 (vs ≠ 0): T-Value = 6.64 P-Value = 0.000***				

*This table reports whether students thought that CAATs in the form of generalized audit software were useful for conducting an audit, before and after taking the module. The 95% Confidence Interval for the mean difference and the T-test of the mean difference are given in the last two rows of the table. ***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively.*

When the above differences are further analyzed by a directional One Sample T-test, shown in Table 2, it becomes evident that students strongly believe that generalized audit software is useful for conducting an audit, with a mean value on the Likert item of 2.460 at p-value of 0.000. A mean less than 3 indicates strong concordance with the given Likert statement, and thus the null hypothesis that the mean equal to 3 ($\mu = 3$) is rejected in favor of the alternative hypothesis ($\mu < 3$).

Table 2: One-Sample T-Test for Audit Software Usefulness (After Effect)

Variable	N	Mean	StDev	SE Mean	95% Upper Bound	T	P
useful.7b	113	2.460	1.210	0.114	2.649	-4.74	0.000***
Test of $\mu = 3$ vs < 3							

*This table shows through a directional One Sample T-test whether students thought that generalized audit software were useful for conducting an audit after taking the module. The hypothesis examined is shown in the last row of the table, while the statistical significance is shown in the last column under P. ***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively.*

The above statement was extended to ascertain whether learning about audit software was useful for understanding some of the 'actual techniques' used by auditors, and specifically, whether they believe that learning about such software showed them how computer technology can improve the effectiveness and efficiency of auditing. Students were also asked whether they thought the incorporation of material on generalized audit software made the auditing course more engaging and interesting. Table 3 presents these results. The Paired T-test in Panel A of Table 3 indicates a statistically significant difference between the *before* perception for the Likert item (mean 3.168) to the *after* mean perception of 2.336 at a p-value of 0.000. This is also confirmed by the One Sample directional T-test with a mean of 2.336 at a p-value of 0.000 in Panel B of the table. Panel C of Table 3 also shows that students strongly believe that computer technology in the form of generalized audit software can improve the effectiveness and efficiency of auditing. It can be seen that the null hypothesis ($\mu = 3$) is rejected in favor of the alternative hypothesis at a p-value of 0.000, indicating strong agreement with the statement.

Furthermore, the positive belief statement towards incorporating generalized audit software material into the course is supported by the finding that it makes the course more engaging and interesting. It can be seen from Panel D of Table 3 that the p-value for the latter statement is 0.003, which favors the alternative hypothesis ($\mu < 3$). These findings also lend credibility to the effectiveness of the pedagogy utilized to incorporate the audit software material into the curriculum.

Table 3: Aspects of the Perceived Usefulness of Audit Software

Panel A							
	N	Mean	StDev	Mean			
useful.8a	113	3.168	1.541	0.145			
useful.8b	113	2.336	1.147	0.108			
Difference	113	0.832	1.880	0.177			
95% CI for mean difference: (0.481, 1.182)							
T-Test of mean difference = 0 (vs ≠ 0): T-Value = 4.70 P-Value = 0.000***							
Panel B							
Variable	N	Mean	StDev	SE Mean	95% Upper Bound	T	P
useful.8b	113	2.336	1.147	0.108	2.515	-6.15	0.000***
Test of μ = 3 vs < 3							
Panel C							
Variable	N	Mean	StDev	SE Mean	95% Upper Bound	T	P
useful.15b	113	2.354	1.077	0.101	2.522	-6.38	0.000***
Test of μ = 3 vs < 3							
Panel D							
Variable	N	Mean	StDev	SE Mean	95% Upper Bound	T	P
useful.14b	113	2.699	1.133	0.107	2.876	-2.82	0.003***
Test of μ = 3 vs < 3							

*Table 3 shows specific aspects of the perceived usefulness of generalized audit software after completing the CAATs module. Panel A reports the Paired T-Test for the variable 'Learning about generalized audit software was useful for understanding some of the actual auditing techniques utilized by auditors' (before/after effect). Panel B reports the One-Sample T test for 'Learning about generalized audit software was useful for understanding some of the actual auditing techniques utilized by auditors' (after effect). Panel C reports the One-Sample T test for 'Learning about generalized audit software showed me how computer technology can be used to improve the effectiveness and efficiency of auditing' (after effect). Finally, Panel D reports the One-Sample T test for 'Learning about generalized audit software made the auditing course more engaging and interesting' (after effect). ***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively.*

