

# Study on Software Agreement (EULA)

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## ABSTRACT

EULA - End User License Agreement defines the terms and conditions of software usage. Presenting EULA and agreeing to the terms and conditions outlined in EULA are regulatory requirements for software publisher and end user respectively. Prior studies show most users skip or ignore the EULA section of the software installation for variety of reasons and blindly accept and agree EULA. In this paper, we discuss the problems users face when it comes to reading and understanding the terms and conditions in EULA. We aim to present our study that clearly defines the problem statement, identifies the factors that affects the perceived user cognizance and ways to improve these factors and propose solutions that ultimately improves the overall user cognizance of EULA.

## Author Keywords

EULA - End User License Agreement, privacy, informed consent, agree, experiment, user behavior, field experiment, design, malicious, spyware, legal, terms, conditions.

## ACM Classification Keywords

Human Factors; Theory.

## INTRODUCTION

Computing devices are so ubiquitous and have become an integral part of our daily lives. Old school computers sitting at desks, portable sleek laptops, smartphones pushing notifications every minute, wearables people wear them all the time and connected Internet of Things in the living areas are a common place in this ever so becoming sci-fi world of ours. The continuous burgeoning of various form factors of computing devices is primarily fueled by the cutting-edge technology and software that drive millions of these devices. No matter how things have changed from decade old clunky looking software interfaces from Windows 95 to the well-polished looks of apps on retina screened iPhones,

one thing yet remains common, End User License Agreement (EULA) / Software Agreement. The Software Agreement of every software talks about the agreements between a software developer and an end - user. It is an instrument governing the use or redistribution of software. It contains provisions which allocate liability and responsibility between the parties entering the agreement. The agreements contain certain important terms like limitation of liability, disclaimer of warranties, indemnity if the software breaks property rights of others. Reading and understanding EULA is very important to users to avoid grave consequences should they arise. But most users overlook and in most cases skip EULA and “agree” to terms and conditions without understanding them. Users blindly accepting Software Agreements have led to grave consequences including installation of spyware at their own consent. Users not reading Software Agreement have also downloaded wrong software. Users don’t realize how dangerous the problem can be. Hence our study aims at identifying the factors that lead to the problem and measure them and further focuses on different ways to improve upon these identified factors and ultimately enhance user experience and improve the cognizance of EULA. Our research concludes, using between subject’s experiments with different types of EULA (Long, Short (summarized) and Infographic), it is found that Short and Infographic EULA result in improved user observation and understanding the terms and conditions compared to standard EULA (long format). In this following sections, we formulate the research question, review the related works in this area that serves as a base for our research, qualitative research, experimental methodology, statistical data analysis, results and conclusion with scope for further study.

## RESEARCH QUESTION

The research question we are trying to solve here is ‘*What are the factors affecting the user cognizance of EULA (End User License Agreement) and how to measure these factors and the ways to improve the experience and users’ cognizance of EULA*’.

## RELATED WORKS

Ubiquitous EULAs have trained even privacy-concerned users to click on “accept” whenever they face an interception that reminds them of EULA [1]. This behavior thwarts the very intention of informed consent [2]. The long-term effect of well-meant measures goes in the opposite direction: rather than attention and choice, it ends

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up in exhibiting ignorance. This experiment did not alter the overall semantic of the message, but rather tried to simulate the systematic or heuristic path with contextual cues. It played around by modifying the perception of the dialog between a typical EULA which usually coerce users into accepting terms to continue using the software versus a truly voluntary decision to participate, yet the results indicated that people just agree. This study ended up asking for an intuitive interface design and called for more field experiments to complement laboratory studies.

A study titled ‘Noticing Notice’ experimented having different notices before and after software installations in addition to the EULAs stating the presence of spyware in with that installation. This study validated that the use of short summary notices and post installation notices have definite impact on the users knowing what they are getting into [3]. Though having notices helps, a study [4] discovered that regardless of the bundled content in EULA, users will often install an application if they believe the utility is high enough and that the security and privacy become important factors when choosing between two applications with similar functionality. They also noticed that providing vague information in EULAs and short notices created an unwarranted impression of increased security and they suggested to have a standardized format that works well with the users.

