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Web design: digital literacy and user preference

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Abstract

The purpose of this research is to investigate the relationship between users' digital literacy and webpage layout preferences. This research examines how factors such as age, internet usage, and occupation impact users' choices regarding structured or abstract layout types. Aspects of layout include headers, footers, informational sections, and calls-to-action. This research could inform businesses and web designers when designing a website for a specific audience in terms of functionality and aesthetic. If your website is not designed to both aesthetically pleasing and user-friendly to your target audience, it is unlikely that you will succeed in reaching that demographic. This research will hopefully help guide designers to use layouts that will resonate with their target audience.

Keywords: Digital Literacy, Web Design, Layouts, User Preferences, Aesthetics

Introduction

As our world becomes increasingly digitized, businesses of all kinds, from finance to food industries to medicine, are turning to websites to reach their consumers and clients. Web design plays a significant role in how a client interacts with businesses and has the potential to be a determining factor in whether a client will choose to form a relationship with the company.

Digital literacy is defined by the American Library Association's Digital Literacy Task Force as "the ability to use information and communication technologies to find, evaluate, create, and communicate information, requiring both cognitive and technical skills" (American Library Association, 2011). Digital literacy can be impacted by many factors, such as age and familiarity with the internet, and it is important that companies tailor their web design layouts to their target consumers' level of digital literacy. Businesses could see a decline in engagement with their website if customers are unable to understand or effectively utilize the chosen design, or if they are disinterested in or distrustful of overly simplified designs.

In this research, we surveyed individuals aged 18-60+ years old with differing degrees of digital literacy and asked them to review three layouts of varying simplicity and rank their ease of use, aesthetic quality, flow, trustworthiness, memorability, persuasiveness, and overall contribution to product interest. We hope that the results will be able to inform companies of preferred layouts of varying demographics to improve their overall user interaction.

The remainder of this paper is organized as follows: We review existing literature on digital literacy and web design, then methodology of our research, and the results of the survey are presented. Lastly, we discuss our findings, implications and limitations of the research, and the resulting impact on future research and web design practices.

Literature Review

Digital Literacy

The basis for digital literacy can be found in a principle known as information literacy. Information literacy can be narrowed down to "…six aspects of a linear process of information handling: recognizing a need for information, identifying what information is needed, finding the information, evaluating the information, organizing the information, [and] using the information. This still forms the basis for most approaches to information literacy to the present day, though much elaborated, extended, and refined, and with numerous variants differing in detail and emphasis" (Bawden, 2008). The concept of recognizing, identifying, finding, evaluating, organizing, and using information is the foundation of digital literacy. These ideas are something each person who uses the internet must apply to what they are trying to achieve, whether that be placing an online order or finding information for a school project.

Digital literacy is an ever-changing concept as technology advances. Each day new system updates are made available to smart phones, plugins are updated on websites, and new applications are launched. Staying familiar with new practices is extremely important to maintain your literacy, but it is also important to be well-versed in older practices. "'Literacy' must deal with the retrospective nature of literacy, either by including past (and future) instances of literate practice, or by explaining why the retrospective element is not required. A definition must deal successfully with the historical component and legacy of the 'literacy' element of the term. In other words, if the word literacy' is used in new domains in ways not congruent with existing practice, then it would be better that another word was used" (Belshaw, 2012). While it is true that technology is very quick to change, people are not. New technology might be available, but people become used to what they have been using, so they may be slower to make those changes because they don't want to give up that familiarity yet. To be truly literate, you must be able to apply your knowledge to both new technology and old.

Web Design and User Preference

One significant factor one must consider with web design is making sure that the design and content complement each other while also ensuring that the content is what stands out the most between the two. "One of the biggest concerns among usability professionals is the time it takes users to scan the page for the information they want, be it a piece of content, a link to another page, or a form field. The design should not be a hindrance; it should act as a conduit between the user and the information" (Beaird, 2020). The design is meant to enhance the user's experience, while also drawing the user's eye to the featured content. Too few design elements will lose the user's interest, but too many will be distracting and draw them away from the important information.

