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A Sign-Logo Creation Method Using the Combination of Color & Shape

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Abstract of Master's Thesis of Academic Year 2014

A Sign-Logo Creation Method Using the Combination of Color & Shape

Category: Science / Engineering

Summary

Throughout the world, there are many types of signs and logos used for visual communication. In this research, these symbols using the combination of color and shape are defined as Sign-Logos. This thesis presents a creation method for Sign-Logos which could be used as a visual language for people around the world. The objective of this research is to establish a method to create new Sign-Logos expressing a certain message by using the combination of color and shape. This method would contribute to people who wish to create new Sign-Logos based on the message. Several experiments were held to clarify the characteristics of the Sign-Logo features. As a preliminary experiment, a design survey was held to examine the messages people receive from the Sign-Logo images, and a color perception test was held to check how the Sign-Logo images can be visible to people with various color perceptions. Experiment 1 was held to find out the rate of people who agree or disagree with the messages set for the Sign-Logo images. Experiment 2 was held to observe how people create new Sign-Logo images based on a certain topic. The experimental results showed how the Sign-Logo creation method can be expressed in a formula, with each feature representing a part of the message.

Keywords:

Image Creation, Sign-Logo, Universal Design, Visual Communication

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Chapter 1

Introduction

Throughout the world, there are many types of signs and logos used for visual communication. These symbols such as signs and logos represent a certain message by using the combination of color and shape. Some can be understood easily, however some are difficult to understand without the help of words. Since the features of color and shape do not depend on language, these symbols could be used for visual communication between people who do not share a common language. There is a problem in the present, that the colors and shapes are used in various rules and standards.

This thesis presents a creation method for Sign-Logos which could be used as a visual language for people around the world. Sign-Logos are defined as symbols which expresses certain messages by using the combination of color and shape. The objective of this research is to establish a method to create new Sign-Logos expressing a certain message by using the combination of color and shape.

Sign-Logos can be used for showing messages to someone without using words. Communication using words can only be used between people who understand the certain language. In this thesis, the person who is sending the message is called the sender, and the person who is receiving the message is called the receiver. For example, if the sender who is trying to send the receiver a message on their tablet using a word as shown in Figure 1.1, the receiver needs to understand the particular language to receive the message. In this case, the word is "kaucio" which is a word in Esperanto language that stands for "caution". If this message was shown by using a Sign-Logo, it would be as shown in Figure 1.2.

Figure 1.1: Visual Communication by Using Words

Figure 1.2: Visual Communication by Using Sign-Logos

In this way, the message could be shown more intuitively and universally, and the receiver does not need to understand the certain language. Sign-Logos can also be used to send a message from one sender to many receivers. The language of the receiver does not matter, which helps the message to be sent to many receivers at once, speaking various languages. In the near future, people from around the world would be coming to Tokyo for the 2020 Olympic and Paralympic games [18]. The main area would be designed with universal signs to guide people from various countries. On the other hand, there would be problems outside the main area where the designers cannot cover. Local stores and events would need to correspond to global customers in their own way. Creating Sign-Logos to guide people is a way to solve this problem. By using the Sign-Logo creation

method, these people without the knowledge would be able to create new Sign-Logos by using the combination of color and shape. People using smart devices would walk by and see the Sign-Logo message shown on their device screens. Especially, the wearable devices such as Android Wear [5] and Google Glasses [6] would be able to show the message on the fly, even if the Sign-Logo image with the exact frame image and object image combination does not exist in the database. Image processing would be used to decompose the Sign-Logo images into the frame image and object image, which makes it possible to dynamically show the message. Ideally in the future, Sign-Logos would be understood by people without looking it up in the dictionary.

Figure 1.3: Sign-Logos Used on Smart Devices

The chapters in this thesis are organized as follows. In Chapter 2, the existing methods such as sign standards and visual languages are described to point out the issues for this research. In Chapter 3, the basic creation method for Sign-Logos is proposed with the concept and formula. As a preliminary experiment, a design survey was held to examine the messages people receive from the Sign-Logo images, and a color perception test was held to check how the Sign-Logo images can be visible to people with various color perceptions. In Chapter 4, the Sign-Logo Creator using the design method is presented with the settings and functions. In Chapter 5, several experiments were held to clarify the characteristics of the Sign-Logo features. Experiment 1 was held to find out the rate of people who agree or disagree with the messages set for the Sign-Logo images. Experiment 2 was held to observe how people create new Sign-Logo images based on a certain topic. In Chapter 6, the thesis is concluded, and the future works are mentioned.

Chapter 2

Existing Methods

2.1. Sign Standards

2.1.1 ISO

ISO (International Organization for Standardization) [12] sets a global standard for safety signs. There are 4 colors set as the ISO safety colors shown in Figure 2.1: Red (Prohibition, Fire Safety), Yellow (Caution), Green (Safe Condition), Cyan (Mandatory). The 2 colors, White and Black, are used as contrast colors.

Table 2.1: ISO Safety Colors

Category	Color
Prohibition Fire Safety	
Caution	
Safe Condition	
Mandatory	

The 5 categories used in ISO 3864-1:2002 signs are shown in Table 2.2: Prohibition (White Circle with Red Border and Cross), Fire Safety (Red Square), Caution (Yellow Triangle with Black Border), Safe Condition (Green Square), and Mandatory (Cyan Circle).

Table 2.2: Sign Category of ISO Safety Signs

Category	Sign
Prohibition	
Fire Safety	
Caution	
Safe Condition	
Mandatory	

These categories set by ISO should be considered as a global rule. Categories of the frame colors change depending on the frame shape. For example, White Circle with Red Border and Cross representing the category of Prohibition and Red Square representing the category of Fire Safety, both uses Red for the frame color. In the same way, the categories of the frame shapes change depending on the frame color. For example, Red Square representing the category of Fire Safety and Green Square representing the category of Safe Condition, both uses Square for the frame shape.

2.1.2 IAPA

The IAPA (Industrial Accident Prevention Association) [7] is a organization in Canada which sets a local standard for preventing accidents in work places. The color and shape rules for the IAPA signs are shown in Table 2.3. There are 3 categories for frame shape: Regulatory (Circle), Warning (Triangle) and Information

(Square). There are subcategories for frame color and shape such as: Prohibition (White Circle with Red Border and Cross), Mandatory (Black Circle with White Border), Caution (Yellow Triangle with Black Border), Danger (Red Triangle with White Border), Emergency (Green Square with White Border), and General (Blue Square with White Border).

Table 2.3: Sign Category of IAPA Signs

	Category	Subcategory	Sign
	1. Regulatory	1.1 Prohibition 1.2 Mandatory	
	2. Warning	2.1 Caution 2.2 Danger	
	3. Information	3.1 Emergency 3.2 General	

In the IAPA standard, a category is set based on the frame shape, and a subcategory is set based on the frame color and shape combination. The subcategory changes depending on the frame shape. For example, White Circle with Red Border and Cross representing the subcategory of Prohibition, and Red Triangle with White Border representing the subcategory of Danger, both uses Red for the frame color. In the same way, the subcategory changes depending on the frame color. For example, Green Square representing the subcategory of Emergency and Blue Square representing the subcategory of General, both uses Square for the frame shape.

2.1.3 United Nations

The United Nations Special Commission [14] held a survey about the color and shape rules for traffic signs. The result is shown in Figure **??** with a category set for each combination of color and shape: Prohibition (Red Circle), Regulation (Red Triangle), Warning (Yellow Triangle), Aid or Emergency (Green Square), Aid or Emergency (Green Rectangle), Mandatory (Blue Circle), Mandatory (Blue Square), and Mandatory (Blue Rectangle).

Table 2.4: Result of United Nations Survey

	Circle	Triangle	Square	Rectangle
Red	Prohibition	Regulation		
Yellow		Caution		
Green			Aid Emergency	Aid Emergency
Blue	Mandatory		Mandatory	Mandatory

This survey result shows not only how the categories can change depending on the frame colors and shapes, but also how people cannot recognize the changes. There are several combinations of color and shape representing the same categories, such as Green Square and Green Rectangle both representing the categories Aid or Emergency, Blue Circle, Blue Square, and Blue Rectangle all representing the category of Mandatory.

2.2. Visual Language

2.2.1 PIC

PIC (Pictogram Ideogram Communication) [15] is a visual language created by Subhas.C.Maharaj in 1980. It is an international symbol used in more than 20 countries over the world such as Europe, Japan, Portugal and Brazil. The first version had 400 symbols, and new designs have been created in Canada, Sweden and Japan over the years. The concept for PIC is "White & Black & Simple". Figure 2.1 shows an example of a PIC sentence using 4 images. Each image has a Black Square background with a White detailed picture in the center. The sentence is "La kato estas sub la table" in Esperanto language which means "The cat is under the table".

Figure 2.1: Example of PIC Sentence

The images showing the cat and table can be guessed without knowing the language, however the other images are hard to guess. The receiver needs to know how this language works in order to look and understand what the message is.

2.2.2 LoCos

LoCos (Lovers Communication System) [21] is a visual language created by Yukio Ota in 1960. LoCos uses simple lines to represent concepts, and can be used for both reading and writing. Sentences can be created by combining several images, and the message changes depending on the position of each image. Figure 2.2 shows an example of a LoCos sentence using several images in various positions. The sentence means "This morning a postman brought an enjoyable letter from my home town".

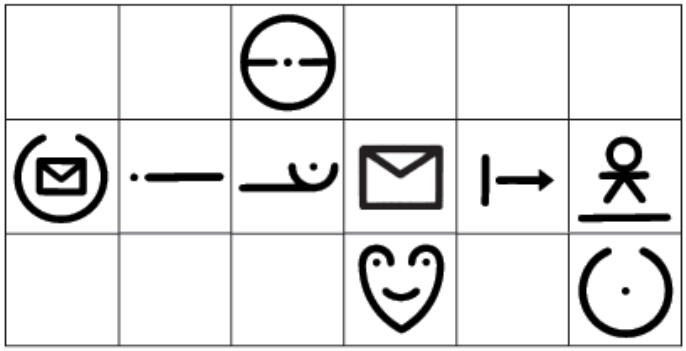

Figure 2.2: Example of LoCos Sentence

LoCos is a unique and interesting language, which needs some background knowledge in order to understand. Although some parts of the sentence can be guessed from simple images such as the envelope and human, many parts cannot be understood without knowing the language.

2.3. Issues

The existing methods for sign standards showed some variations in the use of color and shape features. Rules by the ISO standard should be considered as universal and Sign-Logos should follow this rule. Some sign standards showed some conflict in the rule of color and shape. For example, a Green Square frame in the ISO standard represents the category of Safe Condition. On the other hand, a Green Square frame in the IAPA standard represents the category of Emergency. This kind of conflict between the rules make the signs to be confusing, and the rules for color and shape should not change based on the standard it belongs to. The rules for color and shape should be harmonized to a global rule.

The existing methods for visual languages showed several rules to represent the whole sentence using several images. Some parts of the sentence can be guessed from simple images, however most parts cannot be guessed without knowing the language. The significance of using color and shape is to make it become intuitive and universal, which means there should be a way to show the main points of the sentence by using the combination of color and shape.

Chapter 3

Basic Creation Method for Sign-Logos

3.1. Concept of Sign-Logos

Sign-Logos are defined as symbols which express a certain message by using the combination of color and shape. Sign-Logos can be used for showing messages to someone without using words. Communication using words can only be used between people who understand the certain language. Figure 3.1 shows some examples of Sign-Logo images.

Figure 3.1: Example of Sign-Logo Images

The person who is sending the message is called the sender, and the person who is receiving the message is called the receiver. The Sign-Logo creation method is for the senders to create new Sign-Logos to show the message intuitively and

universally, without knowledge about color and shape. Since each color and shape represents a category, the receivers would be able to understand what the message is by just looking at the Sign-Logo. Sign-Logos are designed to show the main points of a sentence, and not to cover every word in the sentence. It is not for replacing existing rules or standards such as road signs and public signs.

