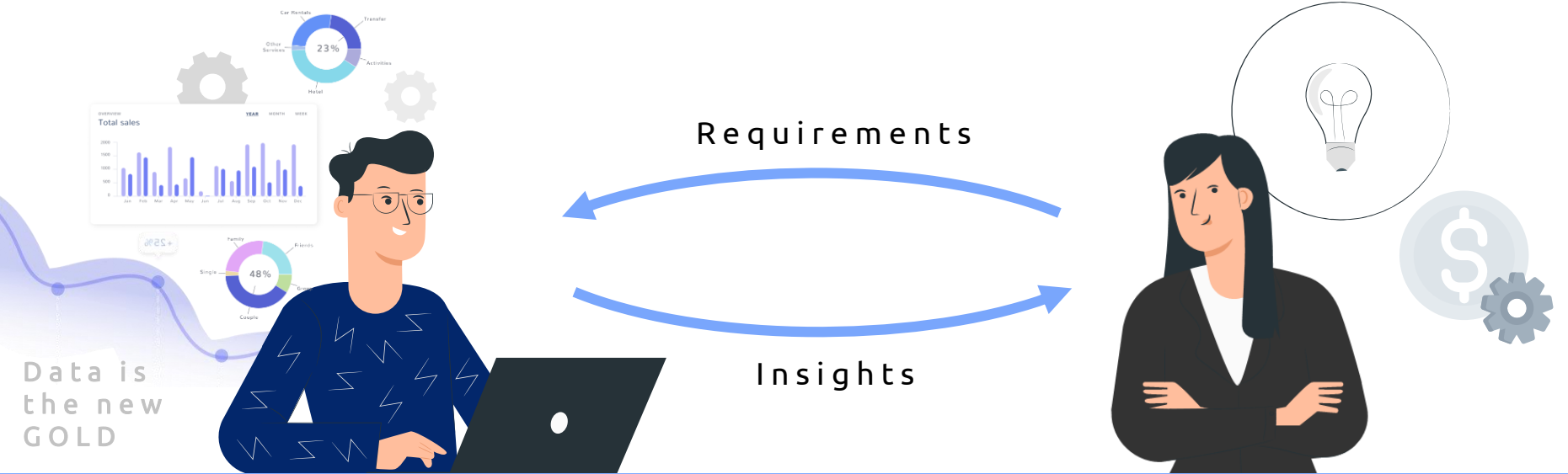


Human Computer Interaction in Business Analytics: The case of a Retail Analytics Platform

Research in progress

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MOTIVATION



Data analyst

The majority of Business Intelligence and Analytics (BI&A) tools are complex and are addressed to experienced data analysts

