

Should Blockchain be added to the Accounting Curriculum? Evidence from a Survey of Students, Professionals and Academics

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Abstract

Blockchain is quickly emerging as a technology that could transform the accounting profession, as we know it. As with any new technology, accounting academics must assess if the instruction of this new technology should be added to the curriculum. Our paper sheds light on this topic through a series of surveys given to professionals, students and academics in an effort to understand expectations of student's knowledge of blockchain. This study provides evidence that professionals expect students to have a basic understanding of blockchain yet they do not have this knowledge, despite showing an interest in learning about blockchain. Professors also believe students should have this knowledge, yet some institutions have failed to add it to the curriculum. For those institutions interested in adding blockchain to their curriculum, this study provides support for adding this content to an AIS/Systems course, which may be easier to implement at the graduate level.

Introduction

Blockchain is one of the most promising emerging technologies that has the potential to vastly transform the accounting and auditing profession (Dai and Vasarhelyi, 2017). Because many companies, including the Big Four, have already implemented blockchain prototypes, the argument is being made that the ability to understand, utilize and implement blockchain is increasing essential for all CPAs, no matter what industry or line of practice (Appelbaum & Smith, 2018). Wang and Kogan (2018) note that the convergence of accounting and blockchain technology shows great promise for reducing redundant manual effort, increasing the speed transactions are settled, and preventing financial reporting fraud. Dai and Vasarhelyi (2017) argue that blockchain-based accounting has the potential to provide real-time verifiable information disclosure and more progressively automated assurance. Andersen (2016) believes that blockchain technology could end up supplanting double-entry accounting, which has been in practice since the Renaissance. Yermack (2017) argues that blockchain could also drastically change the way of corporate finance and governance in similar ways as the 1933 and 1934 Securities and Exchange Acts did.

Blockchain is a digital ledger technology that uses a global distributed network of computers to record transactions that are approved by peers, therefore, enabling real-time verification and communication of information (Appelbaum & Smith, 2018). Each transaction, once approved, creates a new block on the blockchain that cannot be altered. To date, there has not been a breach or hack of a blockchain (Appelbaum & Smith, 2018). The content of the block can be a transaction, a contract, property rights or any other information that interested parties would like to preserve on the blockchain. If a participant adds a new record to the ledger, the new information is validated by the nodes

supporting the blockchain and added to the ledger where all participants can see the updated information (Vaidyanathan, 2017). Applebaum and Smith (2018, p. 33) argue, "In a blockchain-enabled accounting environment, information is readily available and continually confirmed by all network participants" potentially eliminating the need for confirming outside information.

In order to meet the shifting demands of the accounting profession, colleges and universities need to assess how/if new technologies, such as blockchain, should be integrated into the accounting curriculum. This study aims to assist in this decision making process by providing information on students', educators' and accounting professionals' understanding and expectation of graduates blockchain knowledge. This study also provides information on specific courses where blockchain technology could be or is expected to be introduced.

This study is organized as follows. The next section provides an overview of what blockchain is and why it is important to accountants through a review of the current literature in addition to providing support for the development of our research questions. The third section discusses research methodologies followed by a discussion of the results and limitations of the study.

Literature Review and Research Questions

Blockchain technology is argued to have major benefits for the accounting and auditing profession including a traceable audit trail, automation of the audit process, authentication of transactions, tracking asset ownership, development of smart contracts and the ability to register and inventory a wide variety of assets (Baron, 2017). Applebaum and Smith (2018) argue that blockchain will change the accounting profession most notably through reconciliations and the use of continuous auditing, among other areas. Traditional reconciliations involve comparisons of external and internal information and can consume a large amount of staff and possibly supervisors' time. The authors' argue that in a blockchain-enabled accounting environment the information can simply be exported from the blockchain because the information is readily available and continually confirmed by all network participants. Critics of the audit profession argue that the traditional audit is based on samples and periodic events rather than a continuous cycle. Applebaum and Smith (2018, p.36) note that "blockchain-enabled auditing enhances the efficiency, effectiveness, and reliability of the evidence collection process". This can be accomplished through a blockchain network set up between the auditors, the client and client's third parties where information is verified by all parties when it is added to the blockchain. This consensus process also allows the auditors to examine 100% of the transactions, providing a higher level of assurance.

