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AN INVESTIGATION INTO THE TIME-SAVING BENEFITS OF USING A COMPUTERISED TAXATION PROGRAM

by

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ABSTRACT

Software programs designed to calculate the tax liability of individuals and other types of tax entity are being designed and used with increasing frequency. Research done in the United States of America appears to indicate that these programs do not achieve any saving in time and, in fact, may take longer to use than to complete a tax return by hand. As the South African revenue collection system appears to be moving closer to a self-assessment system, where the calculation of tax owing will be the responsibility of the taxpayer, the research essay sets out to determine whether there is a saving in time when calculating a tax liability using a tax software program, instead of calculating it by hand. In addition, the research aims to determine how much time, on average, is saved or lost, using such a program, and whether there is any correlation between the time taken to perform a calculation by hand and that using the software program. It does so by comparing the average estimated time it would take to complete tax calculations for individuals by hand with the average time taken to complete the same tax calculations using a tax software program. The average time taken to do the calculations by hand is based on the time allocation given for questions by the authors of a published question bank for university students. The time taken using software is determined by using a stop-watch to time each question being processed. The results, subject to assumptions made in carrying out the research, show that there is a substantial saving in time using the software program. Based on the data, however, the results indicate a weak correlation between the estimated time taken to do a calculation by hand and the estimated time using the software program. Possible reasons for the weak correlation are discussed. A recommendation is also made for the standardization and certification of existing tax calculation software.

Key words: Income tax; tax software programs, self-assessment

INTRODUCTION

Nature of the Problem

The development and utilization of taxation software programs has been escalating rapidly in recent years and the number of taxpayers who prepare their returns by hand has diminished significantly. Use of tax software is one way in which taxpayers have taken advantage of technological change to adjust to increasingly complex tax law (Guyton, Korobow, Lee & Toder: 2003). A tax software program is any computerized system that calculates a tax liability.

It is submitted that with many tax software programs guaranteeing their work, it appears that tax software programs are easy to use and accurate. With mathematical checks and easy print-offs for personal records, it is evident that there are many advantages to using a tax software program. While convenience and accuracy are evident advantages, however, it cannot be concluded with certainty that taxation software provides a time-saving advantage. For example, an American study showed that it was faster to complete a simple income tax return on paper than to use taxation software to complete the same income tax return. (Guyton et al: 2003.)

The statements made by tax software companies that their products quickly and accurately process tax calculations should therefore not be accepted as fact. Such statements made by tax software companies and articles about tax software include:

> *Tax professionals can spend as much as 90% of their time on compliance, giving them less time to focus on planning and related issues. (Louw: 2006.)*
>
> *What was previously an onerous task involving many valuable hours of tax and financial peoples' time, has become a streamlined and integrated process. (Louw: 2006.)*
>
> *…is a program which greatly facilitates the quick and accurate calculation of P.A.Y.E, S.I.T.E and personal tax assessments according to the South African tax regulations. (Easytax: 2007.)*
>
> *Compliance with tax legislation has become increasingly complex in South Africa and in order to reduce risks and save time, the use of technology for this purpose has become a business imperative for South African corporates. (Louw: 2006.)*
>
> *"Save time and money" (Complete Tax: 2007).*

Although these software programs are designed to allow individuals and companies to calculate their taxes more accurately and quickly, there is no technical research which confirms this outcome, no verifiable data is provided, and there is no reference to the degree of time saving that can be achieved. There are only unsubstantiated claims.

In fact, as mentioned above, it is suggested by an American paper entitled "The Effects of Tax Software and Paid Preparers on Compliance Costs" (Guyton et al: 2003) that the use of a tax software program could increase the preparation time for income taxes. The research suggests that the average individual not using a tax software program will spend about 18 hours filling in a tax return, whilst an individual who uses a tax software program will spend an average of 37 hours filling in a tax return. However, because the two groups include individuals with very different characteristics, these times might simply reflect the fact that taxpayers who use taxation software have more complicated returns than those who prepare their own returns without using software. It is also likely that taxpayers who use software choose to spend more time than they otherwise would

because of other benefits achieved from software (such as greater accuracy or enhanced ability to do tax planning).

In the research paper it was reported that, in the United States of America, there has been an increase in the number of individuals who use software in the preparation of their taxes. Studies showed that in 1993, only 8 percent of individuals used software to aid in calculating their tax returns and in 2003 it had tripled to 25 percent. These figures only relate to individuals and not tax practitioners. If one were to include tax practitioners, the study shows that 85 percent of returns where completed on computer. In 1987 only 13 percent of all tax returns were completed by computer. (Guyton et al: 2003.)