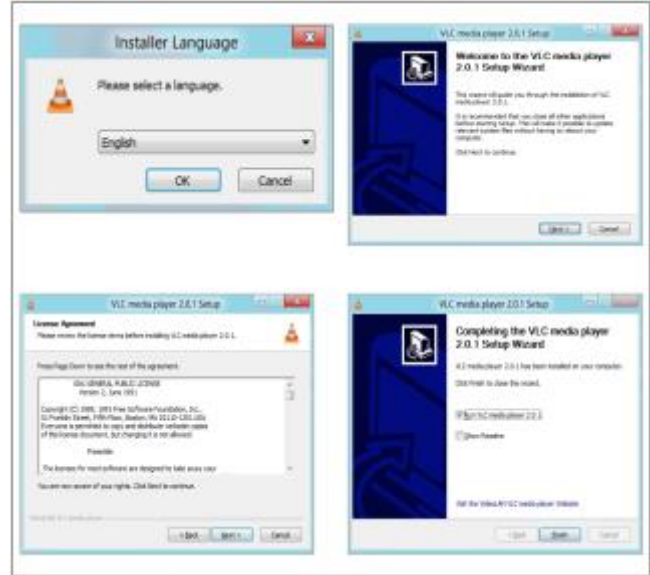
A study [5] further states that human intervention should be consumed economically in security applications and should not be over consumed as that might impose negative externality. These studies gave us the motivation to work towards a standardize intuitive interface with less overloaded data resulting in enough user attention that is required for a good user cognizance. The following sections explains about the factors considered, the hypothesis defined and validated using the experiments.

## QUALITATIVE RESEARCH

In this section, we present our study aiming to understand the usage of software, user behavior and identify relationships and grounded theories from the qualitative research point. The identified theories and results will serve as a base for the following research. Even before the smartphone storm, people have been using software for various purposes ranging from personal computing, education, research, gaming, online activities etc. The usage of software has seen an unprecedented growth ever since the birth of “smart-” era things like smartphone, tablets, IoT, wearable technologies etc.

We performed ethnographic data collection methods to closely observe people’s experience on the software installation process. The main objective or focus was to study people’s experience on the Software Agreement of all software. The setting for this study consists of observing user behavior with respect to downloading and installing the software followed by informal interview about the installation process and EULA. The qualitative research

helped us to observe certain consequences which occur when people blindly accept the Software Agreement. It also helped us to observe certain features which can be incorporated in an EULA to make more people read the Software Agreement. We’ve picked VLC media player since it is widely used for watching media. The installation consisted of following steps as shown in figure 1.



**Figure 1. VLC Software Installation Process.**

To analyze the qualitative data, we have used Grounded Theory approach. In this approach the analysis of the data is done by various coding techniques namely Open Coding, Axial Coding and Selective Coding. Because of the coding steps, we’ve identified the relationships and stories as shown in Table 1.

STORY	TEXTUAL DATA POINTS
Fairly large set of users often install software for various purposes but usually refrain from using pirated versions	"I mostly install free or student copies of software that I need. I download from UW Madison software sources or from google search. I avoid using pirated copies for good reasons"
Software download is easy but risky with ads and malwares these days	"I think it is pretty easy to download but I'm worried about clicking on ads or malwares while downloading unfamiliar software"
Users feel installation process is boring	"I feel it is really boring to install them because all software installations are the same and consists of clicking bunch of "Next" buttons. Why can't I use it just like that without installing"
Users don't pay attention to software installation process	"No I don't look at the contents. Do I need to? I just assume it's all good you know. I just don't want to waste time reading them"
Users feel Terms and Conditions are important yet don't read	"It's lot of verbatim. It is boring and uninteresting. Also, its same across all software and I don't think I'll find anything interesting in there. Terms and Conditions are important and must be presented for users to avoid problems"

**Table 1: List of stories and textual data pints from field test and interview**

Results from qualitative research are summarized as following stories

- Users feel installation steps are boring.

