

## An Auditing Approach for ERP Systems Examining Human Factors that Influence ERP User Satisfaction

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*This paper tries to connect the successful implementation and operation of the ERP (Enterprise Resource Planning) information systems with people and their characteristics through a pilot survey. It examines the human factors that influence ERP user satisfaction. The presented survey tests 14 hypotheses and is based on the model developed by Zviran, Pliskin & Levin [21]. An additional factor has been added to the specified model, the self-efficacy factor analyzed by Bandura [1]. The results are based on 250 ERP users that responded to the survey. The key findings that were revealed by data analysis were that none of the human socio-demographic characteristics do influence ERP user satisfaction. Additionally it was found that perceived usefulness and self-efficacy are the key directors of the ERP user satisfaction. Moreover suggestions are given about how the companies should handle ERP usage in order to develop the prerequisites for increasing user satisfaction and productivity accordingly.*

**Keywords:** ERP Audit, User Satisfaction, Perceived Usefulness

### 1 Introduction

This paper tries to connect the successful implementation and operation of the ERP (Enterprise Resource Planning) information systems with people and their characteristics. It examines the human factors that influence ERP user satisfaction

From the literature review it can be seen the importance of the ERP systems for the companies that want to gain competitive advantage. Researchers have found that ERP user satisfaction is connected with their productivity. The high productivity of the employees gives to the company competitive advantage and increases the human capital. If the high investments on ERP systems will also be taken into consideration, it derives that it is very important to understand the human factors that influence ERP user satisfaction.

The model that will be followed in the current paper is the one analyzed by Zviran, Pliskin & Levin [21] as it doesn't only measure user satisfaction, but also tries to find the reason of the possible difference of use satisfaction between groups of users with different characteristics. The self-efficacy factor will also be added, as from the literature review derives that the specific characteristic has impact on computer use. The literature

review provides convincing evidence that measuring user satisfaction is worth researching as it leads to useful conclusions about how to obtain competitive advantage. Identifying factors that influence ERP user satisfaction is important because knowledge of these influences may help managers to structure successful training and implementation strategies aimed at enhancing user satisfaction.

The key objective of the fieldwork is to understand which factors affect more ERP user satisfaction. Apart from that, a significant objective is to validate the proposed framework model. Finally, the impact of self-efficacy will be measured and analyzed.

### 2 Research model

The proposed framework model is the one presented in figure 1.

The research model consists of the 13 factors and the 14 hypotheses. This is an extended model from the one that was followed by Zviran, Pliskin & Levin [21] with the additional component of self-efficacy. Below all the factors will be analyzed.

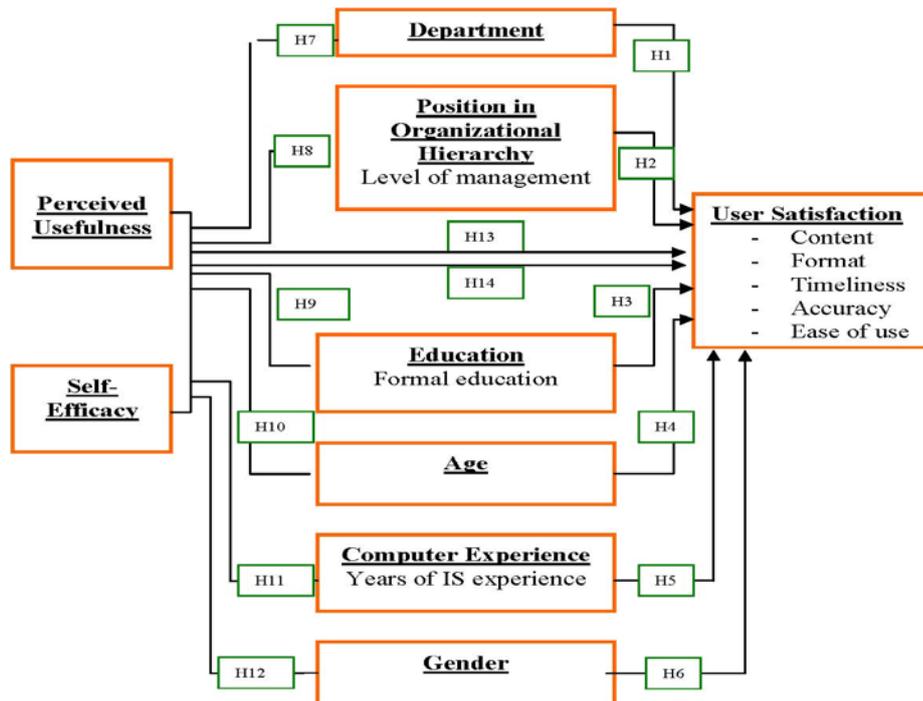


Fig. 1. Research Model and Hypothesis

**2.1 User Characteristics**

As mentioned before, six of the factors refer to specific socio-demographic user characteristics. These characteristics analytically are the following:

*Department:* The functional department where the user belongs. Several studies have found significant differences between different user groups in terms of user satisfaction ([17], [18], [19]). Thus, the first hypothesis (H1) that is made is that there is a relationship between ERP user satisfaction and ERP users that belong to different functional departments.

*Position in organizational hierarchy:* This user characteristic has to do with the responsibilities that an ERP user has in an organization. According to this characteristic, some studies show that there is no relation between ERP user satisfaction and his/her position in the organizational hierarchy ([8], [10]). Other studies show that such a relation exists ([12], [11]). The second hypothesis (H2) is that there is a relationship between ERP user satisfaction and the position in the organizational hierarchy (the responsibilities in his/her position).

*Education:* Several studies show that there exists a relationship between the user satisfaction and the educational level of the ERP user ([15], [8], [11]). The third hypothesis (H3) is that there is a relationship between ERP user satisfaction and his/her educational level.

*Age:* Studies have shown that a relationship be-

tween the user satisfaction and his/her age also exists. Younger users are more satisfied than older ([15], [8], [11]). Thus, the fourth hypothesis (H4) is that there is a relationship between ERP user satisfaction and the ERP user's age.

