Subject:
“Factors Affecting The Ability To Detect Spreadsheet Errors”

Academic Year: 2012 - 2013

Student: Tzouros Michalis
Supervisor: Maditinos Dimitrios

4724
Contents

1 INTRODUCTION ........................................................................................................... 3

2 CHAPTER TWO ............................................................................................................ 5
  2.1 Introduction............................................................................................................. 5
  2.2 Errors Found In Spreadsheets............................................................................... 6
  2.3 Older Researches for Errors On Spreadsheets..................................................... 8
  2.4 Error Types............................................................................................................. 13
  2.5 Creating Errors ...................................................................................................... 14
    2.5.1 Errors during programming ............................................................................ 14
    2.5.2 Errors during the development of the program and the data input .............. 15
    2.5.3 Errors during the final stage of programming .............................................. 15
    2.5.4 Detectable and non-detectable errors during the inspection procedure ...... 15
    2.5.5 Errors in the operating systems of spreadsheets ........................................... 16
  2.6 Spreadsheets and Models Helping the Making Decision Proses ....................... 18
  2.7 The Users of Spreadsheets.................................................................................... 20
  2.8 References............................................................................................................. 23
  2.9 Past Researches done in common subjects .......................................................... 23
    2.9.1 Klobas Jane and Tanya McGill...................................................................... 23
    2.9.2 Harry Howe and Mark Simkin................................................................. 27
    2.9.3 Finlay and Wilson........................................................................................ 29
  2.10 Sum Up ................................................................................................................ 30

3 THE RESEARCH ......................................................................................................... 30

4 RESULTS OF THE RESEARCH .................................................................................. 37
  4.1 Department of Social Administration of Dimokritio University ......................... 37
  4.2 Department of Business Administration of TEI Kavalas .................................. 39
  4.3 Both Institutes ....................................................................................................... 40

5 CONCLUSIONS ......................................................................................................... 41

6 REFERENCES ............................................................................................................. 42
  6.1 Foreign References ............................................................................................... 42
  6.2 Greek References ................................................................................................. 47
  6.3 Web References .................................................................................................... 47
1 INTRODUCTION

Despite the widespread usage of spreadsheets there are not many documented researches that are trying to understand the process of learning to use the spreadsheets. They are distinguished in two main categories: the first refers to the different uses made by users when dealing with work organized by spreadsheets, while the second refers to the mistakes made by the users and the likely risks posed (Earl, 2004).

The extensive computational and formatting skills that spreadsheets have nowadays allow users to create complex analytical standards with professionally formatted results. However, these reports, impeccably designed, almost perfect, can cover a multitude of mistakes in the input procedure, errors if formulas and computational errors (Howe, Simkin, 2006).

Although spreadsheets models used mostly for small applications, they are equally used to develop larger also. In recent years, we have learned a lot about mistakes people make when developing spreadsheets. Generally, errors occur in a fairly large number of spreadsheets, which means that for large spreadsheets, the question is how many mistakes there are, and not if there is any mistake. These error rates, though troublesome, are associated with errors that occur in programming, and other human factors. In the development process, we are following strict rules to eliminate most errors. The researches done to develop spreadsheets show that the creation of spreadsheets is informal and very few organizations have the wile and required knowledge for further development in this area. Although some remarkable articles have focused on such characteristics as the regulation and development of the respective parts, they may be less important than other innovations such as the scrutiny of spreadsheet after the development phase (Panko, 2008).

Something that has also become widespread in recent years is the decision support systems. The development of such decision, based on calculations using a spreadsheet is also used widely by businesses today. The opportunities that comes up for companies using such applications, allow them to develop very complex business models. Unfortunately, most spreadsheet users do not follow any particular
methodology when developing such models. This then leads too many useless hours of correcting and reprogramming and often produces models are more complicated than it should have been (Mather, 1999).

Furthermore, most of these systems are not verified carefully and this has led, in some cases, to serious errors. One of the main reasons for the lack of evaluation is the lack of a functional validation methodology (Finlay and Wilson, 2000).

Through most of the references used we can see there is a high possibility of spreadsheets containing errors. Experts estimate that nearly one in every three spreadsheets contains one major error (Creeth, 1985). In research made by Houston in some companies, he discovered 128 errors in four of spreadsheets worth several billion dollars (Simkin, 1987). In another case, a garment manufacturer was lucky when he discovered a mistake in the formulas resulted in a mistake worth $1.5 million (Ditlea, 1987). In a third case, a mistake on a spreadsheet resulted in an error in the reports of many billions dollars (Godfrey, 1995). In a fourth case, an error in a spreadsheet of Dallas Oil and Gas resulted losses of several million dollars and led to the dismissal of many managers (Hayen & Peters, 1989).

The above incidents are not isolated incidents. In a study of Coopers and Lybrand in 1996, in large companies using large spreadsheets, the researchers found that 90% of the models contained at least one calculation error (Freeman, 1996). Summarizing, in nine studies on prototype spreadsheets for the last 10 years, Panko (2005) calculated an average error rate of about 94% in businesses prototype spreadsheets, which means that 94% of operational prototype spreadsheet included in these studies contained one or more errors.

What we see in these studies is that the possibility of errors in spreadsheets often corresponds to the large degree of self-esteem by users that their models do not contain errors. Eventually, when 113 post-master students in Business Administration (MBA) checked a spreadsheet for which they knew it contained just 8 errors, Galletta et al (1996) found that on average, participants were able to recognize only half of these. The conclusions drawn from these observations, are concerning while obvious at the same time. It obvious that many large spreadsheets have several major mistakes that most users reflect undue trust on spreadsheets, even if they contain many errors and many users base important decisions on their spreadsheet models, regardless of
the accuracy and fairness. These findings do not seem to be eliminated in the future because the general trend is to design ever larger and more complex spreadsheets without giving special weight to the errors arising (Shaw, 2004). A study by Pricewaterhouse Coopers in 1999 indicates that the business spreadsheets are getting bigger (double) in size and content every three years (Whittaker, 1999).

Taking in to consideration of the above, this paperwork is attempting to study the potential factors that affect the ability to detect errors in calculations with spreadsheets while simultaneously evaluating the decision support system based on the reliability of spreadsheets. We are also developing a methodological framework for evaluating these tools. The questions that include the determinants factors of error detection capabilities are the testable hypotheses. We investigate factors such as age (maturity), general academic education, prior experience in spreadsheets and user confidence. The gender plays a big role in the ability to detect errors in spreadsheets; men are more successful than women. Finally, we investigate whether the error recognition rates are the same in various types of errors in spreadsheets.

In order to understand the role of each factor in the recognition of errors that can occur in spreadsheets, we must first understand the mistake, in its nature, its function, its structure, its effects, how to calculate it and its cause. In the second chapter we will try, through past surveys by people who have dealt with this issue, to reach these areas, which will help us develop our theory and test cases. We will try to verify through our own research on the correctness or otherwise of our assumptions about the factors that can affect the ability to detect of errors that occur in spreadsheets.

2 CHAPTER TWO

2.1 Introduction

Spreadsheets are considered to be small and simple applications and their development is often used for an isolated activity. Many spreadsheets calculations are big and complex and their development often involves interactions between people.
The development of spreadsheets is a very important asset that any business or organization can exploit to its advantage.

The errors on spreadsheets, that occur during the development or even the appliance of spreadsheet models, is a big disadvantage that modern students have to face and also the users of those spreadsheets that have to understand and solve them.

In this chapter there will be a small brief about the errors that can occur during the appliance of spreadsheets models while at the same time an extended report about results on previous researches on the subject.

2.2 Errors Found In Spreadsheets

Previous researches about errors that are done by the users of the spreadsheets, show that regardless the experience that the users had, all of them did a small or big amount of mistakes (Kruk, 2005). Despite that we know very few things about the types of errors that occur usually (Kay, 2005). Panko and Halverson (1996) mention that errors done in spreadsheets have to be examined thoroughly in all levels. In the first level errors are divided in two categories, we have quantitative errors and qualitative errors. By quantitative errors, we mean numerical errors that lead us to fault numeric results, while by saying qualitative errors we mean errors that can downgrade the quality of the model and lead to fault quantitative mistakes. Furthermore Panko and Halverson (1996) came to the conclusion that the researches that are focusing on a second level of analyzing the quantitative errors, usually end up categorizing them on other three types: 1) routine errors, 2) logical errors and 3) failure to notice errors.

In the references we also find a more detailed distinction of errors in spreadsheets, either by the user or by software (Rajalingham, 2001). At the first level, the errors that appear in spreadsheets are divided into two categories: 1) the mistakes made by the software itself and 2) those made by the user.

