GNG1103 Report

Project Deliverable - C

Submitted by

Group B03-5

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Abstract

This report details the specific design criteria that will be applied to develop a functioning prototype at the request of the client EllisDon Construction represented by Patrick Lalonde. As a result of the identification of the client needs generated from the customer statements in the initial client meeting on September 25th, precise design criteria are established and classified to identify all the prototype requirements based off the clients interpreted needs. Furthermore, a benchmarking analysis is used to identify optimal prototype target specifications that were determined based on the defined metrics. It as well further discusses the target specifications in comparison to competitive products, against the identified design criteria described in the report, which will be considered moving forward in the conceptual design stage of prototype development.

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1 Introduction

The contents of this report provide a summary of the culmination of design criteria based on interpreted client needs from the preliminary meeting on September 25th with Patrick Lalonde, the Director of Virtual Design and Construction (VDC) for Eastern Canada at EllisDon. Based on Lalonde's statements and responses to the designer's questions during the meeting, a list of client needs was developed in the previous deliverable. Using these client needs, a specific set of design criteria is now established to adequately address and define the most important functional and non-functional requirements as well as constraints of the final prototype. In order to adequately define the protype target specifications, the design criteria are classified and ranked based on their importance. Furthermore, a technical benchmarking analysis was conducted using the defined metrics. It was imperative to analyze the ideas presented by the client in the definition of design criteria and metrics to ensure the prototype fulfills all the needs of the client. It also details the benchmarking process and desired target specifications compared to its competitive counterparts, which will aid in conceptual design for the prototype.

2 Design Criteria

Based on each need formulated in project deliverable B, a design criterion has been identified as follows in table 2.1, these are therefore client requested design criteria. These criteria are then further translated into design metrics and classified as either a functional or non-functional requirements or a constraint with applicable metrics where appropriate in table 2.2, and then further ranked based on their overall importance to the final prototype using the ranking scale found in appendix I.

Table 0.1 Design Criteria Based on Interpreted Client Needs

#	**Interpreted Client Need**	**Design Criteria**
1	The product provides the user with the ability to view and interact a building in an augmented reality environment.	Ability to view 3D Building Information Models (BIM) in Virtual Reality.
2	The product will be compatible with IOS and android platforms.	Compatible with common Mobile Devices (iOS or Android).
3	The product will be used on a mobile device.	At minimum be accessible in the form of a mobile application.
4	The product serves a specific purpose and provides users with training and tutorials.	Training and implementation documentation must be provided.
5	The product will not cost the user any money.	Software application must be free to users.
6	The product will have the ability to isolate mechanical, electrical, structural and architectural systems.	Ability to view 3D internal systems in BIM's in Virtual Reality.
7	The product will include a user guide and a tutorial.	Navigation and interface must be user friendly.
8	The product will be cost effective.	Software application must be open source or free to use.
9	The product will work offline but have online capabilities in range of internet.	Viewing of BIM is available offline and cloud syncing available online.
10	The product will include warning notifications and necessary safety equipment reminders.	In app safety reminders and warnings for any hazards on works site.

Table 0.2 Classified Design Metrics with Appropriate Units

#	**Design Metric**	**Units**	**Importance**
Functional Requirements			
1	Ability to view 3D Building Information Models (BIM) in Virtual Reality.	Y/N	5
2	Compatible with common Mobile Devices (iOS or Android).	Y/N	5
3	Viewing of BIM is available offline and cloud syncing available online.	Y/N	4
4	Ability to view 3D internal systems in BIM's in Virtual Reality.	Y/N	4
Non- Functional Requirements			
5	Navigation and interface must be user friendly.	Subjective Rating*	4
6	In app safety reminders and warnings for any hazards on works site.	Y/N	2
7	Software application must be open source or free to use.	Y/N	4

8	Training and implementation documentation must be provided.	Y/N	3
Constraints			
9	Software application must be free to users.	$	4
10	At minimum be accessible in the form of a mobile application.	Y/N	4

*user rating based off 1-5 scale

3 Technical Benchmarking

To attain a better understanding of the current consumer market and any competition the final product would encounter, a benchmarking analysis as summarized in table 3.1 is done using the specified metrics and units in table 2.2 to identify target specifications in the following section.