- Users think EULA is important yet they ignore.
- EULA is too big, textual and time consuming.

## METHODOLOGY

To answer our research question, we started off by identifying the independent and dependent variables of interest and formulated hypotheses that predict the relationships between them. Next, we came up with an experimental design and procedures to empirically test the predicted hypotheses, which will be discussed in this section. In this section, we will also discuss on the relevant measurements and participants that we had identified to measure user cognizance.

## Hypotheses

### Identifying Variables

We identified the independent and dependent variables of our research question. An independent variable is a circumstance that is manipulated in an experiment to obtain a change or effect in a human response while interacting with a computer. A dependent variable is a measured human behavior due to an interaction involving an independent variable. For our research, the identified independent variables are *length of EULA*, *representation of EULA*, *time spent on software installation*, *usage of field specific language (e.g., jargons, abbreviations, etc.)*, *number of installations of the software*, *user rating of software*, *recognizability of software*, *intended use or purpose of software*, and *location of EULA in software installation process*. The dependent variable which is affected by the independent variables are *user cognizance* of “Terms and Conditions” or EULA in software installation process and *user preference* to read “Terms and Conditions”.

Drawing on findings from our research, we developed the several hypotheses below on how the independent variables might affect the dependent variables.

**Hypothesis 1:** If the length of the EULA document is small then the chance that people might read it increases. If a huge text document is shown together then users might ignore reading the terms and conditions. Thus, we believe shorter EULA will help towards gaining users' cognizance. Figure 2 is an example of a shorter summarized EULA.

**Hypothesis 2:** The current EULA template straightaway shows a lot of text which makes users take no notice of the “Terms and Conditions”. Thus, plain textual representation of EULA is not an effective way to get user attention and leads to poor user cognizance.

**Hypothesis 3:** If users spend more time on the software agreement of the installation process then we believe that the preferences of users reading the EULA is more, resulting in more cognizance. By adding video links of the EULA or quiz at the end of the EULA would make the user spend more time on EULA and would positively affect user cognizance and preference.

**Hypothesis 4:** Presently, different types of software are used by users of divergent field. If the language used in the EULA is field specific (i.e., contains jargons, abbreviations, etc.) and hard then it becomes very tough for people to understand the “Terms and Conditions”. This makes users blindly accept the EULA and leads to user negligence.

**Hypothesis 5:** If a software is not very frequently used and has low number of installations then a new user will be heedful while installing such a software. Thus, low number of installations will have positive effect on user cognizance.

**Hypothesis 6:** When the user rating of a software is low, a new user will be attentive while installing the software. Thus, low user rating of a software will have positive effect on user cognizance.

**Hypothesis 7:** If a software is well known, people tend to blindly assume there won't be any interceptions required, thus resulting in less user cognizance.

**Hypothesis 8:** If users know the functionality and usability limits of a software that is being installed, users usually tend to not worry about knowing new details about the software, thus affecting the user cognizance by not reading the EULA. For example, while installing a desktop calculator widget, most users assume that this has nothing to do with anything else.

**Hypothesis 9:** While installing a software, generally the EULA is shown at the end of the installation process. This has negative effect on user cognizance, as by this time user wants to get done with the installation process and click the finish button.

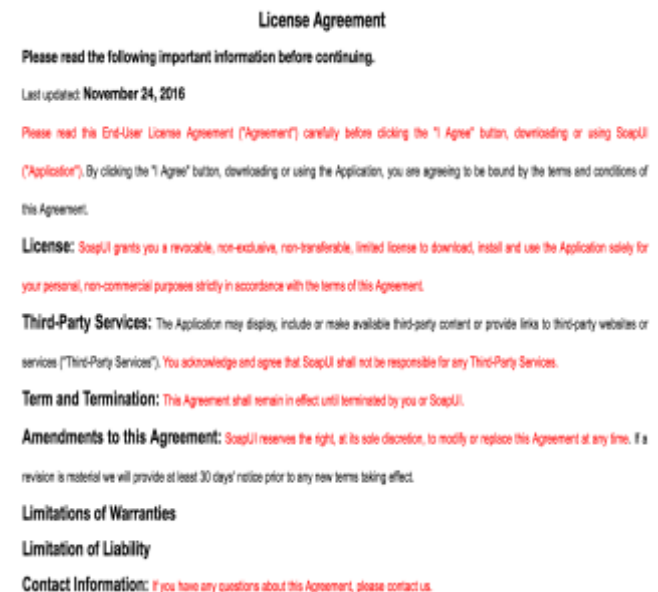


Figure 2. A Smaller Summarized EULA.