Decision maker

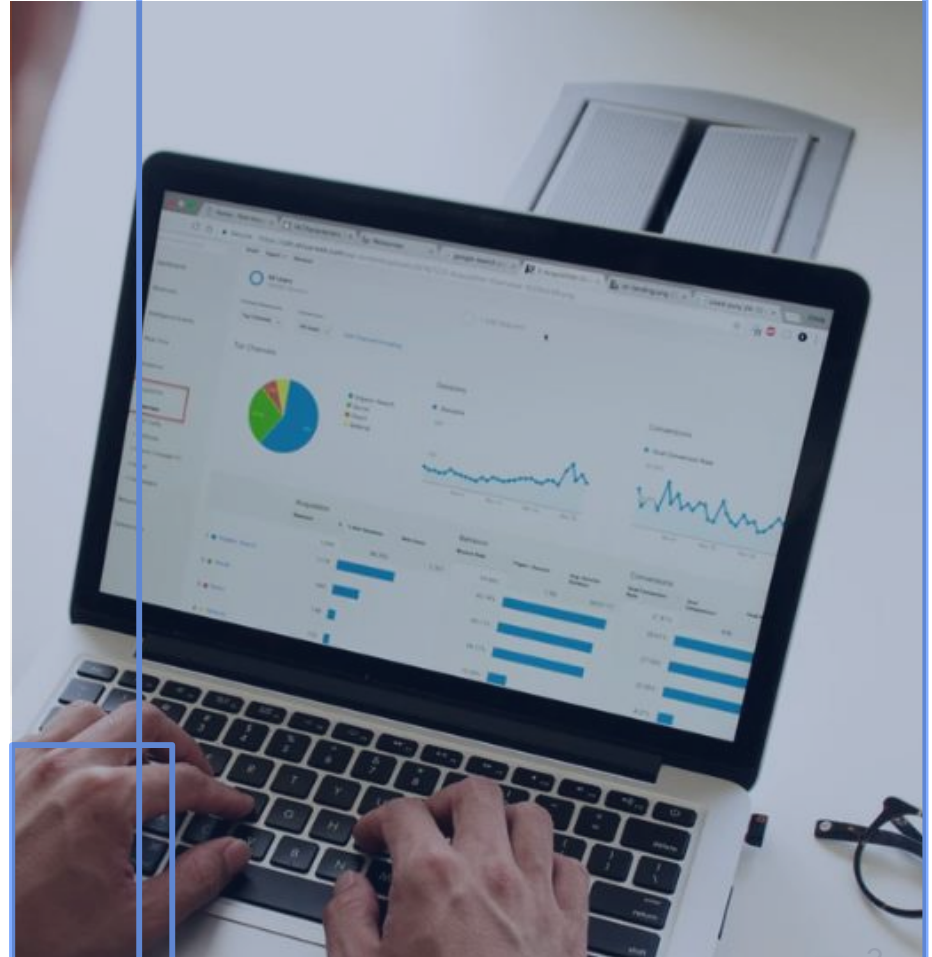
Business users should take control of their analytics needs in order to adopt intelligent and faster decisions.

ANALYTICS TOOLS FOR BUSINESS USERS

BI platforms that incorporate such 'agile' and 'self-service' or 'ad-hoc' capabilities have been labelled as self-service BI, situational BI, on-demand BI, or even collaborative BI to underline that the data analysis is accomplished by non-technical users to deliver their own ad-hoc reporting.

Considering that BI&A platforms should provide an agile environment for decision making, it is important to ensure an enhanced end-user experience (UX).

The challenge that we face nowadays is to provide the ability in every user to understand this analysis, regardless of their knowledge background.



Human Computer Interaction (HCI)

HCI is “the research area that studies the interaction between people and computers, which involves the design, implementation, and evaluation of interactive systems in the context of the user’s task and work” (Dix et al. 2004).

Usability

ISO defines product usability as the extent so that users can use the product to achieve their goals with effectiveness, efficiency and satisfaction.
(ISO 9241-11:2018, 3.1.1, 2018)

User Experience

User experience (UX) is defined as: ‘user’s perceptions and responses that result from the use and/or anticipated use of a system, product or service’
(ISO 9241-11:2018, 3.2.3, 2018).

Aesthetics

Aesthetics deals with the nature of beauty and is considered as a multidimensional and subjective variable that differs both in cultural and individual level.
(Miniukovich and De Angeli, 2015)

RELATED WORK

Studies that evaluate HCI elements, but they focus on **traditional BI platforms**.

(e.g., Pohl, Smuc and Mayr, 2012; Jooste, Van Biljon and Mentz, 2014)

Papers usually study **one HCI element** (mainly usability) and not more of them collectively (i.e. usability, UX, aesthetics).

(e.g., Pohl, Smuc and Mayr, 2012; Jooste, Van Biljon and Mentz, 2014)

Academic effort has been structured mainly around **'information visualization'** that deals with efficient data representation.

(Sorapure, 2019)

The majority of studies in information visualization focus solely on designing **optimal visuals** to maximize insights comprehension.

(e.g. Banissi, Forsell, Marchese and Johansson, 2014; Luo, 2019)

Lack of empirical research -> focusing on contemporary BI&A platforms.

