

# IDENTIFYING THE PERCEPTION TOWARD PRIVACY-RELATED MEDICAL MOBILE APPLICATION PAGE DESIGN

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## ABSTRACT

Since the European Union enforced the General Data Protection Regulation, organizations across the globe started to adjust the privacy notices and privacy policy to comply with the regulation, which required easy-to-understand privacy notices and privacy policy. However, some of privacy-related pages were written with legal or technical jargons, and contains lots of text, which is harder for individuals to read nor understand, affecting the ignorance of those documents completely. Furthermore, in order to offer some medical treatments, patients are required to sign informed consent to let medical professionals perform treatment based on the choices they desired. For these issues and individuals might not acknowledge the rights of data protection as data subject by themselves. From the motivations, researchers conducted survey with samples at 356 participants, which included the general perception toward privacy-related issues as well as the perception of the privacy-related medical mobile application page designs. Then, researchers use the information to find the relationship between the core design aspects and the general perception of privacy toward the design. The results showed that there is a direct correlation between the design and the perception of privacy of each organization, especially in terms of layout arrangement, font size, and visual representation. By incorporating those aspects to privacy-related medical mobile application design, it can, indeed, improve the positive sentiments of their privacy practices, trust, and control to the general users.

**Keywords:** privacy, user experience, perception

## 1. INTRODUCTION

Since the European Union introduced the General Data Protection Regulation (GDPR), organizations across the globe started to improve privacy notices and privacy policy that reflected the Regulation that the European Union enforced.

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However, most of users who use services from organizations do not pay attention to privacy-related pages, including consent messages, privacy management, and privacy notices, due to the fact that these were created as text documents or pages [1], even though it is necessary to exercise privacy rights, especially in medical field that required informed consent for patient to give permission to medical professionals in order to perform medical treatments as one of the privacy requirements in medical-related legislations, including the Health Insurance Portability and Accountability Act (HIPAA) from the United States of America [2].

For example, an article from the *New York Times* read the privacy policy from 150 companies to determine the duration and linguistic complexity, using linguistic analytical service for measuring the complexity based on sentence length and complex words, of the pages.

The results from the article stated that it would take on average 18 minutes to complete reading each privacy policy. Interestingly, a large quantity of the pages required college degree or higher to understand the content in each page, which may be caused by usage of legal terms and jargons.

When comparing linguistic levels of the pages with literacy index from the National Center for Education Statistics [3, 4], it showed that most pages were exceeded the average literacy index, that is comparable with the college level [5].

On the topic of the problem with legal terms and jargons, one study conducted in 2014 by *ROLAND Rechtsschutz-Versicherungs-AG*, a German legal firm, revealed similar issues for those aspects.

The study was conducted with 1,500 German citizens by filling out the survey about general perception toward language used in German regulations. The results showed that over 61% of participants found that the regulations were complex and hard to understand [6].

Moreover, based on the previous survey results, another study used natural language processing (NLP) to determine the linguistic challenges in German regulations based on structure and linguistic choices and found that there was a significant correlation between the length of paragraph and readability of legal documents [7].

Furthermore, with strengthened regulations from countries across the globe, organizations are pressured to follow the privacy protection principle of each country, by including the options for users to see how the organizations use data and give users some control for their own data.

Even though, most of privacy regulations required organizations across the world to create easy-to-read and straightforward privacy-related pages. Still, there are some organizations decided to not implement best practices for creating privacy-related page designs. These cause flawed privacy-related designs affected overall user experience and the trust that the organizations expected to get [8].

Thus, this study is a reflection to the organizations about privacy perception of users in terms of privacy-related page design to improve transparency, trust, and overall perception toward how the organizations use data.

## 2. LITERATURE AND RELATED WORKS

This section will discuss about privacy legislations, user experience, and related studies in both fields, in order to understand the context and background of the research.

### A. Privacy Legislations

Researcher selected three privacy legislations from three continents: the General Data Protection Regulations (GDPR) from the European Union and the United Kingdom [9], the California Privacy Rights Act (CPRA) from the State of California, the United States of America [10], and the Personal Data Privacy Act of Thailand (PDPA) [11].

For the United States, researcher selected the CPRA since there is no federal level of privacy regulation that is comparable with the GDPR, and the CPRA is considered to be strictest law among the state-leveled regulations across the States, according to a privacy advocate [12].

The reason for selecting those legislations is based on case studies that researchers used for conducting survey, which are developed in Thailand and overseas countries, usually from the United States of America.

Moreover, most of the case studies are designed to be used globally. Therefore, they are required to comply with the regulations in the European Union, which is the GDPR.

Researchers selected specific aspects that are related to the study, including general information, data disclosure and collection approach, definition of sensitive data, and general requirements for complying with such regulations, as shown in Table 1.

**Table 1** Comparison of Privacy Legislations

	GDPR	CPRA	PDPA
<b>General Information</b>			
<b>Legislators</b>	The European Union	The State of California, the United States	Kingdom of Thailand
<b>Enforcement</b>	Organizations across the world using data from citizens of member countries in the European Union and the United Kingdom.	Organizations collected data from over 100,000 Californians, or based in the state, or gather over 50% of revenue from the state.	Organizations across the world using data from Thai citizens commercially, except for government agencies.