The above statements indicated that students positively viewed the impact of generalized audit software in conducting an audit and also that it facilitated understanding some of the actual methods used by auditors, whilst concurrently making the course more engaging and interesting. Given these generally positive views, students were asked whether it is important to introduce CAATs in the form of generalized audit software as an integral component of the auditing curriculum, and whether it would be more useful and appropriate to have learnt about these methods starting in the Principles of Auditing course rather than having the content deferred to the Advanced Auditing course. Table 4 presents these results.

Panel A of Table 4 shows that the consensus among students is that generalized audit software must be integrated into the auditing curriculum, with a mean of 2.558 that is less than the neural value on the Likert item of 3. The result is statistically significant with the p-value at 0.000, which rejects the null hypothesis ($\mu = 3$) in favor of the alternative hypothesis. An interesting finding, however, is about students' perception towards incorporating audit software in Principles of Auditing, rather than deferring the module to Advanced Auditing. These results are shown in Panel B of Table 4. It is found that students do not perceive that there is merit in learning about CAATs in the earlier offered Principles of Auditing course. This is indicated by the mean value of 3.336, which is above the mean value on the Likert item scale of 3. This is also confirmed by the p-value of 0.996, which indicates that there is no evidence to show that the true mean is less than 3, indicating concordance with the statement.

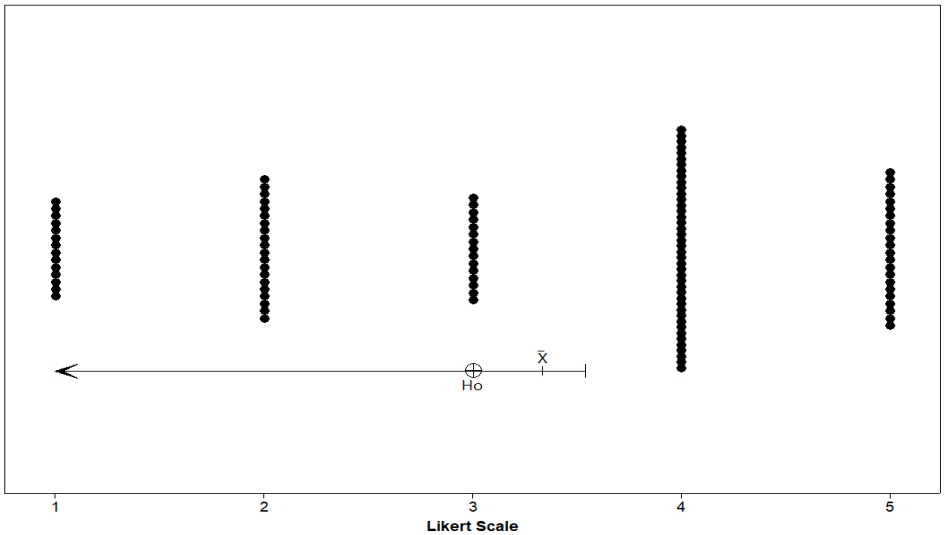
An individual value plot of the responses for this Likert item further clarifies the students' perception towards introducing CAATs in the Principles of Auditing course, and is presented in Figure 1. It is clear from the individual value plot that the mean response ($\overline{X}$) exceeds 3, and that most students have marked their responses on either 4 or 5 of the scale indicating their disagreement towards introducing CAATs in Principles of Auditing. A possible reason for this outcome may be due to the fact that nearly all students who complete Principles of Auditing also go on to take Advanced Auditing. Thus, from the students' viewpoint, they will not be missing learning about CAATs entirely, but merely deferring it to a later semester in Advanced Auditing. Students may perceive this to be advantageous, as they are better able to follow the CAATs module with the foundation laid in the earlier principles level course.