3.2. Formula of Sign-Logo Creation

A Sign-Logo is created by the combination of frame color, frame shape, object color and object shape. The frame shows the category of the message and the object shows the target of the message. The formula of Sign-Logo creation is shown in Equation 3.1. Addition is used in this formula, since the object image overlaps the frame image. An example of a Sign-Logo creation is shown in Figure 3.2.

$$SignLogo \quad = \quad Frame + Object \tag{3.1}$$

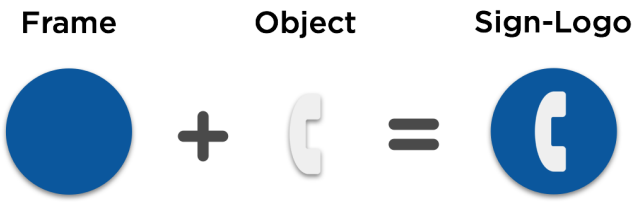

Figure 3.2: Example of Sign-Logo Creation

The formula of frame creation and object creation is shown in Equation 3.2 and Equation 3.3. Multiplication is used in these formulas, since the color fills the shape. An example of a frame creation is shown in Figure 3.3, and an example of an object creation is shown in Figure 3.4.

$$
\begin{aligned}
Frame &= frame_c * frame_s \\
frame_c &= the\ frame\ color \\
frame_s &= the\ frame\ shape
\end{aligned}
\tag{3.2}
$$

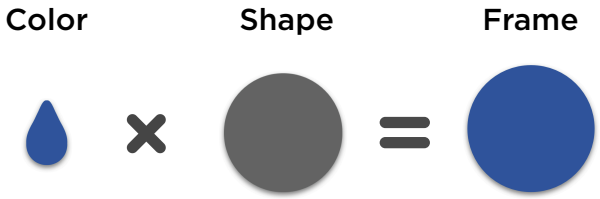

Figure 3.3: Example of Frame Creation

$$
\begin{aligned}
Object &= object_c * object_s \\
object_c &= the\ object\ color \\
object_s &= the\ object\ shape
\end{aligned}
\tag{3.3}
$$

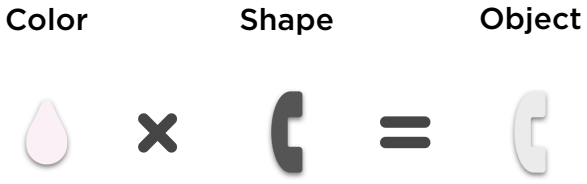

Figure 3.4: Example of Object Creation

3.3. Design Survey

3.3.1 Purpose

A design survey was held to examine the messages people receive when they look at a certain Sign-Logo. The answers were sorted based on the valid answers, frame categories, and common results to find out the tendency of color and shape features.

3.3.2 Setting

Answers from 240 people were collected through an online survey. The participants were from 27 countries such as: Japan (124 people), USA (25 people), Carribian (25 people), etc.

The variation of 12 frame colors are shown in Figure 3.5: Red, Orange, Yellow, Yellow Green, Green, Cyan, Blue, Purple, Magenta, White, Gray, and Black. These frame colors were selected as the basic colors based on the safety colors.

Figure 3.5: Frame Colors Used in Survey

The variation of 18 frame shapes are shown in Figure 3.6: Circle, Triangle_Up, Triangle_Right, Triangle_Down, Triangle_Left, Square, Rhombus, Pentagon_Up, Pentagon_Right, Pentagon_Down, Pentagon_Left, Hexagon_Up, Hexagon_Down, Heptagon_Up, Heptagon_Right, Heptagon_Down, Heptagon_Left, Octagon. These frame shapes were selected as the basic shapes, and some shapes were rotated.

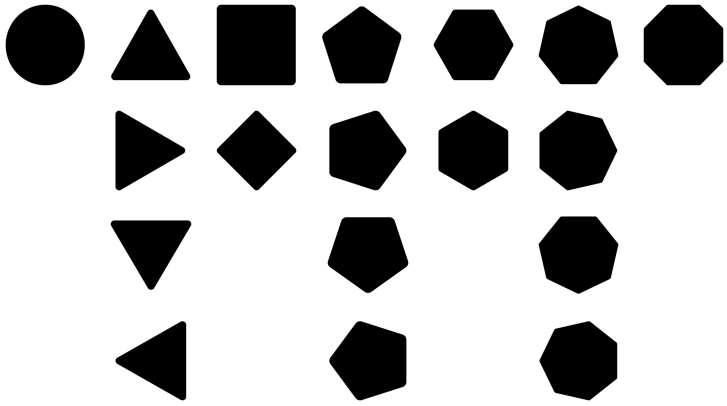

Figure 3.6: Frame Shapes Used in Survey

The variation of 2 object colors are shown in Figure 3.7. These White and Black colors are the contrast colors which changes based on the frame color. When the frame color is Red, Orange, Green, Cyan, Blue, Purple, Magenta, Gray, or Black, the object color is White. When the frame color is Yellow, Yellow Green, or White, the object color is Black.

Figure 3.7: Object Colors Used in Survey

The variation of 12 object shapes are shown in Figure 3.8: Phone, Smartphone, Man, Exclamation, Question, Line, Minus, Plus, Arrow_Up, Arrow_Right, Arrow_Down, and Arrow_Left. These object shapes were selected as samples. In the actual Sign-Logo creation method, the sender is allowed to use their own object shape.

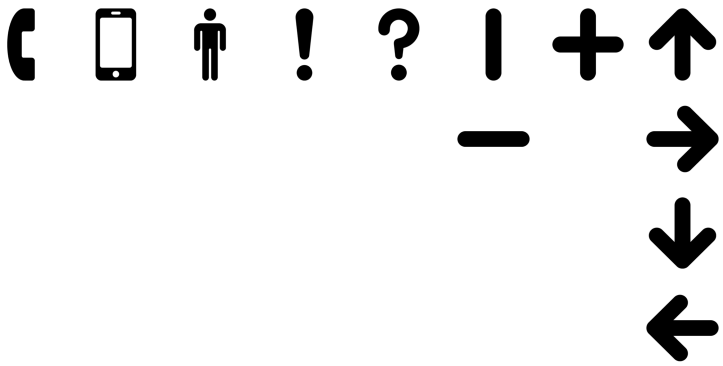

Figure 3.8: Object Shapes Used in Survey

In the survey, a Sign-Logo image was shown for each open question. An example question of the survey is shown in Figure 3.9. This example shows a Sign-Logo image using a Red Circle frame with a White Minus object. The question is "What is the message?" with a text box for the answer to be written. There was no limit to the length of the answer, and the person was able to write as many answers as they like. If the person had no clue of what the message is, they were allowed to skip the question. There were 10 questions per survey in 12 sets as shown in Figure 3.10. The Sign-Logo images used in the survey was generated using image processing, with the random selection of the color and shape features.

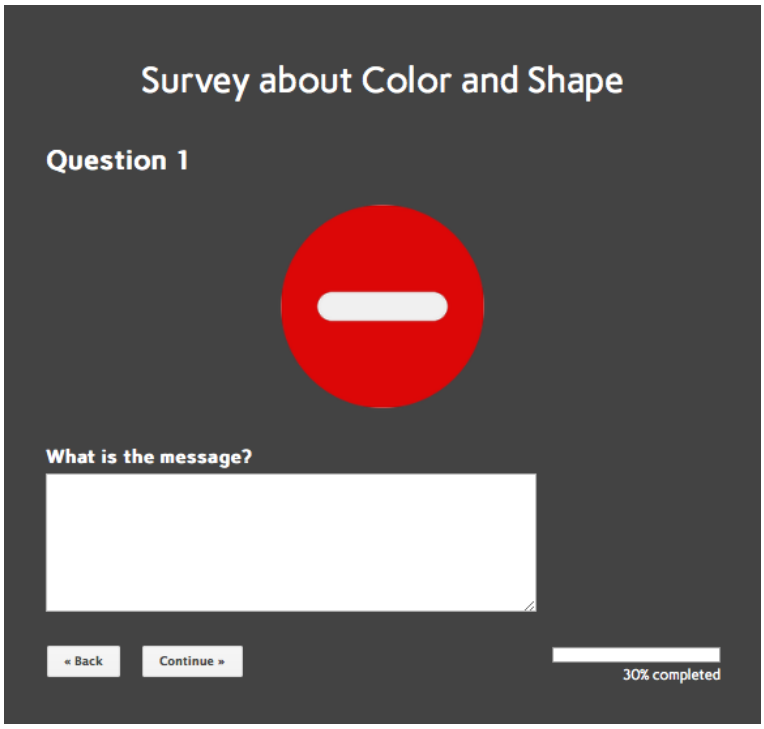

Figure 3.9: Example Question in Survey

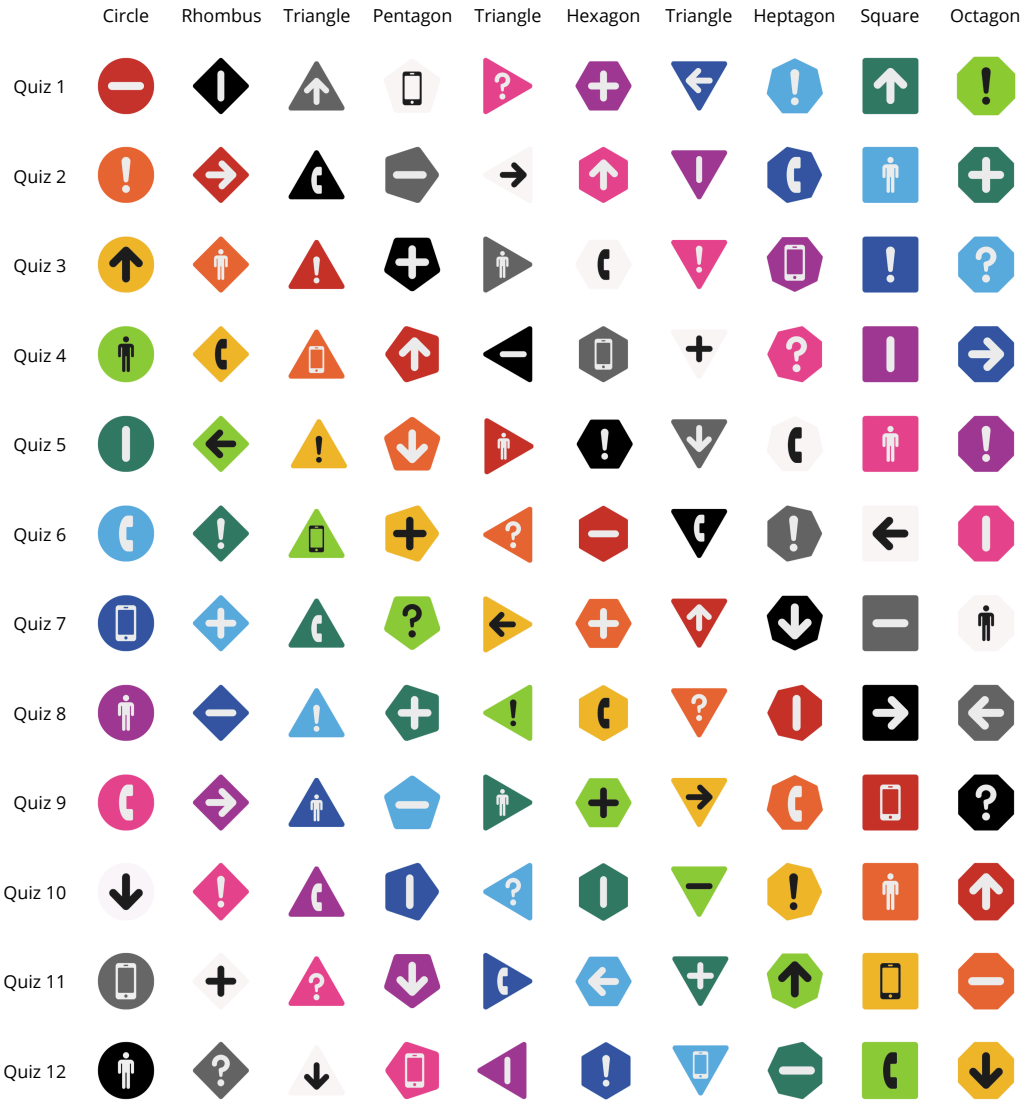

Figure 3.10: Sign-Logo Images Used in Survey

3.3.3 Frame Color Result

The number of valid answers were counted to check how many people were able to understand a message. If there was something written in the text box, it was counted as the written answer. If the written answer was "Phone", it was sorted as an object answer, and if the written answer was "Allowed to use phone", it was sorted as a frame answer which shows that this person thought the frame category was Permission. The percentage of written answers show how the message is clear, and the percentage of frame answers show how it can represent a category.

