Issues with common Expense Sharing Application: An Experiment, Survey and Literature Review

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ABSTRACT

Software applications are being used for almost all the purposes. Similarly, people use software applications to track and share their expenses. The paper begins with most commonly used expense sharing and tracking application. We observed user using these applications and document the observations. The paper also discusses the user survey conducted by us to solidify our observation of most common user errors. This paper also discusses the literature review regarding the problems that users face with the most common expense sharing applications. Finally, the problem statement is defined using user observations, user survey and literature review.

Keywords

Receipts; Expense sharing; User Input errors; Manual Entry

1. INTRODUCTION

Technology is omnipresent in daily aspects of our life. Everything is being automated. On similar line expense sharing and tracking has been automated. Applications are being developed for the same. Some common applications used for expense sharing and tracking are Splitwise, BillPin, Receipt Ninja, etc.

The paper aims to identify the problems faced by the user while the user uses the above expense sharing applications. Identification of problem is done by participant studies, surveys and literature review. The study consists of two parts: 1) Participant Study and Survey, and 2) Literature Review. We then compile observations from the above instruments and then list down the problems identified.

2. PARTICIPANT STUDIES

2.1 User Observation

An experimental study was conducted on a group of students who regularly use expense sharing applications to manage their expenses. The study was conducted on 12 student volunteers over the course of two weeks under different conditions, where each participant was observed for an hour.

Each participant was briefed regarding the experiment by – "Hello. We are conducting a survey for a Software Engineering project. We would like to analyze how users manage their expenses using software tools. We would like to document the observations while you perform the given tasks using your expense sharing application." To give an idea to the user about the experiment we shared an expense using our preferred expense application.

Later, each user was given a set of 3 receipts to be entered into their expense sharing application. The set consisted of receipt of varying length. A movie ticket receipt (Fig 3), a restaurant bill (Fig 2) of 2 entries and a third receipt was a grocery store bill (Fig 1) which had 19 entries. We took receipts of varying size to differentiate the user behavior depending on the number of entries in the receipts. The participants were requested to enter the given receipts into their expense sharing application. Each receipt had to be shared differently across users. The movie ticket was to be shared equally.

User	Application Used	Duration of Usage (in Months)	Total time taken to use (in Minutes)	Predominant error type	Do users use receipt in future?
User 1	Splitwise	4	75	Technology Unfamiliarity Error, Input Error	Yes
User 2	Splitwise	24	45	Input Error	No
User 3	Splitwise	14	50	Input Error, Reading Error	No
User 4	Splitwise	15	57	Input Error	Yes
User 5	BillPin	9	62	Non English Speaking Linguistic Error, Reading Error	Yes
User 6	Receipt Ninja	7	65	Technology Unfamiliarity Error	Yes
User 7	Splitwise	27	52	Reading Error	Yes
User 8	Splitwise	21	55	Reading Error	No
User 9	BillPin	18	35	Input Error, Reading Error	Yes
User 10	Conmijo	19	70	Non English Speaking Linguistic Error	Yes
User 11	Splitwise	25	50	Reading Error	Yes
User 12	Splitwise	21	45	Input Error	No

Table 1: User observations

The restaurant bill was to be shared unequally depending on the items consumed by individual user. Lastly, in the grocery store receipt, 10 items were shared equally among four people and 9 items had to be shared unequally.

The observed errors are mainly classified into Reading error, Input error, and issues of Non-English speakers, and Technology unfamiliarity.

Input Errors: The errors caused by user reading the receipts and then typing it incorrectly in the app. These all errors are considered as Input errors. We observed that the users were predominantly making mistakes while trying to enter the amount into their application. During our observation we found that users had no input errors while trying to update the movie ticket bills into their application. Few users had made input mistakes while sharing the proportion of the restaurant bills. When the users were given the task of entering the itemized bill, most of the users had made input errors while entering the items.

Reading Errors: The error when person read wrong amount from the receipt, and entered in whatever he read from the bill into the application. These types of errors are classified as Reading errors. The participants had no trouble in reading the movie receipts and the restaurant receipts. However, the grocery receipts had many items in the receipts and users misread few of the item amount while updating the bill.

Non-English Linguistic Errors: People not fluent in reading and writing English take time to read the bills and may misinterpret the numbers and characters. We classified them as non-English linguistic errors. We had one participant who was not familiar with English language and had trouble reading the bill, but still had to use the app as he had to share the expenses among his roommates.

Technology unfamiliarity Errors: The participants were not familiar with all the features that the application provided. These features were meant to ease their work, but the user took the longer way to do the work. Also, the users were missing the key features of the application. Users had no trouble in sharing the expenses of the movie equally with other users. Few of the participant struggled while sharing the expenses unequally and instead took a longer route to update the bill. Many users were not aware of the features that were present in the application. They struggled in entering the itemized bill

We also asked the participants if they refer to the receipts in future. We learnt that the users generally discard the movie and restaurants receipts. However, some of the users keep the original receipts for future references. Since, the receipts generally fade after certain period, users had hard time to refer the items in the past receipts. The application which the users uses had features to take the snapshot of the receipts. We found out that the users were not aware of such feature.