Table 4: Perceptions Towards Integrating Audit Software into the Auditing Curriculum

Panel A							
Variable	**N**	**Mean**	**StDev**	**SE Mean**	**95% Upper Bound**	**T**	**P**
useful.9b	113	2.558	1.274	0.120	2.756	-3.69	0.000***
Test of μ = 3 vs < 3							
Panel B							
Variable	**N**	**Mean**	**StDev**	**SE Mean**	**95% Upper Bound**	**T**	**P**
useful.13b	113	3.336	1.313	0.124	3.541	2.72	0.996
Test of μ = 3 vs < 3							

*Panel A of the table reports the One-Sample T test for the variable 'It is important to introduce students to CAATs in the form of generalized audit software as an integral part of the auditing curriculum', while Panel B shows the One-Sample T test on the variable 'It is more appropriate to have learnt about generalized audit software starting from the Principles of Auditing course rather than in Advanced Auditing'. ***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively.*

Figure 1: Individual Value Plot of Introducing CAATs in Principles vs. Advanced Auditing



This figure shows the individual responses on the Likert scale for the statement 'It is more appropriate to have learnt about generalized audit software starting from the Principles of Auditing course rather than in Advanced Auditing.' Responses above 3 indicate disagreement with the statement. The horizontal arrow indicates the 95% confidence interval for the responses. The test value for the null hypothesis (H_0) and the mean of the responses are also reported.

A number of statements sought to obtain information from the students about specific aspects of the pedagogy used to introduce CAATs into the curriculum. These include soliciting students' perceptions about (a) whether they believed that audit software activities should be incorporated into every topic of the Advanced Auditing course; (b) whether it is always necessary for the instructor to provide guidance to

students in solving these activities; and (c) whether the time allocated to audit software activities described earlier in the paper is sufficient. Table 5 presents students' perceptions for these three aspects of the module using One Sample T-tests.

The results presented in Panel A of Table 5 indicate that students perceive the value of CAATs in the auditing course, where the mean response of 2.779 on the scale is statistically significant at a p-value of 0.046. The null hypothesis that the mean is equal to 3 ($\mu = 3$) is rejected in favor of the alternative hypothesis ($\mu < 3$), demonstrating that students perceive the usefulness of incorporating generalized audit software activities into every topic of the auditing course. In contrast, however, students were found to be neutral on the statements concerning whether the instructor should always provide guidance in solving these activities and whether the time allocated to the CAATs module is adequate. This is shown in Panels B and C of Table 5. The p-values of 0.074 and 0.968 respectively indicates evidence in favor of the null hypothesis ($\mu = 3$) and does not indicate a statistically significant level of agreement with the latter two statements. Students' attitude hovering on neutrality on these two statements might be indicative of the fact that they are comfortable with the level of guidance provided by the instructor in the course, and the allocated time for the module being sufficient.

Table 5: Perceptions on Aspects of the Pedagogy used to Introduce CAATs into the Curriculum

Panel A							
Variable	**N**	**Mean**	**StDev**	**SE Mean**	**95% Upper Bound**	**T**	**P**
actv.10b	113	2.779	1.387	0.130	2.995	-1.70	0.046**
Test of $\mu = 3$ vs < 3							
Panel B							
Variable	**N**	**Mean**	**StDev**	**SE Mean**	**95% Upper Bound**	**T**	**P**
guide.11b	113	2.814	1.353	0.127	3.025	-1.46	0.074*
Test of $\mu = 3$ vs < 3							
Panel C							
Variable	**N**	**Mean**	**StDev**	**SE Mean**	**95% Upper Bound**	**T**	**P**
time.12b	113	3.230	1.303	0.123	3.433	1.88	0.968
Test of $\mu = 3$ vs < 3							

*Panel A in this table shows the One-Sample T test for the variable 'It is important to have generalized audit software based activities integrated into every topic of the auditing curriculum' (after effect); Panel B shows the One-Sample T test on the variable 'It is always necessary for the professor to guide students in solving generalized audit software based activities' (after effect), while Panel C shows the One-Sample T test on the variable 'The time allocated to learning about generalized audit software in the course was sufficient' (after effect). ***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively.*