While it is easy to guess that a new user can make more mistakes unlike a more experienced user, experience proves just the opposite. The reason lies in the fact that newer users are not so confident about the results of the spreadsheet, and it is this
lack of confidence that makes them more suspicious in the design and use of models in spreadsheets.

It is not known whether factors such as age, sex, experience in the use of spreadsheets or intelligence play a role in a person's ability to detect or not mistakes. Nevertheless, there are evidence in the references to suggest that this is possible. An earlier study by Teo and Lee-Paridge (2001) suggests that the experience in the use of spreadsheets, can positively affect the detection rates of errors. Similarly the study of Coffee (1995) suggests that the intrinsic intelligence can be more important than the correction tools in the programming language.

In conclusion, a number of studies have focused on the differences between the sexes as a possible factor in the overall capacity on computer programing or stress when a person uses a computer (Havelka, Beasly & Broome, 2004).

There have been long enough evidence, verifying that errors in spreadsheets is a common phenomenon. The calculations with spreadsheets, even after careful development, contain errors in 1% or more of their cells. In large spreadsheets, which contain thousands of formulas, there may be dozens of non-detected errors. Even the major errors can "pass" as a non-detected error because the official control in the development of spreadsheets is rare and even serious mistakes may not be obvious (Panko, 2008).

Nevertheless, the existing data, most companies have given little attention to serious mistakes that occur during calculations with spreadsheets. However, in 2002, the American Council passed a law, which requires companies to have a well-regulated system of financial results. Several other countries have developed or are currently developing similar procedures for companies for their financial results (Panko, 2008).

Participating in the process of evaluating control systems, many companies have discovered that many of the information systems used for financial reporting is not very reliable because they are poorly checked. For example it is shown that 95% of U.S. companies use spreadsheets for their financial reports in accordance with their experience (www.coda.com).
In 2003, Hacket Group researched some medium-sized companies. Found that 47% of companies use spreadsheets for autonomous planning and budgeting and not interdependent (www.thehacketgroup.com). The CFO interviewed 168 senior finance executives in 2004, the executives were asked about their use of information technology within the finance departments. Out of the 14 technologies that were mentioned, only two of those were commonly used. These were spreadsheets and basic system of budgeting and planning. However, each member claimed that their department was using spreadsheets.

Although research on the mistakes of spreadsheets in corporation gives enough information to researchers of the subject, there is a need for more and newer research directions. In the past, developers of spreadsheets have focused more on "innocent mistakes" caused by human factor and not from malice. However, to meet corporate needs derived from various tax laws, spreadsheets developers should focus on how to develop controls not only for innocent mistakes, but for the complete fraud. Existing testing techniques aiming at finding innocent mistakes probably will not discover errors that are aiming at a greater potential fraud. New forms of software control are in needed and the spreadsheet control should work in preventing and discovering fraud.

2.3 Older Researches for Errors On Spreadsheets

Ever since people started using spreadsheets, questions and concerns have been created both about the mistakes that occur and for the consequences of these errors. Davis (1982) warned that the advanced spreadsheets systems can be dangerous to a business organization in general, because users rarely follow the known necessary instructions for the development of model. With these programs, users were able to develop models (for analysis) containing thousands of cells. (Panko, 2008).

Through the years, various annoying occurrences development that are related to spreadsheets have been reported (Panko, 2005). In most cases, either the company by making the mistakes was forced to reveal the mistake or the advisors that were informed of the error, revealed it. Taking into account the normal reluctance of
companies to talk about their mistakes, we must ask whether these events were rare cases or if these errors occur rather frequently in practice (Panko, 2008).

Generally, various consultants, based on their practical experience, said that a rate of 20% to 40% of all spreadsheets contain errors (Panko, 2005). During an audit of a company mining and ore processing, the errors that were found was approximately 30% of the tested spreadsheet. Freeman (1996) states that by examining data from a consultancy firm Coopers and Lybrand in England, found that 90% of all spreadsheets (with more than 150 lines) that he checked, included errors. A consultant from Price-Waterhouse checking four large spreadsheets, found 128 errors (Ditlea, 1987).

In his extensive research Panko (2008) lists tables, which reveal researches that have been done on spreadsheets and the errors found (in percentages). Here we can study these tables.
### TABLE 1: RESEARCHES ON SPREADSHEET ERRORS:

<table>
<thead>
<tr>
<th>Researcher</th>
<th>Year</th>
<th>Number of Spreadsheets</th>
<th>Cells</th>
<th>Percentage of Errors</th>
<th>Percentage of Cells Eith Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Davies &amp; Ikin</td>
<td>1987</td>
<td>19</td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cragg &amp; King</td>
<td>1992</td>
<td>20</td>
<td>50 to 10,000</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>Butler</td>
<td>1992</td>
<td>273</td>
<td>11%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dent</td>
<td>1994</td>
<td>Unknown</td>
<td>30%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hicks</td>
<td>1995</td>
<td>1</td>
<td>3,856</td>
<td>100%</td>
<td>1,2%</td>
</tr>
<tr>
<td>Coopers &amp; Lybrand</td>
<td>1997</td>
<td>23</td>
<td>More than 150 lines</td>
<td>91%</td>
<td></td>
</tr>
<tr>
<td>KPMG</td>
<td>1998</td>
<td>22</td>
<td>91%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lukasic</td>
<td>1998</td>
<td>2</td>
<td>2,270 &amp; 7027</td>
<td>100%</td>
<td>2.2% - 2.5%</td>
</tr>
<tr>
<td>Butler</td>
<td>2000</td>
<td>7</td>
<td>86%</td>
<td></td>
<td>0,4%</td>
</tr>
<tr>
<td>Clermont</td>
<td>2002</td>
<td>3</td>
<td>1,3% - 6,7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hanin &amp; Mittermeier</td>
<td></td>
<td></td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lawrence and Lee</td>
<td>2004</td>
<td>30</td>
<td>2182</td>
<td>100%</td>
<td>6.9%</td>
</tr>
<tr>
<td>Pawell, Lawson and Baker</td>
<td>2007</td>
<td>25</td>
<td>64%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>425</td>
<td>88%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Table one includes data from 12 audits about spreadsheets. Form 1995 and later, when companies that were checked, used improved methods, errors on spreadsheets decreased.
TABLE 2: RESEARCHES FOR ERRORS ON SPREADSHEETS

<table>
<thead>
<tr>
<th>Research</th>
<th>Spreadsheet</th>
<th>Percentage of Errors</th>
<th>Percentage of Errors in Spreadsheets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown &amp; Gould (1987)</td>
<td>27</td>
<td>63%</td>
<td></td>
</tr>
<tr>
<td>Olson &amp; Nilsen (1987-1988)</td>
<td>14</td>
<td></td>
<td>21%</td>
</tr>
<tr>
<td>Lerch (1988)</td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hassinen</td>
<td>92</td>
<td>55%</td>
<td>4.3%</td>
</tr>
<tr>
<td>Janvrin &amp; Morrison 1st (2000a)</td>
<td>61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Janvrin &amp; Morrison 2nd (2000b)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kreie et al. (post test) (2000)</td>
<td>73</td>
<td>42%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Teo &amp; Tan (1997)</td>
<td>168</td>
<td>42%</td>
<td>2.1%</td>
</tr>
<tr>
<td>Panko &amp; Halverson (1997)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Panko &amp; Halverson (2001)</td>
<td>35</td>
<td>86%</td>
<td>4.6%</td>
</tr>
<tr>
<td>Panko &amp; Sprague (1998)</td>
<td>26</td>
<td>35%</td>
<td>2.1%</td>
</tr>
</tbody>
</table>


Table 2 contains information related to various topics that start pondering the non-experienced through the highly experienced users for developing spreadsheets. Although there is great diversity in methodology and detailed results, a basic design clearly stands: any study that has attempted to count errors, has discovered plenty of them.
Looking at the table above, the first question that is created is: is that possible to have such big percentages of errors in spreadsheets. In fact, it is not only possible but it is entirely in accordance with the data on human error rates from other work areas. Various empirical studies (Panko, 2001) show the corresponding data. Generally, when people perform some routine work such as typing, they make non-detectable mistakes in approximately 0.5% of all their actions. When you make more complex logical operations such as developing programs the error rate increases to about 5%. However, the tasks used in these studies were generally almost the same level as creating a formula in a spreadsheet.

The largest set of data regarding the percentage of errors comes from programming, which is closely associated with the development of spreadsheets. In programming, many companies use codes control practices applied to programs. In this method, teams of inspectors initially inspect each program module separately and then come together as a team to check each module again (Fagan, 1976). It is important to have an indication of the number of errors found during the above process. This has led to the publication of data from thousands of checks (Panko, 2001).