It is important to note that blockchain networks can be either private (permissioned) or public (permissionless). Public blockchains, such as the Bitcoin blockchain, are open for anyone to participate. Participants agree to relay and validate transactions on the network by offering their computer as a processing node. Participants in private blockchain are limited to those that have been granted permission by agreed-upon administrators (AICPA, 2017). Applebaum and Smith (2018) note that private blockchains, depending on the types of information, users and functionality the organizer wants to establish, seem to be the most logical and business friendly option for organizations.

While the literature seems to show a clear path for blockchain playing an important role in the future of accounting, little research has been done to show if academics, students and business professionals all agree that blockchain is important to the future of accounting. This led to the development of our first research questions:

RQ1: Do business professionals, academics and students believe that blockchain is an important part of the accounting professions' future?

The potential for blockchain technology to change the accounting profession is so large that all four "Big Four" accounting firms (KPMG, PricewaterhouseCoopers, Deloitte and Ernest & Young) have invested significant resources in the development of blockchain technologies (Applebaum & Smith, 2018). PwC notes blockchain as number three of ten technology forces that matter in 2020 and beyond (PwC FinTech Q & A, 2016). Deloitte compares the impact of blockchain technology on commerce to the revolution of the Internet and email and the creation of an organized postal system (Massey & Pawczuk, nd). EY states, "Blockchains will do for networks of enterprises and business ecosystems what enterprise resource planning (ERP) did for the single company" (EY, nd).

In a white paper issued jointly by the American Institute of Certified Public Accountants (AICPA) and the Chartered Professional Accountants of Canada the argument is made that “CPAs may need to broaden their skill sets and knowledge to meet the anticipated demands of the business world as blockchain technology is more widely adopted” (AICPA, 2017, p. 2). In fact, Deloitte, KPMG and EY were in the top five in posted blockchain job advertisements according to data provided by Indeed (Palmer, 2019).

As the AICPA noted, CPAs should evolve their skill sets to include knowledge and understanding of blockchain technologies. Large accounting firms and companies have the resources to implement training programs for interested staff members, like PwC’s digital accelerator training program (see <https://digiday.com/marketing/pwc-launches-two-year-digital-skills-course-train-1000-employees-everything-drones-blockchain/> for more information).

The amount of resources firms are dedicating to blockchain research and training supports Watty et al.’s (2016) argument that employers are demanding digital literacy of their employees. What the literature fails to explore is; are these digital upscaling initiative designed to be permanent additions to the firms training program or temporary bridges to get their employees up to speed with emerging graduates who already possess this knowledge? That is, does the accounting profession expect academics to take over providing training on blockchain? This uncertainty lead to the formulation of our second research question.

RQ2: Do professionals believe graduating students should possess knowledge of blockchain? If so, what level of knowledge?

Traditionally, skills needed to be successful in the accounting profession are taught in college and university degree programs. Accounting curriculum has adapted in the past to accommodate emerging technologies such as the introduction of Microsoft Excel, Accounting Information Systems and Enterprise Resource Planning Systems. Watty et. al (2016) explored the use of new learning technologies in accounting curriculum and found that despite “sound educational reasons” for doing so accounting educator’s resistance to embracing new technologies are the biggest inhibitors to technology adoption. The authors also found that accounting academics are slow to adopt new technology because they often have little resources to learn the technology adequately themselves. Some argue that there is a digital divide between students and academics and that academics lack of technological literacy is a reason to be concerned (Prensky, 2001, Lewis, et. al, 2013). Others argue that this divide is not as severe (Kennedy et. al, 2008). Organizations such as the American Accounting Association have provided conferences and resources in an attempt to educate accounting educators on blockchain technologies so they can in turn pass the knowledge on to their students. The Pennsylvania Institute of Certificated Public Accountants argues, “Effectively introducing blockchain into the curriculum will ensure that accounting education maintains relevancy and prepares students for the future” (PICPA, 2019). While there is a clear argument for including new technologies, such as blockchain, into the accounting curriculum, it is not clear if this is actually being done. This leads to our final research question.

