Dashboard for Business Intelligence, Data Visualisation and Decision Making

Final Year Project

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Abstract

This report aims to develop a web application for performance dashboards, which helps clarify several aspects of using dashboards in business intelligence (BI), data visualisation, and decision making. From Literature Review section, it points out that there is a rising proclivity to use dashboards for business/project management. Based on the research findings and academic analysis, the dashboard seems to be vital and beneficial for data visualisation, decision making, and impacting the growth of a business or organisation. Literature Review also identifies the causes of failure to use the dashboard and identifies relevant data types and visualisation information. The product of this project is developed with a focus on front-end (UI/UX) design and offers visualization of data alongside various functional and interactive features. This report, in addition, will investigate, discuss and scrutinise the process of the dashboard development and the decisions made throughout.

Introduction

The rapid development in society as well as the continued advance of technology over the past decade have transformed the way we communicate and collaborate on the Internet. They also have profoundly affected business modelling, which requires the use of proper metrics to monitor business performance, often known as KPI – Key Performance Indicators (Chowdhary, et al., 2006). KPIs are shown to the analyst via a dashboard, which is a user interface (UI) that offers a view of all critical business indicators, a key factor in day-to-day operation to reflect the success of a modern organisation or enterprise. Take that as motivation as well as by concentrating on the development of a Performance Dashboard, this project is to produce an efficient solution to these challenges and enable decision-makers to visualize the right metrics for a successful market edge.

Project Idea Objectives

This project is aimed to develop a UI dashboard application using HTML, CSS and JavaScript with a multi-device responsive mock-up (PSD). This dashboard plays a role in utilizing data visualization techniques to simplify complicated data sets to provide users with a quick overview of current performance and to maintain track of their business. Project idea objectives are divided into 3 phrases: Researching for the report, dashboard application development and testing & evaluation.

Methodology

The waterfall method is the preferred way to maximise this project development strategy because specifications and deliverables are already well-defined in the pre-production stage. Moreover, it is an individual project so there will be no demand for iteratively testing, discussing and fine-tuning. Sequential procedures will keep it easy to understand, simple for development, listed as below:

1. Requirements gathering: Answer questions about objectives, requirements, feasibility, quality of the project.
2. Design: Get an in-depth look at the design and functionalities required for a dashboard.
3. Coding and unit testing: Make and follow a coding plan of each part of the dashboard properly and efficiently as well as a detailed testing plan to ensure that no errors are missed.
4. Integration and system testing
5. Development and report documenting
6. Maintenance.

Literature Review

The use of Information systems (IS) in project management is a key to the development of a business. There has been a growing number of businesses and organisations modernising their systems and processes to improve their performances and market value by adapting technology solutions. Bhattacharya, et al. (2005) believed that those Business Performance Management (BPM) solutions offered several advantages to company owners and organisation runners. There are several tools available to assess growth and guide the company down a profitable path, a performance dashboard application might be viewed as an excellent solution to satisfy those needs as it can transform data into valuable information and construct meaning of it to make better decisions.

The Literature Review also discovered two major explanations for dashboard failure, which are the unnecessarily complex design of the dashboard and overpriced/unaffordable cost for businesses that are not ready or need it yet. These findings are incredibly valuable and serve as a baseline for this project to specify criteria and requirements, resulting in a more successful completion.

Design & Implementation

Design is the first phase of this project's dashboard development, following the analysis of research findings and the identification of requirements. The design phase is essential as it is the phase that focuses on the website's appearance rather than its functionality or performance. Here are 3 design development versions: Paper-based design, wireframe design and final high-fidelity prototype with responsive design.

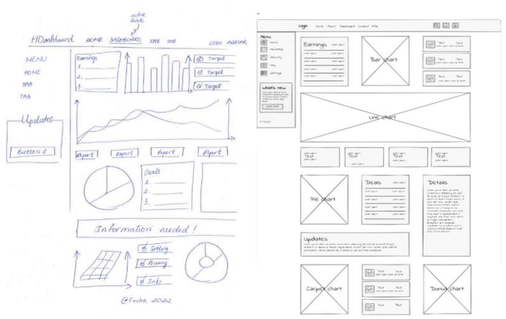


Figure 6.1.1.a. Skete design

Figure 6.1.2. Wireframe

Prototype @media 1150px *Prototype @media 1050px* *Prototype @media 800px* *Prototype @media 750px* *Prototype @media 700px* *Prototype @media 400px*

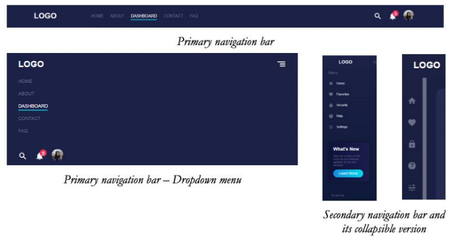
11.2.2 High fidelity prototype

Navigation, layout colour scheme and typography design are also considered in this phase, based on functional and non-functional requirements:

-A clear and easy-to-understand navigation, which is colapsible;
-Different layout designs to adapt devices of all sizes;
-An eye-catchy and professional colour scheme;
-Typography and icons to improve readability, improve visual appeal, minimise screen space and save time for users.