It is not surprising that many people make mistakes when they function, but they also fix a lot them when reviewing what they have already done. The rates are high on corrections for mistakes made mechanically, but are considerably lower for logical errors. On mistakes made by an omission of an incorrect diagnosis of the problem, the correction rate is even lower.

There have been several studies on the topic of errors. There is, however, a theory for what is causing the creation of errors. Reason (1990) has presented a theory which refers to why human beings make mistakes. However, many other researchers have added their own versions (Baars, 1992). In general, the theory of Reason says that human beings are amazingly fast and flexible (Reason, 1990) and can achieve multiple goals having also limitations (Flower & Hayes, 1980). However, the same processes that allow humans to function like that are same the lead inevitably to occasional errors.
2.4 Error Types

When referring on spreadsheet errors, most people believe that we are referring to someone who has input wrong number, or enter the minus instead of plus in one type or chose the wrong cell to enter a formula. Alongside these errors, there are many other kinds of errors in spreadsheet development. Panko and Halverson (1996) categorize errors as below:

First, we have quantitative errors, based on which the spreadsheet gives an inaccurate result. In Table one only quantitative errors are taken in to consideration. However, there are also qualitative errors which may later lead to quantitative errors. Teo and Tan (Teo & Tan, 1997) showed in a survey how qualitative error led to quantitative mistakes.

Panko and Halverson (1996), following Allwood (1984) found it useful to distinguish quantitative errors in three categories:

1. Mechanical errors, simple mistakes often derived from momentum, such as entering the wrong number or entering information into the wrong cell.
2. Logical errors, are usually design errors and do not cause interruption of program execution. They include entering a wrong type due to an error in reasoning. They come up from make errors in the logic of problem solving. The rates of logical errors are higher than the rates of mechanical errors. Logical errors are also difficult to detect and correct (Allwood, 1984). The computer performs all the operations of a program without being able to understand if the solution is correct. False results of a program that has not been checked, is due to programmer errors and mistakes and those are called logical errors. Logical errors are responsible for incorrect results of a program (Sarris, 2009).
3. The most dangerous type of errors is errors made by failing noticing them. Those errors are extremely difficult to detect.

When Panko and Halverson (1997) analyzed the types of errors made during the development of a spreadsheet (spreadsheet), they found out that all three types of errors were common. Later, Panko and Sprague (1998) found the same general pattern of errors. The Panko and Halverson compared different types of errors. Even if all the errors were eliminated, each type of error produced an unacceptable number of inaccuracies in spreadsheets.
Rajalingham etc. (2001) and Purser etc. (2006) have developed a more elaborate classification for errors (Table 3). The first distinction is made between the errors "discovered" by the program and those associated with the user or the developer. There are eight cases of errors that the spreadsheet itself "discovers" and it refers to the first category.

**TABLE 3: Error types**

<table>
<thead>
<tr>
<th>A. Errors detected by the model itself</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Errors detected by the developer or the user of the model</td>
</tr>
</tbody>
</table>

a. Qualitative Errors  
   i. Structure errors  
      1. Visible  
      2. Non visible  
   ii. Time Errors  

b. Quantitative errors  
   i. Justified  
      1. Due to lack of knowledge (of spreadsheets)  
         a. Lack of knowledge of using spreadsheets  
         b. Lack of the right mathematical approach of the problem  
      2. Runtime errors  
         a. Syntax errors  
         b. Logic errors  

ii. Random  
   1. During input  
   2. During update  
      a. Modify  
      b. Deletion

*Source: Purser and Chadwick, 2006.*

There is no generally accepted classification of errors in spreadsheets, possibly because each classification serves a different purpose. The first researchers who studied such mistakes did not deal at all with classifying the errors. In studies that followed errors were distinguished in errors due to lack of knowledge of the program and errors due to the program itself (Powell et al, 2009).

### 2.5 Creating Errors

#### 2.5.1 Errors during programming

There is a variety of errors during the programming procedure. Developers make many mistakes when building a mode, but they also find many of these errors
before they run the module and submit it for approval. In the process for approval, by checking the program they discovered some more mistakes, while in a second phase of continuous check they discovered even more. During the procedure described above the errors that are not found must be very few, the minimum possible.

2.5.2 Errors during the development of the program and the data input

Errors been done during the input of the data in the cells. Two studies have previously examined these errors (Lerch, 1988, Olson & Nilsen, 1987-1988), when the developer of the program inputs the types. The details of these surveys confirm that people make many mistakes while working and they are unable to discover many of these errors. An interesting output of Lerchs’ study (1988) is that the rates of mechanical errors increased dramatically when the equations contained references to cells that were in different columns and different rows of the cell that was the type.

2.5.3 Errors during the final stage of programming

Most studies in Table 2 focus on the mistakes made at the end of the development procedure, when the developers stated that the programs were ready for use. Besides the research of Janvrin & Morrison (2000), the error rates in cells in these studies were similar, although the experience of users ranged from little experience too big enough for the development of spreadsheets. A study of Panko and Sprague (1999) compared undergraduate students with MBA students with little experience on the development of spreadsheets and MBA students with more than 250 hours of experience in development of spreadsheets. Their performance was similarly. Even when the object of the research was something very simple, without requiring any special knowledge (Panko & Sprague, 1998 Teo & Tan, 1997), approximately 40% of all spreadsheets contained errors.

2.5.4 Detectable and non-detectable errors during the inspection procedure

Checking the program for detection of errors can be applied to detect errors that remain until the final stages of development. Fagan (1976) developed a strict principle for checking the programs. This technique involves groups of people which
inspect the program sector by sector. Then, all groups come together as one and check the program again from the start bit by bit. There are clear instructions about what should be checked, such as the maximum length of the modules tested and the maximum control rates (usually 100 to 200 lines per hour). If these rates are not exceeded, error detection rates fall sufficiently (Panko, 2001).

Experience has shown that checking these programs is very difficult. In the experiments, it has been found that individual “inspectors” (users) detect only half or less of all errors in program modules (Basili & Selby, 1986, Johnson & Tjahjono, 1997, Myers, 1978). Even the final check made by the groups usually only detects 80% or less of all the errors in a program module (Panko, 2005).

2.5.5 Errors in the operating systems of spreadsheets

The first study of Davies and Ikin (1987), checked 19 operational spreadsheets from 10 developers in 10 different companies. The developers expressed their confidence in the accuracy of their spreadsheets.

However, four of the spreadsheets (21%) were found to have serious quantitative errors, and 76% had quantitative or qualitative errors. One of error involved a transfer of funds, between departments of the company, worth of 7 million dollars. In another case, there were currency conversion numbers that were not matching in different parts of the spreadsheet. A third problem was a negative balance for the available stock. There was insufficient documentation in 68% of spreadsheets. Ten of the 19 failed to use cells protection. Only someone had used the software of audit to check the spreadsheets and manual audits were "rare."

Later, Cragg and King (1993) inspected 20 operational spreadsheets from 10 companies. That audit found serious errors in 5 spreadsheets (25%). This time, the tested companies described their methodology. A single person conducted the two-hour check of the programs. They also noted that probably discovered only a few of the errors in these spreadsheets. Also, they noted that the spreadsheets were characterized by poor layout, use of protective cells in only 30% and the use of names set to only 45%. Only half had clearly separated segments of import and production,
and all mixed cells calculation with the production cells. Only two of them had checked their types before importing them into spreadsheets.

A general conclusion of Cragg’s and King’s (1993) research, in this survey there was an informal iterative development. In none of the spreadsheets formal specification, design, or coding was used. In addition, there was extensive revision due to poor original design. There had been a term review, although the spreadsheets were only used in average six months per year. In 17 of the spreadsheets there had to change their structure during the recheck. In six cases, there had been problems with spreadsheets in previous revisions.

Butler (1996) described it, the United Kingdom, auditing 273 spreadsheets submitted to the custom agency of the country. The audit methodology included the use of a program designed to look for inconsistencies in spreadsheets. If the program finds inconsistency in one part of the spreadsheet, a single independent auditor is checking that section carefully for errors. This program traced probably only a fraction of all the errors because it could not find errors such as omissions, numbers that are not correct, the types that are inaccurate, and many other types of errors. However, the team found errors in 10.7% of spreadsheets.

Since 1995, five studies have examined spreadsheets using the following methodology. Hicks (1995) checked a huge master budgeting spreadsheet with 3,856 cells. Three people were working on this review checking the spreadsheet cell-cell. Errors found in only 1.2% of all cells. Noteworthy is that these errors would cost over one billion U.S. dollars if they had not been detected.