We formulated several hypotheses to improve user cognizance and preference but for our study we mainly focused on the first three hypotheses. We basically focused

only on the effect of the length, representation of EULA, and time spent on software installation, on the dependent variables.

### **Experimental Design**

We created three synthetic software installation environments with longer, shorter, and infographic EULA. We then evaluated the environments by showing them to our participants separately. We preferred an in-between participants model design, instead of a within-participants model, due to the long survey process. The participants were asked to individually observe the synthetic EULA's and answer specific questions which is further explained in the next section.

### **Experimental Task and Procedure**

We interviewed several participants by conducting web based surveys or questionnaire, to understand how the above mentioned independent variables affect user cognizance of EULA in software installation process. In the survey, we showed the synthetic software installation processes to the participants separately and asked them questions related to the EULA that they read. In the survey, we also asked them questions based on features that are relevant to user's EULA experience and would lead to more people reading the EULA instead of simply accepting. Next, we scored their responses and evaluated their understandings on the three different EULA formats. As discussed earlier, we preferred an in-between participants design model and not a within-participants model. Performing these experimental tasks and procedures helped us to test our hypotheses and evaluate the effect of independent variables.

### **Measurement**

To ensure that our experiment is successful, we asked the participants a few questions related to the several EULAs that they could see in the survey. We asked them several questions on a ten-point scale in the survey. The score that they achieved helped us to measure their understanding on the EULA and helped us to find the relevant features which can increase a user's preference to read the EULA. This in return assisted us to validate our hypotheses. This will be explained in detail in the measurement section of the paper.

### **Participation**

For our study, we interviewed 29 male and female participants from the University of Wisconsin - Madison campus. Participants represented a variety of university majors and occupations including Computer Science and non-Computer Science backgrounds. Along with students we also interviewed participants who were not students and worked on campus.

### **MEASUREMENT**

Here we will discuss about the steps we practiced in constructing a subjective measurement scale. We started by collecting data. We conducted web-based surveys of 29 candidates from our University of Wisconsin - Madison campus. The measures were based on responses to the web-

based survey or questionnaire. In the survey, participants were asked to describe their opinions about EULA or Terms & Conditions of software as well as their experience on the three different restyled forms of EULA (i.e., longer, shorter, and infographic EULA). The responses of the participants to the web-based questionnaire were graded on a ten-point scale.

Next, we performed factor analysis using principle component analysis on the collected data. This was followed by applying factor rotation to our factor matrix. This helped us to identify candidate items to construct scales to measure our research concept. Finally, after identifying the scales we tested the reliabilities of the scales.

### **FACTOR EXTRACTION AND ANALYSIS**

After collecting data, we performed factor analysis on the data to measure several factors. The factor analysis was basically performed on the data which was related to the features relevant to user's EULA experience. We performed principle component analysis on 12 items and measured four factors. All factors had eigenvalues of over 1. We also tested the reliability of the identified factors. To test reliability of the factors, we computed Cronbach's Alpha of the factors. We used IBM's SPSS Statistics tool for the scale construction process.

Based on factor analysis, we developed four factors.

*Understandability:* It comprised of two items - time spent on EULA and overall understanding of EULA. The Cronbach's alpha of this factor comprising of two items was very reliable ( $\alpha = 0.94$ ).

*Representation:* It comprised of three items - Longer EULA, coloring critical Information Technology terms of EULA, and highlighting security terms of EULA. The Cronbach's alpha of this factor comprising of three items was less reliable ( $\alpha = 0.29$ ) but factor analysis proposed that the three items to be combined to create a single factor.