The result for the answers for frame color is shown in Table 3.11. The horizontal axis shows the percentage of answer about frame category, and the vertical axis shows the percentage of written answer. In descending order, the frame colors with written answers were Yellow (94%), Orange (92%), White (91.5%), Red (90%), Cyan and Black (87%), Green (85%), Yellow Green (84%), Blue and Gray (83.5%), Magenta (82.5%), and Purple (80%).

The frame colors with frame answers were Red (92.8%), Yellow (91%), Orange(89.7%), Yellow Green (86.3%), Green (84.7%), Magenta (82.4%), Cyan (83.3%), Black (81%), Blue (80.2%), Gray (79%), White (78.1%), and Purple (74.4%).

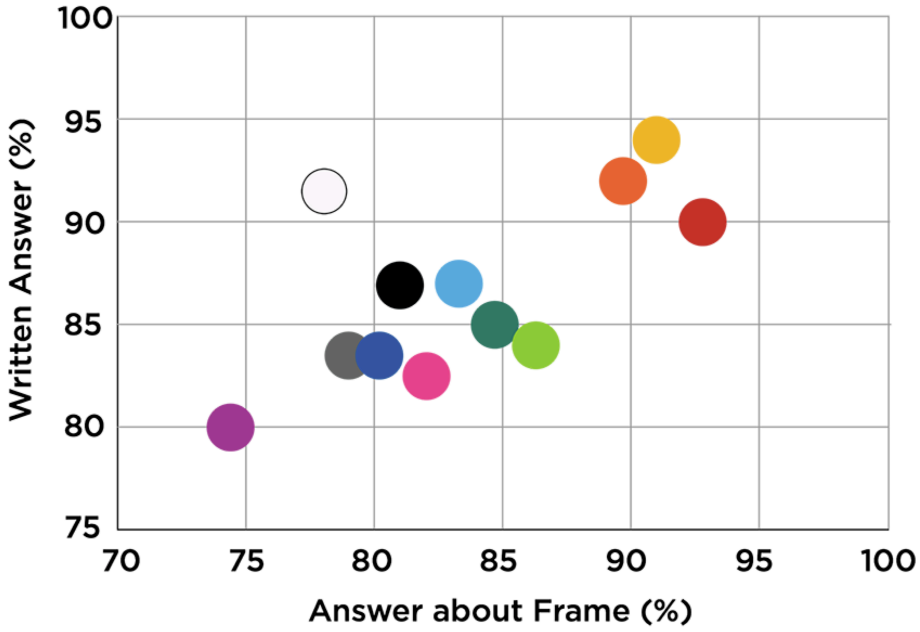

Figure 3.11: Survey Result for Frame Color

Red, Orange and Yellow appeared on the right top, which shows how these frame colors are clear, and tends to show a frame category. Purple appeared on the left bottom, which shows that this frame color could be confusing. There was a gap in the written answer and frame answer for White, which shows that it tends to only show the object.

3.3.4 Frame Shape Result

The result for frame shape is shown in Table 3.12. In descending order, the frame shapes with written answers were Circle (94.1%), Heptagon_Up (91.7%), Pentagon_Left and Hexagon_Down and Heptagon_Right and Heptagon_Down(90%), Square and Rhombus (89.1%), Hexagon_Up (88.2%), Octagon (87.5%), Triangle_Right (84.5%), Pentagon_Down (83.3%), Triangle_Up (81.4%), Pentagon_Up (75%), Triangle_Down (73.6%), Heptagon_Left (73.3%), Triangle_Left (72.7%), and Pentagon_Right (50%).

The frame shape with frame answers were Triangle_Up (99.5%), Octagon (92.9%), Hexagon_Down (89.9%), Heptagon_Right (88.9%), Pentagon_Up and

Triangle_Down and Pentagon_Right (86.7%), Hexagon_Up (86%), Heptagon_Up (85.5%), Pentagon_Left(85.2%), Heptagon_Left (84.1%), Triangle_Right (82.5%), Rhombus (79.6%), Triangle_Left (79.1%), Circle (77.6%), Square (77.5%), Heptagon_Down (72.2%), and Pentagon_Down (70%).

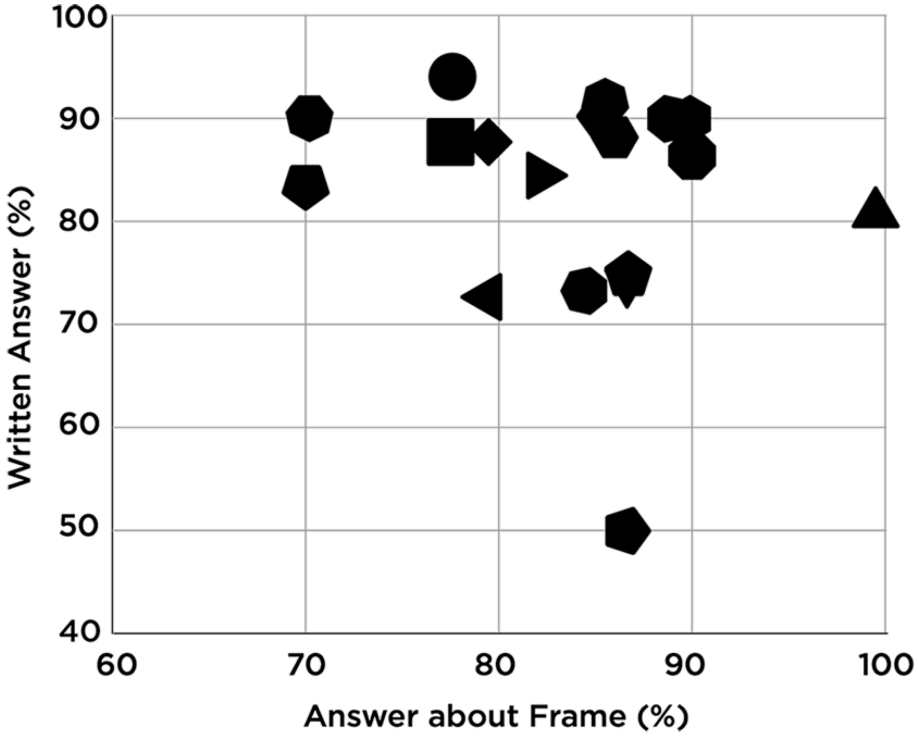

Figure 3.12: Survey Result for Frame Shape

Most people answered something about the frame category of Triangle, which shows that it tends to show a frame category. Circle appeared at the top, which shows how people tend to be more familiar with this frame shape. Pentagon_Right appeared at the bottom, which shows that it is confusing. Pentagon_Down and Heptagon_Down appeared on the left top, which shows how these frame shapes tend to show only the object.

3.3.5 Common Category Result

Sign-Logo images with common answers are shown in Figure 3.1: Red Circle frame with White Minus object, Yellow Triangle frame with Black Exclamation object, and Blue Circle frame with White Smartphone object. For the Sign-Logo using Red Circle frame with White Minus object, 19 out of 20 people answered Prohibition as the frame category. For the Sign-Logo using Yellow Triangle frame with Black Exclamation object, 11 out of 20 people answered Caution, 7 people answered Danger, and 5 people answered Warning as the frame category. This shows how people tend to not notice the difference between Caution, Warning and Danger. For the Sign-Logo using Blue Circle frame with White Smartphone object, 10 out of 20 people answered Permission, and 3 people answered Mandatory as the frame category. There is a conflict when this result is compared with the global standard for ISO safety signs, since the standard defines the Blue Circle frame as Mandatory. This also shows how people tend to get confused with Mandatory and Permission. Following the ISO safety sign rules, the results for the Yellow Triangle frame representing the category of Caution, and Blue Circle frame representing the category of Mandatory was lower then expected, showing that many people could not recognize the message although it is set as a global standard.

Table 3.1: Common Category Result

Category	Prohibition (19) Danger (1) Warning (1) Wrong (1)	Caution (11) Danger (7) Warning (5) Attention (2) Important (1)	Permission (10) Mandatory (3)

3.3.6 Category of Frame Color

Sign-Logo images using the same frame shape, object color, and object shape, with different frame colors are shown in Table 3.2. For the Sign-Logo using Magenta Square frame with a White Men object, 7 out of 20 people answered Women, 4 people answered Men, and 3 people answered Prohibition as the frame category. For the Sign-Logo using Cyan Square frame with a White Men object, 13 people out of 20 people answered Men, 3 people answered the object name, and 3 people answered Other as the frame category. This example show how the category can change based on the frame colors.

Table 3.2: Change in Categories Based on Frame Color

Category	Women (7) Men (4) Prohibition (3) Permission (1) Unavailable (1)	Men (13) Permission (1)

The frame categories from the answers were listed to check the categories for every color, shown in Table 3.3. Every answer was sorted into categories such as: Permission, Prohibition, Optional, Mandatory, Safety, Danger, Caution, Warning, Emergency, Important, Unimportant, Available, Unavailable, Attention, Good, Bad, Hot, Cold, New, Old, Men, and Women.

Table 3.3: Category Result for Frame Color

Category	Prohibition Mandatory Caution Danger Warning Permission Men Optional Emergency Women	Prohibition Mandatory Caution Men Warning Permission Danger Available Attention Emergency Hot Bad Important	Caution Mandatory Warning Danger Available Emergency Permission Attention Prohibition Important Optional	Mandatory Caution Available Prohibition Permission Men Danger Attention Warning Safety Emergency	Mandatory Caution Safety Men Prohibition Available Permission Attention Warning Emergency Unavailable	Mandatory Caution Men Permission Prohibition Warning Available Attention Danger Unimportant

Category	Mandatory Permission Caution Prohibition Men Available Attention Warning Safety Optional Good Cold	Mandatory Permission Prohibition Caution Available Men Warning Attention Important Women	Caution Mandatory Women Attention Prohibition Warning Optional Important Permission Men New Danger Available	Mandatory Available Permission Men Caution Prohibition Attention	Mandatory Prohibition Permission Caution Men Unavailable Available Attention Important	Mandatory Prohibition Men Caution Available Permission Attention Danger Warning Unavailable

3.3.7 Category of Frame Shape

Sign-Logo images using the same frame color, object color, and object shape, with different frame shapes are shown in Table 3.4. For the Sign-Logo using Orange Square frame with a White Men object, 8 out of 20 people answered Men, 5 people answered Prohibition, 5 people answered the object name, and 3 people answered Permission as the frame category. For the Sign-Logo using Orange Rhombus frame with a White Men object, 5 people answered Caution or Men, and 3 people answered Prohibition as the frame category. This example show how the category can change based on the frame shapes.

Table 3.4: Change in Categories Based on Frame Shape

Category	Men (8) Prohibition (5) Permission (3) Caution (1)	Caution (5) Men (5) Prohibition (3) Bad (1) Danger (1) Mandatory (1) Permission (1) Warning (1)

The categories from the answers were listed to check the possible categories for every frame shape, shown in Table 3.5. Every answer was sorted into categories such as Regulation, Notification, Direction, Location, Situation, and Condition.

Table 3.5: Category Result for Frame Shape

Category	Regulation Direction Location Situation Notification	Notification Regulation Location Situation Direction	Situation Location Direction	Direction Location Notification Regulation	Direction Location Notification	Location Situation Direction Regulation Notification

Category	Notification Direction Location Regulation Situation	Regulation Direction Location Notification	Location Regulation Notification Direction Situation	Location Direction	Location Direction Notification Situation	Direction Location Notification Situation

Category	Notification Location Regulation Direction Situation	Notification Location Situation Regulation Direction	Notification Location Situation	Direction Regulation Location	Regulation Notification Location	Direction Location Notification Regulation Situation

3.4. Color Perception Test

3.4.1 Purpose

A color perception test was held to check how the Sign-Logos can be seen from people with several color perceptions. There are 4 types of color perceptions: Common, Protanope, Deuteranope, and Tritanope. For men, the incidence of Protanope is 1.3%, Deuteranope is 1.2%, and Tritanope is 0.001%. For women, the incidence of Protanope is 0.02%, Deuteranope is 0.01%, and Tritanope is 0.03%.

3.4.2 Setting

By using an application called "Color Glasses" [1], the variations of color were checked. The variation of frame colors used in this test is based on the colors used in the design survey, the frame shape is Square, the frame shape is Square, the object color is White and the object shape is Man.