In England, it is obligatory by the law, for some spreadsheets to be checked. Coopers and Lybrand, a consulting firm, they were able to provide advice on the spreadsheet review. Representatives from the firm stated that they had never seen a spreadsheet without any errors during audits. In addition, they reported data suggesting that approximately 5% of all tested spreadsheets had "very serious mistakes." They noted that this percentage may be low for other types of spreadsheets because the tested spreadsheets have a specific structure due to their publication.

In 2000, Butler, who checked the spreadsheet for the collection of taxes in the UK, found errors in six out of the seven spreadsheets which were controlled by
one person. The errors were related to the requirements for the payment of additional taxes or refunds.

In 2004 Lawrence and Lee in Australia tested 30 spreadsheets, created to justify the funding of a program. These audits are conducted by one person. These spreadsheets had in average 2.182 formulas. It took an average of six tests in order these spreadsheets to be properly accounted for.

Generally, what we conclude from spreadsheets matches the results of laboratory studies. Studies have shown that spreadsheets are a useful tool in the hands of any user, and much more at the discretion of any business. The issue is whether pay attention during the development of a spreadsheet, correctness of the information and whether they focus on avoiding making mistakes. The truth is that mistakes are made and will be made during the use of spreadsheets mainly due to the "blind" trust that people have to the computer and specific programs. As users we should check each item that we input on spreadsheets we have to be sure of its correctness and assumptions we use to be as accurate as possible. Regarding the design of a spreadsheet, the check should be done before inputting the formulas and the values, with the possibility of using ready formulas. Finally, something noted in all these studies, is the regular check or perhaps creating a control system that will not allow the emergence of many errors, and a result there won’t be wrong conclusions coming up from such a useful tool.

2.6 Spreadsheets and Models Helping the Making Decision Proses

Although it took more than a generation to start using the term "decision support system", there is still no common line on definitions of decision support systems and decision support (Finlay & Wilson, 2000).

Most companies collect and manage data using modern programs. With the built-in capabilities of spreadsheets providing the users with the tools operational configuration are easy and efficient, there is a growing trend in the business environment, on using spreadsheets on making decisions. The main benefits of spreadsheet-based models are their operational characteristics: transparency and volatility. One of the factors that usually facilitate the smooth development process is
that most users of spreadsheets do not follow a specific framework for model development (Mather, 1999).

A recent study of a sample of companies using spreadsheets reported some alarming statistics about the poor quality of standards developed (Cragg & King, 1993). Several other researchers in this area have also documented the very high use of spreadsheets in business and have noticed additional problems associated with the open and unstructured shape (Cornford & Doukidis, 1991).

However, several studies have raised concerns about the accuracy of spreadsheets in general and for the appliance of end users in particular. Panko and Srague (1998) is referring in error rates between reviews of spreadsheet from 10 to 25 percent, in real spreadsheet reports, while Brown and Gould found that 44% of spreadsheets developed by experienced users had at least one essential mistake, even though the users/developers were confident that their calculations were correct. Supporting a view, in favor of the decision making process through the use of programs, Kreie etc. (2000), indicate that final users are often unaware of formal development processes such as data validation, safety data, testing and documentation, that would help ensure the integrity of an information system.

Although a large part of research confirms the high frequency of errors even in the most critical standards spreadsheet, it can’t be specified what errors occur most frequently or who (men or women, or non-experienced users) are more likely to either discover, or to ignore them. For example, although there are errors found formulas are the most important in spreadsheets, errors during data entry, violations of company rules or other examples of problems can also contribute to miscalculations. Similarly, although it is easy to suspect inexperienced people are more likely to commit or fail to notice their mistakes than experienced users, experience shows that it is often the opposite. Finally, it is not known whether other factors such as age, gender, experience using spreadsheets or intelligence play any role in explaining the varying capacities of individuals to commit or to detect errors in spreadsheets. Coffee’s survey (1995) suggests that intelligence can be an important factor for correcting errors in the process of error finding. Finally, several studies have investigated gender differences as a possible factor of general ability or anxiety when using computers.
2.7 The Users of Spreadsheets

Spreadsheets are often used by large and small companies to analyze using financial data. Spreadsheets, however, often contain errors, which have an impact on the quality of the analysis performed by the users that they develop the spreadsheet on their own (Klobas, McGill, 2004).

Many important organizational information systems are developed by the users themselves. Employers recognize the skills of handling spreadsheets as some of the most important skills handling information technology that a new employee may have. (Davis 1997, Ives, Valacich, Watson, Zmud et al, 2002). Often, several critical financial data and analyzes based on these data, are told to people who are responsible for the development of spreadsheets and aim to analyze the data (Govindarajulu, 2003). Spreadsheets however, often contain errors that affect the quality of the analysis performed by users who design and develop their own spreadsheets (Panko and Halverson, 2001).

Teachers of senior institutions suggest that the quality of spreadsheets would be improved by teaching students to design systems and also with familiarizing students with these systems. Also useful would be to learn how to use the various features of these systems (Teo and Tan, 1999). Improving the quality of university education of the people in charge of spreadsheets development and similar accounting systems has improved quality on spreadsheet developed by new entrants to the workplace. Furthermore, appropriate courses should be developed and taught by spreadsheet developers that are already active in the workplace (Govindarajulu 2003, Kreie others 2000).

People in charge for the development of accounting systems in the workplace should be encouraged to attend training courses on spreadsheets. We cannot take for granted that these people know either that their accounting sheets contain errors or that the quality of their spreadsheets can be improved (McGill, 2002). Note that the confidence and knowledge on spreadsheets usage is rare and also difficult to obtain. For this reason, Hall (1996) proposed to develop a "measure". In 2003, Torkadech and Lee mentioned again the need for the formation of a gradient of skills for spreadsheet users.
Very few researches have been done around the definition and measurement of knowledge or ability to develop spreadsheets. The most known try was simply to use the creation of spreadsheets or try to replace one of them (Chan and Storey 1996, Harrison and Rainer 1992, Janvrin and Morrison 2000, Panko and Sprague 1999, Rivard and Huff 1988). The question in this study is whether the experience and education lead to higher levels of knowledge and skill of users. However, another study puts this assumption into question. For example, Chan and Storey (1996) found no connection between education on computers and the quality of spreadsheets. A measure of knowledge rating for spreadsheets is necessary.

The ability of users is defined as "the ability of the user to use the technology to its limits in order to maximize the performance of specific work targets" (Marcolin et al 2000). This definition applies to the use of spreadsheets to develop systems that support the work of a user. There are two forms of knowledge that are required in order for a user to be considered a user able to develop systems:

1. Knowledge associated with the effective use of spreadsheets (Bowman, 1988, Cheney and Nelson, 1988), and
2. Knowledge associated with the development of information systems in general, such as those which refer not only to use but also in the design and development of spreadsheets in decision-making process etc. (Bowman, 1988, Janvrin and Morrison, 2000).

Consequently, the competent user is required to have knowledge of the general characteristics of the type of the tool used (for example managing spreadsheets or databases) and knowledge of the specific features of the tool is selected (for example Microsoft Excel or Acces). They also require the knowledge of developing systems that include the ability to modulate the real problems as well as knowledge of the appropriate technics to analyze and system design. These forms of knowledge enable a responsible user to produce useful and reliable applications (Bowman, 1988). We can therefore identify two categories of knowledge required to develop reliable spreadsheet:

1. knowledge of the tool: Features of spreadsheets in general and the features of specific spreadsheets used, and
2. Knowledge of systems development, as applied to the development of spreadsheets.

In fact, training on spreadsheets that develops knowledge of the characteristics and practices of development, should help the improvement of the outcome of used spreadsheet. However, the quality of spreadsheets can only be partially explained by their knowledge (Klobas, McGill, 2004). Other factors that can contribute to the quality of spreadsheets include the intelligence of the user and the motivation for their duties (Marcolin et al, 2000), and possibly the user's knowledge about the extent of the problem.

Various scientists have investigated the role of knowledge in successful use on the development of spreadsheets, but have concluded that the limiting factor is usually the knowledge of the tool rather than the knowledge of the area for which the application is developed (Agboola, 1998, Galleta k.a.1993, Mackay and Ellam, 1992). However, future research could examine the relative influence of education, the ability of the users, their motives and their knowledge not only on spreadsheets but also the of the quality aspects of spreadsheets.