Another factor web designers must consider is their target audience. A university website whose target audience is college students will likely have a different style than a financial advisor's website whose target audience is retirees. Different styles can be broken down into two basic categories: Modernist and Experience Oriented. "There are two domineering trends within Web design that reflect respectively a taste for the modernist style and a taste for an eclectic experience-oriented style. Whether to choose the modernist style or the experience-oriented style should depend on the taste and the needs of the target audience" (Thorlacius, 2007). Thorlacius further describes Modernist style as being very minimal and simple with few design elements to maximize cleanliness and ease of use. Experience Oriented is then described as being much more aesthetically focused and meant to appeal to the user's experience so that the design helps

to influence interest in the product. It's critical for businesses to understand who their target audience is so that they know whether Modernist or Experience Orients is more appropriate to encourage engagement. User preferences are a difficult concept to quantify because they differ for every person. There is no one design element, color palette, or layout style that will please every user, but there are factors one can consider when designing a layout that are important to most users. A customer's satisfaction with a website can be influenced by ease of use, information, entertainment, trust, and currency (Jach, 2018).

Ease of use is critically important because in the most basic sense, websites serve a function. If your users cannot understand your website, then there is little point in having one. Information must be easy to find, access, and understand so that users continue to engage with your website. Entertainment is what helps your website stand out to your users, and by extension your business and product. Websites need to be visually interesting to keep the user engaged.

Trust is important for all websites, but especially businesses. Users will not visit, come back to, or input personal and payment information into a website that they feel is not trustworthy. Identity theft is a serious issue in today's world, and for this reason most users will not interact with websites they do not trust. Finally, currency is significant because of the effect that it has on your business's image. Having a current and professional website gives your website a level of credibility and establishes further trust and interest with your users.

Methodology

To begin, we chose four metrics to represent digital literacy: age, education, personal internet usage, and professional internet usage. We chose age because individuals that are part of Generation Z have been raised in an entirely digital age. Many of the members of this generation cannot remember a time in which the internet was not a part of their day-to-day lives. Most of them were also in elementary school when the first smart phone was released to the public. As people who have never known a time without the internet, they are very likely to have a higher digital literacy than those of previous generations based on their volume of experience. We chose education because individuals who achieved higher levels of education in the form of a college degree have had a great deal of exposure to the internet, as well as evolving technology in general. Whether this be in the form of utilizing technology for research purposes or simply for taking notes or accessing course materials, their higher education likely afforded them with some level of digital literacy. We chose personal internet usage as a metric because self-guided experience is important to the idea of life-long learning, and people with high personal internet usage are more likely to be well-versed in the fast-changing practices of the web. The same can be said for work internet usage, possibly even more so since many businesses will try to stay ahead of the curve to keep their clients engaged and their systems at the top of line.

After choosing metrics for digital literacy, we designed three layouts of varying simplicity for our survey. Each layout was for a fictional subscription business called "Join the Club" that allowed users to join digital book clubs. The first layout, known as the Square Layout, was by far the layout with the highest ease of use. It was very structured with few design elements. The second, called the Circle Layout, was also structured with high ease of use, but it had a larger number of design elements than the first. The final layout, called the Abstract Layout, had the least amount of structure and the highest number of design elements. While it was still easy to retrieve information and interact with the site, it did have the lowest ease of use among all the layouts. Our overarching hypothesis was that individuals with high digital literacy will prefer the abstract layout, while individuals with low digital literacy will prefer the square layout. Please see Figure 1 for full layout designs.