3.4.3 Test Result

Table 3.6 shows how the colors can be seen from people with each type of perception. Some frame colors change depending on the color perception, however some frame colors stay the same. The colors that stay the same are the unique frame colors, and the colors that changes and resembles to another color are the confusing frame colors. Although the frame color changes, if the color does not resemble to other colors, it was counted as a unique frame color.

Table 3.6: Generated Images Based on Color Perceptions

Common						
Tritanope						
Deuteranope						
Protanope						

Common						
Tritanope						
Deuteranope						
Protanope						

Table 3.7 shows the unique frame colors. The monochrome colors such as White, Gray, and Black showed the same color for all types. The colors Cyan and Yellow mostly showed the same color with tritanope type showing a different color. However, these colors can still be used as unique colors, since the colors do not match any other colors.

Table 3.7: Unique Frame Colors

Common						
Tritanope						
Deuteranope						
Protanope						

Common						
Tritanope						
Deuteranope						
Protanope						

Table 3.8 shows the confusing frame colors. The frame colors Red and Orange changed colors to brown in deuteranope and protanope types. Also for the tritanope type for Orange turned out to be more like salmon pink, close to Magenta. This means frame colors Orange and Magenta should not be used for the same frame shape. The deuteranope and protanope types for Yellow Green looks like Yellow, which means Yellow and Yellow Green should not be used with the same frame shape. Also, the deuteranope and protanope types for Green looks like Gray, which means Green and Gray should not be used with the same frame shape.The tritanope type for Blue is similar to Green, which means Green and Blue should not be used with the same frame shape. The deuteranope and protanope types for Purple and protanope type for Magenta looks similar to Blue, which means Blue, Purple, and Magenta should not be used with the same frame shape.

Table 3.8: Confusing Frame Colors

Common						
Tritanope						
Deuteranope						
Protanope						

Common						
Tritanope						
Deuteranope						
Protanope						

Chapter 4

Sign-Logo Creator

4.1. Basic Settings

The Sign-Logo Creator is a system for people who want to create new Sign-Logos based on the color and shape rules. This system is necessary for controlling the combination of color and shape based on the method for Sign-Logos. The system generates a Sign-Logo image based on the frame color, frame shape, object color, and object shape selected by the user.

4.2. User Interface

The user interface of the Sign-Logo Creator is shown in Figure 4.1. The frames are shown on the left side, the objects are shown on the right side, and the colors are shown on the bottom line.

The Sign-Logo Creator was developed by using HTML5, CSS3, Javascript and Python. The main section is the HTML5 canvas which creates a new Sign-Logo image based on the frame color, frame shape, and object shape selected by the user. The combination of color and shape is controlled by the system, and when the user selects a frame color, the variation of frame shapes changes.

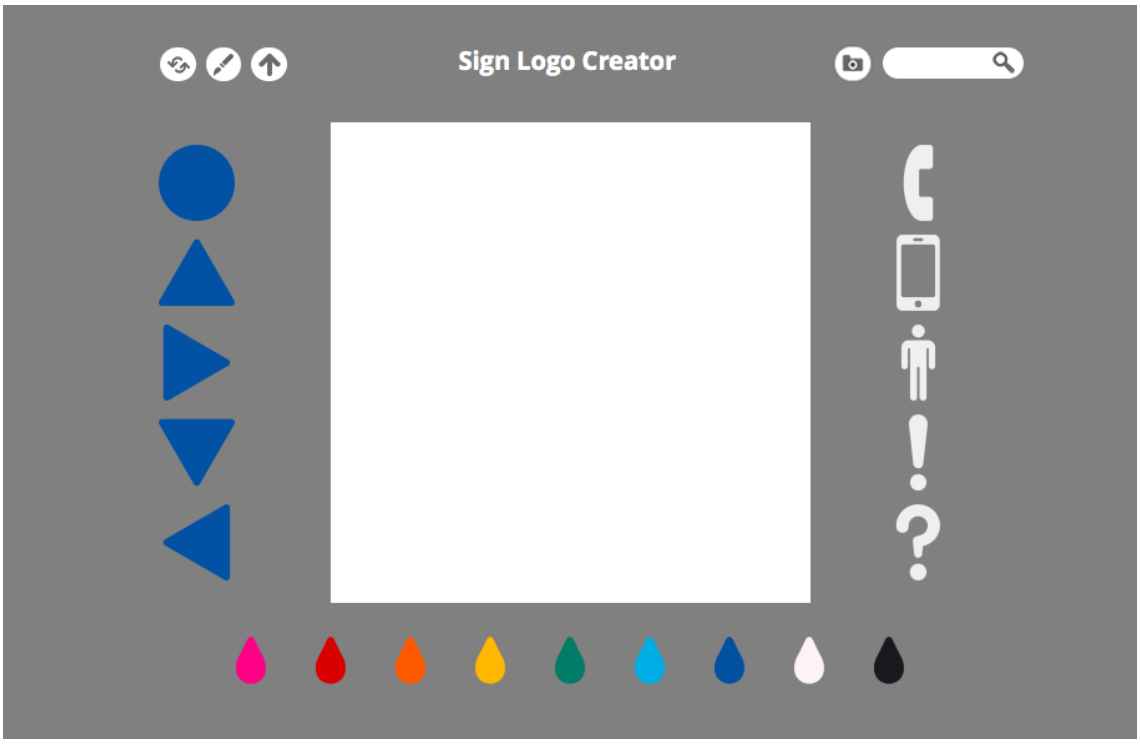

Figure 4.1: User Interface of Sign-Logo Creator

4.2.1 Frame Color

The frame colors used in this experimental system are the 9 frame colors shown in Figure 4.2. The RGB value and order of the frame colors is as follows: Magenta = [236, 0, 140], Red = [197 14 10], Orange = [249 103 0], Yellow = [255 183 0], Green = [0 118 101], Cyan = [0 174 239], Blue = [10 87 157], White = [248 241 252], Black = [28 26 30]. Based on the value, the colors are ordered and indexed. The variation of frame colors and shapes can be changed in the setting.

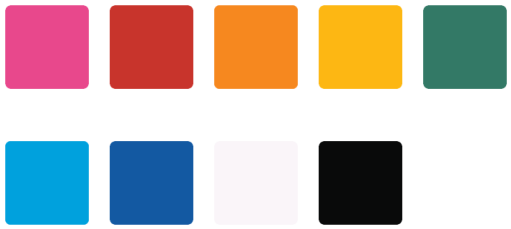

Figure 4.2: Frame Colors Used in Sign-Logo Creator

4.2.2 Frame Shape

The frame shapes used in this experimental system are the 13 frame shapes shown in Figure 4.3. The order of the frame shapes is as follows: Circle, Triangle_Up, Triangle_Right, Triangle_Down, Triangle_Left, Square, Rhombus, Pentagon_Up, Pentagon_Right, Pentagon_Down, Pentagon_Left, Hexagon_Up, and Hexagon_Down.

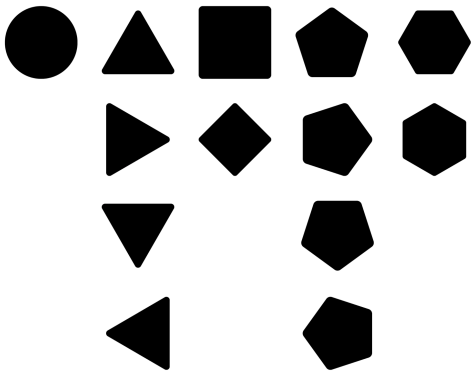

Figure 4.3: Frame Shapes Used in Sign-Logo Creator

4.2.3 Object Color

White and Black colors shown in Figure 4.4 are used as the object colors. The object color depends on the frame color, and is automatically changed based on the selected frame color. This is for creating contrast so that the Sign-Logos could be seen from a distance. When the frame color is Magenta, Red, Orange, Green, Cyan, Blue, or Black, the object color would become White, and when the frame color is Yellow or White, the object color would become Black. White frames could also use other colors for the object, however only Black is used in the current system.

Figure 4.4: Object Colors Used in Sign-Logo Creator

4.2.4 System Structure

The system structure of the Sign-Logo Creator is shown in Figure 4.5. This system mainly has three functions: (1) Create, (2) Search and (3) Register. The user selects the functions according to their needs. The result information from the main processes would be shown to the user on the interface.

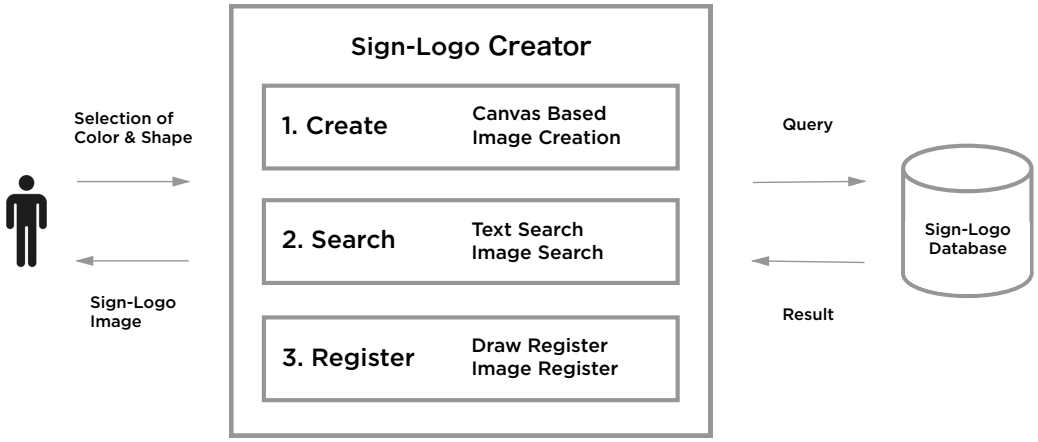

Figure 4.5: System Structure

4.2.5 Database Structure

There are 4 tables used in the Sign-Logo Creator: Object Image, Frame Image, Frame Combination, and Sign-Logo Image. Table 4.1 shows the table for the object images used in the Sign-Logo Creator. The registered object images are inserted into this table. Table 4.2 shows the table for the frame images, which can not be changed by the user, and is controlled by the combination showed in Table 4.3. When the user creates a new Sign-Logo and saves it with a message, it would be saved in Table 4.4. The database is used for showing information dynamically to the users on the Sign-Logo Creator.

Table 4.1: Object Shape Table

OBJECT_IMAGE	
OBJECT_IMAGE_ID	(INTEGER)
OBJECT_NAME	(TEXT)

Table 4.2: Frame Shape Table

FRAME_IMAGE	
FRAME_IMAGE_ID	(INTEGER)
FRAME_NAME	(TEXT)

Table 4.3: Frame Combination Table

FRAME_COMBINATION	
FRAME_ID	(INTEGER)
MAGENTA	(INTEGER)
RED	(INTEGER)
ORANGE	(INTEGER)
YELLOW	(INTEGER)
GREEN	(INTEGER)
CYAN	(INTEGER)
BLUE	(INTEGER)
WHITE	(INTEGER)
BLACK	(INTEGER)

Table 4.4: Sign-Logo Image Table

SIGN_LOGO_IMAGE	
IMAGE_ID	(INTEGER)
MESSAGE	(TEXT)

4.3. Create Function

The user is able to create new Sign-Logos on the interface by drag & drop. The image of the selected frame and object will be shown on the canvas. When the user selects only the Blue Circle frame, it would be shown as Figure 4.6, and when the user selects only the White Phone object, it would be shown as Figure 4.7. When the user combines these images by drag and drop onto another, it would become a Sign-Logo image as shown in Figure 4.8. The order of selecting the frame color, frame shape, or object shape does not matter, and the object color is automatically selected based on the selected frame color.