*Computer experience:* according to the user's computer experience, the studies have shown that there is a relationship between user satisfaction and computer experience. More experienced users are more satisfied than less experienced ([15], [8], [11]). The fifth hypothesis (H5) is that there is a relationship between ERP users' satisfaction and their computer experience.

*Gender:* it is believed that there are differences between user satisfaction and the user's gender ([15], [8]). Thus, the sixth hypothesis (H6) is that there is a relationship between ERP users' satisfaction and their gender.

**2.2 User satisfaction**

The factors that will be measured in order to show the level of user satisfaction according to Doll & Torkzadeh [6] are the content, accuracy, format, ease of use and the timeliness.

Past research has demonstrated instrument validity (content validity, construct validity), and reliability as well as internal validity ([5], [4], [14]). Thus, if ERP users believe that the content is satisfactory, the data of the ERP are accurate, the format is like what they want, the ERP system is easy to use and if they can take output in time, then they are satisfied with the ERP system.

### 2.3 Perceived Usefulness

Perceived usefulness is defined by Davis [3] as “the degree to which a person believes that using a particular system would enhance his or her job performance”. Igbaria [9]; have concluded that perceived usefulness affects user satisfaction and is affected by system quality, information quality, and benefits to individuals, organizations and society. Davis [3] found significant positive correlation between perceived usefulness and the predicted future use of the technology, within the context of his Technology Acceptance Model (TAM) that is presented in Figure 2. The per-

ceived usefulness has direct and indirect impact on user satisfaction. The direct impact that will be examined is the hypothesis 13 shown in figure 1. Thus, the hypothesis (H13) is that there exists a relationship between the perceived usefulness of an ERP system and user satisfaction (possibly there is a positive effect of perceived usefulness on user satisfaction). The perceived usefulness will consist of factors that have to do with the actual use of the ERP system, the actual use of the reports provided, the actual need for data correction and the actual usefulness of the report’s format.

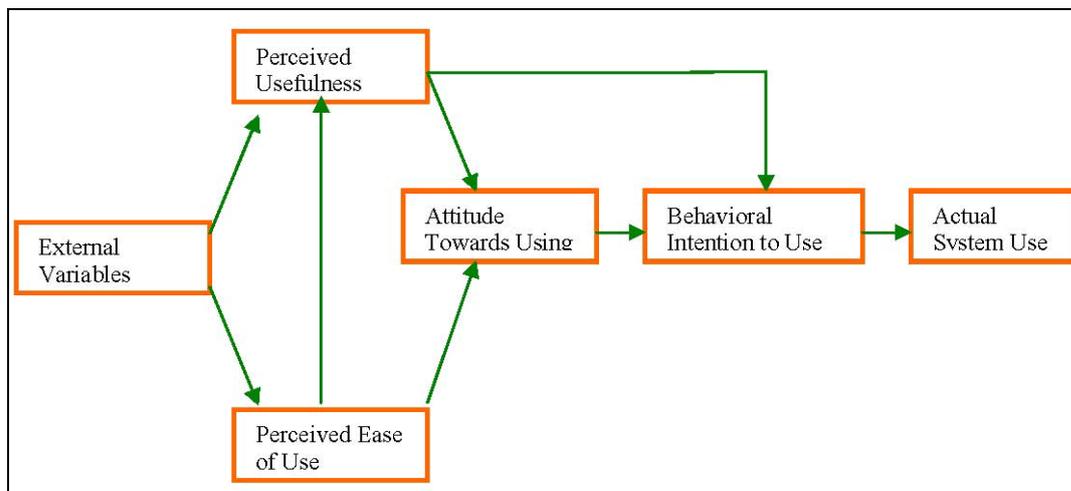


Fig. 2. Technology Acceptance Model (TAM)

### 2.4 Self-Efficacy

The additional characteristic that will be examined is the self-Efficacy. As mentioned in the literature review, the relation between user satisfaction and self-efficacy was subject of research from Collins, Caputi, Rawstorne, Jayasuriya, [2]. The 14th hypothesis is that there exists a relationship between user’s self-efficacy and user satisfaction (possibly there is a positive effect of self-efficacy on user satisfaction).

The self-efficacy will consist of factors that have to do with the confidence of the ERP users about the use of the system, understanding the terms relating to the ERP system, the troubleshooting of problems and the fulfilling of the arising requests.

### 2.5 Other influences

Except from the direct impacts of the eight different factors on user satisfaction, there also exists an indirect impact of the perceived usefulness and self-efficacy that together with the user socio-demographic characteristics influence user satisfaction. For example, Gallagher [7] showed

that there exists a relation between perceived usefulness and users with different position in the organizational hierarchy. Furthermore, several studies have found significant differences between different user groups from different departments in terms of the perceived usefulness Igbaria, [9]. Thus, the hypotheses H7 to H12 are that there exists a relationship between the department that an ERP user belongs to, the position on the organizational hierarchy, the educational level, the age, the computer experience and the gender on the self-efficacy and perceived usefulness in terms of user satisfaction.

## 3 Research Design and Methodology

In this section the research design and methodology of the survey will be presented. The main aim of the current survey is to find out if and which factors affect ERP user satisfaction.

### 3.1 The Methodology

The survey method was used in the current paper. The survey method does not involve direct observation by a researcher. Inferences about beha-

avior are made from data collected via interviews or questionnaires. The strengths of this method are that surveys are particularly useful when researchers are interested in collecting data on aspects of behaviors that are difficult to observe directly (ERP user satisfaction in the current case). Some limitations also exist in the survey research method. The major limitation is that it relies on a self-report method of data collection. In some cases there exist inaccuracies in the data because of misunderstanding of the question or other reasons. In the current survey standardized data collection instruments (questionnaires) were sent to ERP users.

Users completed the questionnaire by choosing the rate of influence of every factor on a five-point scale (intensity questions). This way of answering the questions was kept for every part of the questionnaire (except from the first part that includes the personal data) in order to be simplest for answering it. The responders were asked to answer the questions by choosing one of the five degrees of feeling about a statement from strong approval to strong disapproval. Additionally, some of the questions were demographic in order to develop a picture for the personal characteristics of the participant.

### 3.2 The target group

In total, the questionnaire was sent to 300 employees from five different companies that use ERP as their main information system (mainly SAP or Oracle Financials). The main criterion in order to send the questionnaire was that the recipient was an ERP user. In this way there were not questionnaires that sent back without having been answered at all.