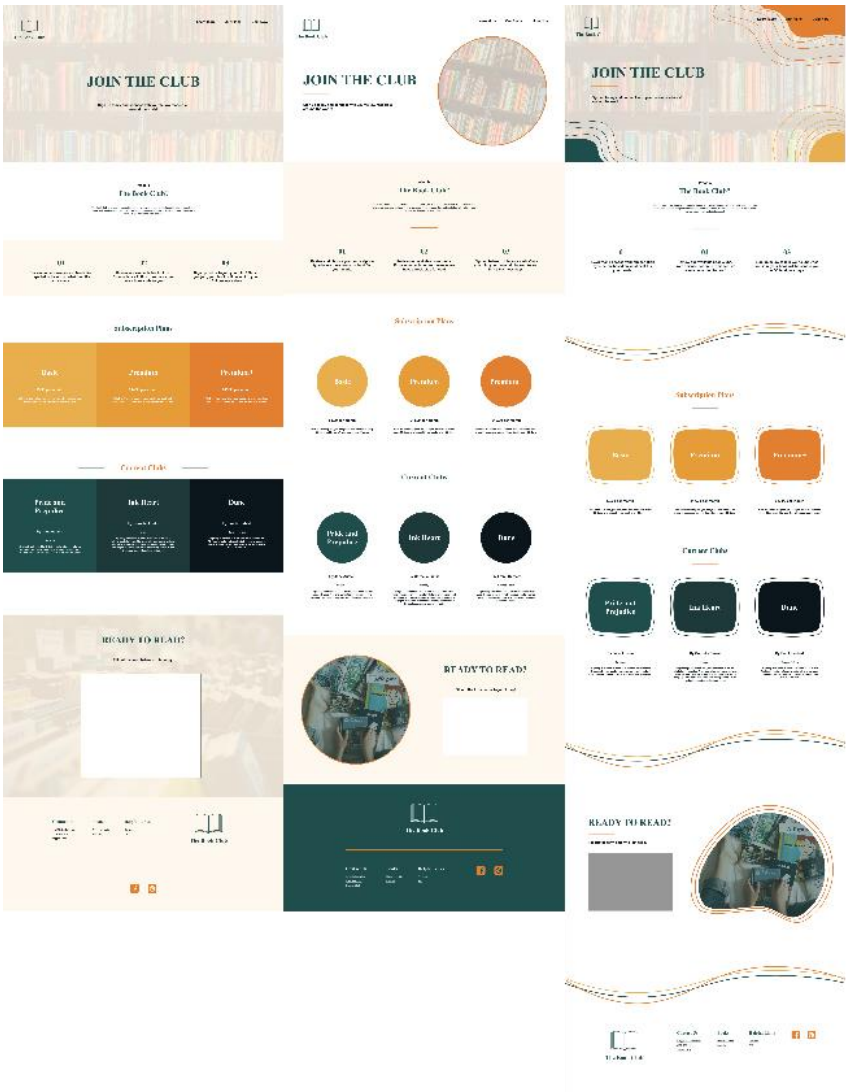

Figure 1: Layouts

Once the layouts were designed and implemented, we began to survey individuals in our target age range of 18 – 60+. Volunteers consisted of friends, family, and coworkers of mine who were willing to participate in the study. It was distributed via a landing page link that took volunteers to a consent statement, and after they were shown the three layouts, and finally they were taken to a Google Form to answer survey questions. We presented each individual with the three webpage layouts and asked them to choose which one they preferred. They were asked to rank the aesthetic quality, flow, trustworthiness, memorability, persuasiveness, and overall contribution to product interest of six aspects of each page: the header section, information section, call-to-action (CTA) section, footer section, and the layout as a whole. We also asked a few demographics related questions regarding their age, gender, education level, personal internet usage, and professional internet usage. No personally identifiable information was collected. This study was approved and conducted in compliance with the University's Institutional Review Board. Further information on survey questions can be found in Appendix A.

Results

This section includes basic statistics such as the frequency and percent of demographic information and layout choice distribution, the mean and standard error of each of the satisfaction metrics (aesthetic quality, flow, trustworthiness, memorability, persuasiveness, and overall contribution to product interest), group comparisons using a One-Way ANOVA analysis, and a summary and categorization of survey comments.

In terms of demographic information, the volunteers tended to be between the ages of 18-60 with very few respondents over the age of 60. For gender, the distribution was about 70% female and about 30% male, with one individual choosing opting not to record their gender. With education, most of our survey group had achieved some form of higher education with roughly 75% having achieved past a high school diploma or GED equivalent. For personal internet usage, 57% recorded high internet usage with over 4 hours per day. Surveyors also reported high professional internet usage, with roughly 70% attesting that they use the internet "frequently" during their workday. One individual did not complete this question. The full results are reported in Table 1 below.

Table 1: Basic Statistics

		Frequency	Percent
Age	18 – 25	27	32.1
	26 – 40	18	21.4
	41 - 60	32	38.1
	60+	7	8.3
	Total	84	100.0
Gender	Female	60	71.4
	Male	23	27.4
	Prefer Not to Say	1	1.2
	Total	84	100.0
Education	High School Diploma	20	23.8
	Associates	11	13.1
	Bachelor's	45	53.6
	Masters	6	7.1
	Doctorate	2	2.4
	Total	84	100.0
Personal Internet Usage	< 2 hours	16	19.0
	2 – 4 hours	20	23.8
	4+ hours	48	57.1
	Total	84	100.0
Work Internet Usage	Rarely	2	2.4
	Sometimes	7	8.3
	Often	15	17.9
	Frequently	59	70.2
	Total	83 (1 missing)	98.8