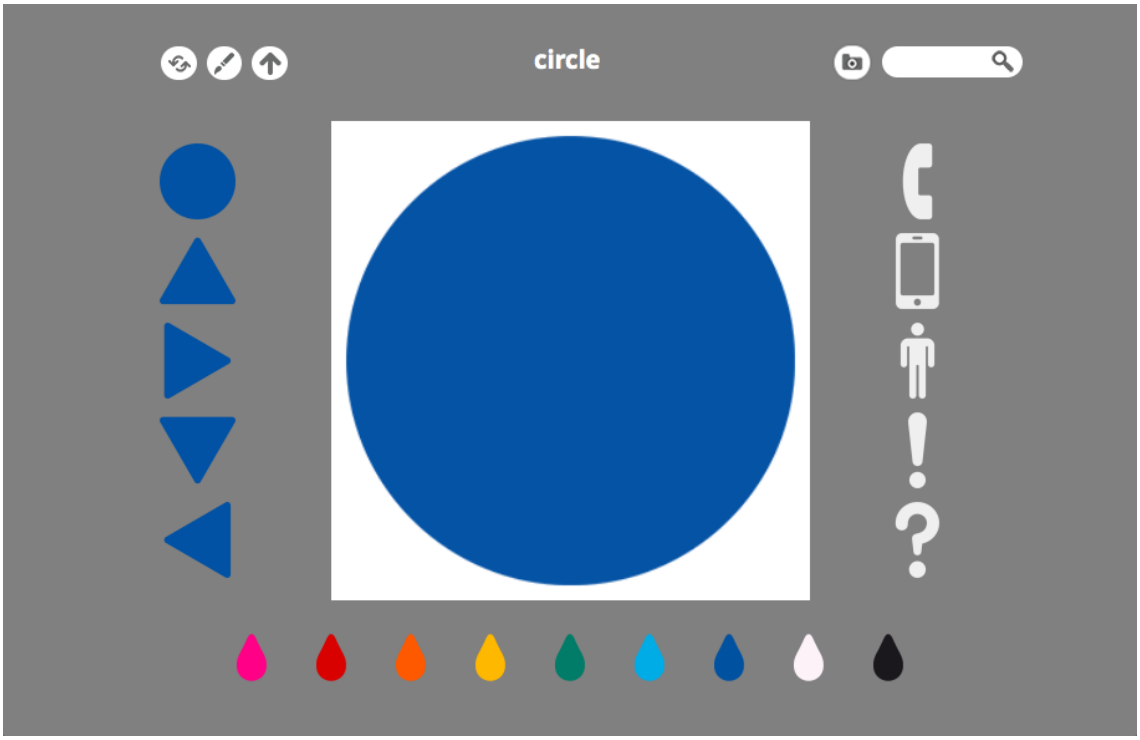

Figure 4.6: Frame Image Shown on Canvas

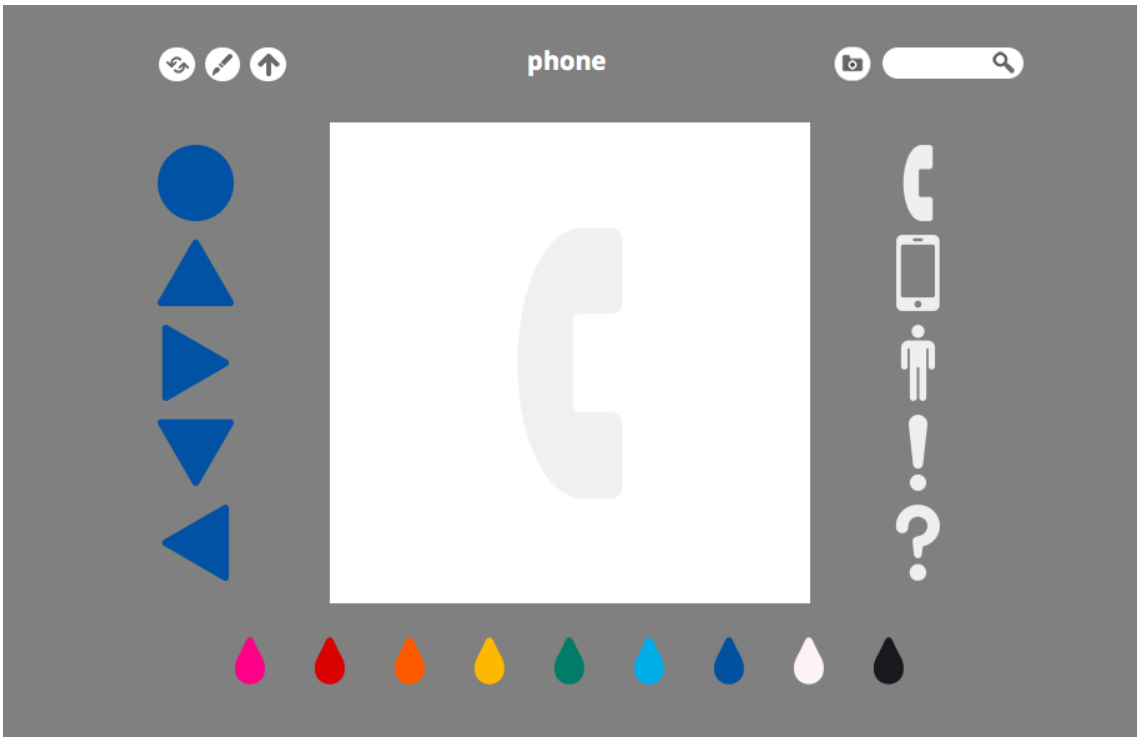

Figure 4.7: Object Image Shown on Canvas

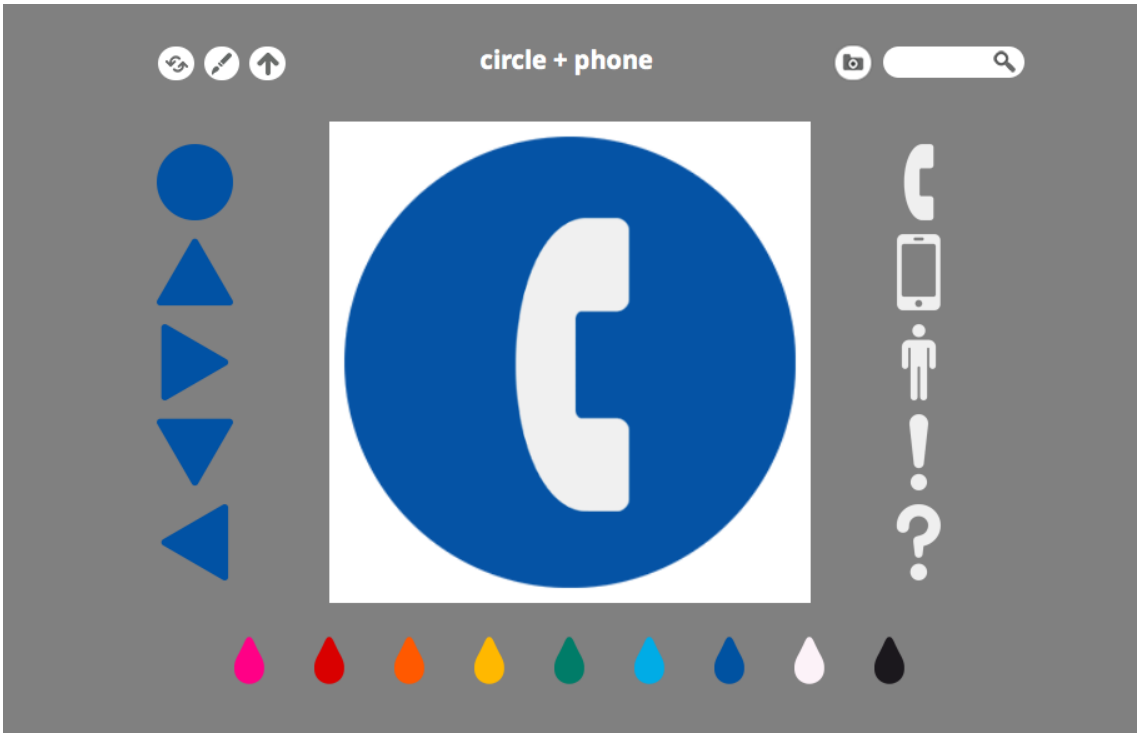

Figure 4.8: Sign-Logo Image Created on Canvas

Chapter 5

Experiment

5.1. Experiment 1

5.1.1 Purpose

The purpose of Experiment 1 was to find out the rate of people who agree or disagree with the Sign-Logo message set for each frame color and shape. If most of the people agree, the design should be used in the method. If half of the people agree, or most people disagree, the design should be considered as confusing, and not be used in the method. The messages were set so that there are no conflicts between the existing methods and survey results.

5.1.2 Setting

Answers from 76 people were collected. The participants were from 11 countries such as: Japan (58 people), India (10 people), Taiwan (7 people), USA (5 people), etc. An example of the worksheet is shown in Figure 5.1. For every question, there was a Sign-Logo image and a message shown with a question, "Do you agree?". There were 5 choices: Strongly Agree, Agree, Neutral, Disagree, or Strongly Disagree. There was an additional question for the people who selected Disagree or Strongly Disagree, to clarify the reason of disagreement. The choices were the color, shape and message features of the Sign-Logo image.

■ Do you think the Sign-Logo is “Men's place”?

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

■ If “Disagree” or “Strongly Disagree”: Which part do you feel is wrong?
This is a multiple choice question.

Frame
a. Color
b. Shape

Object
c. Color
d. Shape

Message
e. “Men’s place” → _____

Figure 5.1: Example Worksheet Page

The rule for the frame color and shape was set as shown in Figure 5.2. Each frame shape represents a category of the message: Regulation (Circle), Notification (Triangle), and Location (Square). Each frame color and shape combination represents a subcategory of the message: Prohibition (Red Circle), Prohibition (White Circle with Red Border and Cross), Permission (Blue Circle), Permission (White Circle with Blue Border), Attention (Magenta Triangle), Danger (Red Triangle), Warning (Orange Triangle), Caution (Yellow Triangle), Notification (Cyan Triangle), Direction (Blue Triangle), Girl (Magenta Square), Women (Red Square), Boy (Cyan Square), and Men (Blue Square).

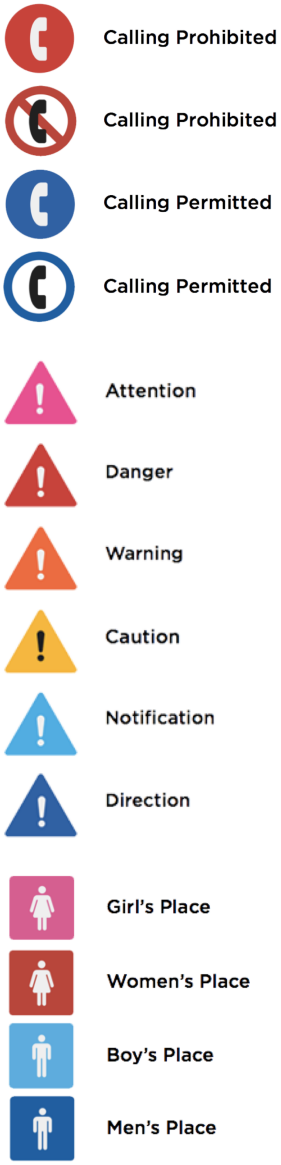

Figure 5.2: Messages Set for Worksheet

5.1.3 Result 1: Circle Frame Showing Regulation

Figure 5.3 and 5.4 shows the result for Circle shapes representing the category of Regulation. For the Red Circle representing the subcategory of Prohibition, 81.25% of the people disagreed with the message, and for the White Circle with Red Border and Cross representing the subcategory of Prohibition, 66% of the people strongly agreed with the message. No one strongly agreed, and most people disagreed with the Red Circle. This shows that this color and shape combination should not be used as a universal rule. Even though the Sign-Logo using White Circle with Red Border and Cross is a universal rule, 16% of the people answered neutral. For the Blue Circle representing the subcategory of Permission, 62.5% of the people answered that they agree with the message, and for the White Circle with Blue Border representing the subcategory of Permission, 41% people answered that they agree with the message. More people agreed, and no one strongly disagreed with the Blue Circle.