### 3.3 Contact with the target group

This study utilized the mail questionnaire survey. Thus, the final submission took place by e-mail. It was preferred to send an e-mail with the attached questionnaire to every person separately and not a mass e-mail. This type of contact would make the person to take the task more "personally" and therefore increase the response rate.

After the final submission, there was also another contact either by phone or face-to-face, in order to explain the scope of the research and the importance of everyone's response. The reason for sending questionnaires to more than one company was to attempt to obtain responses from multiple users of the ERP systems (Yap, Soh & Raman, [19]). A thank letter was sent to the responders that had sent the completed question-

naire to the authors.

### 3.4 Questionnaire design

The questionnaire, derived from the findings of the literature review, was divided to two general sections. The second section is sub-divided to three more detailed sections. Thus:

- Group 1: General personal information. This section includes some demographic questions in order to reach information about the responder's profile.
- Group 2: Information about the ERP system and its use.

Information about what an ERP user gets from the information system that he/she uses. This section will give evidence about the ERP user satisfaction.

- a. Information about personal characteristics and the use of the ERP system. In this section, the self-efficacy human characteristic is examined.
- b. Information about the expectations versus actual advantages from the use of the ERP system. This last section gives information about perceived usefulness.

## 4 Research Results & Analysis

In the current section, the results of the statistical analysis will be presented.

### 4.1 The data preparation

From the 300 questionnaires that were sent to the ERP users, a total of 250 people returned it completed.

From the questionnaires that reached the authors either by e-mail or by fax, there were not any incomplete ones. From the 250 completed questionnaires, the 53 percent were returned from the Intracom Holdings group of companies and the 47 percent from other companies (like ELTA Hellenic Post, Germanos Group of Companies, AMY) that also use an ERP information system.

As the questionnaire did not contain unstructured answers, it was easy enough to code the answers. The coded answers were stored into an Excel file, in order to be ready for input in the SPSS for further statistical analysis. After the data input to the SPSS some variables were added, in order for the data to be ready for analysis. Most of the questions could be answered through a positive formulated scale.

Below it will be presenting the analysis of the data through SPSS and Microsoft Excel.

## 4.2 Descriptive Statistics

Firstly, the socio-demographic data will be examined. The gender distribution was 55,4% males and 44,6% females. The age distribution was as follows: 21,7% between 20-30 years old, 50% between 30-40, 26,1% between 40-50 and 2,2% more than 50. The last scale (“more than 50”) represents only the 2.2 percent of the sample, thus a new variable was created, named “New Age” in which the two last scales (between 40-50 and the more than 50) became one, named “More than 40”.

As far as the educational level of the recipients regards, 19.6% have not university/bachelor degree, 48.9% have a university/bachelor degree and 31.5% have a master or higher degree.

The position characteristic, from the data analysis showed that 33.7% hold a responsible (supervisory) position in the company that they are employed and 66.3% do not. The user characteristic that refers to the working computer experience (named “PC Experience” in the current analysis), showed that 2.2% have 2-5 years of working experience on computers, 27.2% 5-10 years and 70.7% have more than 10 years.

Most of the participants belong to the administrative departments. Thus, 8,7% belong to the sales departments, 50% to the administrative departments, 8.7% to logistics departments, 2.2% to production departments and 30.4% to other departments (including the HR department).

Some additional questions were asked in order to

gain a better understanding about the profile of the sample of the current survey. Thus, users were asked to answer about the ERP information system they are using and about the time of working on ERP information systems.

From their answers it derived that the participants mainly use the SAP ERP information system in the current sample 79.3% use SAP, 15.2% use Oracle Financials and 5.4% use other ERPs.

The answers from the second of the additional questions showed that 119.6% have less than two years of working experience in using ERP information systems, 30.4% have 2-5 years of experience, 41.3% have 5-8 years of experience and 2.2% have 2-5 years of working experience on computers, 27.2% 5-10 years and 70.7% have more than 10 years of experience and 8.7% have more than 8 years of ERP working experience. This variable was also shortened in order to include statistical important samples and became as follows:

## 4.3 Analysis of the Self-Efficacy factor

The next factor that will be examined is the third group of questions that included four questions referring to the new factor that was added to the model of Zviran, Pliskin & Levin [21], the self efficacy factor. In order to examine this factor, there was created a new variable, named “Mean\_SelfEfficacy”. This new variable is the mean of the score of the four variables. This variable was examined for its reliability through the reliability analysis.

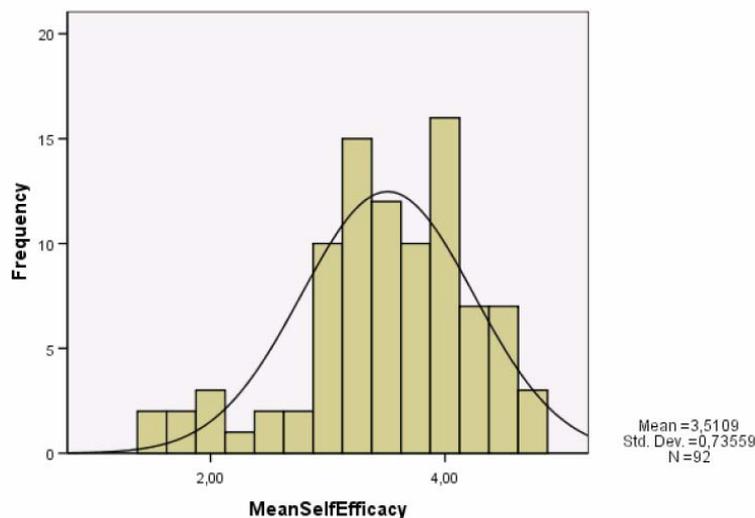


Fig. 3. Distribution of the values of the new variable Mean\_SelfEfficacy

The Cronbach’s Alpha measures how well a set of items measure a single one-dimensional latent construct. When data have a multidimensional structure, Cronbach’s Alpha will usually be low.