Based on the above, we find that there is an urgent need for a measure of evaluating the knowledge of spreadsheets that not only should be applied and be reliable but also useful. To distinguish the different levels of knowledge on spreadsheet among university students but also among users who develop such systems. Knowledge of spreadsheet functions as a link between education, experience and their quality. Even the experience should be the result of a continuing education. Training will start from the early stages of human education, starting from school using the computer. At all stages of education (elementary, middle school, high school, university), the computer should be a tool in the hands a human to become familiar with its use. In a study at the University of Patras on skills on using spreadsheets in high school, it was found that students at this level have few skills in the use and that there is room to improve their skills and their familiarity with computer. Even in the workplace, employee should not only be taught in a theoretical framework but should also apply it on practical training. With continuous training the level of knowledge is getting improved. We believe that it is worthwhile educating people to develop and use spreadsheets because this knowledge depends on the training and the experience the person had, and to get the best possible knowledge has resulted in higher quality on spreadsheets.
2.8 References

The studies made on spreadsheets development so far have a very special picture. Every study that has attempted to measure and understand mistakes, finds out that the error rates are high and dangerous for any business. These error rates are common with error rates found in general human activities.

Despite the outcome of the researches, the developers of spreadsheets and businesses that use them still do not accept them. They don’t use regular and simple standards to check the code. A spreadsheet user may admit that the error rates are quite high, but he thinks that the system to check the code/formulas on a spreadsheet is simply impractical, in other words non-efficient. He claims that the company should continue to base critical decisions in relatively invalid numbers.

A major obstacle to the implementation of standards on spreadsheets is that very few of them have the development of spreadsheets as their primary objective. Businesses should identify the critical spreadsheets and impose strict rules to them (Panko, 1988). Based on the survey data many corporate decisions would still be made on questionable analysis.

Studies that have been done in the past and future studies, are trying to prove the validity or invalidity of their cases. Several theories are techniques are tested to prove the hypotheses of each investigation. The data change depending on the type of research, the field, the participants on the research and even their mood. For something to be considered as given, permanent and acceptable it must be tested and implemented. Each researcher hopes to add something new to the research done in this area and to bring a little more knowledge than previous researchers applied in reality. Below, we will study the ways in which valid and experienced researchers negotiate affairs investigations. All of them with ambition and several different methods are trying to find and prove what they consider possible. Regarding the methodology used in this research it will be discussed in a following section of this chapter, following prior investigations of the aforementioned researchers.

2.9 Past Researches done in common subjects

2.9.1 Klobas Jane and Tanya McGill

In a research by Jane and McGill, concerning the measurement of knowledge of people who develop applications of spreadsheets, they describe the development of
a diagnostic test for knowledge of spreadsheets. This test is used by individuals, teachers, trainers and companies in order for them to recognize the need for education on the spreadsheets and consider whether their education program is efficient. Validity and reliability are two of the parameters examined. Psychometric methods are applied and techniques to develop a diagnostic test that will lead to results.

The first stage in developing a diagnostic test measuring the knowledge of spreadsheets was to develop an experimental test. This experimental test emphasize, as much as possible in the two kinds of knowledge:

1. Features of spreadsheets, and
2. Knowledge on developing spreadsheets

The knowledge of development was measured by using two types of questions. Questions testing the knowledge for the processes on the development and spreadsheets, which were developed specifically for this study and were based on two published methodologies on spreadsheets development (Ronen, Palley and Lucas, 1989). These questions were extended to areas such as the need for application development and programming and test methods. The second category of questions on spreadsheets was originated by Rivard (1997) it concerned a tool to measure the quality of developed applications end users.

Each item in the test was presented as a multiple choice question with 5 options. In each question, the fifth answer one was "I do not know" or "I do not know the specific element." The test was examined for correct structure and content from four information technologies teacher who had participated in teaching and developing spreadsheets. Some revisions were made based on their proposals. The resulting test of 32 data was tested to 60 undergraduate students. They reported an average of 4.4 years’ experience on using spreadsheets. The students were recruited during lectures and completed the test on the spot. It was mentioned that the completion of the test was voluntary and that there was no part of it in their assessment.

This experimental test was statistically reliable. Seven questions, however, were not fully comprehend correctly by the students and eventually removed. The test
contained 25 multiple choice questions. Nine of the questions tested knowledge of features of spreadsheets and 16 related with knowledge on development. The knowledge of spreadsheets is proved by the number of correct questions.

They gathered a new sample of spreadsheet developers to allow the examination of the quality of the test, which was tested in many ways. Responses were gathered from experimental and main subjects in order to have a larger and more diverse sample for psychometric analysis. A larger sample size offers more variation than a smaller sample derived from a single sampling frame. The description of each analysis indicates whether the main sample of the total sample was used. In these cases, the individual sample and the gathered samples were reliable. Those analyzes focused on the following elements:

1. **Validity and effectiveness.** The search for such information via the test was already addressed by the submission of the experiment on experienced teachers on designing and using spreadsheets. They used the factor analysis that examines the data from more than one aspect between questions included in the test. They gathered the responses of both groups involved in this analysis.

2. **Reliability.** They calculated the Cronbach alpha for the new sample to confirm the consistently of the results in different samples.

3. **Adjustment.** Tukey's test was used to ensure that the results of the questions could be added to come up with a complex result.

4. **Difficulty level.** They used the Rasch analysis for data (Andrich, Sheridan, Lyne and Luo, 1998) to determine the degree on which the test measures the knowledge of the subject in a range of difficulty levels. They gathered the results of two samples for analysis.

5. **Geological effectiveness.** Based on the assumptions of previous research, the researchers expected to find differences in knowledge between people with different levels of training and experience. Collected the responses of the two groups for this test and compared the results: a) those that have had some formal training on the subject to those who had little or none at all and b) the novice participants with those who had medium level of experience and those who were very experienced.
6. **Predicted effectiveness.** It is the effectiveness of a test (results of a test) to predict the performance of a next target. Because the knowledge test was designed to examine the knowledge associated with the development of good quality spreadsheets, they used the linear regression to examine the extent on which this knowledge explains the quality developed by the participants.

The quality of each spreadsheet was also evaluated by two experienced developers of information systems. The data used to measure the quality of systems were obtained from a tool developed by Rivard (1997) to evaluate the quality of developed applications. In this study, data were not suitable were excluded from the test. Minor adjustments were also made to the wording to reflect the environment in which the development and use of spreadsheets appeared. The resulting qualitative scale systems consists of 20 elements, each made in a Likert scale from 1 to 5, where 1 means "strongly agree" and 5 means "strongly disagree."

The test was designed to appeal on users who develop and use their own spreadsheets. To ensure that the test was suitable to be used in those users, a sample of developers with a wide range of knowledge on spreadsheets was required. For the research they were also selected members of the general public, creating an actual meaningful sample, participants covered a wide range of ages in experience of spreadsheets and training. Out of the 159 participants in this sample 32.7% were male and 67.3% female and their ages ranging from 14 to 77, with an average age of 42.7 years. They had an average of 4.5 years of experience on using spreadsheets.

Fourteen separate experimental groups were tested in a four hour test for a period five months. The number of participants in each group ranged from seven to seventeen, depending on availability.

Each test took place in various steps. In the first step, participants completed a brief questionnaire about themselves and their previous experience in spreadsheets and then their knowledge on spreadsheets was tested. They were then given a problem about the alternative choices between rental car businesses and asked to develop a spreadsheet to solve that problem using Microsoft Excel. They proposed to treat this exercise as they would treat a personal problem or a task, rather than a test. In the next section, each participant used a spreadsheet to answer a set of questions. After completing this step, they were asked to fill a final questionnaire to give their
perceptions of the quality of the spreadsheet and if they were satisfied when they used it.

2.9.2 Harry Howe and Mark Simkin

In a second study, Harry Howe and Mark Simkin, they were trying to study the factors that affect the determination of errors in spreadsheets; they began creating their hypothesis about factors such as: age, general academic education, previous experience with spreadsheets. Apart from the above factors that seem to affect the results in this research there is even the human gender, which plays a role in the ability to detect errors in spreadsheets. The error-detection rates are common among the different types of spreadsheet errors.

To examine these cases they designed a study that includes four key elements:

1. A primary questionnaire in order to gather the demographic characteristics of the participants,
2. A list of corporate roles that affect the content of the spreadsheet,
3. A Microsoft Excel spreadsheet consisting three worksheets and
4. A questionnaire to evaluate the ability of the participants, if they manage to find any errors and how many did they find.

This study was conducted in two educational institutions in America. In both institutions, they selected schools of information systems, student were given 50 minute time to participate in the study.

**Demographic characteristics:** At the beginning of the semester on each selected institute, participants were given the materials described above. As mentioned, the first item was a questionnaire that collected demographic information that could probably affect the ability of a participant to detect errors in spreadsheets, 120 students were male and 108 were female.

Each participant was asked about the total grades that had taken during the education. They also asked students current average, who acted as a surrogate for overall academic ability in upcoming regression analyzes. They came up with an average of 3.2, which was almost perfect.