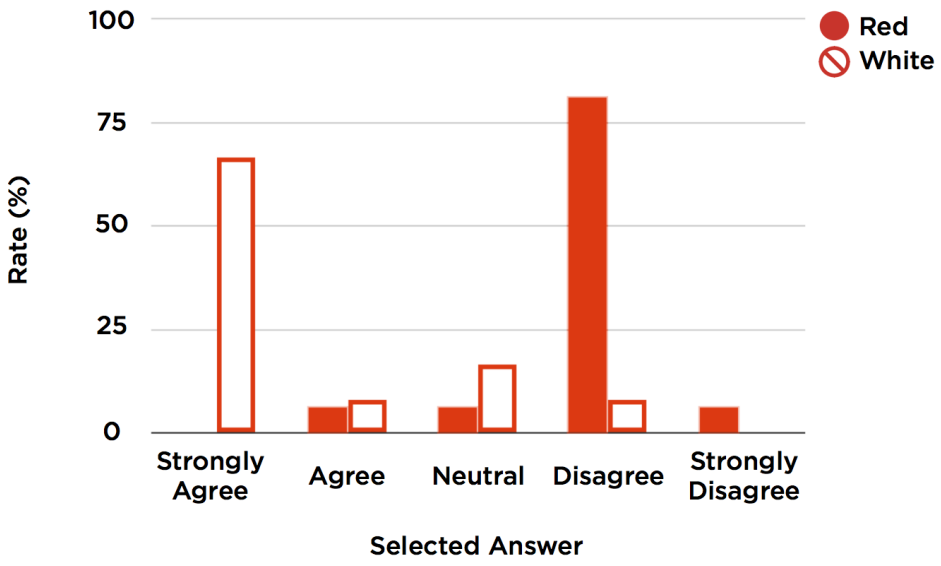

Figure 5.3: Worksheet Result for Red Circle

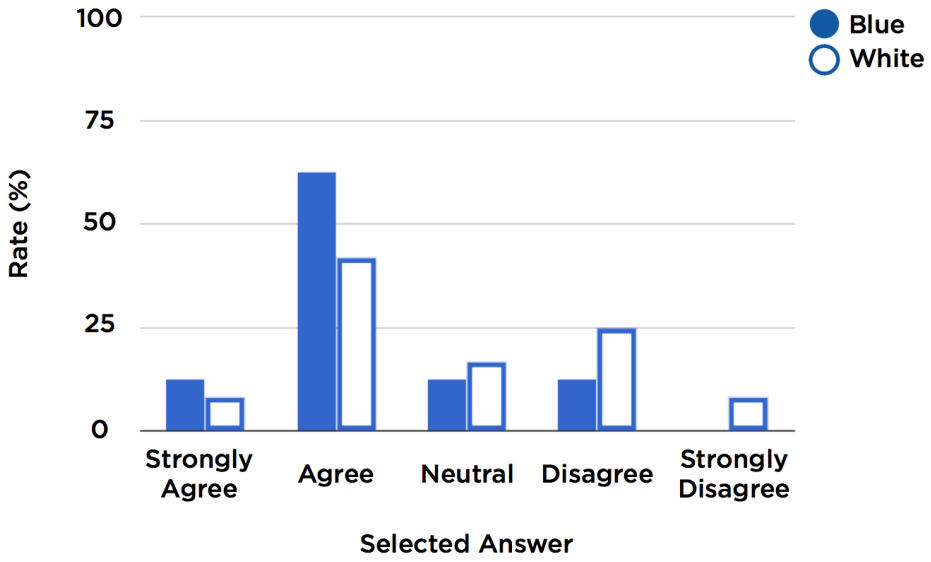

Figure 5.4: Worksheet Result for Blue Circle

5.1.4 Result 2: Triangle Frame Showing Notification

Figure 5.5 and 5.6 shows the result for Triangle shapes representing the category of Notification. The frame colors Red, Yellow and Blue were set as the main colors, and Magenta, Orange and Cyan were used as supporting colors. Many people strongly agreed with the message for Yellow Triangle representing the subcategory of Caution, and Magenta Triangle representing the subcategory of Attention, Red Triangle representing the subcategory of Danger, and Orange Triangle representing the subcategory of Warning. On the other hand, only half of the people agreed with Cyan Triangle representing the subcategory of Notification, and most people disagreed with Blue Triangle representing the subcategory of Direction.

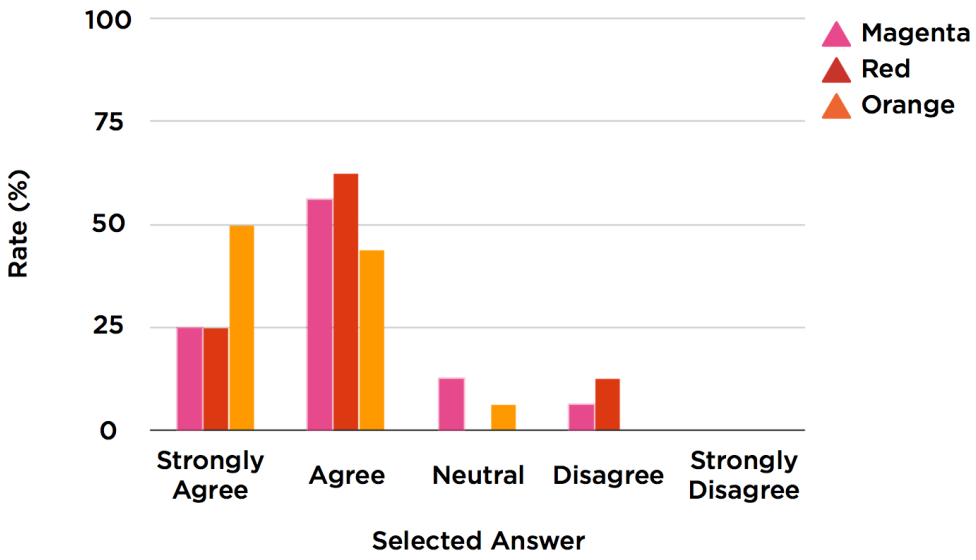

Figure 5.5: Worksheet Result for Triangle 1

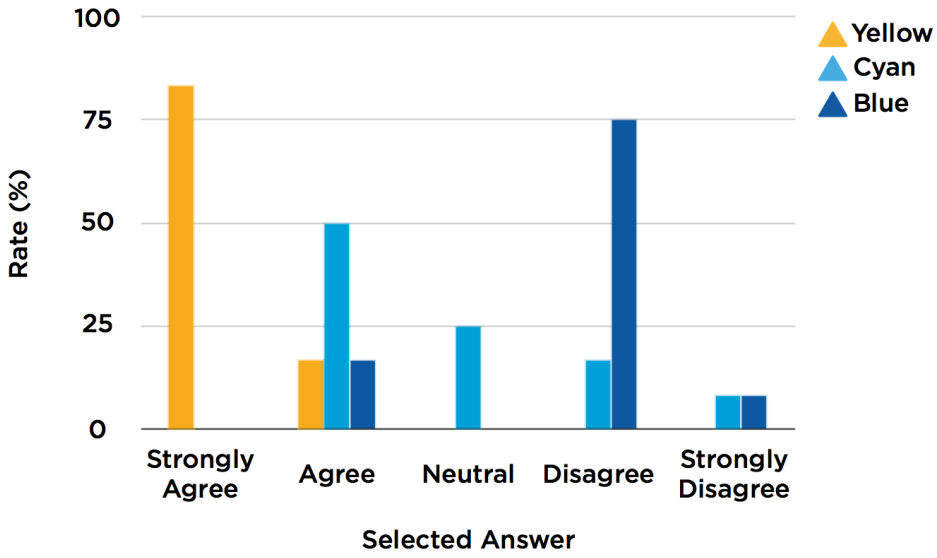

Figure 5.6: Worksheet Result for Triangle 2

5.1.5 Result 3: Square Frame Showing Location

Figure 5.7 shows the result for Square shapes representing the category of Location. About 68% of the people agreed to Red representing the subcategory of Women, 62% of the people agreed to Magenta representing the subcategory of Girl, and 62.5% of the People agreed to Blue representing the subcategory of Men. For Cyan representing the subcategory of Boy, 43.75% of the people agreed, however 31.25% of the people disagreed.

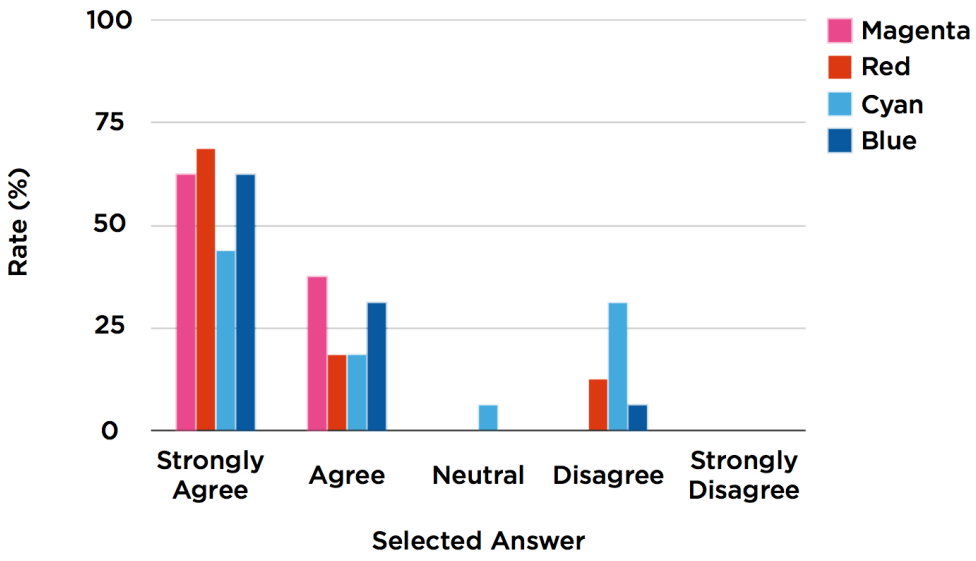

Figure 5.7: Worksheet Result for Square

5.1.6 Summary

The results from Experiment 1 showed how many people agree or disagree to the message. Circle frame shapes could be used to represent the category of Regulation. To represent the subcategory of Prohibition, the White Circle with Red Border and Cross should be used instead of a normal Red Circle. On the other hand, to represent the subcategory of Permission, the normal Blue Circle should be used.

Triangle frame shapes could be used to represent the category of Notification. The Magenta Triangle could be used to represent the subcategory of Attention, the Red Triangle could be used to represent the subcategory of Danger, the Orange Triangle could be used to represent the subcategory of Warning, and the Yellow Triangle could be used to represent the subcategory of Caution.

Square frame shapes could be used to represent the category of Location. The Magenta Square could be used to represent the subcategory of Girl, the Red Square could be used to represent the subcategory of Women, the Cyan Square could be used to represent the subcategory of Boy, and Blue Square could be used to represent the subcategory of Men.

5.2. Experiment 2

5.2.1 Purpose

The purpose of Experiment 2 was to find out how people create new Sign-Logo images. Participants were asked to draw, select, and create new Sign-Logo images based on the message set as a topic.

5.2.2 Setting

There were 4 messages set as topics: "This drink is hot", "This drink is cold", "This book is new", and "This book is old". There were 53 users who created their Sign-Logo images by selecting their frame color and frame shape. For the object, they were allowed to either select an existing shape, or draw and register their own shapes.

5.2.3 Result 1: Hot

The first topic was "This drink is hot". Examples of the created Sign-Logo images are shown in Figure 5.8, and the selected frames are shown in Figure 5.9. For the frame color, 16 out of 20 people selected Red. For the frame shape, 8 out of 20 people selected Circle, and 6 people selected Triangle_Up. The most selected frame color and shape combination was Red Circle, selected by 7 people. Some people intended that the frame shape depends on how hot the drink is. The default should be Circle, however if the message was "This drink is too hot", then the frame shape should be a Triangle.

Figure 5.8: Sign-Logo Images Created for Hot

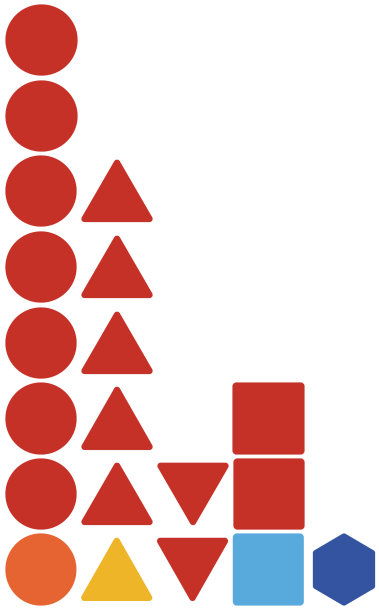

Figure 5.9: Frame Color and Shape Selected for Hot

The object shapes drawn by using the Sign-Logo Creator is shown in Table 5.1. The object color is shown as Black, however the object colors changes automatically depending on the selected frame color. 10 out of 20 people drew a cup with steam, 1 person directly drew the word “HOT” with a cup, and 1 person drew a fire image.

