EMPERICAL STUDY
FOR
MONEY MANAGEMENT SOFTWARE

GROUP 23

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1. FRAMING RESEARCH QUESTIONS:

- **RQ1:** How does the number of income and/or expense categories affect budget usability (on a scale of 1-5)?
    - **H_0:** The budget usability (on a scale of 1-5) does not depend on the number of income and/or expense categories.
    - **H_1:** The budget usability (on a scale of 1-5) depends on the number of income and/or expense categories.

- **RQ2:** How does the number of budget and/or transaction list elements and their layout on the home page affect the aesthetics of the home page (on a scale of 1-5)?
    - **H_0:** The aesthetics of the home page (on a scale of 1-5) does not depend on the number of budget and/or transaction list elements and their layout on the home page.
    - **H_1:** The aesthetics of the home page (on a scale of 1-5) depends on the number of budget and/or transaction list elements and their layout on the home page.

2. DETERMINATION OF VARIABLES:

- **RQ1:**
    - Independent Variables:
        - Number of income categories
        - Number of expense categories
    - Dependent Variables:
        - User Rating
- **RQ2:**
    - Independent Variables:
        - Number of Budget list elements
        - Number of Transactions list elements
        - Layout of features
    - Dependent Variables:
        - User Rating

3. SCALE:

We have used **Manual Recording**. We are using **Nominal Scale** to record observed measurement data for all the five variables from both the questions.

4. INDEPENDENT VARIABLES:

- **RQ1:** Both the variables for the first question are independent.

FACTOR	LEVELS	
Number of income categories (**I**)	2	4
Number of expense categories (**E**)	3	6

- **RQ2:** All the variables for the second question are independent.

FACTOR	LEVELS	
Number of Budget list elements (**B**)	2	4
Number of Transactions list elements (**T**)	3	6
Layout of features (**L**)	Symmetric	Asymmetric

We set the levels for the factors using our previous knowledge and experience of the problem. For e.g., for Income Categories, we know from common experience that a student usually does not have too many income sources. Therefore, we set the levels as two and four, whereas for expense categories, this number can be higher, so we set higher levels of three and six.

5. DEPENDENT VARIABLES:

User Rating is the dependent variable for both the questions.

6. CONTROL VARIABLE:

We consider only the participants who are college students aged 18-24.

7. CONFOUNDING VARIABLE:

We have used random allocation of tasks for both RQ1 and RQ2 in order to avoid practice effect.

8. CHOOSING PARTICIPANTS:

- **Participants Profile-** for this Empirical Study were college students in the age group 18 - 24, in compliance with the control variable.
- **Participant Number-** We asked 12 college students in total to be the participants for our empirical study.

9. EXPERIMENT DESIGN:

- **RQ1:**
  - Since we have only 4 conditions (2x2=4), we decided to go with the **within-subject** approach.
  - **Task-** We ask the participants to rate the budget usability on a scale of 1-5.
  - **Test Condition:**
    - Observe budget usability in a five-point rating scale for interface having 2 income categories and 3 expense categories.
      R1 = <I = 2, E = 3>
    - Observe budget usability in a five-point rating scale for interface having 2 income categories and 6 expense categories.
      R2 = <I = 2, E = 6>
    - Observe budget usability in a five-point rating scale for interface having 4 income categories and 3 expense categories.
      R3 = <I = 4, E = 3>
    - Observe budget usability in a five-point rating scale for interface having 4 income categories and 6 expense categories.
      R4 = <I =4, E = 6>
  - **Assigning Tasks:** To avoid practice effect in within-subject design, we are randomizing the sequence of each participant such that no task sequence is same for any two participants

P#1	R1	R2	R3	R4
P#2	R1	R3	R2	R4
P#3	R2	R4	R1	R3
P#4	R2	R1	R4	R3
P#5	R3	R2	R1	R4
P#6	R3	R4	R1	R2
P#7	R4	R3	R1	R2
P#8	R4	R2	R3	R1
P#9	R1	R4	R3	R2
P#10	R3	R1	R4	R2
P#11	R2	R3	R4	R1
P#12	R4	R1	R2	R3