The key motivation behind incorporating CAATs into the auditing curriculum is to enable students to have an awareness and a practical knowhow of how auditors use these methods in the modern auditing environment, thus making students with these skills more marketable to potential employers (O'Donnell and Moore, 2005; Baker, 2009; Kuruppu, 2012). Indeed, incorporating CAATs into the curriculum will directly assist business schools in actively responding to the call by employers and regulatory bodies to assist in producing accounting graduates who possess the core skills needed in an increasingly IT intensive audit environment (Kuruppu, 2012). A secondary motivation is to facilitate students in attaining the newly established professional certifications in the area such as the International Certified CAATs Practitioner qualification. It is therefore important to ascertain how students themselves feel about the value gained by learning about the application of generalized audit software in relation to above stated dual objectives of incorporating CAATs into the auditing curriculum.

This was assessed by examining students' perceptions regarding increasing their marketability to employers as a result of completing the CAATs module. Table 6 presents these results, which indicate a strong concordance with the statement that learning about generalized audit software increased their potential marketability to employers. The p-value of 0.000 indicates the null hypothesis that the mean equal to 3 ($\mu = 3$) is rejected in favor of the alternative hypothesis ($\mu < 3$). Scores less than 3 indicates concordance with the statement.

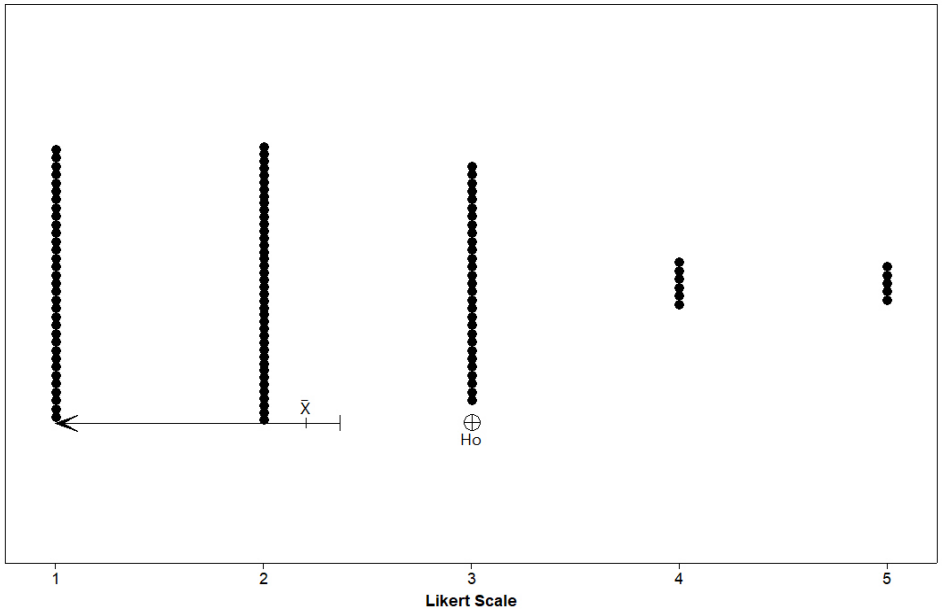
Table 6: Marketability to Potential Employers

Variable	N	Mean	StDev	SE Mean	95% Upper Bound	T	P
job.16b	113	2.2035	1.0620	0.0999	2.3692	-7.97	0.000***
Test of $\mu = 3$ vs < 3							

*This table shows the One Sample T test statistics for students' perceptions of their marketability to potential employers following the CAATs module. The hypothesis examined is shown in the last row of the table, while the statistical significance is shown in the last column under P. ***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively.*

An individual value plot of the responses for the above statement further demonstrates the students' perceptions about their marketability to employers following the CAATs module, and is presented in Figure 2. It is clear from the figure that that the majority of students show agreement with the statement that learning about generalized audit software increased their marketability to employers, with only a significantly smaller number of students opining that it is unlikely to help their job prospects. The 95% confidence interval includes responses in agreement with the alternative hypothesis ($\mu < 3$), further supporting the findings presented in Table 6.

Figure 2: Individual Value Plot of the Perception of Marketability to Employers



This figure shows the individual responses on the Likert scale for the statement 'Learning about generalized audit software significantly increased my marketability to potential employers.' Responses below 3 indicate agreement with the statement. The horizontal arrow indicates the 95% confidence interval for the responses. The test value for the null hypothesis (H_0) and the mean value of the responses are also reported.