There is an anticipated move towards a self-assessment system in South Africa and this change is said to be in line with best international practice; therefore the calculation of individual tax may no longer only be important to practitioners. (RealBusiness [net]work: 2007.) Therefore, due to the increasing use of taxation software by individuals in preparing tax returns and the developing industry for such software, it is important to discuss and analyze the time saving benefits of using taxation software and to address any possible misconceptions.

It should be noted that the present research aims to test the time taken in the calculation of tax and not the time taken to fill out a tax return.

Research Hypothesis

The assumption that using tax software programs will save time is a common perception and, for this reason, it will represent the research hypothesis. Although the assumption that tax software programs save time might be self-evident, the amount of time that programs can save has not been determined. Therefore, in seeking to support the hypothesis that using software saves time, this research paper will, in addition to determining whether or not there is a saving in time, seek to determine the average time one might save using a tax software program to calculate tax. The research will also seek to determine whether there is any correlation between the time taken to calculate the tax liability by hand and using the software program.

Main Objectives of the Research

The purpose of the research project is:

1. To establish whether the use of a tax software program can save time in the calculation of the income tax liability of individual taxpayers.
2. To establish the average amount of time saved (or of time lost) when using a tax software program in the preparation of income taxes.
3. To establish whether there is a correlation between the time taken to calculate a tax liability by hand and using the software program.

Research Methodology and Design

Firstly, a tax software program was developed by the researcher solely for the purpose of this research. The program made use of *Microsoft Excel* and the various functions available within the *Microsoft Excel* package. The program itself was designed to guide

the user through a step-by-step process and, where necessary, required the user to enter certain variables in order to calculate the tax payable. Once the user has proceeded through all the necessary steps, the program provides the user with a summary of taxable amounts, exemptions, deductions and the tax payable.

Externally generated tax software programs that are available could not be used for a number of reasons. The most important reason is the negative bias that a learning curve might have on the data. The learning curve refers to the relationship between the period of learning or experience and the resulting progress made (Ritter & Schooler: 2002). Therefore, to ensure that the maximum time-saving benefit (or minimum time-loss) is optimally calculated an expert understanding of the tax software program used is required. Time is an essential aspect of the research. If two people use the same tax program and the first person has used the program for a long period of time, he or she will be very familiar with how the program works, where the information needs to be inserted into the program, the limitations of the program, and so on. The second person has never used the program before. If one were to assess the amount of time taken for the first person to process data with the program and then assess the amount of time taken for the second person to process the same data with the same program, it would be clear that the second person, who is unfamiliar with the program, would take longer than the first person, who is familiar with the program. This improvement in the time saved relative to experience and understanding is known as the 'learning curve'. Therefore, since the accurate calculation of time is vital for the research, it is necessary to eliminate any

inexperience or misunderstanding of the program. By developing the program, the researcher was able to simulate the maximum learning effect.

Another reason why pre-existing external software programs could not be used was because they are the product of a particular company and have restrictions imposed on their use; they are in fact the sales product of the company. Most companies charge a substantial amount of money for the use of their software products. The software product is also copyright protected so that the consumer does not own the product but merely has the use of the product. In addition, if the software is copyright protected, it is illegal to duplicate or copy it in any shape or form, unless authorized by the copyright holder. Another limitation of using a company's software program is that if there are any errors in the program, they are almost impossible to correct for the purposes of carrying out the research, because companies that produce software programs protect their product by restricting access to the source code. The source code is a set of programming language instructions that must be translated to machine instructions before the program can run. (Microsoft Windows for workgroups: 2007: 1.) The source code is imbedded in the program itself. Therefore, external tax software programs could not be used due to the costs, restrictions and legal/ethical issues that might arise.

The second step in the research process was to process relevant data, in the form of problems involving the calculation of tax, using the custom-designed tax software program. For this purpose, tax questions relating to individuals were taken from a widely used textbook of questions and answers for university lecturers and students: *Graded*

Questions on Income Tax in South Africa (Mitchell & Mitchell: 2007). Each of these questions has a given time allocation. To ensure an adequate sample size, large quantities of data in the form of questions were needed and therefore all the questions from the textbook relating to the taxation of individuals were used for this purpose, except as discussed below. The reason for using the time allocated in *Graded Questions on Income Tax in South Africa, 2007* as the average time, is because the time taken by each individual person calculating their tax liability by hand can only be an estimate. It cannot be said that any one length of time is correct; only an estimated average time can be used because every individual is different. The time allocated by the authors of the textbook for each question also represents the time a student should have achieved by the end of their year of studies in taxation. This would imply a measure of expertise and the achievement of a certain leaning effect.