	GDPR	CPRA	PDPA
<b>Data Disclosure and Collection Approach</b>			
<b>Data Collection Approach</b>	Opt-In	Opt-Out	Opt-In
<b>Categorization of Data Usage Purposes</b>	Required		
<b>Purpose of Data Collection</b>	Required		
<b>Requirements for Disclosing Data Usage Messages</b>	1. Plain and Straightforward language 2. Concise 3. Easy-to-Read	Plain and Straightforward language	1. Plain and Straightforward language 2. Concise 3. Easy-to-Read
<b>When to Update Terms</b>	As up to date as possible	At least, every 12 months	As up to date as possible
<b>Disclosure in Duration of Data Retention</b>	Required		
<b>Disclosing who can access to the data</b>	Required		
<b>Disclosing the benefits of collecting such data</b>	Required		
<b>Right to Decline Data Collection</b>	Yes, unless the data is strictly necessary by regulators, public interest, or for protecting human rights	After data subject request for data deletion	Yes, unless data is strictly necessary by regulators, public interest, government requests, or for protecting human rights
<b>Integrity and Confidentiality</b>	Data controller must ensure that data is up-to-date and must have security measurement to ensure that data is safe and secure.	Businesses are required to have measure to protect the privacy and integrity of data subject.	Data controller must ensure that data is up-to-date and must have security measurement to ensure that data is safe and secure.
<b>Propose Limitation</b>	Data controller and data processor must use data according to the detail provided to data subject.		
<b>Informing Data Subject</b>	Required		
<b>Disclosing privacy rights</b>	Required		
<b>Detail of how to opt-out of data processing</b>	Required		
<b>Detail of how to limit the data processing</b>	Required		
<b>Usage of Sensitive Information</b>	Required		
<b>Sensitive Information Classification</b>			
<b>Identifiable data, including ID number, passport, SSO</b>	Yes		
<b>Credentials, including password and authentication</b>	Yes		
<b>Financial information (account, loan, credit, current balance)</b>	Yes		
<b>Precise Geolocation</b>	No	Yes	No
<b>Racial or ethnic origins</b>	Yes		
<b>Political views or standpoints</b>	Yes		
<b>Religion and beliefs</b>	Yes		
<b>Union memberships</b>	Yes		
<b>Personal conversation</b>	Yes		
<b>Genetic data</b>	Yes		

	GDPR	CPRA	PDPA
Biometric data (fingerprint, iris footprint, facial)	Yes		
Health data	Yes		
Gender and sexual orientation	Yes		
<b>Requirements for Complying the regulations</b>			
Privacy Notices	Yes		
Data Collection Message	Yes		
Data Collection Preferences	Yes	No	Yes
Point of Contact	Data Protection Officer (DPO)		
Request Forms for Exercising Privacy Rights	Not necessary	Businesses must provide toll-free phone number and website.	Not necessary
<b>Response Timeframe</b>			
Proceeding requests for editing, deleting, or providing data	30 days		45 days (with extension for additional 45 day, if necessary)
Reporting data breach (e.g., hacking, exploiting, or violating data privacy)	72 hours		

From the table, it shows that there are some differences between each legislation enforcing organizations across the world if they desired to operate in each jurisdiction.

In order to comply with the regulations, the organization is required to fulfill the requirements of each jurisdiction accordingly.

For example, the approach of data collection defined by jurisdictions, which is opt-out by default in the European Union and Thailand, but not in the state of California. Meaning that, if the organization complies with the GDPR from the European Union, they would not be able to collect personal data, unless the user gives consent to them.

### B. User Experience

User experience (UX) is the field of study related to experience created for users to use products or services in the real world to give the best experience to users.

Since the research is heavily relying on the general perception of users of how they behave based on different approaches in privacy page designs, addressing user experience is crucial for the study, especially in accessibility standards.

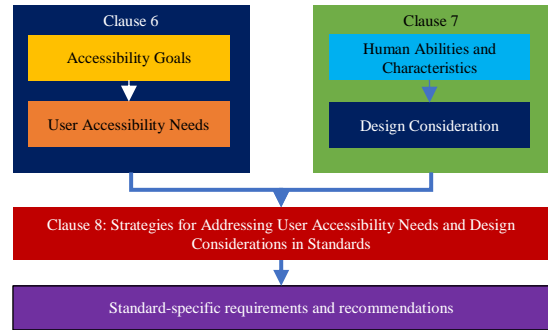


Figure 1 Example of the accessibility standard framework

For the accessibility standards, researchers selected two standards, which are Guide for Addressing Accessibility in Standards (ISO/IEC Guide 71) [13] and Web Content Accessibility Guidelines (WCAG) [14], along with related principles for approaching more user-friendly designs, such as wayfinding, working memory, reading pattern, channel, and informational hierarchy [15], as shown in the Table 2.