CONCLUSION

CAATs in the form of generalized audit software has been recognized as an indispensable part of the auditor's toolbox that can make audits more effective and efficient. Consequently, regulatory bodies and accounting firms have encouraged business schools to consider these recent developments and to integrate audit software into the auditing curriculum. An increasing number of business schools have responded to this challenge, by incorporating material on CAATs in their respective programs. Despite this increase in adaption, little has been done to understand students' perception and attitude towards CAATs, whether the methodology used to introduce CAATs to students is effective and what changes to the curriculum and teaching pedagogy may be necessary to make the learning process more efficient from the students' perspective. This paper addressed these issues by utilizing a survey instrument to ascertain students' perceptions both before embarking on a CAATs module in an Advanced Auditing course, and upon completing it.

An analysis of students' perceptions indicated that they were able to appreciate how generalized audit software is useful for conducting an audit. Students indicated that they had a better appreciation of how computer technology can be used to improve the effectiveness and efficiency of auditing, and also believed that incorporating the CAATs module into the curriculum made the course more engaging and interesting. Although students held that material on generalized audit software should be an integral part of the curriculum, they did not feel that it should be introduced in the principles level course in auditing. This might be explained by the fact that nearly all students taking the Principles of Auditing course also go on to take the Advanced Auditing course. Having the material deferred to the advanced course a semester later is not going to materially change the learning outcome related to CAATs.

As for the degree of integration of the audit software, students strongly believed that related material should be including in every topic covered in Advanced Auditing. However, they also do not believe that it is always necessary for the instructor to provide guidance in solving CAATs based activities, as they can independently attempt the exercises and problems once a solid introduction to the software is given. The time allocated to the CAATs module of three weeks (out of the typical fifteen-week semester) is also seen as appropriate. Importantly, students strongly value the audit software module in the course. It is perceived by them to significantly improve their marketability to potential employers, by imparting on them a key skill that is recognized as being necessary in the current audit environment.

The pedagogy used in this paper in light of the students' perceptions towards the incorporation of CAATs can be used by accounting and auditing faculty to introduce audit software into their own respective curriculums. Where CAATs is already incorporated, students' feedback from the survey can be used to fine-tune aspects of the pedagogy and curriculum structure to make the delivery more effective, thereby adding value to both the students and to the degree program. The conclusions in this paper are derived from the analysis of the perceptions of 113 students in one of the main state universities in the UAE. This may be considered to be a limitation of this paper. Students' perceptions, especially regarding the employed pedagogy, might be found to be dissimilar in other settings. An interesting area for future research is to examine the effect of students' Learning Styles in incorporating CAATs into the auditing curriculum.

APPENDICES

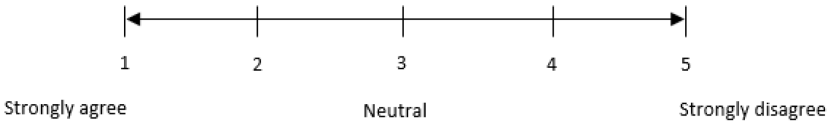
Appendix A: Extract from Survey Instrument

Your Gender:
❑ Male ❑ Female

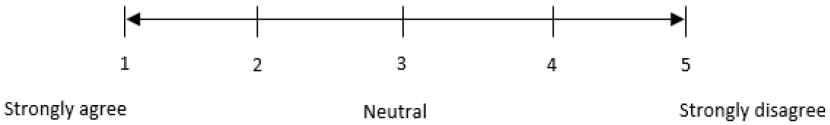
Before undertaking this course, were you aware of CAATs in the form of generalized audit software? ❑ Yes ❑ No

State your level of agreement or disagreement with the following statements. Indicate your response by circling your choice on the scale, which ranges from Strongly agree to Strongly disagree.

