Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

VisualPro: Preference Vs. Performance

Research of the Complexity of Preference and Perfomance

Edward S. R. Patch (1801492)

Software Engineering

Contact Information:
Waterfront IQ Campus
University of Wales Trinity,
Swansea, SA1 8EW.

Email: 1801492@student.uwtsd.ac.uk

Abstract

The content aims to compare preference and performance to conclude whether preference impacts performance. Ultimately, giving insight into User Usability and if a design based on individual preferences is an impactable approach. Experimentation of the development project involving a lightweight, visual scripting software, 'VisualPro', would help provide results within this study.

Introduction

Research to complete the unfinished Jakob Nielson and Jonathon Levy's [5] 'Measuring Usability: Preference vs. Performance' experiment to determine if preference impacts performance. The VisualPro project design and creation usage will support the investigation findings. Suppose it turns out to have a correlation or an indication of good User Usability. The results could change the design of products within projects in the future. It could save the cost and time of the development by listening to the target audience instead of fixing User Usability problems after deployment of the product.

The target audience of the project used for this study is the following members of the public:-

- **Experience Level:** Novice-Intermediate.
- **Expertise:**
  - Software Engineering.
  - Artifical Intelligence and Machine Learning.
  - Web Development.
  - Game Development.
  - Science (Statistics/Data Analytics).

For this experiment to work, two studies details how the target audience would like the Graphical User Interface and the type of functionality they would like to see within the project, and then test the final product with the target audience. After collecting the two studies, these are then compared with Fuzzy Expert logic to categorise each survey into three categories, 'Hard Usability', 'Moderate Usability' and 'Hard Usability'. Cross-referencing the two data results enables comparing Preference and Performance in a User Usability environment.

Main Objectives

1. Conduct two surveys involving the preference of the target audience to construct the end-product, VisualPro.
2. To work out the weights applied to each category for the Fuzzy Expert logic transition.
3. Analyse the two studies and find out the correlation between the two results and see if it forecasts any patterns of User Usability in general.

Materials and Methods

The VisualPro project will use two methodologies to design and develop the project to work with the experiment. These include the Quantitative, Descriptive and Fundamental research methodologies. The Quantitative research methodology would help construct the initial survey to indicate what User Usability features the target audience would like. Whereas Descriptive and Fundamental research help identify the User Usability difficulties and well-known novice struggles when learning how programming works and how to navigate the software. The methodologies would help construct the survey data found in the final study to work with novices'. Two tutorial documents cover both Object-Oriented Programming and Functional Program styles to teach the users different methods available within the software. An Iterative development methodology is an excellent methodology for a project run by a small number of individuals and aids the proposed experiment demands. This methodology helps test the product with feedback and testing throughout the development process.

Performance Fuzzy Logic Setup:-

Mathematical Key:

$\mathcal{U}$ = Usability Categories: 'Hard Usability', 'Moderate Usability' and 'Easy Usability'.
$\mathcal{P}$ = Performance Categories: 'Very Low', 'Low', 'High' and 'Very High'.
$\mathcal{VL}$ = Performance Category: 'Very Low (0%)'. - $\mathcal{L}$ = 'Low (25%).'
$\mathcal{H}$ = Performance Category: 'High (75%)'. - $\mathcal{VH}$ = 'Very High (100%)'.
$\mathcal{R}$ = Responses with Performance Categories. - $\mathcal{T}$ = An array of responses.

$$\mathcal{U} = \sum_{n=0}^{3} \frac{100}{3} - (n = n + 5) \rightarrow \left| \mathcal{HU}\ \mathcal{MU}\ \mathcal{EU} \right|$$

$$\mathcal{P} = \frac{100}{4} \rightarrow \left| \mathcal{VL}\ \mathcal{L}\ \mathcal{H}\ \mathcal{VH} \right|$$

$$\mathcal{R}_P = \left| T_n \right|$$

$$\sum_{n=1}^{n<R_n} \mathcal{M}_{\setminus} = \frac{R_i}{R_T}$$

Essentially to work out the Performance figures, calculation of the code submissions within the survey to generate a percentage. Four statements measured by $\mathcal{P}$, 'The respondent followed the task correctly', 'The respondent seems to have followed the task correctly', 'The respondent seems to have followed the task incorrectly' and 'The respondent followed the task incorrectly' helps to determine the performance level. Each respondent's results are tallied up and positioned in the $\mathcal{R}_{\mathcal{P}}$ array, which provides a performance level of each respondent. Sum of $\mathcal{P}$ of each $\mathcal{R}$ element and then divided by the $\mathcal{T}_{\setminus}$ provides an average percentage. The $\mathcal{U}$ identifies the Fuzzy Expert categories percentage with added weights. The weighing strategy should enable the analysis to be unbiased.

From the initial survey, a selection of two preference questions including Figure 1 - 'According to you, how should the features of the Graphical User Interface have to work?' and Figure 3 - 'How would you prefer to access the software?' helps work out the preference level. A calculation to sort out each category with the responses and whether or not the preference is within the VisualPro design implementation to filter the preference down. The mean of the preference of each category is then calculated and then inserted into the Fuzzy Expert logic. The comparison of preference and performance level determines the overall User Usability and analyse whether preference affects performance.