Table 2 Comparison of User Experience

	ISO/IEC Guide 71	WCAG 2.1	Related Studies
<b>General Information</b>			
<b>Creators</b>	- The International Electrotechnical Commission (IEC) - The International Organization of Standardization (ISO) - The International Telecommunication Union (ITU)	The World Wide Web Consortium (W3C), with: - Adobe - InterAccess - Nomesa - Google - University of Texas at Austin - University of Wisconsin-Madison	
<b>Target</b>	Variety of goods, including software applications, consumer products, and surrounding environments	Websites	General appearance
<b>Foundation of the Guidelines</b>			
<b>Goals</b>	- Suitability for wide range of users - Conformity with user expectations - Support for individualization - Approachability - Perceivability, understandability - Controllability, usability - Error tolerance - Equitable use - Compatibility with other systems	To improve accessibility for websites in three areas: - Users with cognitive and learning disabilities - Users with low vision - Mobile users	Defining the terms as guideline for improving user experience
<b>Ability and characteristics of human</b>	- Sensory abilities - Immunological system function - Physical abilities and characteristics - Cognitive abilities	- Human's visibility - Cognitive abilities	
<b>Approach of Accessibility and User Experience</b>			
<b>Multi-Form Factors Approach</b>	Multiple forms of presentation, in case of someone who is not able to access to specific type of presented forms	Perceivable: the website user interface must be perceivable for everyone.  For example: including text	Channel: medium of general user interaction of product or service  To improve user experience in terms of channel,

	ISO/IEC Guide 71	WCAG 2.1	Related Studies
		alternative for blinds, visual elements	product or service should know target customer, select the right channel, optimize performance of channel, and measure outcome for such approach.
<b>Interaction</b>	Multiple forms of human interaction with facing product or service, including: - Keyboard alternative from mouse input - Touch input - Voice input	Operable: the website must be able to operate by any user, including: - Keyboard - Additional inputs - Time gap	Working memory is a definition for understanding what general user use to the specific user experience in the past to let user familiar with the product or service
<b>Readability</b>	Multiple forms of sizes to accommodate disable persons, including the options for adjusting such preferences.	Robust: the website must be compatible with wide range of browsers and devices, along with accommodating disabled persons	- Reading pattern: designing the product or service accommodating how human read information - Informational hierarchy: designing information structure that makes sense for general user
<b>Language</b>	Reducing complexity of design as much as possible, such as: - Communication language - Reduction of unnecessary limits or constraints on user interaction with system	Understandable: website must use language that is easily understandable by general users, and must be include the assist on website, like error detection, and hints	

From the Table 2, researchers used that information to determine design-related factors being used in the research in order to understand the effects of each design aspect of the medical mobile application designs affecting perceptions toward privacy of the organizations.

**C. Related Studies in Relation with Reading Experience**

One study is comparing the effect in general preference, reading perception, sharpness, ease of reading, legibility, and readability, which included accuracy, reading speed, and accuracy per reading speed, on computer display based on factors related to fonts, which are font sizes, font display methods, and typefaces [16].

In the experiment, researchers evaluated with several font configuration, which are two font sizes (10- and 12-point), two font display (dot matrix and anti-aliasing), and two typefaces (Times New Roman and Arial which represent Serif and Sans Serif accordingly).

The research shows that participants had a variety of affect based on font configuration. A notable example is participants had trouble while reading on computer display using Arial typeface with anti-aliasing and 10-point font size.

In conclusion, optimal font size and font face is Arial using dot-matrix font display and 12-point font size.

Another study experimented the effect of serif and sans serif fonts in terms of readability along with the font weight, cap height, and font sizes. Researchers conducted with four participants with the method of reading scrambled text [17].

While the result stated that Serif-based fonts yield slightly better results in terms of reading speed for 5%, the result is inconclusive about the effect of readability in terms of serif and sans serif.

Similarly, another research, conducted by researchers from Brown University, Adobe Inc., University of Central Florida, and Riverdale Country School [18], experimented with 352 participants from a variety of ages, genders, and reading experiences, which focused on interlude reading, including social media posts and mobile applications.

The results showed the difference in results between the participants who are younger than 35 years old and the rest of them based on reading speed and font preferences using Elo Ratings method [19].

From the result, the participants who are older than 35 years old tend to be more sensitive of font selection and leaning toward EB Garamond and Montserrat font face. The result could not be described in the same way for the rest of the participants, who tend to be varied.

Moreover, font preferences and familiarities were not affected effectiveness of reading as expected, which means that the font preferences were not created a significant effect toward the reading speed when compared to other factors, like type of content, font attributes, or x-height. The result is opposed to participants' beliefs that the font preferences could impact the effectiveness of readability [20].

The researchers concluded that by providing a wide range of font selection could improve readability and suitability for each individual.

**D. Privacy Expectations**

Another study is about the relation between privacy notice and the privacy expectations of users.

Researcher gathered samples from Amazon Mechanical Turk (Amazon MTurk) for two separated surveys, privacy expectation survey and privacy notice survey, stated that, by using this method, it should provide more reliable resource and represents citizens of the United States better than in-person survey.

For testing privacy expectation, the researcher uses privacy ratings with scale from -100 (strongly disagree) to 100 (strongly agree) based on forty questions that were given to respondents. Then, researchers compared privacy expectation to response that respondents gave to researcher.

The results of research showed that the average of privacy expectation (-34.97) is lower than the results that

respondents gave to researcher (-25.11), which showed respondents perceived that privacy notices is data privacy protection measurement from the organization, which is opposite from the truth. The results also supported the theory about “Privacy Paradox” [1].