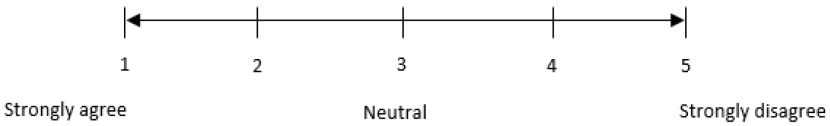
Generalized audit software is useful for conducting an audit. [useful7a/useful7b]



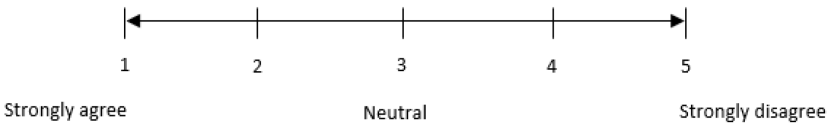
Learning about generalized audit software was useful for understanding some of the actual auditing techniques utilized by auditors. [method8a/method8b]



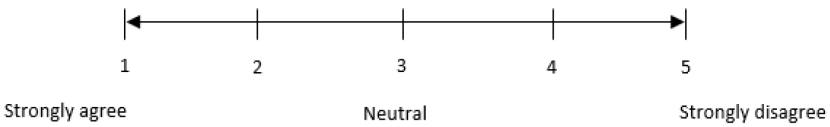
It is important to introduce students to CAATs in the form of generalized audit software as an integral part of the auditing curriculum. [intro9b]



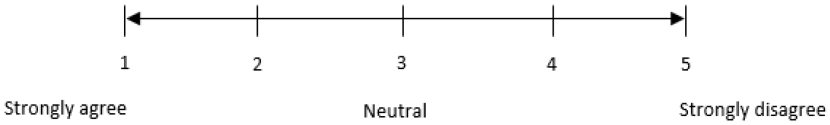
It is important to have generalized audit software based activities integrated into every topic of the auditing curriculum. [actvty10b]



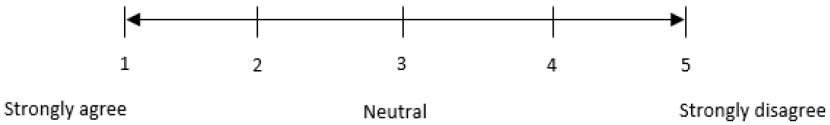
It is always necessary for the professor to guide students in solving generalized audit software based activities. [guide11b]



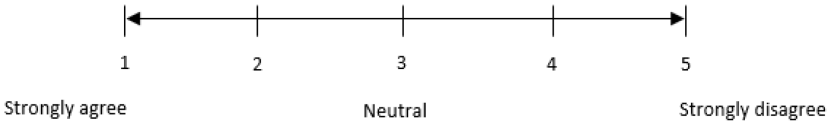
The time allocated to learning about generalized audit software in the course was sufficient. [time12b]



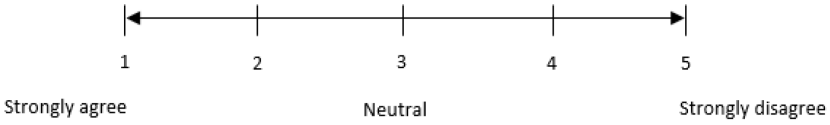
It is more appropriate to have learnt about generalized audit software starting from the Principles of Auditing course rather than in Advanced Auditing. [course13b]



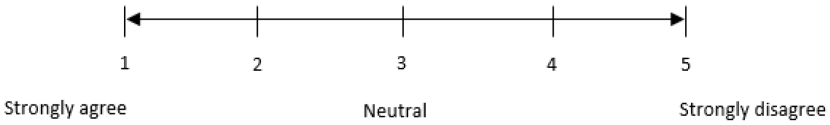
Learning about generalized audit software made the auditing course more engaging and interesting. [interest14b]



Learning about generalized audit software showed me how computer technology can be used to improve the effectiveness and efficiency of auditing. [comp15b]



Learning about generalized audit software significantly increased my marketability to potential employers. [job16b]



Appendix B: Teaching Pedagogy

The following sections detail the pedagogy that was used to introduce students to the ACL generalized audit software, in six sessions of 75 minutes each. This is prior to administering the terminal survey (Appendix A) to gauge students' perceptions of the usefulness and relevance of incorporating CAATs in the auditing course.