Results

Table 1 shows the performance level of each respondent. The study collects qualitative data of each task a respondent attempts and are measured by four statements:-

'The respondent followed the task correctly' - 100%
'The respondent seems to have followed the task correctly' - 75%
'The respondent seems to have followed the task incorrectly' - 25%
'The respondent followed the task incorrectly' - 0%

Performance	Response 1	Response 2	Response 3	Response 4	Response 5	Response 6
100%	3	2	2	1	2	6
75%	4	3	4	4	1	1
25%	1	3	0	0	1	0
0%	0	2	2	3	3	0
Mean Average:	78.13%	65.63%	62.5%	50%	37.50%	59.38%

Table 1: Performance Results

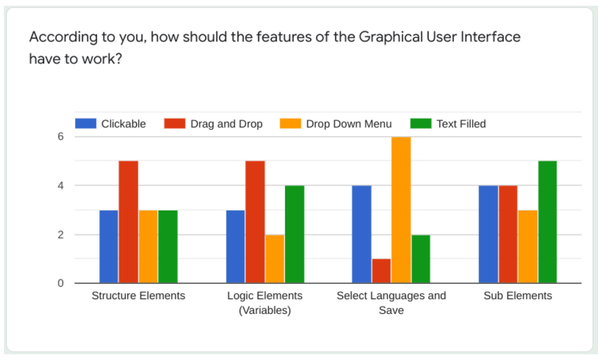

Figure 1: Survey Question 11 - Found at: Original Image

The black plots are performance, whereas the blue plots are preference. The average of performance shows 'Hard Usability' at zero per cent, 'Moderate Usability' at seventy-two per cent and 'Easy Usability' at sixteen point seventy-five per cent. The preference shows 'Hard Usability' at zero per cent, 'Moderate Usability' at forty-four per cent and 'Easy Usability' at seventy-seven point five per cent.

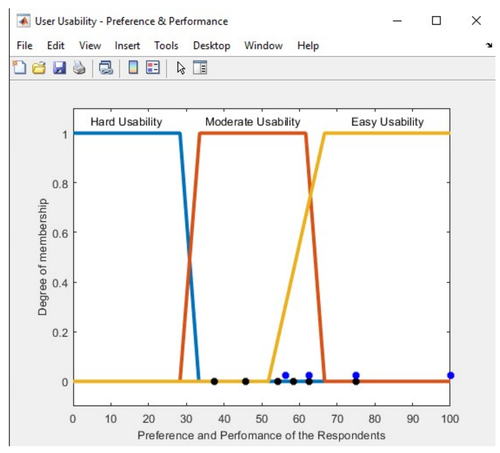

Figure 2: Fuzzy Logic - Preference and Performance

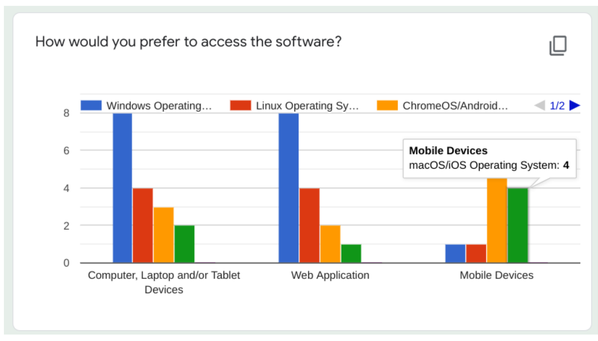

Figure 3: Survey Question 12 - Found at: Original Image

Conclusions

By looking at the figure 2, the performance suggests that the usability of VisualPro is 'Moderate' usability, and the preference indicates that the usability is 'Easy' usability. The preference suggests that the expectations were that the user usability should be easy to use. In contrast, the actual performance states that most users performed moderately well within the environment, whereas others performed better. However, results show a rough guide of the software's usability, which helps a project in an Iterative development methodology.

Forthcoming Research

To further the understanding of the correlation between the two, perhaps trying this approach with the same or different research and development methodologies and converting the data into User Usability data. A comparison of the performance and preference could provide more information. However, this study shows an expectation of users' performance, which could impact the way projects are put together in the future.

References

[1] Albert Bill and Tullis Tom. *Measuring the user experience: collecting, analyzing, and presenting usability metrics*. The Morgan Kaufmann series in interactive technologies. Morgan Kaufmann, Amsterdam ;, 2008. Book Title: Measuring the user experience : collecting, analyzing, and presenting usability metrics.

[2] Chisnell Dana and Rubin Jeffrey. *Handbook of usability testing how to plan, design, and conduct effective tests*. Wiley Pub, Indianapolis, IN, 2nd ed. edition, 2008.

[3] Marwa Hentati, Lassaad Ben Ammar, Abdelwaheb Trabelsi, and Adel Mahfoudhi. A fuzzy-logic system for the user interface usability measurement. In *2016 17th IEEE/ACIS International Conference on Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing (SNPD)*, pages 133–138, May 2016.

[4] Tina Kister. Improving the information development process: A refined iterative development model. 63:186–211, August 2016.

[5] Jakob Nielsen and Jonathan Levy. Measuring usability: preference vs. performance. *Communications of the ACM*, 37(4):66–75, 1994. Place: New York, NY Publisher: ACM.

[6] Wiklund Michael E. *Usability in practice: how companies develop user-friendly products*. AP Professional, Boston ;, 1994. Book Title: Usability in practice : how companies develop user-friendly products.

Acknowledgements

Appreciation goes out to the survey participants, which helped better understand how VisualPro may impact consumers in the future. Having the support from these participants helped advance the UI and UX progress of VisualPro.