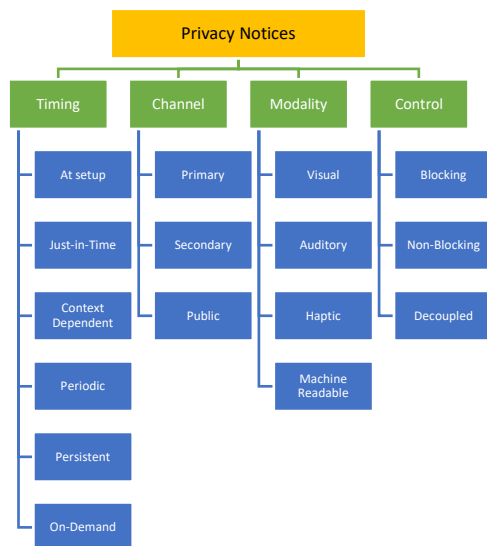
To conclude, the research shows that respondents perceived overly positive about data protection if the organization provided privacy notice on its website than it should be. The respondents perceived that if the organization provided privacy notices, the company should be able to protect personal data better than the company that is not provided any form of privacy notices [21].

### E. Principals of Designing Privacy Notices and Controls

A group of researchers defined the challenge of designing effective privacy notices and controls based on three factors: relevant, actionable, and understandable.

While privacy policies are not necessarily required to meet those factors since the policies are created to abide by the law, as the researchers pointed out. The researchers strongly recommended that privacy notices and controls should apply those three factors [22].

The researchers were also suggesting that by leveraging another four principles of designing privacy notices: when to display privacy notices (timing), where to deliver the notices (channel), what is covered in the notices (modality), and how choice that data subjects can manage (control) [23], as displayed in the Figure 2.



**Figure 2** Showed the Four Principles of Designing Privacy Notices. Recreated from the Research Journal “*A design space for effective privacy notices*”

### F. Urbanization

For the term of urbanization, researcher uses the methodology of defining territorial development from the *Applying the Degree of Urbanisation*, defined by the Statistical Office of the European Union, the Food and Agriculture Organization of the United Nations, the United Nations Human Settlement Programme, the Organisation for Economic Co-operation and Development (OECD), and the World Bank.

On the classification for territorial development, the purpose is separated into three classes, which are cities, town or semi-dense area, and rural area.

The method of separating between the threes is based on the population density, in the unit of residents per square kilometers (residents/km<sup>2</sup>), using density grid as separator in each territory.

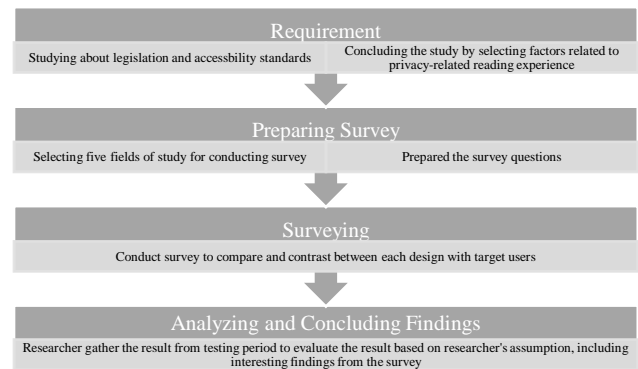
The criteria for separating each territorial development into specific classes are detailed as follow [24]:

- A city is defined by cluster of grids where the population density in each grid is over 1,500 residents/km<sup>2</sup> for over 50% of the cluster.
- A town, or semi-dense area, is defined by cluster of grids where the population density in each grid is over 300 residents/km<sup>2</sup>, but less than 1,500 residents/km<sup>2</sup>, for over 50% of the cluster.
- If the specific area is not classified as a city nor town, it is considered as a rural area.

## 3. METHODOLOGY

This research consisted of 4 phases, which are requirements, developing questionnaires, conducting survey, and analyzing and concluding findings.

The goal of this study is to understand the related factors for designing privacy-related pages for better user experience. To understand it, researchers created a theoretical framework, which consists of four processes, which can be summarized in Figure 3.



**Figure 3** Research methodology

## A. Requirements

In this phase, researchers review privacy legislations across the world, accessibility standards, and other related studies to understand related factors of the research.

As a result, researchers selected five user experience factors, and five evaluation factors which are:

- User Experience Factors
  - Font size
  - Font styles and spacing
  - Language
  - Visual Representation
  - Layout
- Evaluation Factors
  - The organizations respect your privacy.
  - The organizations will collect strictly necessary data and will not use your personal data for other purposes that are not disclosed in the pages.
  - You trusted the organizations to collect your personal data.
  - The organizations will use your personal data according to the pages.
  - You can control your personal data that you desire.

Researchers decided not to include every single aspect of user experience factors based on the study since researchers would like to limit the scope of research and reduce the time to complete the survey.

## B. Preparing Survey

Researchers developed a survey form consisting of the following categories:

- Selecting case studies for each privacy-related page design.
- Developing the proposed privacy-related page designs based on assumptions of researchers.
- Developing survey questionnaires, which are:
  - General demographics of participants
  - General perception related to privacy and privacy regulations.
  - Design evaluations based on the case studies, which are recreated and removed branding from the page to preserve the integrity of the results, along with the proposed designs.
- Creating online survey forms via Microsoft Forms, which support automation system through Microsoft Power Automate.
- Preparing automated system for collecting survey results for further analysis.