Class session 1 (75 minutes)

A brief introduction to the course together with the course outline and the initial survey is given to the students to determine students' attributes and the 'before' effects prior to completing the CAATs module. Following this, students are given a brief lecture on ACL and its specific uses, and told how the next three weeks will be proceeding. Then they are asked to install the ACL software off a CD on their laptops. As most students do not bring textbooks to class which contains the ACL program CD until the second week of lectures, it is efficient for the instructor to use several copies of the CD to ensure the quick installation

on each of the students' laptops. Students are specifically asked to also install the 'ACL in Practice' PDF file as part of the installation routine.

Class session 2 (75 minutes)

The second class starts the hands-on practice using ACL. Prior research such as Weidnemier and Herron (2004) show that they essentially got students to go through the ACL workbook at their own space covering the first five modules. However, having first tried this approach, it was found to be more challenging for students as they had to familiarize themselves with the program and it capabilities on their own, with minimal input from the instructor.

A more effective method that improve the cognitive experience of students and get them off to a faster start is to first familiarize them with the ACL workspace, and then go on to the necessity of creating an ACL project, which precursor any analysis. This is done using a separate dataset on a company's accounts receivable data. During this time, key points including the need to define data columns in the proper formats are explained. This first visual introduction to ACL is easily achieved by the use of a projector hooked onto the instructor's laptop. It is also important to inform students that the source data used in creating the project is read-only, as ACL does not modify them at all.

Most students initially fail to see the purpose of creating a project in ACL, as they are mainly familiar with spreadsheets such as Excel. It helps at this juncture to stress that an ACL project is like a drawer or a cabinet, which is used to store all the relevant data for a particular audit. Once the project has been created, the concept of data categories should be explained in more detail, emphasizing that the three commonly encountered data types in ACL is character (ascii), numeric and date formats (Arens and Elder, 2008). Many students will have the misconception that if a particular column in ACL contains numbers, then it should be defined as numeric data. It is helpful to tell students that if a particular column is not going to be used for performing mathematical operations, then it should be set as character, unless it contains date type data. The example of a column of students' ID numbers can be used to illustrate this further. Since there is little value in adding or subtracting students' ID numbers, such a column should be defined as character even though they comprise of numbers or digits. This can be contrasted with a column of sales figures, where the auditor would be interested in obtaining the total value of sales or the highest value of a sales transaction. Such a column should always be defined as numeric.

After this visual introduction to ACL, students are asked to work through the first two chapters of the 'ACL in Practice' manual in the remainder of the class. This can be achieved by students in about 45 minutes as the first chapter is only a description of the fictitious company used in the manual. Chapter two requires students to open an existing project and familiarize themselves with basic ACL functions such as the statistics command and duplicate commands. It also introduces students to simple filters.

Class sessions 3-5 (225 minutes)

Once the students are familiar with the basics, they proceed to complete chapters 3-5 chapters in the 'ACL in Practice' manual during the next three subsequent class sessions. These three chapters require students to first create a new project from a number of file types including Excel, Access and Text files. More advanced aspects of ACL are covered in these sessions, comprising of advanced filters and functions. Each chapter is allocated one class session of 75 minutes, and most students are able to complete each of the chapters in less than 75 minutes. During these sessions, the instructor will monitor the progress and provide feedback. It was also found to be practical and effective at this stage to engage 2-3 students who are ahead of the other students to help their colleagues in going through the more challenging parts of the chapters. It was found that the chosen students were eager to contribute in this way, and it also ensured that students

needing assistance received it in time as the instructor may not have sufficient time to devote to each individual student, especially in large classes.

By the end of chapter five, most students will have a good grasp of the key ACL commands ranging from the creation of projects to the writing of appropriate filters to achieve specific objectives such as to isolate invoices amounts within a given range. A number of students, however, will still overlook the importance of having to properly define variable columns according to the data types. It is therefore important for the instructor to frequently remind students of this critical task before starting to perform any analysis using ACL.

Class session 6 (75 minutes)

Session six is the final sitting for the module and it is used to reinforce in students the main concepts that they have learned in the previous classes. Each student is provided with a printed sheet of six ACL exercises based on an accounts receivable dataset. The data in Excel format is made available to students via Blackboard™. They are instructed to solve them within 45 minutes and submit to the instructor for marking. This assessment counts towards the final grade for this module. Appendix C presents these final exercises. Once the exercises have been submitted, the students are given the terminal survey instrument to assess their perceptions of CAATs after completing the module.