In addition to this, Cronbach’s Alpha measures the internal consistency of items in a scale. Alpha equals zero when the true score is not measured at all and there is only an error component. Alpha

equals 1.0 when all items measure only true score and there is no error component. In the specific variable, the value of 0.845 is high enough. A reliability coefficient of 0.60 or higher is considered “acceptable” in most Social Science research situations. Therefore, the instrument is considered stable and should provide consistent and error-free results.

The histogram in Figure 3 shows the distribution of the values of the new variable. Most of the participants 51% scored between 3-4 to the questions about their self-efficacy.

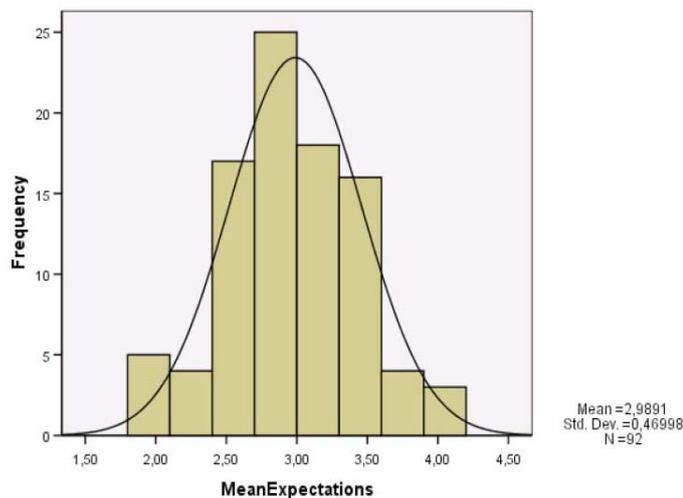


Fig. 4. Distribution of the values of the variable MeanExpectaions

The 49% of the participants scored between 3 to 4 to the questions about their perceived usefulness (their expectations about the ERP system versus what they get).

**4.4 Analysis of the Perceived Usefulness**

The perceived usefulness factor was examined through six questions. The mean of score of these six questions was calculated in order to be further examined.

The reliability analysis of this set of items shows a score of 0,642 that could also provide consistent results. Thus, the new variable of the Perceived Usefulness mean will be used for the analysis. The distribution of the values of the new variable is presented in figure 4.

**4.5 Analysis of User Satisfaction**

The descriptive statistics for the 11 user satisfaction items in the questionnaire are contained in table 1.

Table 1. Descriptive Statistics of the User Satisfaction items

	N	Mean	Std. Deviation
Friendliness	250	3,47	0,845
Up-to-date	250	3,92	0,929
Accuracy	250	4,15	0,825
Sufficient	250	3,91	0,910
Timeliness	250	3,77	0,786
Format	250	3,43	0,929
Support	250	3,66	1,009
Change	250	2,92	0,929
Valuable	250	3,35	0,977
Choose again	250	4,08	1,051
Job Satisfaction	250	3,79	0,638

From the 11 items, the first 6 items were adopted from the Doll & Torkzadeh [6] model. The next 4 items (1.6 to 1.10) were added in order to get additional information about the ERP user satisfaction, and the last item (1.11) refers to job satisfac-

tion and not ERP user satisfaction for comparing this item with user satisfaction and gain useful conclusions about job satisfaction in general. From Table 1 it could be seen that the “Friendliness” and “Choose again” items have the higher

Means (most positive answers). Analytically, the scores of the participants for the questions about their ERP satisfaction were:

The 40% of the users answered that the ERP system is almost “Excellent” (value 4 of the five point scale) according to the user friendliness/ easy to use characteristic.

Regarding to the up-to-date information characteristic of the ERP system the 36% answered that the information is almost up-to-date (value 4) and the 32% that the information is absolutely up-to-date.

Again the 47% of the responders answered that the ERP system is almost “excellent” accurate (value 4). The 37% answered that it gives absolutely “excellent” accurate information which is a high score.

The information that the ERP provides is almost sufficient according to the 48% of the participants’ opinion. The 26% said that the information is “excellent” in sufficiency, which is again a high score.

The 51% of the users said that they almost get the information they need in time.

Additionally, the 43% answered that the format of the reports that they get from the ERP system is almost exactly what they need.

As far as the support that they have, the 40% answered that they have almost excellent support. In the question about how easy it is to change the functions of the ERP system according to the ERP user’s requirements, most participants (the 43%) said that it is “so and so” easy. This was the characteristic that scored the lowest from all the

others that have to do with user satisfaction.

The 40% of the participants feel almost “excellent” valuable for their company by using the ERP system.

The “Choose again” characteristic that refers to the question if the participants would choose to work with an ERP system in the future again than working with a non-ERP system reached a very high score. The 44% answered that they would absolutely choose an ERP system again.

For the last variant, job satisfaction, the answers showed that the 59% of the participants said that they are almost “excellent” satisfied with their job.

From the factor analysis that took place to investigate the structure of the user satisfaction scale, no theoretically interpretable factors about the components could arise, therefore, the author made a trial to develop three groups that better represent the different dimensions of the user satisfaction in the specified questionnaire. The first group contains the items: Friendliness, Up-to-date, Accuracy, Sufficiency, Timeliness and Format (the items that adopted from Doll & Torkzadeh (1998) instrument will be analyzed together in the current survey). In order to confirm the consistency of this set of items, the reliability analysis took place:

The Cronbach’s Alpha value in the specific case is  $0,711 > 0,6$ . Thus, this set of items could give reliable results. A new variant (named “UserSatisfaction1”, basic features) was created, that is the mean of the six items (figure 5).