Highlighted implementation:

1. Collapsible navigation bar: Can turn into a dropdown menu to adapt to smaller screen sizes.



Primary navigation bar

Primary navigation bar – Dropdown menu

Secondary navigation bar and its collapsible version

Figure 6.2.1. Navigation

2. Various scientific charts from Plotly graphic visualisation online library such as pie chart, line chart, carpet chart, etc.
3. Grid system for responsive design

I divided it into 6 different screen sizes as followings:

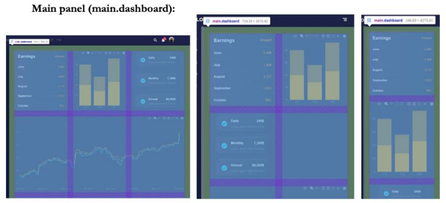
Table of different screen sizes

				span			
		navbar	sidebar	panel	sales	details	updates
@media ≥ 1150px	Large	full	full	3	4	x=2, y=1	x=1,y=2
@media ≤ 1150px	Medium large	full	full	2	2	x=1, y=2	x=1, y=1
@media ≤ 1050px	Medium	full	collapsed	2	2	x=1, y=2	x=1, y=1
@media ≤ 800px	Medium small	collapsed	collapsed	2	2	x=1, y=2	x=1, y=1
@media ≤ 750px	Small	collapsed	collapsed	1	1	x=1, y=1	x=1, y=1
@media ≤ 700px	Small	collapsed	collapsed	1	1	x=1, y=1	x=1, y=1
@media ≤ 400px	Small	collapsed	collapsed	1	1	x=1, y=1	x=1, y=1

With x: vertical span, y: horizontal span

Navigation bar and side bar: *See figure in section 6.2.1.*

Main panel (main.dashboard):



Span = 3 *Span = 2* *Span = 1*

Figure 7.2.4. Responsive design of main panel with large, medium and small screensizes.

Evaluation

Table of Product Assessment

Criteria	Result	Comment
Visibility of Application Design	✓	The dashboard site is made sure to be clearly visible to the user. Users know which page they are on thanks to the page title and easily access other pages through the navigation panel (navbar, sidebar).
Practicality	✓	The product meets the set requirements and has the potential to develop into a real-world application if there are more resources (time, cost, HR, etc.)
Consistency	✓	Consistency is maintained throughout the product. For a page, the colour scheme, font, and layout are the same. For many pages, the layout of the navigation bar and the design of the buttons are the same.
Uses of icons	✓	The choice of suitable alternative icons helps save UI design space, save memory in the programming file, and increase the user's recognition as people process visual data better than textual. à That's also the main aim of this project: Dashboard for data visualisation supporting decision-making
Design	✓	The UI design is simple, aesthetic and provides a a comfortable UX.
Chart functionality	✓	Offers users functions to work with charts such as zoom in and out, change axes. Allows user to download charts as images and generate new charts from available data via Plotly.

Future developments: If this dashboard is improved with more features, it will have a lot of potentials.

- The addition of pages: Currently, the product has only one main page, called "Dashboard". Other pages like Home, FAQ, and Settings should be added. Besides, reports on Goals, Sales, and Deals are being placed on the Dashboard main page. I hope to be able to extend them with their subpages.
- Extension of interface design: More themes, more options for users about font size, font style, etc.
- Plotting charts and tables: The types of charts displayed on the dashboard are generated via Plotly tools. The application will be more powerful and independent if it can create its table from the input information. This requires developers to work with JavaScript and its libraries (eg: ReactJS) and frameworks (eg: Express from NodeJS).
- Database with CRUD, REST API: To upgrade this dashboard, the database is extremely important. In the current version, the data to create charts is manually entered, only for the UI/UX part. As suggested above, it is possible to work with JavaScript extension libraries and back-end frameworks to work with the data flow.

Conclusion

This project is a challenging experience, yet it is also rewarding for me. Despite the ups and downs during the development of the project, I am pleased with the result and find the process an enjoyable journey. this project has also taught me a great amount about software project management and development, which is beneficial for my personal development as well as my future career path. I was allowed to experience the whole development cycle, from the beginning to the end. The tiniest experience can have a big impact and hopefully, I will be able to gain bigger experience from my future work with real-life projects.