Appendix C: Final Exercises

A summary of the exercises, the corresponding ACL steps needed to achieve them and key teaching notes are presented below. The instructor walks through each of the exercises using the projector once the students have submitted their answers in the remainder of the class, stressing the main points.

Exercise 1

Objective: Provide a statistical snapshot of the credit sales transactions.
ACL steps: Go to Analyze} Statistical} Statistics. Select 'Amount' and click OK.
Teaching note: explain to students that a similar snapshot can also be obtained by using the 'Profile' command. However, this command provides more concise information than that provided by the statistics command, and it only works on numeric fields. On the contrary, the statistics command works with both numeric and date type data. This alternative approach can be quickly shown on screen.

Exercise 2

Objective: Identify if there are any duplicate invoices in the accounts receivable file.
ACL steps: Go to Analyze} Look for Duplicates. Select 'Invoice_Number' in the Duplicates On section and click OK.

Teaching note: inform students that the Duplicates command can be used on numeric, character and date fields. Mention that the result of this procedure is automatically saved as a file unless it is specified otherwise before running the command. Show students that more information about the identified duplicates can be viewed by clicking on the hyperlinks in the results table.

Exercise 3

Objective: Identify any gaps in the invoice numbers.
ACL steps: Go to Analyze} Look for Gaps. Select 'Invoice_Number' in the Gaps On section and click OK.

Teaching note: inform students that if there are more than five missing items, then ACL by default will report the results in ranges. This behavior can be changed by selecting the 'List Missing Items' radio button and changing it to a different number. It is important at this point to emphasize the difference between the Gaps command and the Sequence command. Many students consider both commands to be identical. However, it should be stressed that ACL does not consider gaps or duplicates to be sequence errors, as long as the data is in ascending or descending order.

Exercise 4

Objective: Determine if there are any issues with the segregation of duties between the Accounts receivable clerk and the Cash receipts clerk.

ACL steps: Click 'Edit View Filter' button. Write the filter 'AR_Clerk = Cash_Receipts_Clerk' by double clicking on the variable names in the 'Available Fields' section. Click the Verify button followed by OK.
Teaching note: many students tend to manually write filters thereby increasing the risk of errors in the formulae. This is specially the case when dates have to be entered into the filter, given that ACL has its own syntax for describing date values. Therefore, it is helpful to advise students that it is more efficient to select variables for the filters by double clicking on them from the 'Available Fields' section, or by utilizing the 'Date' button where appropriate.

Exercise 5

Objective: Determine the total value and number of transactions for each customer.
ACL steps: Go to Analyze} Summarize. Select 'Customer_Number' in the Summarize On field and select 'Amount' in the Subtotals field. Click OK.

Teaching note: it is important to stress that the Summarize command can only be used on data defined as character or date type. An alternative to the Summarize command is the Classify command, which will give in addition the percentages for the classified items. Students find it helpful to see both techniques demonstrated on screen with the difference in the output pointed out.

Exercise 6

Objective: Perform an aging of the accounts receivables data to determine accounts that are more than three months overdue.

ACL steps: Go to Analyze} Age. Click on the Age On button and select 'Due_Date' from the list of available fields. Click Subtotal Fields button and select 'Amount'. In the Cutoff Date field, enter 31 December 2007, which is the company's year end. Keep the default periods in the Aging Periods section and click OK.

Teaching note: students often misunderstand or misinterpret the purpose of the Age On field and the Cutoff Date field when performing the aging. It is important for the instructor to clarify the latter points by explaining that the Age On field is used to calculate overdue period for each account, while Cutoff Date refers to the entity's year end. The intervals used in the aging are based on the values in the Aging Periods section, and this often requires further explanation. It should be emphasized that the default intervals calculated by ACL for aging are: 0-29 days, 30-59 days, 60-89 days, 90-119 days and 120-10,000 days. Students often query the last value of 10,000 in the interval. It should be explained that while the value of 10,000 is useful for identifying exceptionally old accounts, the user is able to designate any interval as required.

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