Apart from that we also noticed that the users faced some other problems as well. Sometimes people instead of adding a bill in one account by mistake added it to other account. They soon realized their mistake and than re-entered it to the correct account. Also, sometimes it happened that the other person in the group with whom the expense was shared did not get a notification. Either because the contact details with which the user added him was not registered from his end, or he might be not connected to the Internet. A very common thing noted in all the observations of users was that while typing, users had to use backspace because the type in wrong character. To finish the task in a hurry, the user presses the left or the right of the intended key on the keyboard. Although this error does not get propagated, as the user soon realizes it, its still time consuming. Some users also made mistakes while clicking the buttons on the screen. There is a slight shift in the web page when it is completely loaded. If the user clicks a button while the page is being loaded, an unintended button gets clicked. Then the user has to go back to the previous page and re click the intended button. This type of mistake costs users a few minutes. A few users made mistakes while entering the decimal point for the amounts in the bill. They might forget to enter the point, hence changing the value completely. Sometimes the user realizes it as soon as the mistake is made, but sometimes they may realize it at the end, when the total amount does not match. The second case is more time consuming, since in this case the user has to go through the entire bill and cross check it again. After the end of the observation, the users were asked which difficulties they faced, and which was the easiest thing to do. Generally, users reported that after some time, entering of the bill got very frustrating. However according to them, stating that the bill is to be divided among who all was very easy and least time consuming. Some users also reported loss of concentration while entering the data. Users with native language other than English reported that reading the bill itself was very confusing and time consuming. Overall, almost all the users reported efficiency errors of some type.

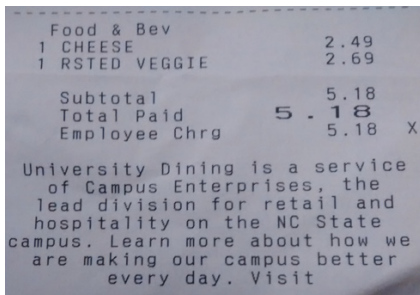Fig 1: Grocery store receipt given to the user

Fig 2: Restaurant receipt given to user

Fig 3: Movie ticket receipt given to user

2.2 User Survey

After observing 12 participants, we observed a common set of problems that the participants generally face. To get evidence on observation of problems, we conducted a survey on 50 new participants using online forms.

For the survey we used Google Forms. Each participant was given a set of 6 questions (Fig 4). Users were asked which application do they use, by searching the top most used applications on the internet. They were also given the option to enter their own application. They were asked do they make mistakes to understand whether the users realize when they make mistakes. If the users report that the application is time consuming in the third question it means that the data entry becomes frustrating after some time. The question of whether the user losses receipt and and do they need to refer it in the future gives us an insight into weather the saving of the receipts on the application in an important task.

The responses of the users were compiled into an Excel Sheet and analyzed them using Pie Chart (Fig 5). After the analysis we found that the response of the participants was similar to earlier participant observations.

Fig 4: Google form given for online survey

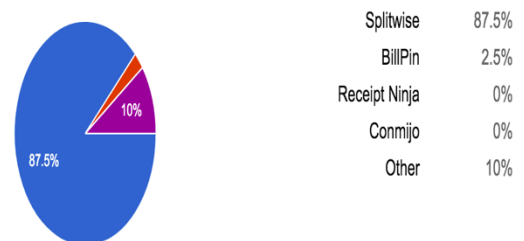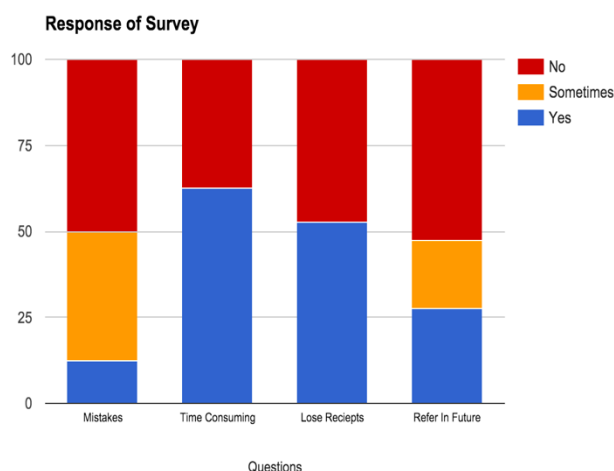Fig 5: Pie-chart representing the expense sharing applications used

Fig 6: Split bar graph representing the answers of the online survey questions.