The data relating to the time allocated to answering the questions was then compared to the average amount of time it would have taken an individual using a tax software program to process the same data. The data in each question was entered into the software program by the researcher.

The final step was to transform the data into useable information. This was done by determining the average difference between the time taken to complete a tax calculation by hand and the time taken to complete the same tax calculation, using the tax software program. For this purpose, as stop-watch was used. The correlation coefficient between the two sets of time data was also determined in order to establish whether or not a

relationship exists between the time taken for a calculation by hand and using the software program. In other words, if it could be said that for every 'x' minutes taken to calculate the tax by hand, 'y' minutes would be required to calculate it with the aid of the software program.

By using the software program to process the data in each of the questions from the textbook, a further objective was achieved. Where the software program yielded the same final solution as the solutions provided by the authors of the textbook the accuracy of the process carried out by software program could be established. Where the software program yielded a different final solution to the solution provided by the authors of the textbook, the researcher followed up the difference and was able to amend the software program or recognize that there was an error in the given solutions.

Limitations and Assumptions

Due to the variety of taxes relating to different categories of taxpayers, the software program was designed to calculate only the normal tax payable by an individual. In other words, only for a salaried person, commission earner or sole proprietor of a business.

Only an estimate of times was used. Just as the time taken by different people to perform a tax calculation would differ, so software programs also differ. The difference might arise due to the complexity of the program or its user friendliness. The term "user-friendly" relates to a program or device whose use is intuitive to people with a non-technical background. (Computer Help: 2007: 1.) Therefore this paper makes the assumption that there is an approximation in the time (the average time) that it would

take for an individual to calculate taxes by hand and using a software program. It also assumes that the time given in *Graded Questions on Income Tax in South Africa, 2007* is an accurate estimation of the time it would take for an average individual to complete the relevant question by hand.

This research aims to measure the amount of time saved or lost by using a tax software program to calculate tax and does not take into account the time taken to fill in the tax return.

DISCUSSION OF THE DATA AND ITS SELECTION

There are three main sources of data used in the research paper. The first is the questions and/or calculations, the second is the estimate of time taken to complete the questions and/or calculations by hand and the third is the estimate of time taken to complete the questions and/or calculations using a tax software program.

Tax Questions, Solutions and Time Allocations

The data selected, in the form of the questions, comes from *Graded Questions on Income Tax in South Africa, 2007* (Mitchell & Mitchell: 2007) . Attached to each question is an estimate of the time to be taken to complete the calculation by hand. This allocated time forms part of the data selected and is the estimate of time taken to complete the questions and/or calculations by hand. The questions and/or calculations are then processed through a tax software program and timed. This time is the final source of the data and is the estimate of time taken to complete the questions and/or calculations by a tax software program.

As the tax software program is limited to calculating individual tax only, the questions processed were 'Natural Persons' (Chapter 10), 'Fringe Benefits' (Chapter 16) and 'Lump-Sum Benefits' (Chapter 22) of *Graded Questions on Income Tax in South Africa, 2007* (Mitchell & Mitchell: 2007). In order not to create any bias in the data and to have a large sample representing a wide variety of tax scenarios for the types of tax calculation covered by the research, all questions in each chapter were processed using the software program. However, due to the limitations of the tax software program, some of the questions could not be processed at all, some could be processed in part and others could be processed in full. The questions that could not be used are highlighted on the data sheet in *Table 1* below. The questions were omitted either because they required multiple-year calculations or because they included aspects of tax not included in the software program. Discussion questions fall outside the capabilities of the software program and could not be used. Questions involving small technical differences between the solutions provided by the textbook and the program (in certain cases errors in the suggested solutions and in other cases omissions in the software program) that would not contribute to any lost time, were used. It is important to bear in mind that it is not the accuracy of the software program that is being tested but the time taken to process questions and/or calculations.

The Software Program

The software program used to calculate the tax liability of individual taxpayers was designed by the researcher using *Microsoft Excel*. The accuracy of the software in calculating the tax liability of individual taxpayers was tested on all the questions

selected for the research. The program also tested the accuracy of the suggested solutions to *Graded Questions on Income Tax in South Africa, 2007* (Mitchell & Mitchell: 2007).

The Comparative Data

The time taken (in minutes and seconds) to calculate the tax liability in respect of each of the selected questions was recorded, using a stop-watch. This was compared to the time allocated to the solution of each question by the authors of the textbook. The difference was calculated (in minutes and seconds).