Next, we observed the layout choice distribution among all participants, regardless of any demographic information. Among the header sections of the 3 layouts there was a preference for the Square Layout header with 46.4% of surveyors selecting it as their preference, followed by the Abstract header and then the Circle header. For the information section, the Circle Layout had the highest distribution with 39.3%, followed by the Square Layout and then the Abstract Layout. For the call-to-action section, footer, and the full layout, all three cases had the Circle Layout with the highest distribution, then the Abstract Layout, with the Square Layout being the least popular. Though the Circle Layout did have the highest distribution most frequently, the difference between the percentages was never significant enough to declare one layout to be the clear favorite. Please see Table 2 below for full results.

Table 2: Layout Choice Distribution

		Frequency	Percent
Header	Square Layout	39	46.4
	Circle Layout	19	22.6
	Abstract Layout	26	31.0
	Total	84	100.0
Info	Square Layout	28	33.3
	Circle Layout	33	39.3
	Abstract Layout	23	27.4
	Total	84	100.0
CTA	Square Layout	21	25.0
	Circle Layout	36	42.9
	Abstract Layout	27	32.1
	Total	84	100.0
Footer	Square Layout	9	10.7
	Circle Layout	50	59.5
	Abstract Layout	25	29.8
	Total	84	100.0
Full Layout	Square Layout	25	29.8
	Circle Layout	30	35.7
	Abstract Layout	29	34.5
	Total	84	100.0

The next section explores the overall mean and standard error of the seven surveyor satisfaction metrics. Volunteers were asked to rank their satisfaction for each layout section on a of 1-5 (1 being the lowest, 5 being the highest) for each of the seven-satisfaction metrics. For Ease of Use, Aesthetically Pleasing, Flows Well, and Trustworthy, all layout sections had an average satisfaction of 4.5 or higher. This indicates that most of the survey responses choose either a 4 or a 5, which suggests a very high level of surveyor satisfaction. However, for Memorable, Persuasive, and Encourages Interest, the average satisfaction tended to be below 4.2. This indicates most survey responses were either a 4 or a 3. While this does still suggest that the volunteers were mostly satisfied, it does also suggest some level of indifference regarding these 3 metrics. Full results can be found below in Table 3.

Table 3: Overall Mean & Standard Error

	Header	Info	CTA	Footer	Full Layout
	μ (SE)	μ (SE)	μ (SE)	μ (SE)	μ (SE)
Ease of Use	4.64 (0.061)	4.74 (0.051)	4.67 (0.059)	4.71 (0.058)	4.62 (0.068)
Aesthetically Pleasing	4.68 (0.061)	4.73 (0.052)	4.59 (0.073)	4.64 (0.075)	4.49 (0.075)
Flows Well	4.61 (0.066)	4.77 (0.049)	4.63 (0.074)	4.68 (0.068)	4.58 (0.077)
Trustworthy	4.50 (0.082)	4.55 (0.080)	4.50 (0.079)	4.65 (0.065)	4.51 (0.073)
Memorable	4.05 (0.110)	4.27 (0.087)	4.24 (0.098)	4.28 (0.093)	4.31 (0.093)
Persuasive	3.93 (0.092)	4.19 (0.087)	4.17 (0.098)	4.19 (0.094)	4.22 (0.087)
Encourages Interest	4.18 (0.085)	4.36 (0.080)	4.34 (0.085)	4.30 (0.088)	4.30 (0.083)

This section analyzes group comparisons using a One-way ANOVA comparison. For the results of the comparison to be considered statistically significant they must have a p-value equal to or lower than 0.05. Overall, there were very few statistically significant instances in the group comparisons. In the age demographic metric, the CTA – Ease of Use comparison had a p-value of 0.008 as the mean for the 60+ age group was lower than the rest. However, since only seven individuals fell into this age demographic, we would argue that this only indicates that most of the surveyors over the age of 60 chose a 4 out of 5 for satisfaction. This would still indicate an overall high level of satisfaction within this group. There was also the CTA memorability with a p-value of 0.011 and the footer memorability with a p-value of 0.048. Both values were for the 18-25 age group, and since their group means were significantly lower than the other age groups, this likely suggests that it is more difficult to make a layout aspect memorable to individuals ages 18-25. This could be due to their high internet exposure which may make it more difficult to design something memorable in relation to the volume of other content it is competing with. In the education metric, the Footer – Aesthetic comparison had a p-value of 0.043 for individuals who have achieve a doctorate. However, there were only two surveyors in this category. Although the group mean is lower than the others, since there were on two people in this group, this only indicates that both chose 4, or they chose a 5 and a 3. With either option, this still shows that the surveyor has been satisfied with their choice. You can see the full results in Table 4 below.