RQ3: Is blockchain being taught in the current curriculum? If so, in which courses is it added? If not, in what courses would you like to see it taught?

Research Methodology

The method of research for this study is a descriptive analysis, employing surveys as the main research tool. Surveys were employed as the main research method due to ease of distribution and lack of synchronous time commitment needed, as with interviews. We deployed three different surveys: one for students, one for professors and one for professionals in the field. The survey questions were designed to extract information on current knowledge of blockchain and its usefulness for accountants, the future direction of blockchain and current classroom coverage of blockchain. See the appendix for a full list of survey questions.

Our survey was administered through Google Forms via email. IRB approval was granted from the institutions at which the research was conducted. The surveys were sent to accounting and business students of a large public university, a small public university and a small private college. All three have an accounting graduate program. The survey requests for professors were sent to accounting professors at local and national institutions of various sizes.

The surveys sent to accounting professionals were sent to regional, national and international accounting firms as well as accountants working in middle to large size private companies across all industries. Respondents were allowed to skip questions and were kept anonymous. In an effort to validate the survey questions, several individuals, both students and faculty, were asked to read the questions and to provide feedback to ensure the meanings to each question and the types of responses desired were clear. The survey was sent to approximately 1,500 people resulting in an approximate 15.6% response rate. Figure 1 summarizes the survey responses. Figure 2 shows a breakdown of the professionals' responses and the area they work in.

Results and Discussion

To better understand what level of blockchain knowledge our survey respondents possess, we asked each group of respondents how familiar they are with blockchain technology. These results are summarized in Figure 3.

Over half of the undergraduate students surveyed had never heard of blockchain even though when asked a similar question about Crypto-Currencies only 6% had never heard of it and over 70% reported being somewhat to very familiar with these currencies. When asked if they would like to learn more about blockchain 55 % responded yes, 10 % no and 35% maybe. The students were mostly accounting majors (72.5%) but also general business majors (18.5%) and other majors (9%). The other majors were likely included in our survey requests because they have a business minor or recently changed their major from business to another field. Surprisingly, professors reported having the highest percentage of respondents which were very familiar with blockchain as well as having the lowest percentage of respondents who have never heard of blockchain. This contradicts previous literature that suggests both a digital divide between students and professors and a lack of academic's technological knowledge. This supports Kennedy (2008) et. al's position that there is no clear evidence that this digital divide exists. These results also provide some clarity on RQ3, showing that students are not graduating with a basic understanding of blockchain. Although current students and not recent graduates, over half of undergraduates had not heard of blockchain while less than 30% were somewhat to very familiar with it. Some of the students surveyed may not have yet completed a course where blockchain may be introduced but at the graduate level 28% of students reported never hearing of blockchain. Next, we asked each group about their expectations of learning about blockchain in college. The results are summarized in figure 4.

The results that are most informative here are that 75% of business professionals and 92% of professors expect accounting students to be taught basic knowledge of blockchain in college. This provides an answer RQ2, which asks if professionals expect students to graduate with a knowledge of blockchain and if so what level. When compared to Figure 5, which summarizes the responses from professors on where blockchain is currently taught, we see a clear disconnect of expectations and reality.

Almost a quarter of the respondents stated that blockchain is not currently taught yet only four percent agree that they would not like it to be taught. These results are a direct response to part one of our RQ3, is blockchain taught in the current curriculum?

This, then, begs the question where should it be (or is it currently being) taught in an already packed accounting curriculum? Figure 5 summarizes in which courses the different groups surveyed believe blockchain should be taught or is already taught. Respondents were directed to check all that applied. The response to this question indicates that the most natural place for blockchain to be added to the curriculum would be in AIS/systems course and/or a data analytics course. These results provide an answer to the second part of our RQ3.

The next step after identifying where blockchain technology would be a logical fit into the accounting curriculum is to ask professors if the content could be easily added to their current curriculum. The results are summarized in Figure 6.

The survey results show professors perceive that it would be less difficult to add blockchain to a graduate curriculum compared to an undergraduate curriculum. This is most likely due to the already overloaded undergraduate curriculum due to state education requirements for licensure.