Table 5.1: Object Shape Drawn for Hot

Category	Image
Cup with Steam	
Word	
Fire	

5.2.4 Result 2: Cold

The second topic was "This drink is cold". Examples of the created Sign-Logo images are shown in Figure 5.10, and the selected frames are shown in Figure 5.11. For the frame color, 14 out of 21 people selected Cyan. For the frame shape, 7 out of 21 people selected Circle. The most selected frame color and shape combination was Cyan Circle, selected by 6 people. Pentagon, Heptagon, and Hexagon shapes were selected as the frame shapes compared to the other topics. This reason was because these shapes look like ice cubes.

Figure 5.10: Sign-Logo Images Created for Cold

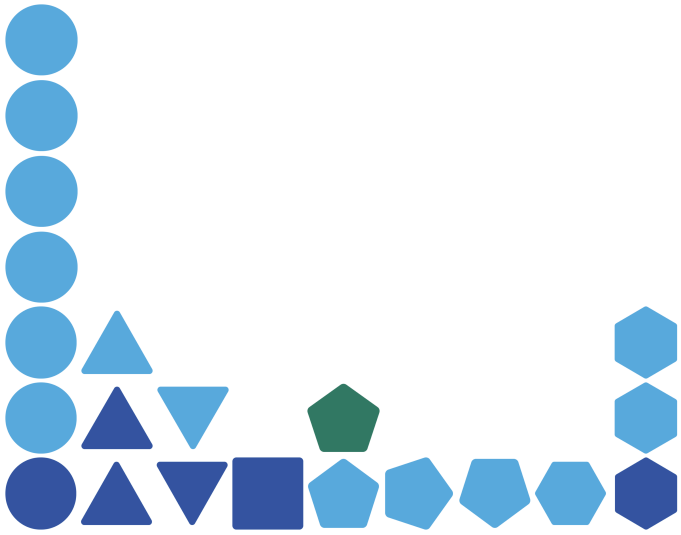

Figure 5.11: Frame Color and Shape Selected for Cold

The object shapes drawn using the Sign-Logo Creator is shown in Table 5.2. 7 out of 21 people drew a cup with ice cubes, 4 people drew a cup with a straw, 2 people directly drew a letter “C”, and 2 people drew a water image.

Table 5.2: Object Shape Drawn for Cold

Category	Image
Cup with Ice Cubes	
Cup with Straw	
Letter	
Water	

5.2.5 Result 3: New

The third topic was "This book is new". Examples of the created Sign-Logo images are shown in Figure 5.12, and the selected frames are shown in Figure 5.13. For the frame color, 7 out of 18 people selected Cyan. Bright colors tends to be selected. For the frame shape, 6 out of 18 people selected Circle. There were no particular frame color and shape combination that was selected for this topic.

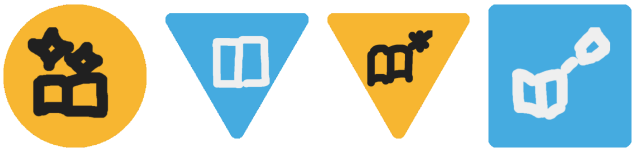

Figure 5.12: Sign-Logo Images Created for New

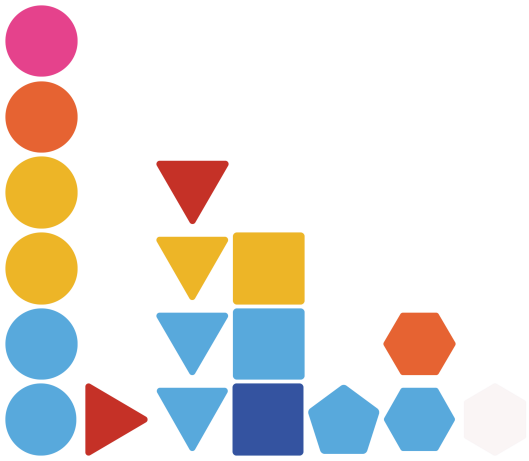

Figure 5.13: Frame Color and Shape Selected for New

The object shapes drawn using the Sign-Logo Creator is shown in Table 5.3. 4 out of 18 people drew a plain book, 7 people drew a shiny book, 3 person drew a book with a symbol, and 1 person drew a book with a price tag.

Table 5.3: Object Shape Drawn for New

Category	Image
Plain book	
Shining book	
Book with symbol	
Book with price tag	

5.2.6 Result 4: Old

The fourth topic was "This book is old". Examples of the created Sign-Logo images are shown in Figure 5.14, and the selected frames are shown in Figure 5.15. For the frame color, 7 out of 15 people selected Yellow. The dull colors tend to be selected. For the frame shape, 5 out of 15 people selected Square. The most selected frame color and shape combination was Yellow Square.

Figure 5.14: Sign-Logo Images Created for Old

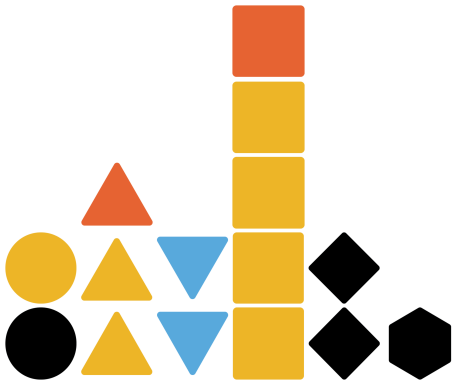

Figure 5.15: Frame Color and Shape Selected for Old

The object shapes drawn using the Sign-Logo Creator is shown in Table 5.4. 5 out of 15 people drew a written book, 11 people drew a damaged book, and 1 person drew a book with glasses on.

Table 5.4: Object Shape Drawn for Old

Category	Image
Written book	
Damaged book	
Book with glasses	

5.3. Discussion

The experiment results showed how the Sign-Logos can be created to represent messages set as the topic. The frame shape represents the category of the message, the frame color represents the subcategory of the message, and the object shape represents the target of the message which could be a noun or an adjective.

There were several points of improvement for the Sign-Logo Creator that was clarified through these experiments. The registered object shapes should be positioned in the center of the frame shape by calculating the correct position, since the message could change based on the positioning. Currently the Sign-Logo Creator uses one object shape, however there could be situations where the user would want to use several object shapes within one frame shape. In this case, the user needs to be allowed to position the object shapes themselves in the right position.

Chapter 6

Conclusion

This thesis has proposed a creation method for Sign-Logos using the combination of color and shape. The Sign-Logo creation method is for the senders to create new Sign-Logos to send the message intuitively and universally, without knowledge about color and shape.

In Chapter 1, the objective and background of the research was introduced with situations to demonstrate how Sign-Logos could be used in the near future for visual communication. In Chapter 2, the existing methods such as sign standards and visual languages were described to point out the issues for this research. The existing sign standards had conflicts in the rules of color and shape showing the same categories, which is not the way colors and shapes should be used. The existing visual languages used several images to represent a sentence, which made the points in a sentence unclear and complicating. In Chapter 3, the basic creation method for Sign-Logos was proposed with the concept and formula. As a preliminary experiment, a design survey was held to examine the messages people receive from the Sign-Logo images, and a color perception test was held to check how the Sign-Logo images can be visible to people with various color perceptions. The results from the design survey showed the tendency of the frame color and frame shape features based on the valid answers, the possibility of Sign-Logos to be understood universally from the common results, the change in the message between Sign-Logos with same objects and different frames, and the variety of categories for the frame color and frame shape. The results from the color perception test showed which colors should be used as a universal rule. In Chap-

ter 4, the Sign-Logo Creator using the creation method was presented with the settings and functions. This Sign-Logo Creator was used in the experiments to create new Sign-Logos. In Chapter 5, several experiments were held to clarify the characteristics of the Sign-Logo features. Experiment 1 was held to find out the rate of people who agree or disagree with the messages set for the Sign-Logo images. The result showed that the Circle frame shape could be used to represent the category of Regulation, Triangle frame shape could be used to represent the category of Notification, and Square frame shape could be used to represent the category of Location. Experiment 2 was held to observe how people create new Sign-Logo images based on a certain topic. The created Sign-Logo images showed which part of the message the features could represent. The frame shape represents the category of the message, the frame color represents the subcategory of the message, and the object shape represents the target of the message which could be a noun or an adjective. The object color did not represent a part, since it changed based on the frame color. As a conclusion, the Sign-Logo creation method works for representing messages which changes depending on the color and shape features such as the frame color, frame shape, object color, and object shape. The experimental results showed how the Sign-Logo creation method can be expressed in a formula, with each feature representing a part of the message. This creation method would contribute to people around the world who wish to create new Sign-Logos based on the message based on the universal rules for color and shape.

In the future, data collected from people creating new Sign-Logos would be used to analyze and to develop the mechanism of a word to Sign-Logo translation. This would lead to creating a Sign-Logo language which could generate Sign-Logos automatically and dynamically based on the text.