Table 4: One-way ANOVA Group Comparisons

		p-value	Group	Group Mean	Other Means				Comments
Age	CTA – Ease of Use	0.008	60+	4.14	4.63	4.94	4.66		Mean lower than rest, only seven people
	CTA – Memorable	0.011	18 – 25	3.81	4.67	4.34	4.33		Mean much lower than rest
	Footer - Memorable	0.048	18 – 25	3.96	4.67	4.29	4.43		Mean much lower than rest
Edu.	Footer - Aesthetic	0.043	Doctorate	4.00	4.30	4.91	4.73	4.83	Mean lower than rest, only two people

The final question on the survey allowed participants to add any additional comments about the layouts or the survey. We only received eighteen comments, but they can be grouped into 3 categories: positive, constructive criticism, and not relevant. Positive comments mostly consisted of praise for the design or content, constructive criticism was largely a mixture of praise and helpful suggestions, and there were two that were simply observations or opinions about design elements. Please refer to Table 5 below for the full summary, or to Appendix A for the full list of comments.

Table 5: Survey Comment Summary and Categorization

Comment Type	Number Received
Positive	6
Constructive Criticism	10
Not Relevant / Other	2
Total	18

Discussion

Overall, the data collected in the survey indicates that there is no significant difference between the preferences of each demographic group. Age, gender, education, personal internet usage, and professional internet usage seemed to have little effect on which layout surveyors chose. There was also no one layout that was significantly more popular than the other. When asked to choose their favorite full layout, the results were nearly split into even thirds with the Square Layout being 29.8%, the Circle Layout being 35.7%, and the Abstract Layout being 34.5%. These results show that there was not a significant preference among the layouts. Due to the lack of difference between the user preferences within each metric, we can conclude that digital literacy has little effect on overall user preference based on this study. However, from the high levels of surveyor satisfaction in all three design layouts, it is more likely that ease of use, aesthetic quality, flow, trustworthiness, memorability, persuasiveness, and overall contribution to product interest perceived by the participants have a greater effect on user experience. The mean satisfaction for the full layout was consistently between 4.30 – 4.62, which indicates a high level of surveyor satisfaction throughout the layout.

These results could be due in part because of the uneven demographics of our survey group. 71.4% of our survey group were women, this is due in part to a large number of our co-workers, friends, and family members being women. This was also affected by the fact that some of the men who we did share the survey with chose not to participate in the study. Overall, the results of the study are more reflective of women's design preferences. The data also shows that 70.2% of surveyors reported high professional internet usage. Many of the individuals who we distributed the survey to work in an office environment as that is a majority of the career choices of our co-workers, friends, and family. Therefore, the data is also skewed in favor of people who work office jobs.

The results could also be affected by the surveyors' familiarity. All the people who took the survey knew us personally and knew that we had designed the layouts for this study. This could have prompted them to be kinder in their responses than they would have been had they not known the designer. The satisfaction metrics could be more favorable because of the surveyors' relationship with us.

Finally, the layout choice distribution results could have been impacted by the high level of creativity among the individuals surveyed. One of the groups of people that we distributed the survey to were those

on our team at work, which includes web designers, graphic designers, photographers, video production artists, and copy writers. In addition, many of our friends and family do artwork for personal enjoyment during their free time. Many of the people in our immediate circle of friends, family, and acquaintances are highly creative, and this could impact their preferences regardless of the level of digital literacy they possess.

Limitations and Future Research

The main limitation that this study faced was the skewed representation in our survey groups demographics. The individuals that had the option to and were willing to participate in the survey heavily favored women, business professionals with high internet usage, and individuals who exhibit a high level of creativity. Each of these factors had the potential to influence design preferences, as a result the research would have likely benefited from a more diverse pool of possible volunteers.