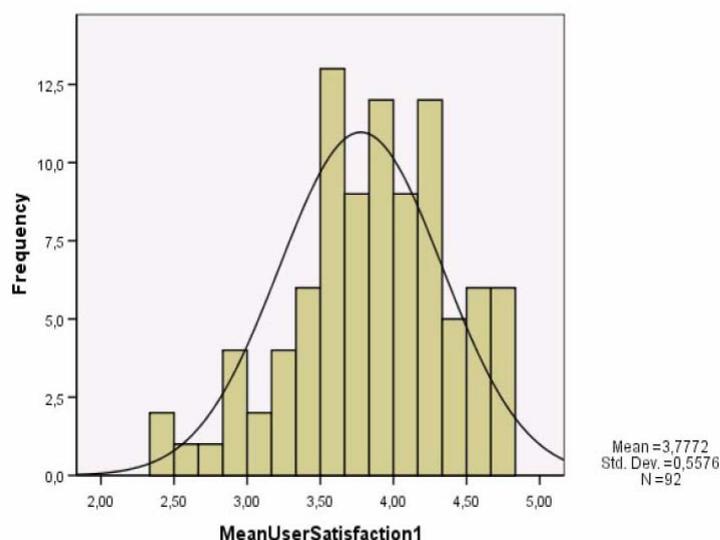


Fig. 5. Distribution of the values of the variable MeanUserSatisfaction1

The second set of items contains the Support, Change, Valuable and Choose again items. This

second group contains the additional items that were added to the Doll & Torkzadeh [6] instru-

ment for analyzing user satisfaction (except from the “Job Satisfaction” item). The reliability analysis gave a: The Cronbach’s Alpha value is 0.699 which is greater than 0.6 which means that

this set will also give consistent results. The distribution of the values from this second variable (named "User Satisfaction 2", Upper Level Features) could be seen in figure 6.

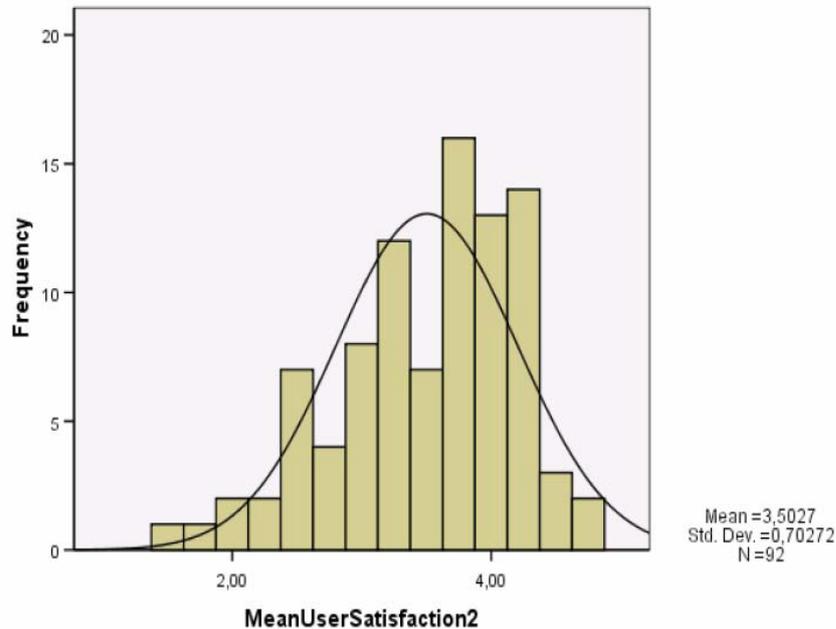


Fig. 6. Distribution of the values of the variable MeanUserSatisfaction2

The item “Job Satisfaction” could be analyzed separately (and it doesn’t need reliability analysis), as it refers generally to the job satisfaction and not to the ERP User satisfaction.

**4.6 Data Evaluation**

In this section, the relationship between the different factors will be examined. Specifically, the relationship between the socio-demographic characteristics and the three variables that indicate user satisfaction will be analyzed through the One Way ANOVA method. Additionally, it will be examined the relationship between the socio-demographic characteristics and self-efficacy and perceived usefulness. A One-Way-ANOVA analysis allows someone to test whether several means (for different conditions or groups) are equal across one variable. Below, it will be examined the relationship between the different socio-demographic characteristics and user satisfaction (the three different dimensions that were developed).

Analysis showed that the only significant socio-demographic characteristic that affects the mean of the factor User Satisfaction 1 (mean of “Friendliness”, “Up-to-date”, “Accuracy”, “Sufficiency”, “Timeliness” and “Format” characteristics) is the time of computer working experience on  $p < 0.05$ . This means that the specific

characteristic will be further analyzed.

The characteristic of education affects the mean of User Satisfaction 2 (that includes the “Support” factor, “Change”, Valuable” and “Choose again”) on  $p < 0.01$ .

One-Way-ANOVA analysis does not give any significant results about the relationship between the user socio-demographic characteristics and job satisfaction item.

To conclude, the One-Way-ANOVA analysis resulted in two specific characteristics which are significant predictors of user satisfaction, the computer working experience and the educational level of the ERP user. These characteristics will be further analyzed. Thus, at this phase, hypotheses H3, H5 are accepted but hypotheses H1, H2, H4, and H6 are rejected (the hypotheses are presented in Figure 1).

In order to test hypotheses 7 to 12 which support that there exists an indirect impact of the perceived usefulness and self-efficacy together with user characteristics on user satisfaction, One-Way-ANOVA analysis took place.

The results do not gave any significant statistical result. The P-ratio for the self-efficacy factor and the perceived usefulness is greater than 0.05. The only ratio, which shows that there may exists a relationship, is the ERP system factor that seems to influence the perceived usefulness. None the

less, SAP users hold the 80% of the overall users in the current survey, thus there cannot derive significant statistical result with this profile of the sample. The conclusion is that the human socio-demographic characteristics that are analyzed do not influence the perceived usefulness in the current survey, neither the self-efficacy factor that was added in the model in order to be analyzed. Thus, hypotheses 7 to 12 have to be rejected.

In the next step the regression analysis will be applied to test hypotheses 13 & 14. Regression analysis is the estimation of the linear relationship between a dependent and one or more independent variables or covariates (from SPSS Help). In the current survey, the dependent variables are those referring to the user satisfaction. Firstly, the variable "UserSatisfaction1", Basic Features (that is the mean of the group of the variables "Friendliness", "Up-to-date", "Accuracy", "Sufficiency", "Timeliness" and "Format") and the relationship with the mean of the Self-Efficacy and Perceived Usefulness user characteristics will be examined.

The linear regression analysis, shows that there is a strong relation between them on  $p < 0,03$ .

The t-statistics can help for determining the relative importance of each variable. In the specific case, t-values are below -2 and above +2 which show that the regression coefficients for the independent variables (self-efficacy, perceived usefulness) are statistically different from zero (they are important for better predictions).