*Digest:* It comprised of four items - shorter EULA, infographic EULA, summarizing overall EULA, and highlighting personal information. The Cronbach's alpha of this factor comprising of four items was reliable ( $\alpha = 0.535$ ).

*Complete Knowledge:* It comprised of two items - video links to explain EULA, and quiz at the end of the EULA. The Cronbach's alpha of this factor comprising of two items was again less reliable ( $\alpha = 0.94$ ) but factor analysis proposed that the two items to be combined to create a single factor.

The factor loadings of each item and the reliability of each factors are shown in Table 2.

Factor	Item	Factor loading
Understandability	Time spent	.96
$\alpha = .94$	Overall understanding	.94
Representation	Longer EULA	.76
$\alpha = .29$	Coloring critical IT terms	.15
	Highlighting security terms	.54
Digest	Shorter EULA	.81
$\alpha = .54$	Infographic EULA	.59
	Summarizing	.64
Complete Knowledge	Video links to explain more	.68
$\alpha = .75$	Quiz at the end	.77

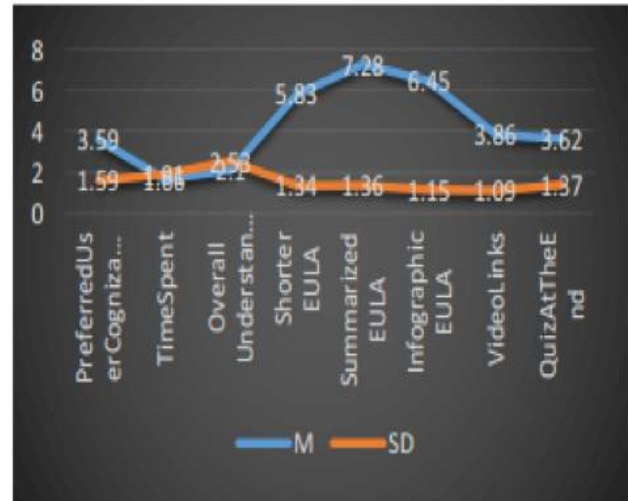
**Table 2. Factor loadings and reliability of each factors.**

The scales that we constructed in the Scale Construction process were mostly reliable. But the *Representation* factor had very low Cronbach's Alpha, so we decided to consider the other three reliable factors for further study.

## RESULTS AND DISCUSSION

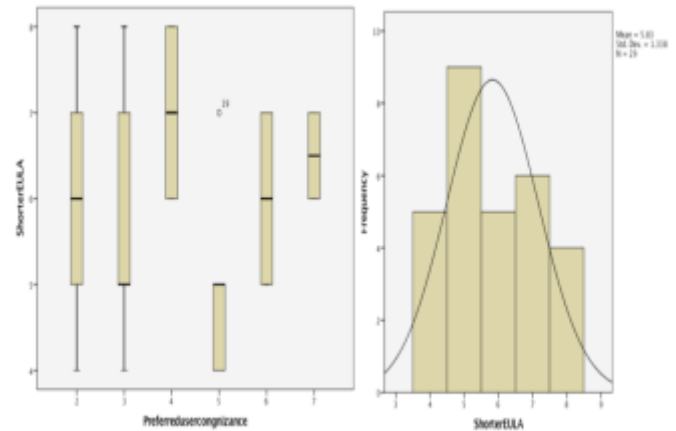
As discussed till now, we interviewed several people, conducted web-based survey and came up with four factors (Understandability, Representation, Digest, and Complete Knowledge) in the Scale Construction process of the study. Out of the four factors, three factors (*Understandability*, *Digest*, and *Complete Knowledge*) were elected based on their good reliability scores. To answer our research question, which is "What are the factors affecting the user cognizance of EULA (End User License Agreement) and the ways to measure them?", next we validated the several hypotheses that we had come up with in the previous steps. We used Statistical Analyses and Inferential Analysis on the collected data and the three scales to analyze our findings and test our hypotheses.