To control the accuracy of outcomes, researchers selected the iPhone 13 screen since it is one of the most

popular screen sizes and resolutions in the world [25], and the designs will be recreated in the Adobe XD to maintain consistency of each design across the board.

## C. CONDUCTING SURVEY

Researchers conducted surveys by sending out online surveys to target audiences by promoting on social media. The target audiences must be over 18 years old and have experience in using mobile devices, including smartphones and tablets for at least a year.

Based on social media channels used for promoting the surveys, researchers expected to reach at least 20,000 users, including overlapping ones, with an expected response rate at 16% based on another related research that has a similar rate [26].

As a result, researchers expected to have at least 3,200 users to participate in the research.

After that, researchers used this number to calculate the samples based on Yamane's formula, which is:

$$n = \frac{N}{1 + Ne^2} = \frac{3,200}{1 + (3200 \times 0.05^2)} = 355.5$$

To ensure that there would be enough samples for evaluating the results, researchers added an additional 12.5% from the sample size, which resulted in 400 users who participated in the research.

## D. EVALUATION

To evaluate the results of the research, researchers created an evaluation formula based on each user experience factor, which are font size, font styles and spacing, language, visual representation, and layout.

### Font size

Researchers calculated the average font size displayed on each screenshot based on ratio of the characters used in each size.

Based on the size of control factor, each screenshot could fit a 600-point character in one frame.

As a result, researchers use 1-600 points as a benchmark for evaluating general font size that is suitable for the designs, in which can be translated into this following calculation formula:

$$FS_{avg} = \sum [((FS_a - 1) \times TR) + 1]$$

Where:

- $FS_i$  is the impact factor of the font size.
- $FS_a$  is the actual font size on each page.
- $TR$  is the ratio of the text in each font size (ranging from 0-1)

### Font styles

Researchers assumed that the font style would affect how readable the text is. Based on research, font styles could affect the readability of different age groups [20].

Based on research, the standard Thai typefaces yield much better result than the Roman-liked Thai sans serif ones in terms of readability and reading speed, for roughly 30% better.

As a result, researchers developed a formula to measure the effect of the font style:

$$ST_{avg} = \frac{\sum[ST_a \times TF_r]}{\sum ST_a}$$

Where:

- $ST_{avg}$  is the impact factor of the font style.
- $ST_a$  is the area of each font style.
- $TF_r$  is the weighting score for each font style (1 represents standard Thai typefaces and 0.7 represents Roman-liked Thai sans serif ones)

### Text Spacing Ratio

Researchers gather the area of textbox that can fit every single character without having any padding, indenting, or line spacing. For comparison, researchers gathered the actual area of textbox displayed on screen with padding up to 10 pixels (10px).

Then, researcher use this following formula to calculate the ratio:

$$TS_i = \sum \left( \frac{A_t \times TR}{A_a \times 100} \right)$$

Where:

- $TS_i$  is the impact factor of the text spacing ratio.
- $A_t$  is the actual textbox area on the page without any padding, indenting, or line spacing.
- $A_a$  is the actual displayed area (with padding up to 10 pixels).
- $TR$  is the ratio of the text in each font size (ranging from 0-1).

### Visual Representation Ratio

Researchers gathered the size of text area with line spacing and size of images, which excluded padding and navigation area of the screen.

The provided images must provide the same definition as the text, otherwise it would be counted as padding and navigation area. The formula that used for calculating such ratio is:

$$VR_i = \frac{\sum A_{vis}}{A_{page}}$$

Where:

- $VR_i$  is the visual representation ratio when compared to the entire page of the design.
- $\sum A_{vis}$  is the total area of the visual representation.
- $A_{page}$  is the area of the page.

### Communication Language Factor

Since the assumption for the research is related to the design and understanding of the language.

Researcher used Thai word count tool to count total words used on the page, and count total legal jargons, technical terms, and other terms that are not easily understandable to find the ratio between the jargons and total words on the page, which can be translated into the following formula:

$$CL_i = \frac{W_{jargons}}{W_{page}}$$

Where:

- $CL_i$  is the Communication Language level that is suitable for the design.
- $W_{jargons}$  is the number of words that are considered as jargon, including technical jargon and legal jargon.
- $W_{page}$  are the total words of the page.

## 4. RESULTS

In this section, researchers summarized the findings based on the criteria described earlier, in this case, we will separate into 4 subsections, which are control factors, general demographics, general perceptions toward privacy, and the relevancy of each individual factor.

### A. Control Factors

Researchers calculated the baseline values for evaluating the factors based on the selected samples of privacy-related page designs, in total of 12 samples.