The following table sets out the results of the comparison between the manual and computer times. The table reflects all the questions used for the purposes of the research, and the questions that could not be used are highlighted.

Table 1

QUESTIONS	TIME BY HAND Minutes: Seconds	TIME BY PROGRAM Minutes: Seconds	DIFFERENCE Minutes: Seconds
10.1	25:00	11:30	13:30
10.2	15:00	3:33	11:27
10.3	5:00	0:54	4:06
10.4	20:00	1:00	19:00
10.5	20:00	2:00	18:00
10.6	20:00	2:15	17:45
10.7	25:00	4:01	20:59
10.8	30:00	3:35	26:25
10.9	20:00	4:19	15:41
10.10	25:00	6:15	18:45
10.11	40:00	2:49	37:11
10.12	30:00	5:21	24:39
10.13	30:00	6:47	23:13
10.14	30:00	4:04	25:56
10.15	30:00	9:12	20:48
10.16	40:00	5:13	34:47
10.17	30:00	4:27	25:33
10.18	35:00	7:28	27:32
10.19	35:00	3:58	31:02
10.20	40:00	5:56	34:04
16.1	15:00	N/A	N/A
16.2	15:00	N/A	N/A
16.3	30:00	3:28	26:32
16.4	40:00	2:13	37:47
16.5	40:00	1:35	38:25
16.6	30:00	2:31	27:29
16.7	30:00	3:45	26:15
16.8	25:00	3:04	21:56
16.9	60:00	2:54	57:06
16.10	30:00	1:52	28:08
16.11	30:00	4:02	25:58
16.12	30:00	N/A	N/A
16.13	30:00	2:23	27:37
16.14	50:00	6:49	43:11
16.15	40:00	3:02	36:58
16.16	45:00	9:04	35:56
16.17	50:00	11:09	38:51
16.18	40:00	8:35	31:25
16.19	40:00	1:15	38:45
16.20	60:00	N/A	N/A

22.1	15:00	N/A	N/A
22.2	20:00	3:25	16:35
22.3	15:00	1:20	13:40
22.4	15:00	1:38	13:22
22.5	20:00	N/A	N/A
22.6	20:00	2:13	17:47
22.7	20:00	N/A	N/A
22.8	40:00	3:10	36:50
22.9	40:00	3:32	36:28
22.10	40:00	5:50	34:10
22.11	20:00	5:01	14:59
22.12	30:00	N/A	N/A
22.13	30:00	N/A	N/A
22.14	30:00	0:52	29:08
22.15	75:00	12:32	62:28
22.16	75:00	5:16	69:44
22.17	45:00	1:32	43:28
22.18	60:00	N/A	N/A
ALL DATA TOTAL:	**1885:00**	**208:39**	**1676:21**
USEABLE DATA TOTAL:	**1235:00**	**168:18**	**1066:42**

Testing the Correlation

In addition to comparing the time taken to calculate an individual taxpayer's tax liability, the research also investigated whether there is any relationship between the time taken to calculate the tax liability by hand and using the software program. To determine whether there is a relationship, the correlation coefficient between the two sets of data was calculated.

The correlation coefficient can be defined as:

$$P = \frac{\text{cov}(X, Y)}{\sigma_x \cdot \sigma_y}$$

(Gujarati: 2006: 61)

The time allocated to the solution of the selected questions by the authors of the textbook was assumed to be the independent variable (X) and the time taken by the software program the dependent variable (Y).

RESULTS AND INTERPRETATION

The selection of the raw data, the design of the software program used to carry out the research, the testing of the software program and the data, the results of the comparison between the times taken to process the raw data by hand and using the software program and the correlation-testing were described above. This section discusses the results, certain problems relating to the research and recommendations for future research.

Time comparison

Of the fifty-eight questions that were processed using the software program, thirty-eight were useable for the research. These questions that could not be used are highlighted in the raw data relating to the time comparisons in *Table 1*, and the questions that could be used are listed.

The total average amount of time taken to complete thirty-eight tax calculations by hand was: 1235 minutes and 0 seconds.

The total average amount of time taken to complete thirty-eight tax calculations by software program was: 168 minutes and 18 seconds.