To familiarize with data, we calculated the descriptive statistics on the dependent and independent variables. The dependent variable for our study is *PreferredUserCognizance* ( $M = 3.59$ ,  $SD = 1.59$ ). The independent variables Time Spent, Overall Understanding, Shorter EULA, Summarized EULA, Infographic EULA, VideoLinksToExplainEULA, and QuizAtTheEnd had  $M = 1.66, 2.10, 5.83, 7.28, 6.45, 3.86, 3.62$  and  $SD = 1.91, 2.53, 1.34, 1.36, 1.15, 1.09, 1.37$  respectively. The overall descriptive statistics are shown in figure 3.



**Figure 3. Descriptive Statistics of variables**

We also plotted graphs like Boxplots and Histograms, as shown in figure 4, to further familiarize ourselves with the data.



**Figure 4. Data description (Shorter EULA)**

After understanding the data properly, next we used Kolmogorov-Smirnov test to determine the distribution of the variables. From the 1-KS test it showed that our variables are normally distributed or Test distribution is normal. Also, our variables are interval scaled. After determining the distribution of the dependent and independent variables we selected Pearson's correlation to test our hypotheses or the relation between the independent and dependent variables.

### Understandability

Based on the calculation, the Pearson's correlation value showed that there's high significance and correlation between user *TimeSpent* and *PreferredUserCognizance*,  $r = 0.94$ ,  $p = 0.00$ . There was also high significance and correlation between *OverallUserUnderstanding* and



*PreferredUserCognizance*,  $r = 0.93$ ,  $p = 0.00$ . From the results, we could verify our hypothesis that the more time a user spends on reading the EULA the more she prefers to know the Terms and Conditions of the software. We could also verify that the more the user is interested in the overall understanding of the User Agreement the more she prefers to know the Terms and Conditions of the software. The result of the calculation validated our third hypothesis.

#### Digest

From the results, we saw that there was good significance and correlation between *SummarizingOverallEULA* and *ShorterEULA*,  $r = 0.40$ ,  $p = 0.03$ . Based on the result we could verify our hypothesis that a shorter length EULA is perceived as a summarized EULA. This means that the best way to represent a shorter EULA is to summarize the contents of the EULA instead of showing the user a huge textual representation of the EULA. There was less significance and correlation between *SummarizingOverallEULA* and *PreferredUserCognizance*,  $r = 0.22$ ,  $p = 0.25$ , which was against our hypothesis expectation that if the Terms and Conditions is summarized then we expect to have more user preferring to read the Terms and Conditions of the software. We suspected that we got poor correlation and significance value due to low data points. We would have required more data to strongly validate our hypothesis. We got poor significance and correlation between *InfographicEULA* and *PreferredUserCognizance*,  $r = -0.09$ ,  $p = 0.64$ , which was also against our hypothesis. We expected good correlation and significance between these since if the Terms and Conditions page is in Infographic form then it should have more user preferring to read the Terms and Conditions. This in turn would increase user cognizance. We again suspected that we got poor correlation and significance value due to low data points. In our future work, we would interview more participants, collect more data points, and include more items to strongly validate the hypotheses.

#### Complete Knowledge

From the results, we saw that *VideoLinkstoExplainEULA* is near-significant and correlated to *PreferredUserCognizance*,  $r = 0.29$  and  $p = 0.12$ . This validated our hypothesis that if there is a video link explaining the Terms and Conditions of a software then it could have more user preferring to read the agreement. Basically, in a broader way if we add a video link at the end of the Software Agreement which will summarize the EULA then we will make users spend more time on the installation process. So, as we have previously validated our hypothesis that the more time a user spends on reading the EULA and understanding the EULA the more she will prefer to know the Terms and Conditions of the software. There was a little poor significance and correlation between *QuizAtTheEnd* and *PreferredUserCognizance*,  $r = 0.19$ ,  $p = 0.33$ . We suspect this is because when a user is installing a software then she would probably not prefer to attend a quiz at the

end to test her understanding on the Terms and Conditions of the Software. We also know that people generally fear taking tests or quizzes. So, when they see a quiz at the end of the installation process then they might fear of losing the software, the time spent on the installation process, and their hard work. Thus, they would not prefer to attend a quiz at the end of the Software Agreement. Thus, we validated most of our hypotheses.