From their answers, one would expect students with more experience in spreadsheets or Microsoft Excel, would be better on detecting errors in a new Excel
spreadsheet from those who had no experience. So, they asked students to calculate the number of years that they were familiar with spreadsheets. A person can be using spreadsheets for several years, but still not feeling very familiar with them. Then, they asked students define their level in spreadsheets, namely: "beginner", "sufficient knowledge", "with average knowledge," "a good knowledge," "very good knowledge" and "expert".

Finally, they asked participants to assess their confidence in the accuracy of the spreadsheets that they create themselves in general. The purpose was to gather information to correlate with upcoming error-detection rates for each user. Demographic characteristics for students in both groups were similar.

The experimental prototype of spreadsheets. After completing the questionnaire, students were asked to check the experimental spreadsheet to identify and correct as many errors as possible. The file with the spreadsheet was given to them either by disk or by downloading it from the main server. Regarding to the experimental spreadsheet, the model included the collection of current information of the operating costs for a construction company and use these information to make a 5 year program for the operational costs. Students were given 50 minutes to complete the questionnaires, to correct errors and to return the work to the teacher, but they were not timed. All participants worked diligently and showed great interest in the study.

The errors in the spreadsheets. Many types of errors can affect the accuracy or effectiveness of a spreadsheet. Because the research is interested in the error-detection rates for several common mistakes, the model was not complicated; it did not require extensive knowledge of the specific application and did not required more advanced skills in spreadsheets. Rather, the types of mistakes done were misspelled labels and data entry errors, but also important errors such as the use of inappropriate formulas or incorrect cell references in the formulas. At least two wrong formulas were copied in several other cells that make up the original errors. A documentation page provided additional data and guidance to assist participants to detect and correct errors. For now, there is no general classification of the type’s errors, although several studies recognize that all errors in spreadsheets are not necessarily the same (Panko, 2005). For convenience in this experiment, they classified the 43 errors in four categories:

a) Office and non-material errors,
b) Violation of rules,
c) Data entry errors, and
d) Formula errors.

Office and non-material errors do not affect the calculated values of a spreadsheet but nevertheless they affect it in other ways. For example, significant misspellings or noticeable errors in dates or similar reports can alter the effectiveness of a presentation to customers or their confidence in model results.

Violations of rules are entries in cells that violate corporate policies, for example, paying overtime to an employee when that person is not performing as it should, they always use the rules of the organization. These errors affect the calculations in a spreadsheet and therefore are an important source of inaccurate results. The potential for similar problems apply to data entry and formula errors.

2.9.3 Finlay and Wilson

The reasons given by Finlay and Wilson for the possible lack of power in the standards of research include time limitation, the confidence given to specialists who develope the systems and the general lack of ability from users. In case, Kreie indicate that users that develop their own applications, are often unaware of the formal development processes such as data validation, data security, testing and documentation that would help to ensure the integrity an informal system. Their research was performed using an iterative approach focused on the user to develop a practical method to validate, seeking for factors that affect the ability to detect errors in spreadsheets. The following activities took place:

1. Develop a methodology
2. Determine the methodology
3. Testing and agreement for the methodology

In stage 1, the goal was to produce a first version of the methodology, which combines probability factors identified by Finlay and Wilson. The methodology used for stage 1 was an interview based on assessing various scenarios for the development of spreadsheets. Six people were interviewed. Participants were asked whether these factors were associated with the development of spreadsheets. The results of the interviews were analyzed with the appropriate statistical analysis.

In the second stage, an experiment was constructed to investigate thoroughly the effect of different factors on this effort. The Conjoint analysis in SPSS was used
to generate a correct plan of the nine highest factors classified in step 1. All participants were volunteers recruited from the final year in the School of Business Administration. These students were chosen as participants because they had been taught the subject and were already familiar with how to create and develop spreadsheet as part of their degree program.

They explained the terms and the definitions needed on the participants and together with four scenarios in which it was required to create a spreadsheet. Participants were given time to read and ask questions for clarification before they begin the experimental. The data gathered in this step were analyzed by using the SPSS.

2.10 Sum Up
This chapter conducts a research on how people will be able to identify errors in completing worksheets and to correct or annihilate the factors that affect the ability to detect errors, and also refers to studies mentioned before.

In order to come up with a conclusion on a study we do the research by questionnaire and further analysis of the results using the SPSS.

3 THE RESEARCH
In this paper we will base our methodology on Howe and Simkin (2006) as we attempt to study the factors that affect the ability to detect spreadsheet errors. In order to examine this hypothesis we designed a study involving four steps:

1. A questionnaire about demographic characteristics of the participants. All students were asked about their age, total grades (of exams that they have passed), current average grade and also how many years of experience they have on spreadsheets.
2. A printed guide about the corporate rules about each worksheets of the spreadsheet.
3. A small spreadsheet made in Microsoft Excel consisting of three worksheets that contains a model about the salaries of the construction company Choi and of the office for the months January, February and March
4. Finally, a questionnaire that each participant was asked to assess their own ability on detecting spreadsheet error and how many did they find.
The study took place in two institutes. In 70 students of the department of Business Administration of the Technological Educational Institute of Kavala kai 20 students of the department Social Management on Komotini. Participants had 50 minutes in order to finish the questionnaire.

The experimental model includes these four steps:

A. **Answer the questions given.**

1. What is your gender
   - Male
   - Female

2. How old are you
   __________

3. Profession (field of studies)
   __________

4. How many lectures have you successfully attended unit now
   __________

5. What is the average of the lectures that you have successfully attended up to now
   __________

6. How many PC lectures have you had
   __________

7. How many years are you using spreadsheets
   __________

8. How many years are you using Excel
   __________

9. How would you evaluate yourself in the usage of spreadsheets?
   A) Novice B) Still learning C) Average D) Advanced E) Experienced

10. How sure you are, about model spreadsheets that you have created (for example for homework), that there are no important mistakes, that will affect the results and the conclusion of your spreadsheets (self-confidence about not having errors in spreadsheets you create)
   A) Not sure at all B) Just a bit C (Quite sure D) Absolutely sure

B. **Check the spreadsheet.** Try to finding as many errors on the spreadsheet, the errors are spelling mistakes, errors on the formulas used or even wrong input, find any errors that you can. Do not correct the errors; just change the color of the text or by filling the cell with color. Remember that finally you will be asked
how many errors you have found, and this way will help you count the mistakes you found.

Use the data given underneath to find the errors:

**Data:**
The spreadsheet was developed by Mrs. Roberta Smith, with the phone extension 4840, in March 2002.
The biggest part of the spreadsheet has been approved by Mr. John Choi, with the phone extension 2345.
The spreadsheet must be showing today’s date.

**Payment:**
The regular hours must be from 0 to 40.
The overtime hours have to be from 0 to 10.
The minimum pay rate is 6.75$ and maximum 21.50$ per hour.
The regular pay comes from multiplying the regular hours to the pay rate.
The total payment comes by adding the regular pay and the overtime pay.
One worker has to have 40 hours regular so as to be able to take over time payment.
If the sum of the hours, that a worker worked is less than 40, then, they are all consider to be regular and not over time.
The overtime pay, comes, by multiplying the pay rate with overtime hours multiply by 1.5.
Daniels’ regular hours must be 37, and the overtime hours of Adams and Daniels must be 0.
Only the employs with the code B and C have the right to get overtime payment.
Employs with the code A can work maximum 40 hours.

**Expenses:**
The water bill is stable at 250 $ per month

**Calculations:**
The expenses of the office in the column “year” they are calculated by multiplying the sum of the three months by 4.
C. The tables that will be given in the spreadsheet. The spreadsheets consist of three worksheets, which they include the payment model of the construction company Choi and the expenses for January, February and March.