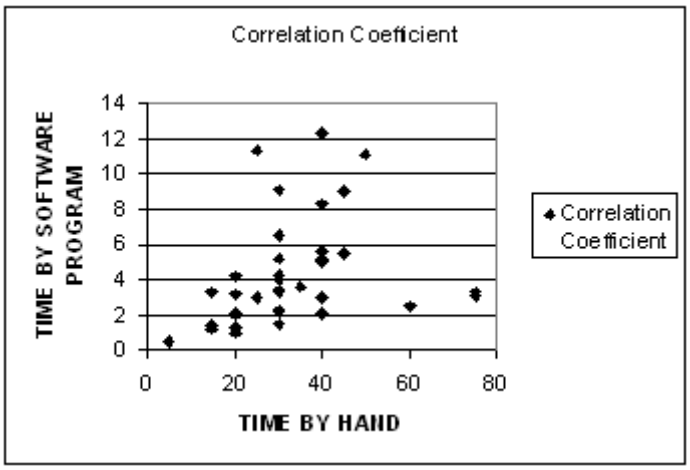
The difference between the time taken to complete the tax calculations by hand and the time taken to complete the tax calculations by software program was: 1066 minutes and 42 seconds.

Therefore the average amount time saved by using the tax software program is: 86 percent.

Correlation testing

To determine whether there is a relationship between the time taken to complete a tax calculation by hand and the time taken to complete a tax calculation by software program, the correlation coefficient between the two sets of useable data was calculated. The data, when plotted on a graph, appears as follows:

Table 2: Correlation coefficient



The correlation coefficient between the two sets of data is: 0.300422

A correlation coefficient may lie between – 1 and + 1, with – 1 indicating a perfect negative correlation and + 1 a perfect positive correlation, while 0 indicates no relationship between the two sets of data. The relationship between the two sets of data is positive, but fairly weak and therefore not strong enough to suggest that there could be a meaningful relationship. Therefore it could be said that the resultant time it takes to complete a tax calculation by a software program depends only slightly on the time it would have taken to complete the same calculation by hand. In other words, the average time taken to complete a tax calculation by hand only plays a small role in the determination of time it would have taken to complete the same calculation by a software program. One reason for this could be that the nature of the actual calculation itself (in other words, the complexity) determines the amount of time saved.

Findings

There appears to be a very substantial saving in time, using a software program to calculate a taxpayer's tax liability. The saving of approximately 86 percent may, however, overstate the case. The time allocated by the authors of the textbook containing the questions used for the research, is based on the estimates of the authors using their extensive experience. An average student is expected to take the allocated time to complete the questions by the time he or she has reached the end of the year of study. By that time, students would have worked out similar questions a number of times. However, the number of repetitions by students is unlikely to reflect the full learning curve effect that would have been experienced by an expert tax practitioner. The time allocation by the authors would also, in part, take into account the complexity of the intellectual input required of the students. A tax program would not reflect this. Even if

both of these factors are taken into account, it is unlikely that the time saving would be completely eliminated. It can safely be concluded that software programs will reduce the tax compliance time and therefore the costs of complying with tax requirements.

There appears to be only a slight positive correlation between the time estimated to complete a tax calculation by hand and the time actually taken to complete a tax calculation by software program. In other words, the amount of time saved, using a tax software program, may be more dependent on the type of calculation involved. The fairly weak correlation may be ascribed in part to the time allocation for a manual calculation having taken intellectual complexity into account.

The research has also enabled the accuracy of both the software program and the solutions to the questions provided by the authors to be tested.

Conclusions

Although South Africa has not yet moved towards a self-assessment system there are ongoing discussions about changing to one in the future (RealBusiness [net]work: 2007). Thus, while tax practitioners in South Africa may be the only persons who calculate individual tax liabilities at present, in the future there may be a significant increase in the number of people who need to calculate their own tax liabilities. Therefore it is probable that there may also be a drastic increase in the number of people who make use of tax software programs.

The industry for tax software programs is growing at a considerable rate and this growth is likely to escalate. Companies that sell these products usually exclude liability for any inaccurate calculations of tax liability by their products. Therefore consumers who buy these products place a great deal of trust in them but are not given any legal guarantee that the software program will indeed calculate the tax accurately. This could cause a doubt in the mind of the consumer about the capabilities of software programs in general and slow down the progression of converting from manual calculations to the use of software programs to perform calculations. Submitting wrong tax calculations to the South African Revenue Services may also involve penalties and other sanctions.

One solution might be to investigate the possibility of introducing tax software program standards. This could consist of a selected group of standard questions, with a comprehensive coverage of all possible combinations of categories of income and expenditure and classes of taxpayer for which the software program would have to calculate the tax liability correctly. The company that sells the product could then make a legally binding claim that the software program falls within the standards and could be held legally liable by users of the program for any inaccuracies that might be contained within the software program. The development of suitable questions could form the basis of future research.

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