Little research -> to examine whether and how improvements in HCI elements can affect insights comprehension within BI&A platforms

OBJECTIVE

The objective of this research is to showcase the impact of usability, UX, and aesthetics on a BI&A platform

Research gaps

1

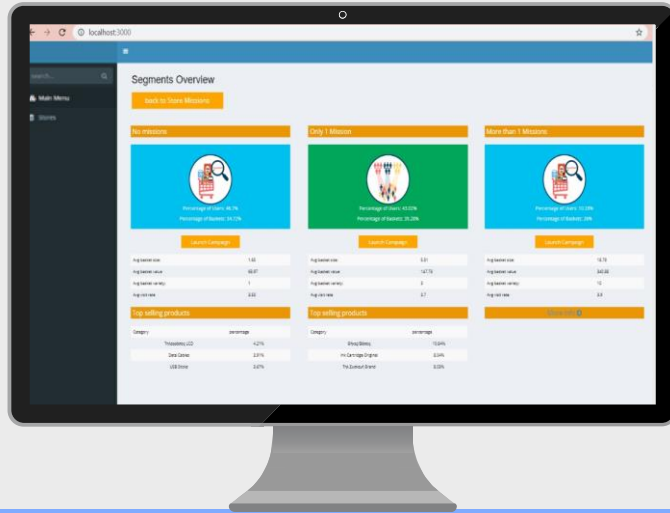
Present the role of HCI elements (i.e. usability, UX and aesthetics) in the design of a retail BI&A platform.

2

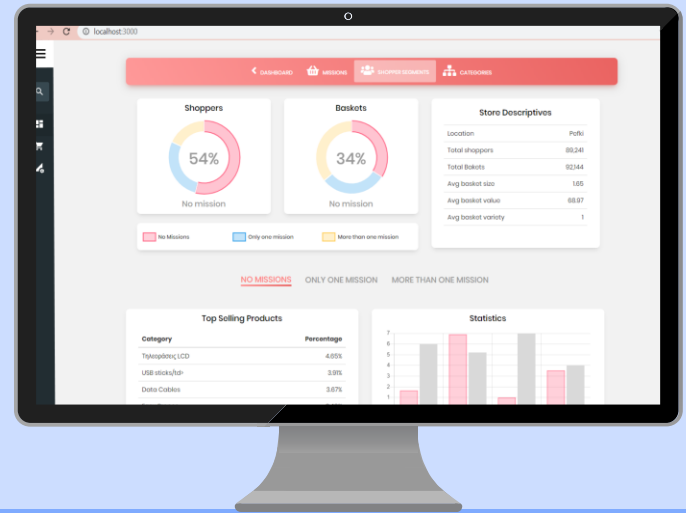
Detect what interface improvements within this platform can affect insights and information comprehension.

THE CASE

Old platform (A)



New platform (B)



The interface of a retail BI&A platform was altered concerning usability, UX and aesthetics elements.

1

Group the information using tabs to reduce the visual noise

2

Use some new visuals to represent data

3

Alter the user's navigation by adding a search engine and a navbar

4

Aesthetic interventions in colors, shapes, and layout of tables and diagrams.

RESEARCH METHOD

We conducted a preliminary **lab experiment** in ten users, with business background, which included a combination of user research methods:

1. **Task-based evaluation**, during which we observe and record users':



expressions



comments



mistakes



run time

2. **Heuristic evaluation** questionnaire, based on Nielsen's ten usability principles
3. **Interviews** to determine the extent to which they understood the results of the analysis on the two different platform interfaces



Question	Nielsen rule
1. Words, descriptions and symbols were fully understood	2
2. I could always go back or undo an action in case of an error	3
3. The design was consistent. Buttons, diagrams, images have schematic and color uniformity	4, 9
4. I was not confused or made any mistake while performing the tasks	6
5. I did not have to remember my previous actions while performing the tasks	7
6. Being an unexperienced user, I found it easy to follow the steps I had to perform	8
7. I could easily understand what the charts show	2, 8
8. I could easily navigate to the home screen from anywhere	3
9. I could correct any action taken by mistake quickly and easily	5, 1
10. I could find every page I was requested to quickly and easily	3, 1

Heuristic evaluation questionnaire

FINDINGS

OLD PLATFORM (A)

Usability

Average degree of compliance: **104,95**

Average run time of each task: **8' 34"**

Average **2.2** wrong answers till they find the correct one.