*Table 1*

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td><strong>Choi Construction Company</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td><strong>225 Main Street</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td><strong>Moscow, IL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td><strong>Today's date:</strong></td>
<td>August 10, 2003</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td><strong>Spreadsheet Developer:</strong></td>
<td>Ms. Roberta Smith</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td><strong>Phone extension:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td><strong>Payroll Processing</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td><strong>Data supplied by:</strong></td>
<td>John Choi</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td><strong>Phone extension:</strong></td>
<td>x-48451</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td><strong>Office Expenses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td><strong>Data supplied by:</strong></td>
<td>John Choi</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td><strong>Phone extension:</strong></td>
<td>x-4951</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td><strong>Projections</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td><strong>Key assumptions:</strong></td>
<td>Approved by J. Choi, 4/24/20022</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td><strong>Calculations:</strong></td>
<td>Prepared by Robert Smith</td>
<td></td>
</tr>
<tr>
<td>Code</td>
<td>Pay Rate</td>
<td>Regular Hours</td>
<td>Overtime Hours</td>
<td>Regular Pay</td>
<td>Overtime Pay</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>---------------</td>
<td>----------------</td>
<td>-------------</td>
<td>--------------</td>
</tr>
<tr>
<td>A</td>
<td>1</td>
<td>40</td>
<td>10</td>
<td>200</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>2</td>
<td>32</td>
<td>8</td>
<td>256</td>
<td>0</td>
</tr>
<tr>
<td>C</td>
<td>3</td>
<td>24</td>
<td>4</td>
<td>192</td>
<td>0</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>16</td>
<td>2</td>
<td>128</td>
<td>0</td>
</tr>
<tr>
<td>E</td>
<td>5</td>
<td>12</td>
<td>1</td>
<td>72</td>
<td>0</td>
</tr>
<tr>
<td>F</td>
<td>6</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>G</td>
<td>7</td>
<td>8</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>H</td>
<td>8</td>
<td>6</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I</td>
<td>9</td>
<td>4</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>J</td>
<td>10</td>
<td>3</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>K</td>
<td>11</td>
<td>2</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>L</td>
<td>12</td>
<td>1</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Table 2*
<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>Fuel</th>
<th>Food Services</th>
<th>Maintenance Fees</th>
<th>Customary (cleaning)</th>
<th>Water</th>
<th>Rent</th>
<th>2000</th>
<th>3000</th>
<th>5000</th>
<th>6500</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>10546</td>
<td>450</td>
<td>450</td>
<td>350</td>
<td>330</td>
<td>350</td>
<td>350</td>
<td>250</td>
<td>250</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>2012</td>
<td>1420</td>
<td>1030</td>
<td>330</td>
<td>350</td>
<td>330</td>
<td>350</td>
<td>350</td>
<td>250</td>
<td>250</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>2016</td>
<td>1660</td>
<td>390</td>
<td>130</td>
<td>130</td>
<td>130</td>
<td>130</td>
<td>130</td>
<td>259</td>
<td>259</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>2000</td>
<td>3026</td>
<td>759</td>
<td>260</td>
<td>250</td>
<td>220</td>
<td>250</td>
<td>250</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>2000</td>
<td>3000</td>
<td>750</td>
<td>259</td>
<td>250</td>
<td>220</td>
<td>250</td>
<td>250</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>2000</td>
<td>2500</td>
<td>770</td>
<td>259</td>
<td>250</td>
<td>220</td>
<td>250</td>
<td>250</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>2000</td>
<td>2000</td>
<td>750</td>
<td>259</td>
<td>250</td>
<td>220</td>
<td>250</td>
<td>250</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>2000</td>
<td>5000</td>
<td>750</td>
<td>259</td>
<td>250</td>
<td>220</td>
<td>250</td>
<td>250</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>2000</td>
<td>6500</td>
<td>750</td>
<td>259</td>
<td>250</td>
<td>220</td>
<td>250</td>
<td>250</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
</tr>
</tbody>
</table>

Table 3: Office Expenses for First Three Months of 20XX

<table>
<thead>
<tr>
<th>Year</th>
<th>January</th>
<th>February</th>
<th>March</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>490</td>
<td>490</td>
<td>490</td>
</tr>
<tr>
<td>2000</td>
<td>490</td>
<td>490</td>
<td>490</td>
</tr>
<tr>
<td>2000</td>
<td>490</td>
<td>490</td>
<td>490</td>
</tr>
<tr>
<td>2000</td>
<td>490</td>
<td>490</td>
<td>490</td>
</tr>
<tr>
<td>2000</td>
<td>490</td>
<td>490</td>
<td>490</td>
</tr>
<tr>
<td>2000</td>
<td>490</td>
<td>490</td>
<td>490</td>
</tr>
<tr>
<td>2000</td>
<td>490</td>
<td>490</td>
<td>490</td>
</tr>
<tr>
<td>2000</td>
<td>490</td>
<td>490</td>
<td>490</td>
</tr>
</tbody>
</table>

Footnotes:
1. Total includes all expenses.
2. Variance expenses include fuel and maintenance fees.
3. Food services include lunch and dinner.
4. Customary cleaning includes office cleaning services.
5. Water includes tap and water heater.
6. Rent includes office rent and utilities.
7. Electric includes office lighting and equipment.
8. Phone includes landline and mobile.
9. Subscriptions include newspapers and magazines.
11. Office expenses include supplies and cleaning.
12. Key figures include total expenses and variance.

Table 3 concludes the Office Expenses for the first three months of 20XX, showing a slight increase in expenses compared to the previous months.
D. After that, the third questionnaire is about the results of the work done in the spreadsheet given:

Please answer these questions after you have done step 2

11. How many mistakes did you find:
   A) 0-10 B) 11-20 C) 21-30 D) 31-40 E) 41-50 F) More than 50

12. Were you given enough time to complete the test? Which one describes more the amount of time that you have been given:
   A. I would prefer to have more time to finish.
   B. I finished on time, but I would like to have some more time to check it again
   C. I finished everything in less time than was given to me
   D. Other (please describe) ________________________________

13. How interested were you about doing this test? Choose the answer that is closer to what you think.
   A. Not interested at all, it was a difficult task to do
   B. Not really interested, it a difficult but possible task to do
   C. Not interested, this task was quite easy
   D. Not interested at all, this task was really easy.

In the next step, an experiment was constructed for the extended investigation the factors affecting this hypothesis. SPSS analysis was used to generate a correct plan of the highest factors affecting spreadsheets in relation to how many errors participants detected in total. The elements in this step were formed and analyzed by using the SPSS.

The equation that includes factors affecting spreadsheets in relation to the errors detected and will be used to analyze the results is this:

\[
\text{Total Errors} = \beta_0 + \beta_1 \text{Gndr} + \beta_2 \text{Age} + \beta_3 \text{Credits} + \beta_4 \text{Gpa} + \beta_5 \text{Prog} + \beta_6 \text{YrSS} + \beta_7 \text{YrEx} + \beta_8 \text{User} + \beta_9 \text{Conf}
\]

These variables of the linear regression model are divided into dependent variables, which in our case is the number of errors detected by two groups of students who participated in the research. And also the independent variables
including in how they define themselves such as: "novice," "apprentice," "intermediate," "advanced," and "expert" and their confidence in the accuracy of the models that they create themselves, such as “not confident at all”, “little confident”, “confident” and finally “very confident”.

The table given below will help us to come to conclusions through SPSS analysis that will lead to statistical results based on the responses of the two groups of the educational institutions of Kavala and Komotini.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Expected sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Errors</td>
<td>percentage of the total errors</td>
<td></td>
</tr>
<tr>
<td>1. Gender</td>
<td>1= male, 0= female</td>
<td>$\beta=0$</td>
</tr>
<tr>
<td>2. Age</td>
<td>In years</td>
<td>+</td>
</tr>
<tr>
<td>3. Courses (passed)</td>
<td>Total courses per semester</td>
<td>+</td>
</tr>
<tr>
<td>4. Average grade</td>
<td>Total average (since the begging)</td>
<td>+</td>
</tr>
<tr>
<td>5. PC lectures</td>
<td>Total lectures attended in life</td>
<td>+</td>
</tr>
<tr>
<td>6. Spreadsheets</td>
<td>Overall experience in spreadsheets</td>
<td>+</td>
</tr>
<tr>
<td>7. Excel</td>
<td>Overall experience on Excel</td>
<td>+</td>
</tr>
<tr>
<td>8. Personal assess</td>
<td>1= “novice”,...,5= “expert”</td>
<td>+</td>
</tr>
<tr>
<td>9. Confidence</td>
<td>1= “none at all”...,4=“extremely confident”</td>
<td>+</td>
</tr>
</tbody>
</table>

4 RESULTS OF THE RESEARCH

4.1 Department of Social Administration of Dimokritio University

In SPSS analysis we used the linear regression to interpret a good plan to identify the nature of the relationship between variables affecting spreadsheets in relation to the total errors students found in the model given. As dependent variable we set the total errors and as independent variables the factors that affect the spreadsheet (as the following analysis shows).

In the first phase according to the sample of 20 students from Social Administration in Komotini, the following statistical tables came up for analysis.