Another characteristic of the linear regression analysis is the beta value. The beta coefficient shows how strongly the independent variable associated with the dependent variable is. It is equal to the relationship coefficient between 2 variables. The standardized coefficients or betas are an attempt to make the regression coefficients more comparable. In the specific case, beta measures the effect of the predictor variable (self-efficacy, perceived usefulness) on the criterion variable of user satisfaction 1, holding the other predictors constant. The beta value shows a moderate effect size. This degree of relationship would be perceptible to the naked eye of a reasonably sensitive observer.

As it can be seen, both perceived usefulness and self-efficacy are significantly related to user satisfaction 1 providing support to hypothesis 13 and 14.

Regarding the variable User Satisfaction 2 (that is the mean of the "Support", "Change", "Valuable" and "Choose again" indicators) the regression analysis has the following results:

P-Value shows again a strong relationship between the variables. T-statistics and beta values show that both perceived usefulness and self efficacy are significant predictors of satisfaction 2.

Again, the user characteristics of self-efficacy and perceived usefulness, show a significant effect on Job Satisfaction.

To conclude, self efficacy and perceived usefulness affect greatly user satisfaction (all the 11 items) in the current survey. Thus, hypotheses 13 and 14 are accepted. Below, the most statistically important results will be analyzed together through linear regression analysis in order to reach to the final results.

User Satisfaction 1 is influenced the most by the self-efficacy characteristic and Perceived Usefulness and not the working computer experience or the educational level. This conclusion derives from the P-value, the t-statistics and the beta values.

Additionally, the User Satisfaction 2 variable is again influenced the most by the same user characteristics.

At the end, job satisfaction is influenced by the self-efficacy and the perceived usefulness in the same way.

From the final linear regression analysis it derived that the only accepted hypotheses that give statistically important results are the H13 and H14. This relationship has to be examined over and above, in order to reach to a conclusion of what kind of relationship it is (positive or negative). Our analysis showed that as the value of the self-efficacy characteristic increases the value of the user satisfaction 1 – basic features, the value of user satisfaction 2 – upper level features and the value of job satisfaction also increases. This means that self-efficacy and user satisfaction have a positive relationship.

Additionally, our analysis showed that as the value of the perceived usefulness characteristic increases, then the value of the user satisfaction 1 (basic features), the value of user satisfaction 2 (upper level features) and the value of job satisfaction also increases. This also means that the perceived usefulness and user satisfaction have a positive relationship.

Briefly, the only statistical important result that arose from the statistical analysis that took place in the current section is the positive relationship between the perceived usefulness characteristic and user satisfaction and more importantly the positive relationship between the new factor that was added for the current survey, the self-efficacy factor with user satisfaction. No signifi-

cant statistical results were found about the relationship of the various human socio-demographic characteristics with user satisfaction (and job satisfaction accordingly) neither between the socio-demographic characteristics and the perceived usefulness or the self-efficacy.

In the next session these results will be discussed in relation with the hypotheses that were made in the literature review section.

## 5 Discussion of Findings

The aim of this fieldwork is to validate the proposed framework model. This model is the one developed Zviran, Pliskin & Levin [21] in which the self-efficacy factor has been added in order to be analyzed as it strongly affects human functioning. Thus, 14 hypotheses have to be analyzed in the current section. All the hypotheses argue that there exists relationship between user satisfaction and 8 individual factors (6 of them refer to socio-demographic human characteristics and 2 of them refer to psychological characteristics).

The question that was formulated from the beginning is if and which factors affect ERP user satisfaction. Practically, answers to this question could help managers and manager's teams to treat differently the different groups of ERP users (in the Greek environment) and achieve greater success in the implementation and operation of an ERP information system and furthermore add more value to the company that implements it.

### 5.1 Hypothesis formulation

As mentioned in the previous section, only the 2 from the 14 hypotheses were accepted. The other 12 hypotheses were rejected. Below, each hypothesis will be analyzed separately.

*Hypothesis 1:* the first hypothesis is that there is a relationship between ERP user satisfaction and the functional department that the ERP user belongs to. From the literature review it derived that some researchers have found such a relationship but some others have not. Our analysis showed that there does not exist such a relation as the One-Way-ANOVA analysis show that the P-ratio (Significance) is  $0,537 > 0,05$  for the first mean of user satisfaction (user satisfaction 1 – basic features),  $0,306 > 0,05$  for the second mean (user satisfaction 2 – upper level features) and  $0,868 > 0,05$  for the job satisfaction factor. Thus, ERP user satisfaction is not affected from the functional department that the user belongs to in the current survey. Employees from the logistics or administrative departments do not differ regarding their ERP satisfaction. This finding agrees

with the findings of some researchers. Thus, the first hypothesis is rejected.

*Hypothesis 2:* the second hypothesis is that there exists a relationship between ERP user satisfaction and the position in the organizational hierarchy that the ERP user holds (if he/she holds a supervisory position). One-Way-ANOVA shows that the P-ratio is 0,948 for user satisfaction 1, 0,411 for user satisfaction 2 and 0,896 for job satisfaction. These values do not show a significant difference for the user satisfaction between users that hold a responsible position in their company and those that do not hold such a position. This finding also agrees with the findings of some studies. The second hypothesis is also rejected.

*Hypothesis 3:* there is a relationship between ERP user satisfaction and the educational level of the ERP user. As far as the factor of the educational level regards, our pilot study (User satisfaction 1 – basic features) shows that the P-ratio is 0,166. For user satisfaction 2 – upper level features the same ratio is  $0,002 < 0,05$ . Moreover factor of job satisfaction the P-ratio is 0,752. Thus, the One-Way-ANOVA shows that there exist a relation between the educational level of the ERP users and their ERP satisfaction 2 (that includes the factors “Support”, “Change”, “Valuable” and “Choose again”). Even if such a relation exists, the Linear Regression Analysis shows that this relation is not so strong compared with other factors. Thus, it doesn't come up a significant result and this third hypothesis has to be rejected. ERP user satisfaction does not differ to users that belong to different educational levels. Hypothesis 3 disagrees with the findings of some surveys, which argue that there exists such a relationship, but agrees with the results of Zviran, Pliskin & Levin [21].

