



Axolotl Industries

Team B03-2

Deliverable C - Design Criteria

Engineering Design - GNG1103

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ABSTRACT

The purpose of this report was to establish design criteria for the needs of the client discussed in deliverable B. The criteria were of three types: functional criteria, nonfunctional criteria and design constraints. Additionally, benchmarking was done between three AR model visualization apps, which was used to define target specifications for the mobile application.

It was determined that Gamma AR had the most desirable criteria, and thus will be used as the main reference app for the development of the team's AR mobile application.

1. Introduction

In the last deliverable, it was established that the digitization of the construction industry will be fulfilled through the development of augmented reality (AR) mobile applications. The purpose of this deliverable is to outline the design criteria of the application, using the interpreted needs discussed in the previous deliverable. The design criteria will be separated into functional and non-functional criteria, as well as the design constraints. These criteria will then be further applied to three AR model visualization apps for benchmarking to clearly define target specifications. The table below (Table 1.) shows the needs of the client and their relative ratings mentioned in deliverable B.

Number	Needs of the client	Importance
1	Ability to view B.I.M. in 3D space	5
2	Compatible with mobile devices (iOS and Android)	5
3	Training and implementation documentation must be provided.	5
4	Navigation and interface has to be user friendly	4
5	Ability to see different layers of the building	4
6	Wireless, on site and off site work capabilities with cloud saving	3
7	Utilize a free to use Software (Unity)	2

Table (1) Table for the Client Needs

2. Design Criteria

For the proposed AR application, the needs of the client were further defined by design criteria. These design criteria are used to specify what aspects of the application need to be focused on to satisfy their respective needs. Additionally, the design criteria were organized into three different types: functional and non-functional criteria, as well as design constraints. Functional criteria are attributes that affect the functionality of the application, while non-functional attributes do not. Design constraints are essential aspects required by the client that must be factored into the design.

Number	Needs of EllisDon	Design Criteria
1	Ability to view B.I.M. in 3D space	<ul style="list-style-type: none"> - Detailed view of BIM - Navigation - Resolution - Scale
2	Compatible with mobile devices (iOS and Android)	<ul style="list-style-type: none"> - Cross platform usage (OS)
3	Training and implementation documentation must be provided.	<ul style="list-style-type: none"> - Quick tutorial - Ease of use
4	Navigation and interface has to be user friendly	<ul style="list-style-type: none"> - Ease of use - Tips when pointing camera at object
5	Ability to see different layers of the building	<ul style="list-style-type: none"> - Navigation - Software
6	Wireless, on site and off site work capabilities with cloud saving	<ul style="list-style-type: none"> - Accessibility - Storage Location - Wireless Connection - Large file upload size
7	Utilize a free to use Software (Unity)	<ul style="list-style-type: none"> - Low Cost (or free)

Table (2) Needs interpreted as Design Criteria

Functional Criteria	Non-Functional Criteria	Constraints
<ul style="list-style-type: none"> - Detailed view of BIM - Navigation - Software - Storage Location (Cloud) - Ease of use - Simple Tutorials - Large file upload size 	<ul style="list-style-type: none"> - Reliable, no bugs - Give tips when pointing the camera - Steady Frames per second - Ability to run on multiple devices - Geolocation 	<ul style="list-style-type: none"> - Cost (< 100\$) - Device specifications - Wireless Connection - Device OS - Rendering Time (hours)

Table (3) Design Criteria and Constraints

3. Benchmarking

While researching similar products to our solution, we came across 3 companies that were offering AR applications that revolved around construction and architecture. We ended up choosing these companies based on popularity and the fact that they offer some variety in their AR programs. Akular, Gamma AR, and ARki are subscription-based programs that offer some of the design criteria we have mentioned. After benchmarking all 3 options, we concluded that Gamma AR would be the best representation of our solution. We will mainly compare our product to that of Gamma AR, and we will also use some design criteria from the other companies to build our solution.

Competition Augmented Reality Model Visualization Apps			
Specifications	AKULAR	GAMMA AR	ARKI
Annual Subscription Cost	\$1200 (per year)	\$280 (per year)	\$340 (per year)
Cross platform usage	Android and iOS	Android and iOS	Only iOS (Android soon)
Cloud saving	Yes	Yes	Yes
Able to transpose BIM models	Yes	Yes	N/A
Tutorials	Standalone Tutorial Videos	Standalone Tutorial Videos	Website for Tutorials and Standalone Tutorial Videos
Ability to see various layers	Yes	Yes	Yes
Max upload file size	500 MB	Unlimited	40 MB

Table (4) Benchmarking the values from Design Criteria of similar products [1]–[3]

Competition Augmented Reality Model Visualization Apps				
Specifications	Importance	AKULAR	GAMMA AR	ARKI
Annual Subscription Cost	2	1	3	2
Cross platform usage	5	3	3	2
Cloud saving	3	3	3	3
Able to transpose BIM models	5	3	3	1
Tutorials	5	2	2	3
Ability to see various layers	4	3	3	3
Max upload file size	3	2	3	1
Total		69	76	58

Table (5) Benchmarking of similar products using Design Criteria [1]-[3]

4. Conclusion

The market for this type of product is limited yet competitive from the very start. The product will be competing with products offered by AkulAR, Gamma AR and ARki. Through benchmarking, it was concluded that Gamma AR had the more desired specifications, scoring a total of 76 points, and thus will be used as the main reference for the development of the app. The product made is estimated to score above 76 according to the criteria listed.

References

- [1] “GAMMA AR - BIM Construction Management and Facility Management App,” *GAMMA AR*.
<https://gamma-ar.com/> (accessed Oct. 11, 2020).
- [2] “Akular.”
https://akular.com/?utm_term=akular&utm_campaign=USA+-+Brand&utm_source=adwords&utm_medium=ppc&hsa_acc=1643061550&hsa_cam=10192044630&hsa_grp=102126991575&hsa_ad=438724729119&hsa_src=g&hsa_tgt=kwd-910949269609&hsa_kw=akular&hsa_mt=e&hsa_net=adwords&hsa_ver=3&gclid=Cj0KCQjw8fr7BRDSARIsAK0Qqr70nx_TxrBTIBn6eeaJhbRPquHLlFd_S92n2X5_ZgviiCn9J2KzhfwaAnHvEALw_wcB (accessed Oct. 11, 2020).
- [3] “Augmented Reality platform for Architecture, Engineering and Construction,” *DARF DESIGN*.
<https://www.darfdesign.com/arki.html> (accessed Oct. 11, 2020).