One way that future research could expand on this study would be to diversify the survey group or to increase the survey group size. We were limited to people within our immediate circle of influence, but others could explore a more even distribution among subjects in terms of age, gender, education, and internet usage. This would help prevent data being skewed in favor of any one demographic group. They could also ensure that the volunteers are not familiar with the designer to prevent bias in the satisfaction metrics. Furthermore, additional research could be done by expanding on the current parameters. Other researchers could delve further into how ease of use, aesthetic quality, flow, trustworthiness, memorability, persuasiveness, and overall contribution to product interest impact user experience. They could also explore more metrics for digital literacy other than age, education, personal internet usage, and professional internet usage. Additionally, they could design layouts with more distinct differences in layout, content, and design aspects to give surveyors less similar choices.

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Appendix A

Demographic Questions:

DQ1: **What is your age?**
18-25, 26-40, 41-60, 60+

DQ2: **What is your gender?**
Male, Female, Other, Prefer not to say

DQ3: **Please select your education level.**
High School Diploma / GED equivalent, Associate Degree, Bachelor's Degree, Master's Degree, Doctorate

DQ4: **How much time on average do you spend on the internet per day?**
Less than 2 hours, 2-4 hours, 4+ hours

DQ5: **In your profession, do you utilize the internet:**
Never, Rarely, Sometimes, Frequently

Design Preferences:

DP1: **Which header did you prefer?**
Layout 1 (Square), Layout 2 (Circle), Layout 3 (Abstract)

Scale: 1 - Strongly Disagree to 5 - Strongly Agree

DP2: ***I feel that the header I chose would be easy to use.***

DP3: ***I feel that the header I chose is aesthetically pleasing.***

DP4: ***I feel that the header I chose flows well.***

DP5: **I feel that the header I chose feels trustworthy and legitimate.**

DP6: I feel that the header I chose is memorable.

DP7: I feel that the header I chose is persuasive.

DP8: I feel that the header I chose encourages interest in the product.

These 8 questions are then repeated for the Information Section, Call-to-Action, Footer, and Full Layout

Survey Comments:

1	Very well done!!
2	They are all great! Great job!
3	Colors could be more vibrant encouraging.
4	Inkheart is a single word, not two. :) Great book.
5	Layout 1 was the cleanest (imo), but very cookie-cutter-esk.
6	I enjoyed the page so much; I found myself wanting to sign up!
7	The third layout felt discordant and a little longer than it needed to be.
8	3's squares looked too much like old tvs which doesn't go well with reading
9	I liked third headers attempt to be more visually appealing. I enjoyed the flow and contrast created in the second layout
10	Love the parallax scrolling but I felt that it was a bit too much here. Less dynamics, more emphasis on content and design.
11	Overall, I liked 3 better, but I did not care for the lines and the funky shapes on a few of the slides. Hope that makes sense.
12	I think Layout #2 is the best choice because it's the perfect blend of being aesthetically pleasing while also clean/easy to use. It appeals to both genders and all ages.
13	I liked the shapes better in layout 2, but I liked the design with the lines on layout 3. Although I didn't like how the design went over the menu options on the header of layout 3.
14	When it comes to trustworthiness, I try to look at things like the hyperlink, owner/organization, sources, etc. The layouts certainly look professional and trustworthy, but when it comes to online sites, that is not the main thing users should look out for.
15	I thought #3 was really cool and retro and I loved #2, but #1 was books, books, books (the full background) and as someone who still loves to hold a physical book in my hands, it was the one that that drew me in more and that I felt was better for this type of "business".
16	First layout looks very generic and template-y. 2nd layout is adding some interest with adding in easy-to-digest-shapes (circles). 3rd layout is best for showcasing products and flow. The header of the 3rd layout is nice, but a little hard to read with the background imagery in front of the navigation/text.
17	Overall, I believe that the web page in all settings feels busy. in the sense that there are simply too many animations and either they are happening too slowly. These interrupts work flow waiting for it to finish the animation. In my opinion some should either be removed or increase the animation speed so that movement doesn’t feel sluggish
18	I viewed the pages on a mobile device. I liked some movement in the page, but ultimately with each section moving or floating in somehow to appear on the page, there was too much movement and I think it made it a bit difficult to focus. Also, the selection menu at the top is difficult to read; there’s no background for the text and it overlaps the page behind it. I chose option 1 as my favorite because the of pricing options layout. I think the complete orange blocks helped divide the options very clearly. Overall thought, the pages were all visually interesting and cohesive.