First of all we need to produce the predicted values. We go to the SPSS menu click: Analyze> Regression> Linear and place the variables.
### Regression Statistics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple R</td>
<td>0.935</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.875</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.762</td>
</tr>
<tr>
<td>Standard Error</td>
<td>0.870</td>
</tr>
</tbody>
</table>

### ANOVA

<table>
<thead>
<tr>
<th></th>
<th>df</th>
<th>ss</th>
<th>MS</th>
<th>f</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>9</td>
<td>1.657</td>
<td>17.619</td>
<td>0.501</td>
</tr>
<tr>
<td>Residual</td>
<td>10</td>
<td>2.376</td>
<td>35.198</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>4.033</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t Statistic</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.623</td>
<td>0.456</td>
<td>3.394</td>
<td>0.005</td>
</tr>
<tr>
<td>Gndr</td>
<td>0.044</td>
<td>0.098</td>
<td>0.542</td>
<td>0.600</td>
</tr>
<tr>
<td>Age</td>
<td>0.009</td>
<td>0.004</td>
<td>4.176</td>
<td>0.012</td>
</tr>
<tr>
<td>Credits</td>
<td>0.017</td>
<td>0.019</td>
<td>0.898</td>
<td>0.390</td>
</tr>
<tr>
<td>GPA</td>
<td>0.004</td>
<td>0.021</td>
<td>0.321</td>
<td>0.755</td>
</tr>
<tr>
<td>Prog</td>
<td>0.047</td>
<td>0.003</td>
<td>2.177</td>
<td>0.155</td>
</tr>
<tr>
<td>YrSS</td>
<td>0.012</td>
<td>0.007</td>
<td>1.881</td>
<td>0.089</td>
</tr>
<tr>
<td>YrEx</td>
<td>0.014</td>
<td>0.016</td>
<td>0.492</td>
<td>0.633</td>
</tr>
<tr>
<td>User</td>
<td>0.066</td>
<td>0.051</td>
<td>0.329</td>
<td>0.169</td>
</tr>
<tr>
<td>Conf</td>
<td>0.123</td>
<td>0.052</td>
<td>0.912</td>
<td>0.383</td>
</tr>
</tbody>
</table>

The table shows that the P Value compared with age as well as how many years using spreadsheet is <0.05. This means that these variables are important in our hypothesis and they affect the dependent variable which is the total errors found. Some of the participants that were younger and with less experience than the others found fewer errors. Those are the two important factors affecting the ability to detect errors in worksheets, the other variable have the sig bigger than 0.05 and appear to play no important role in finding errors in worksheets. The sample is sufficient for research.
4.2 Department of Business Administration of TEI Kavalas

In the second phase according to the study that took place in a sample of 70 students collected in Business Administration of TEI Kavalas we obtained the following statistical tables. We will analyse the data with SPSS using linear regression. The outcomes of this analysis are the following tables:

<table>
<thead>
<tr>
<th>Regression Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple R</td>
</tr>
<tr>
<td>R²</td>
</tr>
<tr>
<td>Adjusted R²</td>
</tr>
<tr>
<td>Standard Error</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ANOVA</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>9</td>
<td>1.819</td>
<td>202.172</td>
<td>2.044</td>
</tr>
<tr>
<td>Residual</td>
<td>60</td>
<td>5.934</td>
<td>98.905</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>69</td>
<td>7.7753</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t Statistic</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.951</td>
<td>22.064</td>
<td>0.411</td>
</tr>
<tr>
<td>Gndr</td>
<td>0.065</td>
<td>2.258</td>
<td>0.560</td>
</tr>
<tr>
<td>Age</td>
<td>0.158</td>
<td>0.630</td>
<td>1.329</td>
</tr>
<tr>
<td>Credits</td>
<td>-0.039</td>
<td>0.019</td>
<td>0.323</td>
</tr>
<tr>
<td>GPA</td>
<td>0.092</td>
<td>0.252</td>
<td>0.786</td>
</tr>
<tr>
<td>Prog</td>
<td>0.095</td>
<td>1.936</td>
<td>0.817</td>
</tr>
<tr>
<td>YrSS</td>
<td>-0.019</td>
<td>0.574</td>
<td>-0.146</td>
</tr>
<tr>
<td>YrEx</td>
<td>0.011</td>
<td>0.683</td>
<td>0.081</td>
</tr>
<tr>
<td>User</td>
<td>0.461</td>
<td>0.634</td>
<td>4.002</td>
</tr>
<tr>
<td>Conf</td>
<td>0.004</td>
<td>2.268</td>
<td>0.030</td>
</tr>
</tbody>
</table>

According to the results of the research in Kavala the P Value in almost all variables is P > 0.05. The sample is sufficient for research. Compared to the results from the survey conducted in Komotini factors affecting the ability to detect errors in spreadsheets are not the age and the years of using spreadsheets but how they assess herself as users of spreadsheets. The P Value = 0 that means that sig = 0. Our results indicate that students that they valued themselves as beginners on detecting errors found fewer errors than students who have more confidence on themselves and found more errors. A conclusion that came up from the study and influenced the
determination of errors in spreadsheets is that those who assessed themselves as a novice found fewer errors than the errors that would normally detect. Comparing the results from both surveys we can see that the results are quite similar apart from some small differences.

### 4.3 Both Institutes

At this stage a statistical analysis will be conducted based on both surveys’ results. The reason for which statistical analysis is been conducted with the results from both institutions together is to identify any similarities and differences in the factors affecting the ability to detect errors in spreadsheets.

<table>
<thead>
<tr>
<th>Regression Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple R 0.204</td>
</tr>
<tr>
<td>R² 0.042</td>
</tr>
<tr>
<td>Adjusted R² 0.166</td>
</tr>
<tr>
<td>Standard Error 11.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ANOVA</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>9</td>
<td>18.6199</td>
<td>125.738</td>
<td>0.386</td>
</tr>
<tr>
<td>Residual</td>
<td>80</td>
<td>50,934</td>
<td>48,594</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>89</td>
<td>10.496</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t Statistic</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>1.456</td>
<td>0.644</td>
<td>0.522</td>
</tr>
<tr>
<td>Gndr</td>
<td>0.045</td>
<td>0.391</td>
<td>0.697</td>
</tr>
<tr>
<td>Age</td>
<td>0.106</td>
<td>0.934</td>
<td>0.353</td>
</tr>
<tr>
<td>Credits</td>
<td>-0.039</td>
<td>-0.333</td>
<td>0.740</td>
</tr>
<tr>
<td>GPA</td>
<td>0.058</td>
<td>0.486</td>
<td>0.628</td>
</tr>
<tr>
<td>Prog</td>
<td>0.015</td>
<td>0.126</td>
<td>0.900</td>
</tr>
<tr>
<td>YrSS</td>
<td>-0.022</td>
<td>-0.187</td>
<td>0.852</td>
</tr>
<tr>
<td>YrEx</td>
<td>0.050</td>
<td>0.452</td>
<td>0.653</td>
</tr>
</tbody>
</table>

Comparing the results of both surveys carried out with those of other surveys mentioned in our article we can see there are some differences and similarities in the factors affecting the ability of errors detection in spread sheets. In our search the factors that affect the dependent variable, which is the total errors found is the pc
lectures students have attended (successfully) while correspondingly important in our survey are the number of lectures (in general) that students have successfully attended, and also played how they assessed themselves as spreadsheet users. Also a common thing to researches is the age. Both studies concluded that the coming age plays an important role in determining errors in spreadsheets. In both surveys the conclusion about age is that it plays an important role in the ability to detect errors.

5 CONCLUSIONS

The rapid development of information systems in recent decades has led to significant developments in the electronic transaction processing systems and therefor more complicated spreadsheet models. But along with technological development in these systems, the necessity for deeper understanding from accountants, auditors, and users have grown also, so it would be possible to identify immediately and evaluate potential weaknesses in a systems that are likely to lead to errors or irregularities (Nickolaou A., 1999).

Overall, the researches that have been done so far in the development of spreadsheets, show a particular image. Every study that has attempted to measure errors, have found many of them, which is unacceptable for any business because even one mistake could have very big consequences on them. However, these error rates are common rates that are found in other human activities also (Panko, 2008).

Despite the researches and their results, developers and companies themselves are in a state of denial. They do not apply regular checks to reduce the errors. A senior officer of a company probably agreed with the results, saying that numerical errors rates are high but a regular check would be simply impractical. In other words, he said that the company should continue to base critical decisions in bad numbers (Panko, 2008).

A major obstacle to the implementation of standards is that few developers have as their primary objective the development of spreadsheets in their work. Finally, because the development of spreadsheets is very complex, the implementation of policies should be left to individual department managers and after that all departments should cooperate to establish their own appropriate application.
While organizations as one, have to identify their interests and enforce as better as possible standards regulations for checking the models (Panko, 1988).

6 REFERENCES

6.1 Foreign References


6.2 Greek References
3. Sarris I., Introduction and basic principles of programming.

6.3 Web References
www.coda.com
www.thehacketgroup.com
www.cfo.com