Next, we asked how important do you think blockchain is to the future of accounting. The results are summarized in Figure 7 and show a clear answer to our first research question.

Over 87% of the professionals surveyed and over 91% of professors felt that blockchain was somewhat to extremely important to the future of accounting. These results seem to echo the literature, which emphasizes the important impact blockchain, will have on the future of accounting.

Lastly, we asked if basic and advanced blockchain knowledge would give a recent graduate a perceived or actual advantage in the workplace. These results are summarized in Figure 8.

Business professionals' most common response was it depends on the position whereas students overwhelmingly agreed that advanced knowledge of blockchain would give them an advantage in the workplace.

Limitations and future opportunities

Our biggest limitation to this study is the number of responses. The category with the least responses were business professionals (32) and professors (36). Although we feel that the number of responses is adequate for analysis, there remains a future opportunity to expand on the survey. Due to the immediate need to understand these research questions, we did have to sacrifice a potential larger sample size. In addition, a follow up analysis that tracks students that obtained knowledge of blockchain either on their own or through their coursework and how/if this knowledge has helped them obtain or excel in their career would be useful for accounting professors when making course decisions. We do acknowledge that there may be a self-reporting basis inherent in the survey, mainly where respondents may not be able to critically assess their own knowledge on any topic, blockchain included. The users of this study should consider this if relying on these results.

Conclusion

In conclusion, our survey results uncover several important issues for accounting academics and professionals. First, there is an expectation that blockchain technology is taught to not only accounting students but all business students yet over half of the undergraduate students surveyed had never heard of blockchain even though they indicated they would like to learn more about it. Second, our results suggest that adding blockchain to an AIS/systems course and a data analytics course seems to be the best fit and it appears to be the easiest to implement at the graduate level even though undergraduate students know the least about blockchain. These results can be used to help academics understand professionals' expectations of blockchain in accounting curriculum and can help institutions plan to implement the addition of blockchain into the curriculum if it is not already in place.

Overall, professionals believe that students should be graduating with a basic understanding of blockchain yet students are not. This is despite professionals, students and professors believing that blockchain should be taught as part of the curriculum. This study provides some key takeaways for accounting academics. First, blockchain is an important technology for accounting instructors, students and professionals to understand. This is highlighted in the results in Figure 7. Second, although all parties surveyed agreed that blockchain should be taught as part of the accounting and business curriculum, students generally do not have a basic understanding of blockchain. Third, this study provides support for adding blockchain into the current curriculum at a basic level. Additionally, we found that implementing blockchain in an AIS/Systems course seems to be the most logical place to start and that adding blockchain to the graduate curriculum may be easier than the undergraduate curriculum.

Appendix- Survey Questions**Blockchain Survey**

1. I am a

Mark only one oval.

- Graduate student
 Undergraduate student
 Business Professional Skip to question 12.
 Professor Skip to question 22.

Students

2. How familiar are you with Blockchain? Mark only one oval.

	1	2	3	4	5	
Never heard of it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very familiar

3. How familiar are you with Crypto-Currencies? (i.e. Bitcoin) *

Mark only one oval.

	1	2	3	4	5	
Never heard of them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very familiar

4 My major is Mark only one oval.

- Accounting
 Business graduate- concentration is something other than accounting
 Business undergraduate- other than accounting
 Other

5. Would you like to learn about blockchain? Mark only one oval.

- Yes
 No
 Maybe

6. How important is it for accounting professionals to understand blockchain? Mark only one oval.

	1	2	3	4	5	
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Not important Extremely important

7. Do you think employers expect you to have a basic understanding of blockchain when you graduate? Mark only one oval.

- Yes
- No
- Depends on degree

8. Do you think having basic knowledge of blockchain will give you an advantage in the workplace? Mark only one oval.

- Yes
- No
- Maybe

9. Do you think having advanced knowledge of blockchain will give you an advantage in the workplace? Mark only one oval.

- Yes
- No

10 In what courses do you expect blockchain to be taught? Check all that apply.

- Financial Accounting- Introductory
- Intermediate Accounting
- Auditing
- Data Analytics
- AIS/Systems course
- Business courses
- I do not expect to learn about blockchain in college

11. How important do you feel blockchain is to the future of accounting? Mark only one oval.

Not important at all 1 2 3 4 5 Extremely important, it is the future of accounting

Stop filling out this form.