*Hypothesis 4:* here, it is argued that there exists a relationship between ERP user satisfaction and the ERP user's age. One-Way-ANOVA shows that for user satisfaction 1 – basic features, the P-ratio is 0,833, for user satisfaction 2 is 0,639 and for job satisfaction is 0,352. This fourth hypothesis has also to be rejected and this means that for the current survey no difference in ERP user satisfaction exists when the age of the user differs. This result also comes in contradiction to the literature where it was found that younger users are generally more satisfied than the older users although it agrees with the results of Zviran, Pliskin & Levin [21]. This was an unexpected finding.

*Hypothesis 5:* there is a relationship between ERP user satisfaction and the ERP user's com-

puter working experience. From the same figures it could be seen that for User Satisfaction 1 – Basic Features, the P-ratio is 0,041, which is less than 0,05. This is a figure, which shows that it is the years of user's computer working experience that may affect ERP User Satisfaction 1 (that includes the factors "Friendliness", "Up-to-date", "Accuracy", "Sufficiency", "Timeliness" and "Format"). The same ratio is 0,490 for User Satisfaction 2 and 0,280 for the job satisfaction. A further analysis with the Linear Regression Analysis shows that this relation is not so strong when other, stronger factors take place in the analysis. The fifth hypothesis has also to be rejected: there does not exist a significant relationship between user satisfaction and the years of the ERP user computer working experience in the current survey. The findings regarding the fifth hypothesis do not agree with the literature but agree with the findings of Zviran, Pliskin & Levin [21].

*Hypothesis 6:* there is a relationship between ERP user satisfaction and the ERP user's gender. From the One-Way-ANOVA derives that the P-ratio is 0,297 for user satisfaction 1, 0,491 for user satisfaction 2 and 0,460 for the job satisfaction factor. The sixth hypothesis has also to be rejected, as it didn't derive any significant difference in user's satisfaction between men and women, finding which also comes in contradiction to the literature from previous surveys and agrees with the study of Zviran, Pliskin & Levin [21].

*Hypotheses 7 to 12:* there is an indirect impact of the perceived usefulness and self-efficacy together with user characteristics on user satisfaction. One-Way-ANOVA (Table 10, Table 11) did not give a statistical important result (p-ratio greater than 0,05), thus the hypotheses that perceived usefulness and self-efficacy together with the human socio-demographic characteristics of gender, age, department, computer working experience, education, position in organizational hierarchy do not have impact on user satisfaction 1 – basic features (that include the factors: friendliness, up-to-date, accuracy, sufficiency, timeliness and format), neither on user satisfaction 2 – upper level features (that include the support, change, valuable, and choose again factors). Additionally, no relationship exists between the specified characteristics of the hypotheses 7 to 12 with job satisfaction. The same analysis shows that perceived usefulness and self-efficacy are not affected by the human socio-demographic characteristics analysed in the current survey. Thus, the hypotheses 7 to 12 have to be rejected in the cur-

rent survey. Also these findings do not agree with the literature from previous surveys and agrees with Zviran, Pliskin & Levin [21].

*Hypothesis 13:* is that the perceived usefulness of an ERP system effects user satisfaction. The literature showed a strong relationship between user satisfaction and the perceived usefulness factor. This result was also expected to be found in the current study. From the Linear Regression analysis derived that there exists a positive relationship between perceived usefulness and ERP user satisfaction. This means that the more expectations from their ERP information system ERP users get, even more than they expected, the greater satisfaction they obtain. Or, in other words, users that have more intention to use the ERP system are more satisfied than other users. Thus, hypothesis 13 is accepted.

*Hypothesis 14:* there is a relationship between ERP user satisfaction and the user's self-efficacy. From the literature overview it derived that self-efficacy is a very strong factor that influences human functioning. Thus, it was expected to be an important predictor of ERP user satisfaction in the current study. From the Linear Regression analysis derived that there exists relationship between self-efficacy and ERP user satisfaction and this relationship is positive. This positive relationship shows that as more confident the ERP users feel about the use of the ERP system, as greater satisfaction they obtain. Hypothesis 14 is also accepted.

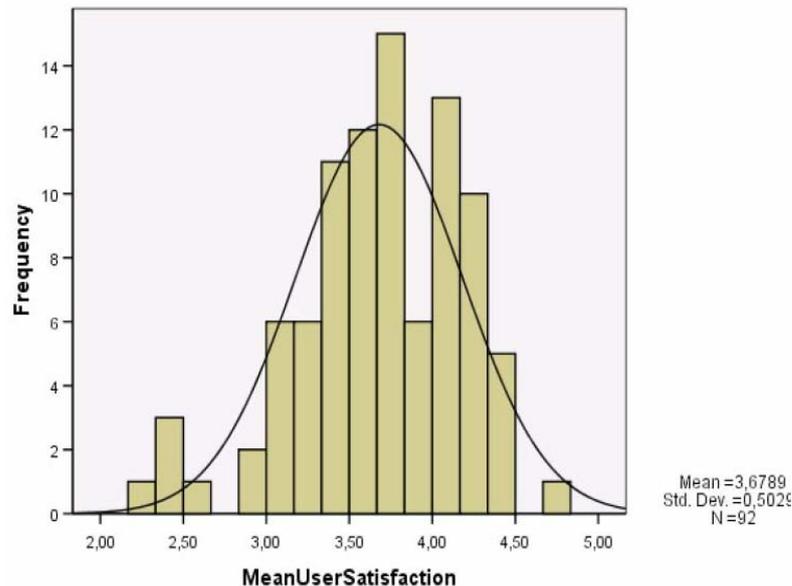
In general, the hypotheses that were accepted in the current survey were H13 and H14. All the other hypotheses (from 1 to 12) were rejected. The socio-demographic characteristics do not give any difference to the ERP user satisfaction. The new characteristic of the self-efficacy that were added to the current survey in the model of Zviran, Pliskin & Levin [21], proved to be a very important factor for ERP user satisfaction.