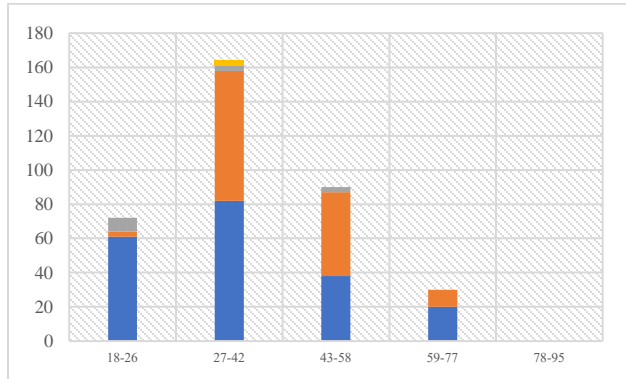
The control factors are as follows:

**Table 3** Control Factors of Each Page Design

Case Study	Font Size	Text Spacing	Font Style	Language	Visual	Layout
Consent A	8.2059879694	0.4468829748	0.7	0.058510638	0.176619273	1
Consent B	6.0946424653	0.3682874071	0.7	0.090909091	0	1
Consent C	3.4572890084	0.1560183497	1	0.183006536	0.238215458	1
Researcher's Consent	4.5727169163	0.2140953957	0.842299533	0.097087379	0.367856927	1
Settings A	4.9799261757	0.2653284117	0.7	0.091954023	0.334145026	1
Settings B	7.1892541391	0.4318084283	0.7	0.151162791	0	1
Settings C	8.8475809717	0.5979109312	0.7	0.099476444	0.007856356	0.8
Researcher's Settings	3.8778220733	0.1980152803	0.856102907	0.203007519	0.152299106	1
Policy A	3.6730839308	0.1756040538	1	0.052511416	0.189404489	0.9
Policy B	9.7120648925	0.4833782963	1	0.024734982	0.006184834	1
Policy C	9.1474975222	0.5618963808	0.7	0.14762931	0.001521798	1
Researcher's Policy	7.6869068536	0.3694423676	0.901288462	0.099678457	0.210333956	1

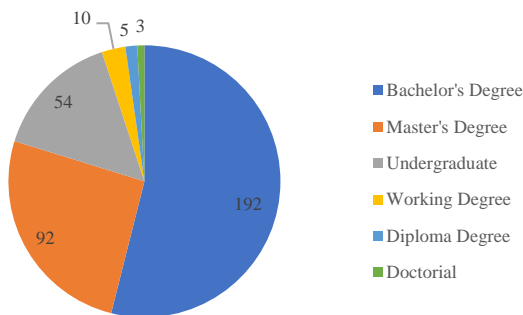
**B. General Demographics**

Based on the results, most of participants are between 27-42 years old who use mobile devices, such as smartphones and tablets for over a year.



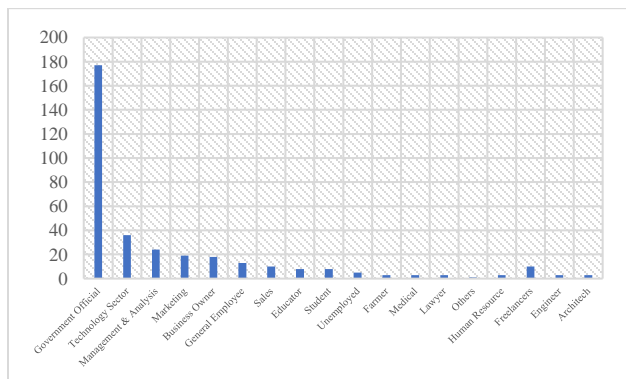
**Figure 4** Total Age Range of Participants

Most of them are within the urban area and had studied up to bachelor's degrees.



**Figure 5** General Level of Education

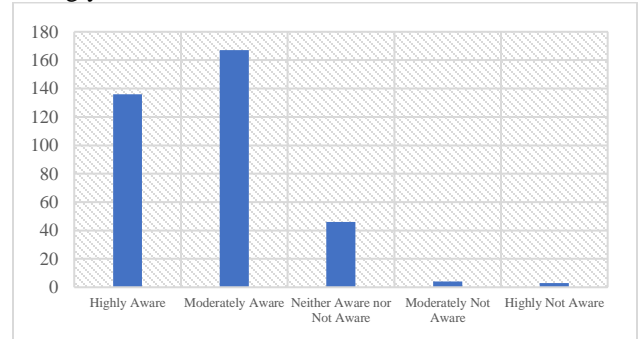
Interestingly, most of participants are in government's official positions, which may be caused by the channel promoting the survey.



**Figure 6** Demographics of Participants in terms of Occupation

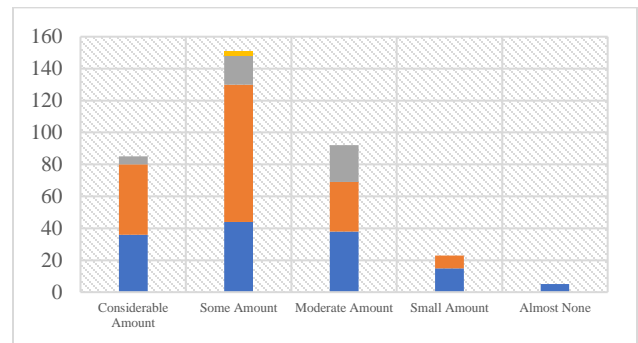
**C. General Perceptions Toward Privacy**

Based on responses, most of participants are generally aware of privacy-related issues based on the average rating of 4.25 out of 5, and mostly tend to skew toward the strongly aware and interested.