Data Analysis and Interpretation

The user survey that was conducted led to some interesting findings. We found that most of the users – about 87.5% of the users use Splitwise for the expense sharing purpose. The other applications including Bill Pin, Receipt Ninja, Conmijo account for less than 13% of the total usage. Contrary to the results of the participant user observations, where we found that almost all the users made some form of error while using the application, about half of the surveyed users – responded that they don't make any mistakes while using the application. However more than 60% of the users admitted that they consume considerable amount of time while sharing their expenses through the application which aligned with our findings of the user observations. Further, even though slightly less than 50% of the users claimed that they don't lose the receipts of their expenses, almost same percentage of the users responded that they refer to the receipts in future.

On further analysis of the data in the user review, we found that most of the users who lose the receipts of the user applications also don't refer to the receipts in future. These people are at a greater risk of making mistakes while entering the expenses in the application. The users also stated additional issues in regards to the usage of the application. The most common concern that was raised by the users was that they found it difficult to split the expenses among the users when the expenses were to be unevenly shared among the users. Suggestions for automatic conversion of the bills into text were also made.

3. LITERATURE REVIEW

After analyzing errors and issues for expense sharing applications, we referred to various academic literatures and data on the same to find specific problems in the applications that may be improved.

The searches for related literature were chosen from the errors and issues found in the user studies and user observation. Common issues like manual text entry errors and time consumption for the same were searched.

A major issue that users discussed was the problem with manual data entries. The text input is the biggest hurdle in expense sharing applications and hence we chose this paper on different methods and models for text input [1], which was found by searching for 'text entry for mobile devices'. The paper discusses possibilities of error prone text inputs on mobile devices and different ways of text input that may suit different applications. There are different tradeoffs amongst a number of factors related to the data entry like accuracy vs speed, performance of a seasoned user vs a new user, tasks involving text entry vs copying texts. All these factors coupled with the drawbacks of manual entry methodologies varies with the different models of the mobile and handheld devices. However irrespective of these differences, mobile computing is becoming increasingly widespread and many applications are becoming accessible on mobile platforms. Therefore, there is a general demand for user-friendly, fast and efficient methodologies for mobile text input that is less error prone. Hence, improving text input methods may help resolve input issues.

The article on text input in mobile devices [2] reflects upon the most common problems encountered while data is manually entered into any application. This article discusses different metrics of text inputs which is relevant to the input issues and time consumption issues found. Speed of the data entry varies from person to person – subjective to the alertness, performance levels which again varies time to time for an individual. Manual data entry is error prone as we tend to make miss out on certain data and/or make grammatical mistakes while entering data. Periodic data entries can be used to combat these errors as compared to continuous entries. This again increases the time taken to make the entries. Interpretation and misinterpretation of data is also documented as a part of the input process. Also, different formats, often dictated by personal entry choices may imply different meanings to the readers.

In order to mitigate the problems of manual data entry, attempts can be made for automating the data entry process in the forms. A viable solution suggested can be done by scanning the images of data forms, converting them to text and entering the values in the forms. The paper '*Improving form-based data entry with image snippets*' [3], has been found as a part of alternative input methods on mobile devices, and talks about a technique whereby the image of the form is converted into small image snippets and each snippet contains a form field. Values can be entered through typing the values into the same screen. The study also supports how the speed of the data entry is considerably improved without compromising the accuracy of the data. This could provide an improvement over our present input methods for expense sharing applications.

While researching papers we found a pool of papers, out of which only few papers were relevant and from that also only few were included in the literature review. We researched about the problems faced during text input in the mobile applications. We focused more on understanding the variety of the problems faced and not on the existing solutions. We didn't include those papers in our study which talks about the different solution models for mitigating the problems of the manual text entry (even though these papers might be referred if we want to device any solutions for solving the problem). One such paper was 'Uncertain Text Entry on Mobile Devices' by D Weir which focuses more on the probabilistic touch models to solve the problem of keyboard error correction [4]. Another paper which we referred titled as 'Pressure-Based Text Entry for Mobile Devices' by Stephen A. Brewster and Michael Hugs talks about how different modes of pressure can be used as input techniques into mobile devices [5]. It doesn't focus on the problems faced and was excluded for the same reason.

The different kinds of errors that humans were prone to during text input was also researched. Here, too papers which cites the human errors, categories and the conditions under which they were made referred to. Papers related to comparison of input devices for user input, correction of human error in alphanumeric input, evaluation of manual vs speech input etc. were excluded from the study. Also the most common categories of errors were focused upon instead of the specific error rates of all possible kinds of errors.

We have observed that issues found in user observation and surveys aligned with some of the errors documented in these academic literatures.

4. CONCLUSION

From the above user observation, user survey and literature review we finally conclude that 'Splitwise' is the most common expense sharing application in our User group. There are two main types of problems that the users have with the application. First is that when the users have to input an item specific bill, there are very high chances of the user making errors. Secondly, entering the entire bill in the application is a time consuming process. Also from the literature review we can understand that the manual entry of the data in the application increase the chances of user making errors, and decrease efficiency.

Hence as future work, we aim to increase the efficiency of the input of input in expense sharing application 'Splitwise', common among the Students.

5. REFERENCES

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