Professionals

12. What industry do you work in? Mark only one oval.

- Private company- small- less than 200 employees
- Private company- large - greater than 200 employees
- Public accounting firm- small- less than 100 employees
- Public accounting firm- large- greater than 100 employees
- Public company- small less than 200 employees
- Public company- large- greater than 200 employees

13. How familiar are you with Blockchain? Mark only one oval.

	1	2	3	4	5	
Never heard of it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very familiar

14. How important do you feel blockchain is to the future of accounting? Mark only one oval.

	1	2	3	4	5	
Not important at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely important, it is the future of accounting

15 In what courses do you expect blockchain to be taught? (Check all that apply) Check all that apply.

- Financial Accounting- Introductory
- Intermediate Accounting
- Auditing
- Data Analytics
- AIS/Systems course
- Business courses
- I do not expect students to learn about blockchain in college

16. Do you expect that business students should be graduating with a basic knowledge of blockchain? Mark only one oval.

- Yes
- No

17. Do you expect that accounting students should be graduating with a basic knowledge of blockchain? Mark only one oval.

- Yes
- No

18. Do you expect that accounting students should be graduating with an advanced knowledge of blockchain? Mark only one oval.

- Yes
- No

19. Would a student have an advantage obtaining or retaining a position at your institution if they had basic knowledge of blockchain? Mark only one oval.

- Yes
- No
- Depends on the position

20. Would a student have an advantage obtaining or retaining a position at your institution if they had advanced knowledge of blockchain? Mark only one oval.

- Yes
- No
- Depends on the position

21. What types of positions would blockchain knowledge be useful for?

Stop filling out this form.

Professors

22. What courses do you teach? Check all that apply.

- Introductory Accounting
- Audit
- Cost/Managerial
- Tax
- AIS
- Business
- Governmental/Non-Profit Data Analytics

23. How familiar are you with Blockchain? Mark only one oval.

	1	2	3	4	5	
Never heard of it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very familiar

24. How important do you feel blockchain is to the future of accounting? Mark only one oval.

	1	2	3	4	5	
Not important at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely important, it is the future of accounting

25. In what courses is blockchain currently being taught? Check all that apply.

- Financial Accounting- Introductory
- Intermediate Accounting
- Auditing
- Data Analytics
- AIS/Systems course
- Business courses
- I do not expect blockchain to be taught in college

26 In what courses would you like to see blockchain taught? Check all that apply.

- Financial Accounting- Introductory
- Intermediate Accounting
- Auditing
- Data Analytics
- AIS/Systems course
- Business courses
- I do not expect blockchain to be taught in college

27. Do you expect that business students should be graduating with a basic knowledge of blockchain? Mark only one oval.

- Yes
- No

28. Do you expect that accounting students should be graduating with a basic knowledge of blockchain? Mark only one oval.

- Yes
- No

29. Do you expect that accounting students should be graduating with an advanced knowledge of blockchain? Mark only one oval.

- Yes
- No

30. How difficult would it be to add blockchain to your current accounting undergraduate curriculum? Mark only one oval.

1 2 3 4 5

Easy Extremely difficult

31. How difficult would it be to add blockchain to your current accounting graduate curriculum? Mark only one oval.

1 2 3 4 5

Easy Extremely difficult

32 Do you think having basic knowledge of blockchain will give students an advantage in the workplace? Mark only one oval.

- Yes
- No
- Maybe

33. Do you think having advanced knowledge of blockchain will give students an advantage in the workplace?
Mark only one oval.

- Yes
- No
- Maybe

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Figure 1- Survey Responses

	Number of Responses	Percentage
Undergraduate Students	128	54.47%
Graduate Students	39	16.60%
Professionals	32	13.62%
Instructors	36	15.32%
Total	235	100.00%

Figure 2- Professional Occupation

What industry do you work in?