Some of the findings and particularly those that have to do with the sociodemographic characteristics disagree with the findings of many previous surveys but agree with the findings of Zviran, Pliskin & Levin [21]. Many researchers have found that a relationship exists between specific socio-demographic characteristics and user satisfaction. The current study did not show the same (expected in some cases) results. A reason that may explain these results is that the studies which found differences in ERP user satisfaction between user groups with different sociodemographic characteristics, took place some years ago. Then, for example, women were not familia-

rized with computers and ERP systems. Generally people were not familiarized with high technology and differences between such user groups were expected to be found. The findings of the survey that took place more recently ([21]) agree with the results of the current study. Regarding the psychological factors, it was found that they affect user satisfaction stronger than the socio-demographic characteristics and this is what con-

sultants and managers have to take care on the most. Thus, more attention should be given to the psychological characteristics than the socio-demographics.

Another important issue that came out from the current survey was the high level of the overall ERP user satisfaction. This could also be seen from figure 7. Most of the participants answered that they are satisfied above the mean.



**Fig. 7.** Distribution of the values of the variable MeanUserSatisfaction

This is an important result, in addition to the examination of the hypotheses, which shows that ERP information systems have become not only acceptable from the users but also a way of getting the things done in business environment.

**6 Conclusions and Recommendations**

From the literature review and the data analysis some important conclusions arose. In the discussion section it was analyzed that from the 14 hypotheses that had been done at the beginning, only the 2 of them (13 and 14) were accepted. The other hypotheses were rejected. This conclusion is consistent with the results that arose from the survey made in [21] (except from the self-efficacy factor that were added) and inconsistent with previous studies. An additional important conclusion that arose in the current survey was that the factor of self-efficacy proved to be very important.

The general conclusions that came out from the survey are the following:

Firstly, it came out that the ERP users are generally satisfied with their information system and they prefer to do their job with an ERP system than a non-ERP system. This means that nowa-

days, the IT companies that provide the other organizations with ERP information systems, have to work a lot on developing and improving the quality of the ERP systems in order to make their customers more and more satisfied as the ERP systems are the future for IT companies. Companies invest a lot on ERP systems because they expect that they will have a high return on this investment. Managers expect that a good-implemented ERP information system will give to their companies an important competitive advantage. This is what every company wants to gain.

In order for companies to gain competitive advantage from the ERP system, a very important factor is the good implementation of the ERP and the best use of it as it has a lot of capabilities that have to be utilized. A determinant factor for a successful implementation and use of the ERP system is the human factor. The human capital can give important competitive advantage to companies. User satisfaction increases productivity and contributes to the net benefits of organizations. Thus it is very important to understand the reasons that increase user satisfaction.

These reasons should be taken into consideration

during the implementation phase and during the use of the ERP information system.

In the current survey 14 hypotheses were tested and analyzed (Figure 1). The 13 of them are based on the Zviran, Pliskin & Levin [21] instrument and the 14th that represents the self-efficacy factor was added in order to be analyzed as this factor according to Bandura affects human functioning. From the analysis it derived that the department that the users belongs to, their position in the organizational hierarchy, their educational level, their age, their computer working experience or their gender are not factors which may contribute to the ERP user satisfaction. In the contrary, the perceived usefulness and the self-efficacy factors impact positively on user's satisfaction.

More specifically, regarding the perceived usefulness, users that have more intention to use the ERP systems are those who have more motivations to use it and feel that they are supported when needed. Thus, leadership should think of ways improving user's support in order to make them feel more comfortable with the ERP system, motivate them to use it in a better way, improve the perceived usefulness and finally increase user satisfaction.

A way for improving support may be the existence of a support group inside a company in order to be available any time it is needed; additionally, in company's net, an information centre where user manuals and other useful information may exist. Another way of improving perceived usefulness is by training programs. This would make users know more about the ERP system, how it works and how to overcome difficulties.

As far as the self-efficacy factor regards, more "confident" employees are more satisfied than the less ones. Self-efficacy is positively correlated to performance ([1], [13], [16]). Therefore, the leadership of organizations should take into consideration this factor. It would be very effective if leadership could influence self-efficacy. An attempt to influence self-efficacy can only be made when leadership is aware of its impact on performance and additionally of the efficacy level of each member of organizations. When this knowledge is obtained, managers should be trained on understanding and influencing self-efficacy. On the one hand, this is not an easy task taken into consideration all the high-prioritized responsibilities that the leadership of every organization has. On the other hand, given the direct relationship of self-efficacy, user satisfaction and performance, the importance of self-efficacy

in organizational settings cannot be overlooked.

According to [22], self-efficacy could be built by assigning tasks that will bring success, avoiding situations in which failure is likely, and measuring success by self-improvement versus triumphs over others. This situation may be the desirable one but practically it is difficult to achieve. The potential difficulties when attempting to build the self-efficacy of employees via mastery experience in actual business environment are significant. Human functioning could not be predictable at all and a trial to improve self-efficacy could bring the opposite results. This is because the training programs to the leadership give only general directions for improving self-efficacy and not specific advice. Managers have the responsibility to promote self-efficacy by creating a culture and environment that increases self-confidence and organizes around teamwork. It should be added here that this is the only possible way to increase self-efficacy, as managers cannot force the employees to increase self-efficacy.

In general, user groups with increased perceived usefulness and self-efficacy are becoming more satisfied than the others. Trying to increase the level of these two characteristics to the employees will help companies to increase user satisfaction, productivity and then add value to the company and increase the return on investment. Thus, the main question of the current study "what factors influence ERP user satisfaction" and the main objective "are some groups of users with specific characteristics more satisfied than other groups in Greece" have been answered.

The findings of the current study conducted in the Greek environment are consistent with findings of studies that took place more recently and inconsistent with older studies (mainly referring to the results of the influence of human socio-demographic characteristics to user satisfaction).

As far as the other secondary objectives of the current study concerns, it was achieved to combine the computerized world with the human factor and mainly with human psychological factors in a great way. Managers and IT consultants should take care on employees with lower level of self-efficacy and perceived usefulness. They can support them by offering self-efficacy trainings. Additionally, the tests taken from the applicants in order to be hired to a company should also include questions that refer to these psychological characteristics and applicants with higher level of possess of these characteristics should be preferred.

Thus, some useful results arose from the current

study. Further studies in the field of ERP user satisfaction could enrich the quality of the implementations and add value to the companies that invest a lot on information systems.

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