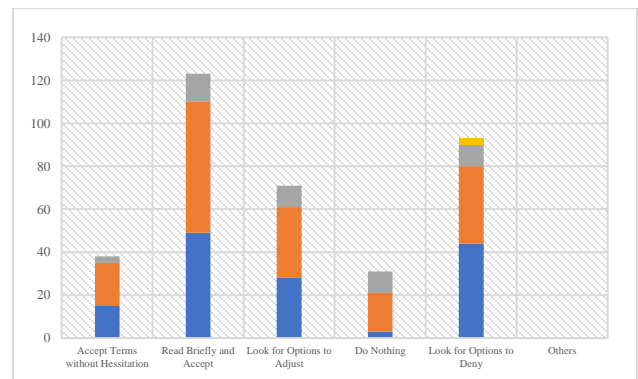
**Figure 7** Privacy Awareness from participants

Most of the participants agree that organizations collected large amounts of personal data (on average, 3.9 out of 5).



**Figure 8** Data Collection of Each Organization

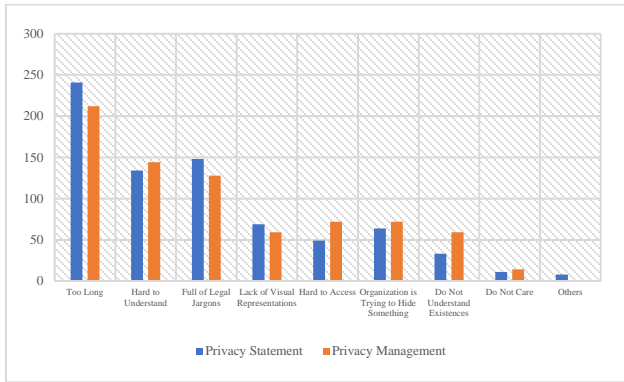
For general behavior of seeing consent pages and privacy notices pages, most of them completely ignore those pages, which reflected to how most participants view about the pages.



**Figure 9** General Behavior When Seeing Consent Pages

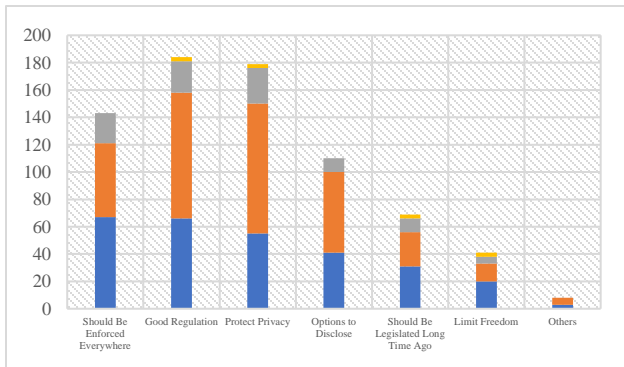


In terms of the general perception surrounded by the privacy statements and privacy management, there were some issues related to the length of statements on the pages, legal jargons, and understandability.



**Figure 10** Comparison Between Privacy Statement and Privacy Management in Terms of Issues with Those Pages

For privacy regulations, the general sentiments were positive, since the regulations were designed to protect participants’ privacy.

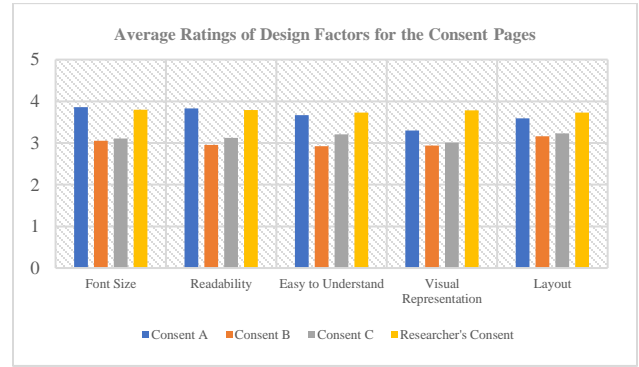


**Figure 11** Privacy Regulation Sentiments

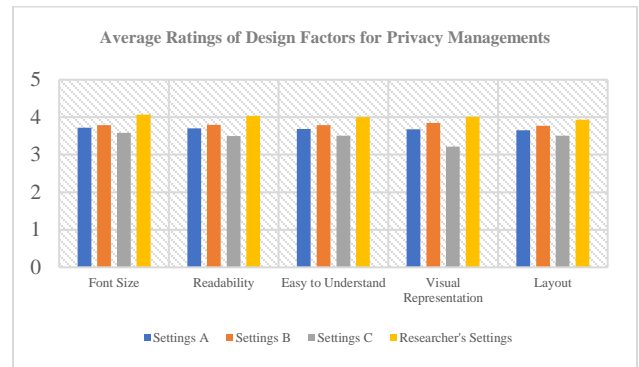
**D. Relevancy of Each Individual Factor**

From the survey, researchers collected the results and calculated with the control factors in subsection A. to find the relevancy of each individual factor for the designs.

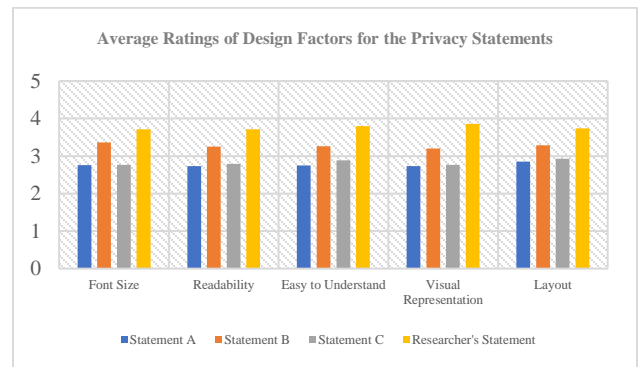
Based on responses, the most relevant factor is language used in the page and visual representation, which most of them lack, especially in disclosure-typed pages (i.e., privacy notices, privacy policy, and privacy disclosure).