- **RQ2:**
  - Since we have only 8 conditions (2x2x2=8), we decided to go with the **within-subject** approach.
  - **Task-** We ask the participants to rate the budget usability on a scale of 1-5.
  - **Test Condition:**
    - Observe aesthetics in a five-point rating scale for interface having 2 elements in budget list, 3 elements in transaction list and symmetric layout.
      R1 = <B = 2, T = 3, L = Symmetric>
    - Observe aesthetics in a five-point rating scale for interface having 2 elements in budget list, 3 elements in transaction list and asymmetric layout.
      R2 = <B = 2, T =3 , L = Asymmetric>
    - Observe aesthetics in a five-point rating scale for interface having 2 elements in budget list, 6 elements in transaction list and symmetric layout.
      R3 = <B = 2, T = 6, L = Symmetric>
    - Observe aesthetics in a five-point rating scale for interface having 2 elements in budget list, 6 elements in transaction list and asymmetric layout.
      R4 = <B = 2, T = 6, L = Asymmetric>
    - Observe aesthetics in a five-point rating scale for interface having 4 elements in budget list, 3 elements in transaction list and symmetric layout.
      R5 = <B = 4, T = 3, L = Symmetric>
    - Observe aesthetics in a five-point rating scale for interface having 4 elements in budget list, 3 elements in transaction list and asymmetric layout.
      R6 = <B = 4, T = 3, L = Asymmetric>
    - Observe aesthetics in a five-point rating scale for interface having 4 elements in budget list, 6 elements in transaction list and symmetric layout.
      R7 = <B = 4, T = 6, L = Symmetric>
    - Observe aesthetics in a five-point rating scale for interface having 4 elements in budget list, 6 elements in transaction list and asymmetric layout.
      R8 = <B = 4, T = 6, L = Asymmetric>

  - **Assigning Tasks:** To avoid practice effect in within-subject design, we are randomizing the sequence of each participant such that no task sequence is same for any two participants

P#1	R1	R5	R3	R4	R2	R7	R6	R8
P#2	R4	R8	R6	R2	R1	R5	R7	R3
P#3	R6	R7	R3	R2	R1	R4	R8	R5
P#4	R2	R4	R7	R6	R5	R3	R1	R8
P#5	R5	R6	R2	R8	R3	R1	R7	R4
P#6	R7	R1	R6	R2	R5	R3	R4	R8
P#7	R4	R6	R8	R1	R3	R2	R7	R5
P#8	R8	R7	R6	R5	R4	R3	R2	R1
P#9	R3	R8	R4	R7	R2	R1	R6	R5
P#10	R1	R2	R3	R4	R5	R6	R7	R8
P#11	R5	R4	R7	R1	R3	R8	R2	R6
P#12	R6	R5	R8	R4	R1	R2	R3	R7

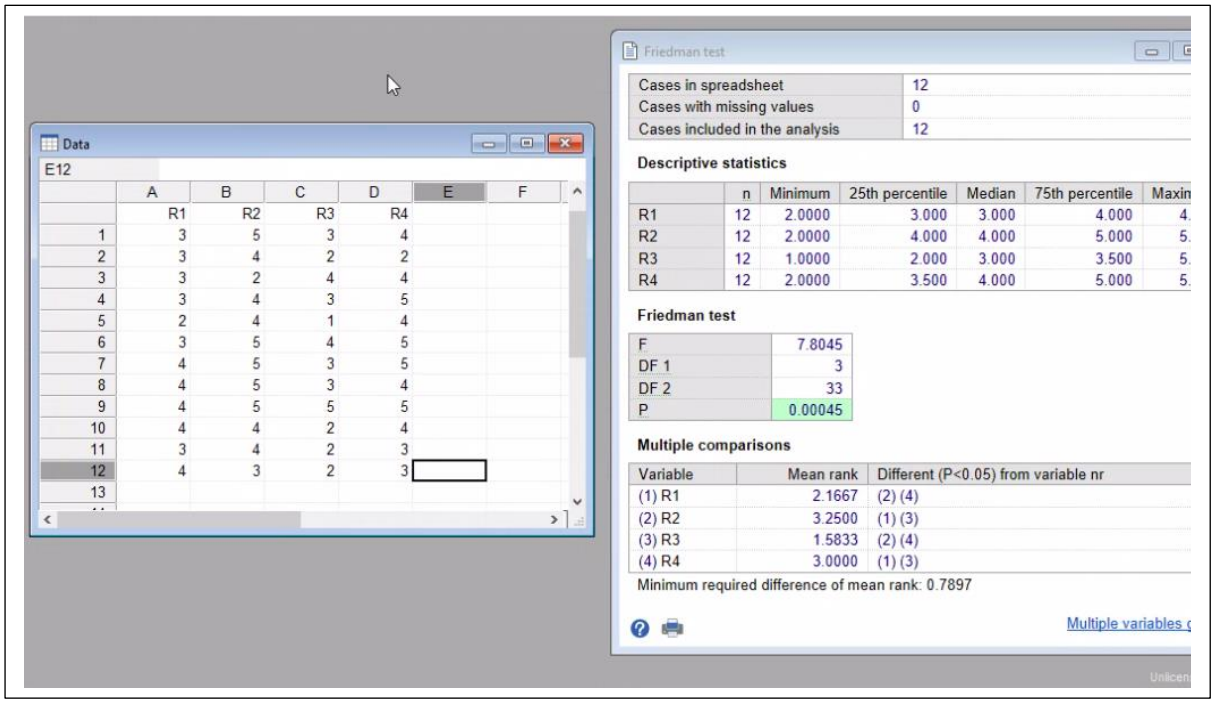
10. DATA COLLECTION AND ANALYSIS:

We used a Google form that had a list of all the interfaces for both RQ1 and RQ2 with the corresponding questions and the participant was asked to rate them. Link to the form: https://forms.gle/A1rMWm3yuNq2tuSC9

- **RQ1:** The data collected is as follows-

Interfaces / Participants	**R1** I=2 E=3	**R2** I=2 E=6	**R3** I=4 E=3	**R4** I=4 E=6
P#1	3	5	3	4
P#2	3	4	2	2
P#3	3	2	4	4
P#4	3	4	3	5
P#5	2	4	1	4
P#6	3	5	4	5
P#7	4	5	3	5
P#8	4	5	3	4
P#9	4	5	5	5
P#10	4	4	2	4
P#11	3	4	2	3
P#12	4	3	2	3

For the Statistical **Significance Test**, we have performed the **Friedman Test**, as we have a within-subject design as we have 2 factors with 2 levels each and since the conditions for the Parametric Test are violated, we have used a Non-Parametric Test.

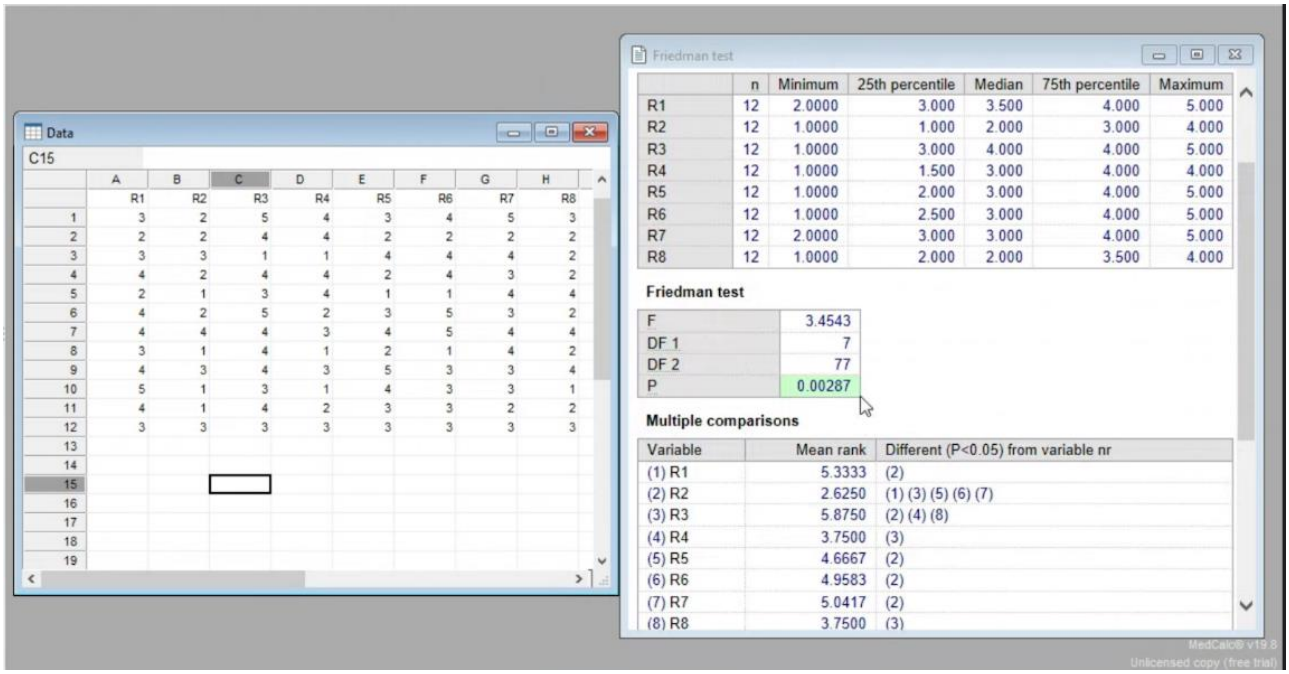


As we can clearly observe, **p-value < 0.05**.
Therefore, we **can reject the null hypothesis** for RQ1.

- **RQ2:** The data collected is as follows-

Interfaces / Participants	R1 B=2 T=3 L=Symmetric	R2 B=2 T=3 L=Asymmetric	R3 B=2 T=6 L=Symmetric	R4 B=2 T=6 L=Asymmetric	R5 B=4 T=3 L=Symmetric	R6 B=4 T=3 L=Asymmetric	R7 B=4 T=6 L=Symmetric	R8 B=4 T=6 L=Asymmetric
P#1	3	2	5	4	3	4	5	3
P#2	2	2	4	4	2	2	2	2
P#3	3	3	1	1	4	4	4	2
P#4	4	2	4	4	2	4	3	2
P#5	2	1	3	4	1	1	4	4
P#6	4	2	5	2	3	5	3	2
P#7	4	4	4	3	4	5	4	4
P#8	3	1	4	1	2	1	4	2
P#9	4	3	4	3	5	3	3	4
P#10	5	1	3	1	4	3	3	1
P#11	4	1	4	2	3	3	2	2
P#12	3	3	3	3	3	3	3	3

For the Statistical **Significance Test**, we have performed the **Friedman Test**, as we have a within-subject design as we have 3 factors with 2 levels each and since the conditions for the Parametric Test are violated, we have used a Non-Parametric Test.



	n	Minimum	25th percentile	Median	75th percentile	Maximum