Private company- large - greater than 200 employees	3.13%
Private company- small- less than 200 employees	12.50%
Public accounting firm- large- greater than 100 employees	43.75%
Public accounting firm- small- less than 100 employees	21.88%
Public company- large- greater than 200 employees	18.75%

Figure 3- Blockchain Knowledge

How familiar are you with blockchain?

	Never heard of it			Very familiar	
Business professional	18.75%	18.75%	34.38%	15.63%	12.50%
Graduate student	28.21%	20.51%	33.33%	7.69%	10.26%
Professor	5.56%	13.89%	44.44%	16.67%	19.44%
Undergraduate student	52.34%	19.53%	17.19%	9.38%	1.56%

Figure 4- Expectations of Learning Blockchain in College

		No	Yes	Depends on degree
Business Professional	Do you expect that accounting students should be graduating with a basic knowledge of blockchain?	25.00%	75.00%	
	Do you expect that accounting students should be graduating with an advanced knowledge of blockchain?	78.13%	21.88%	
	Do you expect that business students should be graduating with a basic knowledge of blockchain?	21.88%	78.13%	
Graduate student	Do you think employers expect you to have a basic understanding of blockchain when you graduate?	41.03%	33.33%	25.64%
Professor	Do you expect that accounting students should be graduating with a basic knowledge of blockchain?	8.33%	91.67%	
	Do you expect that accounting students should be graduating with an advanced knowledge of blockchain?	83.33%	16.67%	
	Do you expect that business students should be graduating with a basic knowledge of blockchain?	8.33%	91.67%	
Undergraduate student	Do you think employers expect you to have a basic understanding of blockchain when you graduate?	24.41%	22.05%	53.54%

Figure 5- Blockchain in the curriculum (multiple selection allowed)

	Professors- In what course is blockchain currently being taught?	Professionals- In what courses do you expect blockchain to be taught?	Students- In what courses do you expect blockchain to be taught?	Professors- In what course would you like to see blockchain taught?
Financial Accounting-Introductory	3%	15.60%	17.10%	5.60%
Intermediate Accounting	0%	34.40%	25%	11.10%
Auditing	6.10%	40.60%	23.80%	52.80%
Data Analytics	21.20%	62.50%	53.70%	47.20%
AIS/Systems	48.50%	65.60%	46.30%	63.90%
Business	9.10%	37.50%	32.30%	25%
I do not expect blockchain to be taught in college	27.30%	9.40%	18.30%	5.60%

Figure 6 – How easy would it be to add blockchain to the current curriculum?

	Easy			Extremely difficult	
Graduate Curriculum	12.12%	12.12%	33.33%	39.39%	3.03%
Undergraduate Curriculum	5.71%	17.14%	14.29%	48.57%	14.29%

Figure 7- Future of Blockchain

	Not Important			Extremely Important	
Business Professional	9.38%	3.13%	40.63%	31.25%	15.63%
Graduate student	5.26%	15.79%	26.32%	28.95%	23.68%
Professor	2.86%	5.71%	20.00%	48.57%	22.86%
Undergraduate student	3.15%	16.54%	33.07%	30.71%	16.54%

Figure 8- Blockchain Advantage

		No	Yes	Maybe	Depends on position
Do you think having advanced knowledge of blockchain will give students an advantage in the workplace?	Professor	13.89%	33.33%	52.78%	
Do you think having advanced knowledge of blockchain will give you an advantage in the workplace?	Graduate student	23.68%	76.32%		
	Undergraduate student	23.62%	76.38%		
Do you think having basic knowledge of blockchain will give students an advantage in the workplace?	Professor	11.11%	55.56%	33.33%	
Do you think having basic knowledge of blockchain will give you an advantage in the workplace?	Graduate student	5.13%	64.10%	30.77%	
	Undergraduate student	7.87%	58.27%	33.86%	
Would a student have an advantage obtaining or retaining a position at your institution if they had advanced knowledge of blockchain?	Business professional	31.25%	25.00%		43.75%
Would a student have an advantage obtaining or retaining a position at your institution if they had basic knowledge of blockchain?	Business professional	31.25%	25.00%		43.75%