Problems that caused delay and mistakes:

- Difficulty in the navigation to understand which page contained the requested information.
- The existence of multiple tables and the lack of visuals
- Bright colors distracted their attention

User Experience

During the evaluation, they seemed confused and stressed. Several people said they 'felt like a fool' as time was running out without finding the answer.

Description of platform: chaotic, complicated, unpredictable.

NEW PLATFORM (B)

Usability

Average degree of compliance: **180,36**

Average run time of each task: **3' 29"**

Average **0.8** wrong answers till they find the correct one.

Problems that caused delay and mistakes:

- Absence of symbols to immediately understand what information was displayed in each visual.
- Not interactive charts.

User Experience

During the evaluation, they did not show any strong negative emotions.

Description of platform: pleasurable, enjoyable, presentable.

 **More usable**

 **More positive UX**

FINDINGS

OLD PLATFORM (A)

NEW PLATFORM (B)

Aesthetics

Both platforms were characterized as 'visually beautiful'. So aesthetic changes in elements did not affect the appearance of the system, but it seems to improve usability and information comprehension.

Insights Comprehension

Description of visualized information:

- They spent more time in describing the information they were viewing.
- They were making assumptions; while they were waiting for a confirmation of their answers, which indicates uncertainty.

Problems that caused confusion:

- information overload on each screen
- tabular presentation of data
- lack of visuals to spot the differences in data

Insights Comprehension

Description of visualized information:

- They spent less time in describing the information they were viewing.
- They were calmer, provided more confident answers and gave more accurate descriptions of the analysis results.



Better understanding of information

Guidelines for BI&A system designers

We identified some preliminary findings relevant to:

- which factors influenced the evaluation of the overall usability of the platform
- which factors led to a positive or not UX
- what aesthetic details played a crucial role in the evaluation

Usability

Usability principles considered most relevant to a BI&A platform are:
'Consistency and Standards,'
'Recognition rather than Recall'
'User Control and Freedom'

User Experience

Navigation, search, and the ability to interact with charts, might be features that influence the UX of a BI&A platform

Aesthetics

The avoidance of many different and vibrant colors, and the visual distinction of the primary from the secondary information, seem to be essential factors in reducing visual noise and, therefore, to aid easier information comprehension

THEORETICAL CONTRIBUTION

1

Examine not only one HCI element (e.g. usability), but more of them collectively.

2

Present an evidence-based evaluation and showcase the impact of all the three HCI aspects on a BI&A platform

3

Examine whether and how improvements in usability, UX and aesthetics can affect insights and information comprehension in such platforms; whereas existing research focuses solely on designing optimal visuals to maximize insights comprehension.

LIMITATIONS

1. The participants of our study had not the same **domain knowledge** as the real end-users of the platform.
2. We do not study the usability attributes of **learnability** and **memorability**. These factors require the system to be evaluated after a period of use.

FUTURE RESEARCH

Conduct a more time-consuming experiment in real-world contexts and use more users as evaluators to:

1. See how **domain-aware users** respond to different information visualizations
2. Better **assess learnability and memorability** attributes.
3. Study the extent to which usability, UX, and aesthetics affect the **final adoption of a BI&A platform** by an organization.
4. Examine how these HCI elements associated with the **decision-making** process.
5. Investigate how the **background and the role of each user** affect their interaction with the BI&A platform

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Thank you!

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