R1	12	2.0000	3.000	3.500	4.000	5.000
R2	12	1.0000	1.000	2.000	3.000	4.000
R3	12	1.0000	3.000	4.000	4.000	5.000
R4	12	1.0000	1.500	3.000	4.000	4.000
R5	12	1.0000	2.000	3.000	4.000	5.000
R6	12	1.0000	2.500	3.000	4.000	5.000
R7	12	2.0000	3.000	3.000	4.000	5.000
R8	12	1.0000	2.000	2.000	3.500	4.000

F	3.4543
DF 1	7
DF 2	77
P	0.00287

Variable	Mean rank	Different (P<0.05) from variable nr
(1) R1	5.3333	(2)
(2) R2	2.6250	(1) (3) (5) (6) (7)
(3) R3	5.8750	(2) (4) (8)
(4) R4	3.7500	(3)
(5) R5	4.6667	(2)
(6) R6	4.9583	(2)
(7) R7	5.0417	(2)
(8) R8	3.7500	(3)

As we can clearly observe, **p-value < 0.05**.
Therefore, we **can reject the null hypothesis** for RQ2.

11. CONCLUSION:

As a result of our data collection and analysis we can reject the null hypotheses for research questions RQ1 and RQ2. Thus, we can conclude that,

H1$_1$: The budget usability (on a scale of 1-5) depends on the number of income and/or expense categories.

H2$_1$: The aesthetics of the home page (on a scale of 1-5) depends on the number of budget and/or transaction list elements and their layout on the home page.

According to these results, we know that budget usability depends on the number of income categories and the number of expense categories. Also, the aesthetics of the home page rely on number of budget list elements and number of transaction list elements.

Budget is a key feature of our application therefore by enhancing budget usability, we enhance the overall usability of our application. Aesthetics play a major part in usability and user experience, so finding the factors that affect the aesthetics of our ‘main page’, the homepage gives an overview into what factors make our application more aesthetically pleasing and hence more usable.