Table 0.1 Benchmarking Analysis Based on Design Metrics

#	Design Metric	Unit	Benchmarks		
			Gamma AR	**Fologram Pro**	**Dalux**
1	Ability to view 3D Building Information Models (BIM) in Virtual Reality or Alternate Reality.	Y/N	Yes	Yes (But limited to Rhino/ Grasshopper)	Yes
2	Compatible with common Mobile Devices (iOS or Android).	Y/N	Yes	Yes	Yes
3	Viewing of BIM is available offline and cloud syncing available online.	Y/N	Yes	Yes	Yes
4	Ability to view 3D internal systems in BIM's in VR or AR.	Y/N	Yes	Yes (more limited)	Yes
5	Navigation and interface must be user friendly.	Subjective Rating*	4/5 Easy to use but slightly glitchy	5/5 Very intuitive and user friendly. No issues whatsoever	4.5/5 Easy to use but not 100% organized well
6	In app safety reminders and warnings for any hazards on works site.	Y/N	No	No	Yes

7	Software application must be open source or free to use.	Y/N	No	No	Yes
8	Training and implementation documentation must be provided.	Y/N	Yes	Yes (Very in-depth)	Yes
9	Software application must be free to users.	$	~860$/year	318$/year	Free
10	At minimum be accessible in the form of a mobile application.	Y/N	Yes	Yes	Yes

4 Target Specifications

Finally, the prototype target specifications can be defined. Table 4.1 details the justified marginal, ideal and target values for the specifications of the final prototype to be presented on design day, during the week of November 25th 2020.

Table 0.1 Prototype Target Specifications

Metric	**Units**	**Marginal Value**	**Ideal Value**	**Target Value**	**Justification**	**Verification Method**
Ability to view 3D Building Information Models (BIM) in Virtual Reality.	Y/N	Y	Y	Y	Prototype must have capability to view BIM in VR or it does not serve its purpose	Test
Compatible with common Mobile Devices (iOS or Android).	Y/N	Y	Y	Y	Prototype must be accessible via a mobile device, important client need	Test
Viewing of BIM is available offline and cloud syncing available online.	Y/N	Y	Y	Y	BIM viewing should be accessible offline since at some construction sites online may not be possible.	Test
Ability to view 3D internal systems in BIM's in Virtual Reality.	Y/N	Y	Y	Y	Internal systems must be accessible to viewing, without prototype would be useless.	Test
Navigation and interface must be user friendly.	Subjective Rating*	<3	5	4	Application should be user friendly and easy to	Survey

					use and operate w/ out unnecessary features	
In app safety reminders and warnings for any hazards on works site.	Y/N	Y	Y	Y	Application should give safety reminders to users which will be incorporated into the BIM for increased productivity and convenience	Test
Software application must be open source or free to use.	Y/N	Y	Y	Y	Application must be free to download and be open source to improve accessibility.	Estimate
Training and implementation documentation must be provided.	Y/N	Y	Y	Y	A short tutorial will need to be provide to familiarize users with all capabilities and functions.	Test
Software application must be free to users.	$	<50	0	0	Important that application is available to EllisDon workers for free, this was the clients request.	Estimate
At minimum be accessible in the form of a mobile application.	Y/N	Y	Y	Y	Client requested that prototype must be available as mobile app, desktop capabilities an asset.	Test

5 Conclusions and Recommendations for Future Work

Conclusively, this deliverable furthered the progression of developing a prototype by identifying and classifying design criteria and metrics and then using them to conduct a benchmarking analysis on three presently existing similar products that don't fulfill our clients needs. Based off the benchmarks, prototype target specifications were defined and justified.

The next stage in the design process will be conceptual design in which, concepts will be generated and ranked based off of the defined customer needs, design criteria and target specifications as outlined in this deliverable.

Bibliography

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Fologram. (n.d.). Retrieved October 06, 2020, from https://fologram.com/

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APPENDICES

APPENDIX I: Importance Rating (1-5)

1 – Not important

2 – Slightly important

3 – Important

4 – Fairly important

5 – Very important