Till now the analysis helped us to find out several features which can be incorporated in a EULA to make more users prefer reading the EULA. Incorporating these features in the current EULA template should allure people to read the Terms and Conditions, instead of blindly accepting them.

We had incorporated these deduced features in three synthetic software installation processes having Longer, Shorter, and Infographic EULA. In the conducted web-based survey we had collected data of user's cognizance on the three-different synthetic software installation processes too. Till now the data that we had used from the survey were based on features that are relevant to user's EULA experience. Next, we used the data which we had collected by asking the participants several questions related to their knowledge on the EULA that they read. We graded their answers and based on their answers calculated their cognizance on EULA. We graded each user's cognizance on a ten-point scale.

Now, we performed Comparative Analysis on this data which was related to User Cognizance. We computed the  $M$  (Mean), Median, Min value, and Max value of user cognizance on the three different forms of EULA. Figure 5, shows the measurements of user cognizance across the three different types of EULA. From, the calculations and analyses as shown in the figure, we validated that Shorter EULA and Infographic EULA have more user cognizance than Longer EULA. We deduced from the results that a user reading a short-summarized EULA and a well-represented infographic EULA scored more on the web-based survey or test that we had conducted and thus had more user cognizance.

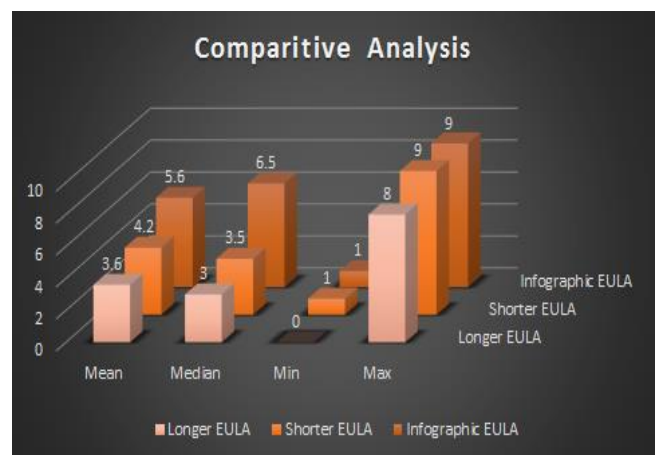


Figure 5. User Cognizance across three different EULA

## CONCLUSION

EULA is a crucial part of software and understanding the “Terms and Conditions” is very essential to avoid serious consequences. Our research supports the prior studies showing “People are trained to accept” EULA with evidences from qualitative research. We also aimed at understanding the factors leading to poor user cognizance. We attribute these factors mainly to the design of current EULA format and representation. Our further study on improving the user cognizance generated results clearly showing good outcomes with respect users cognizance of EULA.

We’ve identified with improved and intuitive designs languages such as

- Summarizing EULA
- Representing the terms and conditions as infographics
- Coloring, highlighting critical terms and conditions
- User friendly quiz and more video links in the EULA

users can be intrigued and made to look out for information in EULA and understand the terms and conditions much better than usual representation which is termed as boring and time consuming.

Our research was conducted on a very small sample size of population with limited background variation. We believe this might not be a fair representation of the wide population of billions of people, who use millions of software and apps every day for various purposes. So, to overcome the limitations, we would like to conduct further experiments and research on a wide and large scale of population with more rich cultural and social backgrounds. We also believe there are better and more interesting design languages available for us to employ in creating user friendly EULA without hurting user experience at the same time achieving far better results than what we have achieved.

Our ultimate aim is to generate substantial data showing the results from our research, factors and our improved design languages in designing better EULA and present the study to policy makers, government regulators, software consortiums and various other agencies to propose and institute changes to current EULA and serve the purposes of EULA to users in a better and more efficient way. We believe our research study would serve as a tool to avoid dangerous and undesirable consequences to all the involved parties of the software ecosystem and make a world a better place for all.

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