**Figure 12** Design Factors of the Privacy Consent Pages

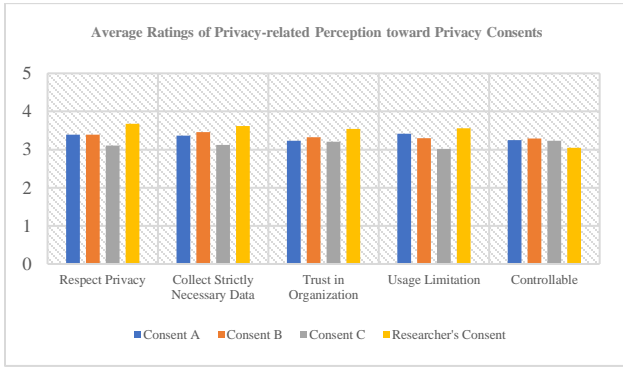


**Figure 13** Design Factors of the Privacy Management Pages

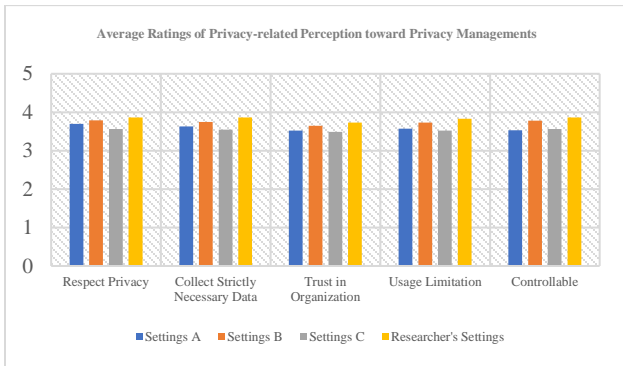


**Figure 14** Design Factors of the Privacy Statement Pages

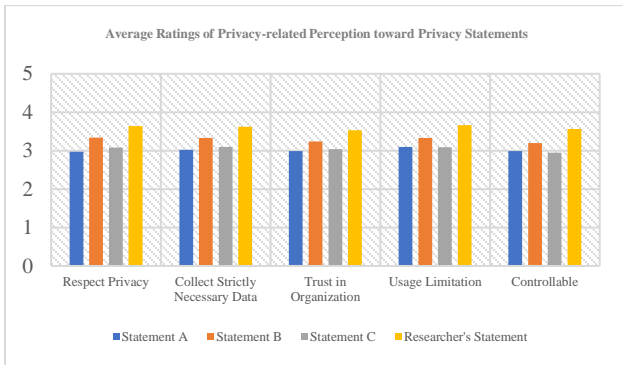
As for privacy perception toward each design, it had direct correlation with the general opinions about the design, stating the strong relationship between privacy-related page designs and general perception about how each organization designs those pages, especially in terms of trust and respecting privacy.



**Figure 15** Perception toward Privacy of the Privacy Consent Pages



**Figure 16** Perception toward Privacy of the Privacy Management Pages



**Figure 17** Perception toward Privacy of the Privacy Statement Pages

## 5. DISCUSSION

Researchers found that the results aligned with the related studies in terms of user experience and privacy expectations. However, this survey can be improved in the future for even more accurate results.

### A. Urbanization

For instance, using postal codes for separating urbanization in each postal code is not quite accurate since some postal codes may contain the highly concentrated areas, along with the loosely concentrated areas.

As a result, some postal codes are translated into “city” rather than “urban”.

Moreover, gathering information from publicly available data from the government’s open data repository can be cumbersome and not that accurate at the village level. Researchers opted for using the entire area of the administrative area, which is not ideal.

To improve the accuracy of urbanization data, researchers suggested to gather highly detailed data, up to village level, including the area of each village, to accurately calculate the population density in each village, which could improve the accuracy of the level of urbanization in each postal code.

### B. Selecting Samples

Selecting samples can be challenging since the samples are not representative of every single variant of those pages.

To improve the result data, researchers suggested using focus group method for better understanding the insight of everyone.

Furthermore, researchers suggested designing more pages to represent a wider range of designs.

### C. Evaluation Methods

Since evaluating the design of the pages is not yet established, researchers decided to create their own, which may not be proved to such accuracy to the degree, since there are several factors for considerations.

For example, some pages included several colors that may affect how users focus on content, including lighter color for detailed explanations. This type of factor is not included at the time of publication.

## 6. CONCLUSION

This research investigates how the factors of page design could affect the understanding of privacy-related pages, especially for privacy notices, privacy policy, and privacy disclosure. Most of participants agreed that adding visual representations and reducing legal jargon should improve understanding of the pages, which should be a focus of improving the pages moving forward. Moreover, the other factors, including font faces, font size, and spacing, could also affect the readability and general understanding of the pages. Based on a study on another

research, using traditional Thai typefaces can drastically improve the readability of the pages. As the privacy regulations are enforcing every single organization, including the medical organization which solely rely on consent of patients, by creating better user experience could drastically affect the general understanding of privacy and should affect the rights of patients and users in general.

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