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Appendix

A. Search Function

A.1 Text Search

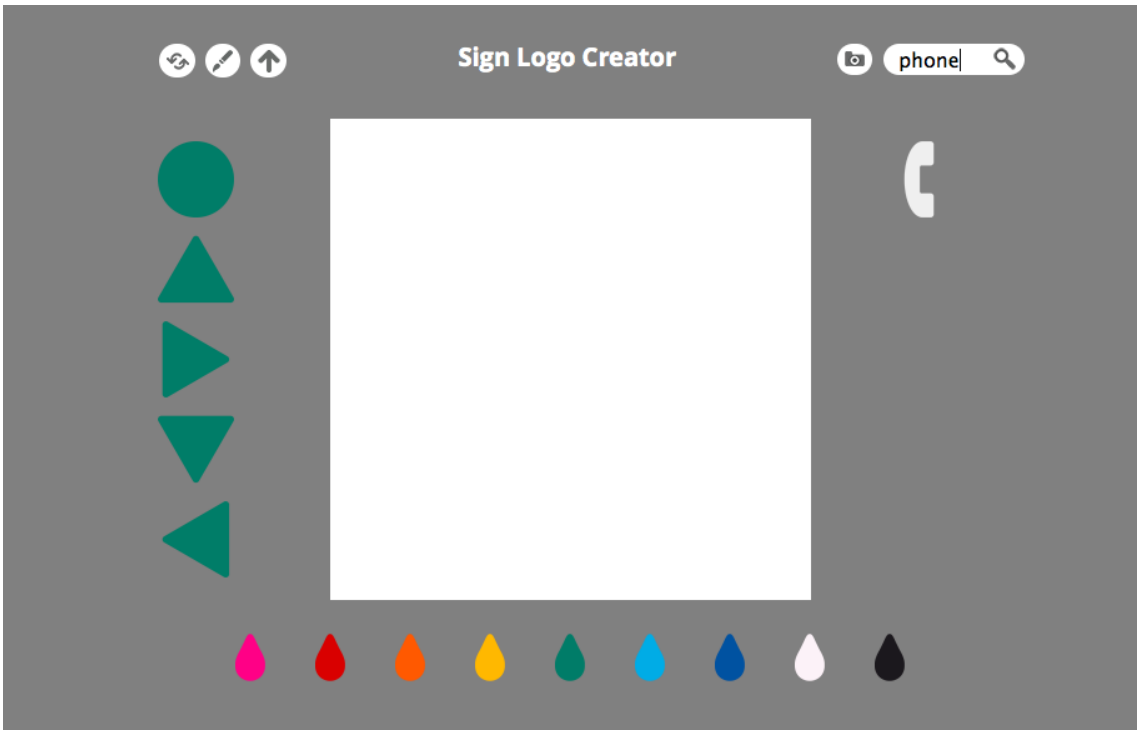


Figure A.1: Text Search Result

A.2 Image Search

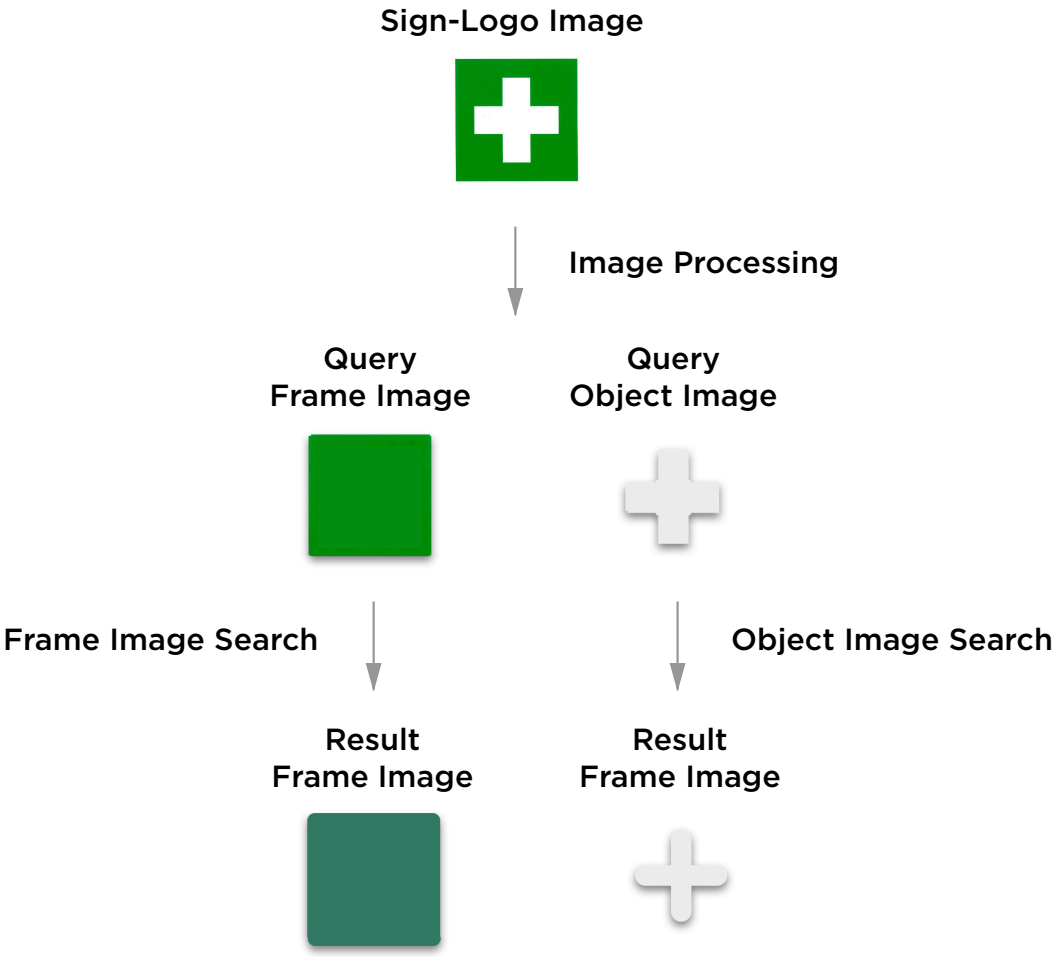


Figure A.2: Image Processing

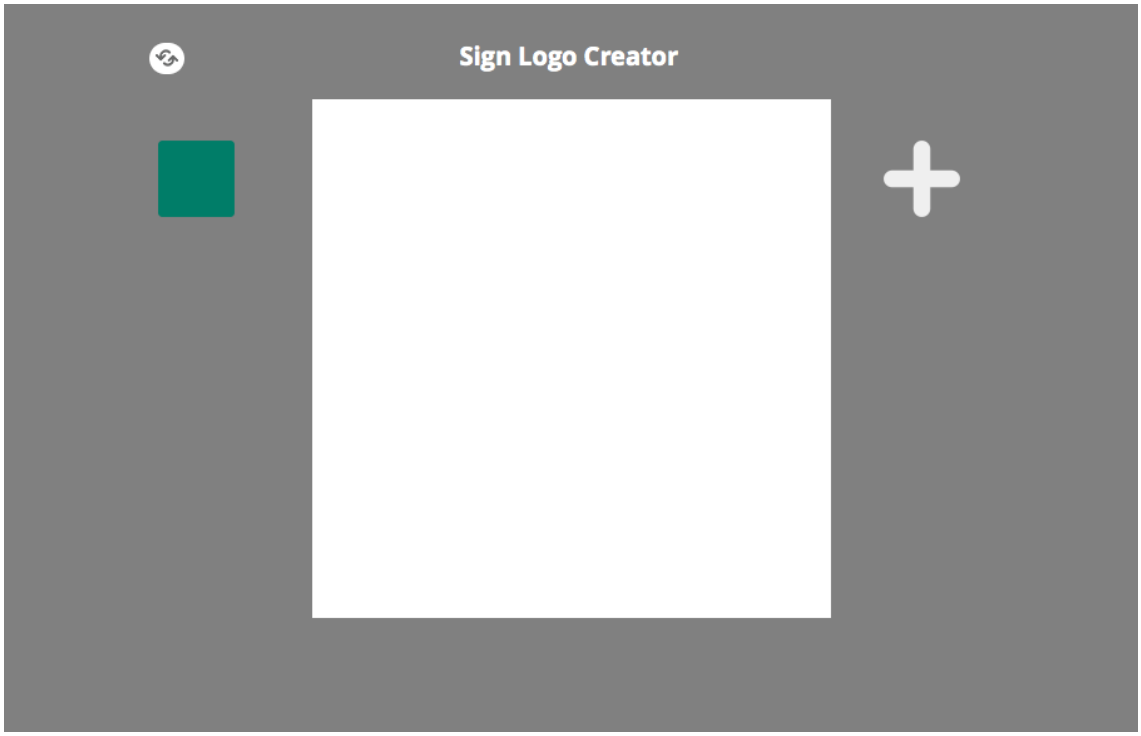


Figure A.3: Image Search Result

B. Register Function

B.1 Image Register

Figure B.1: Object Image Uploaded on Canvas

B.2 Draw Register

Figure B.2: Object Shape Drawn on Canvas

C. Design Survey Question

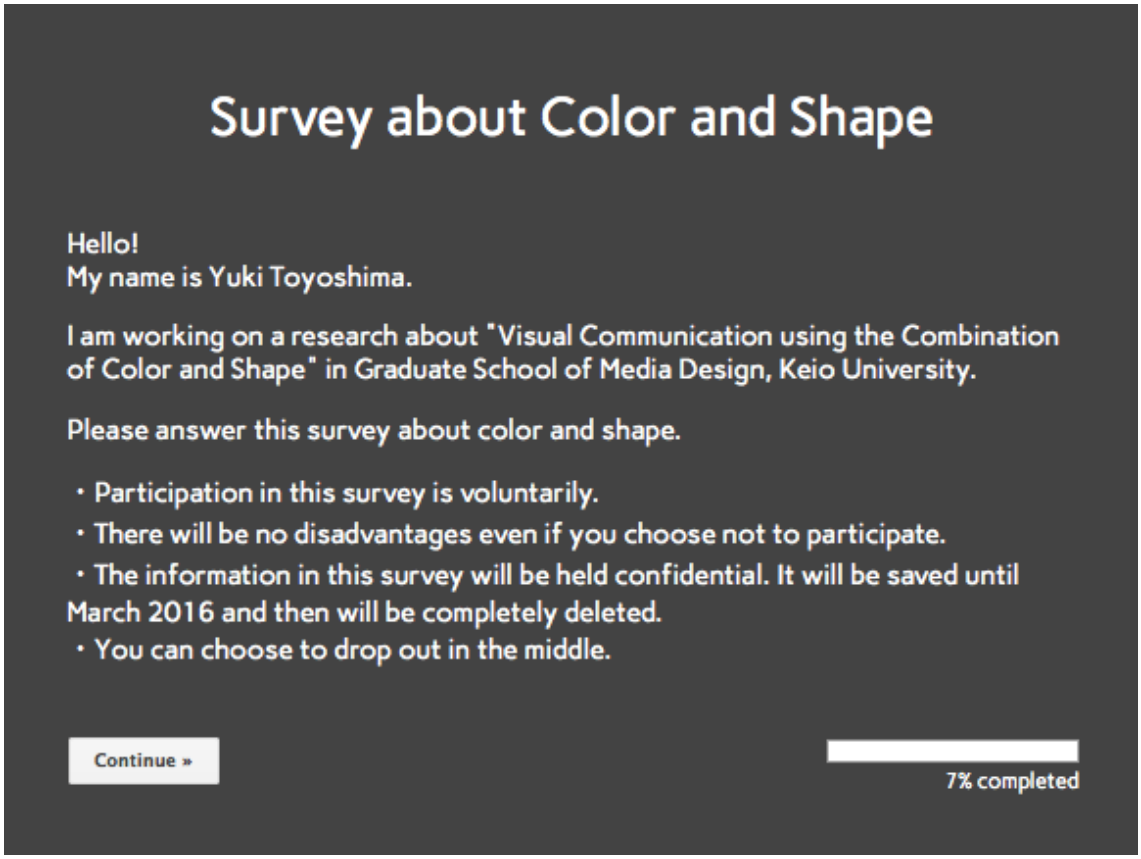


Figure C.1: Design Survey Page 1

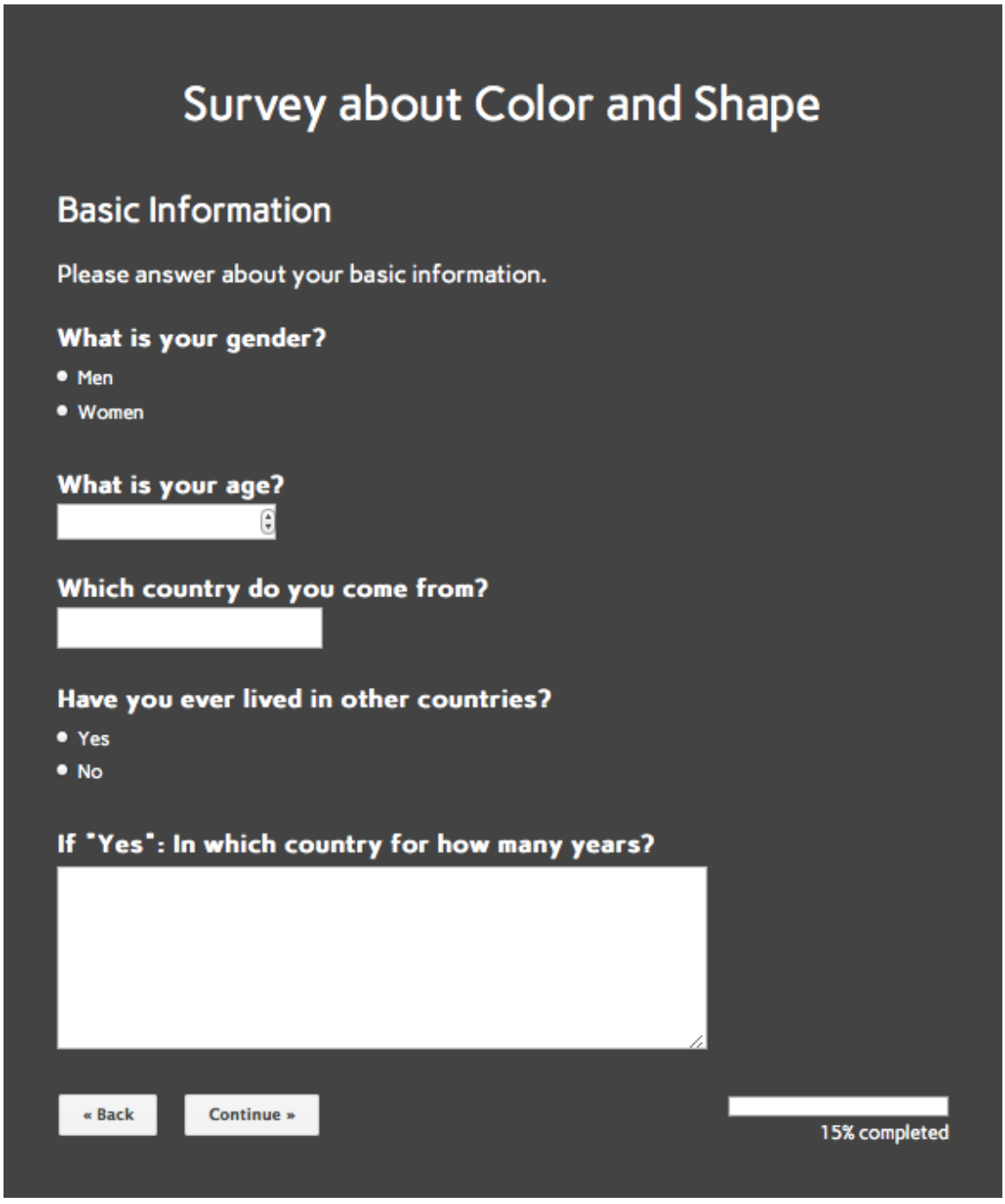


Figure C.2: Design Survey Page 2

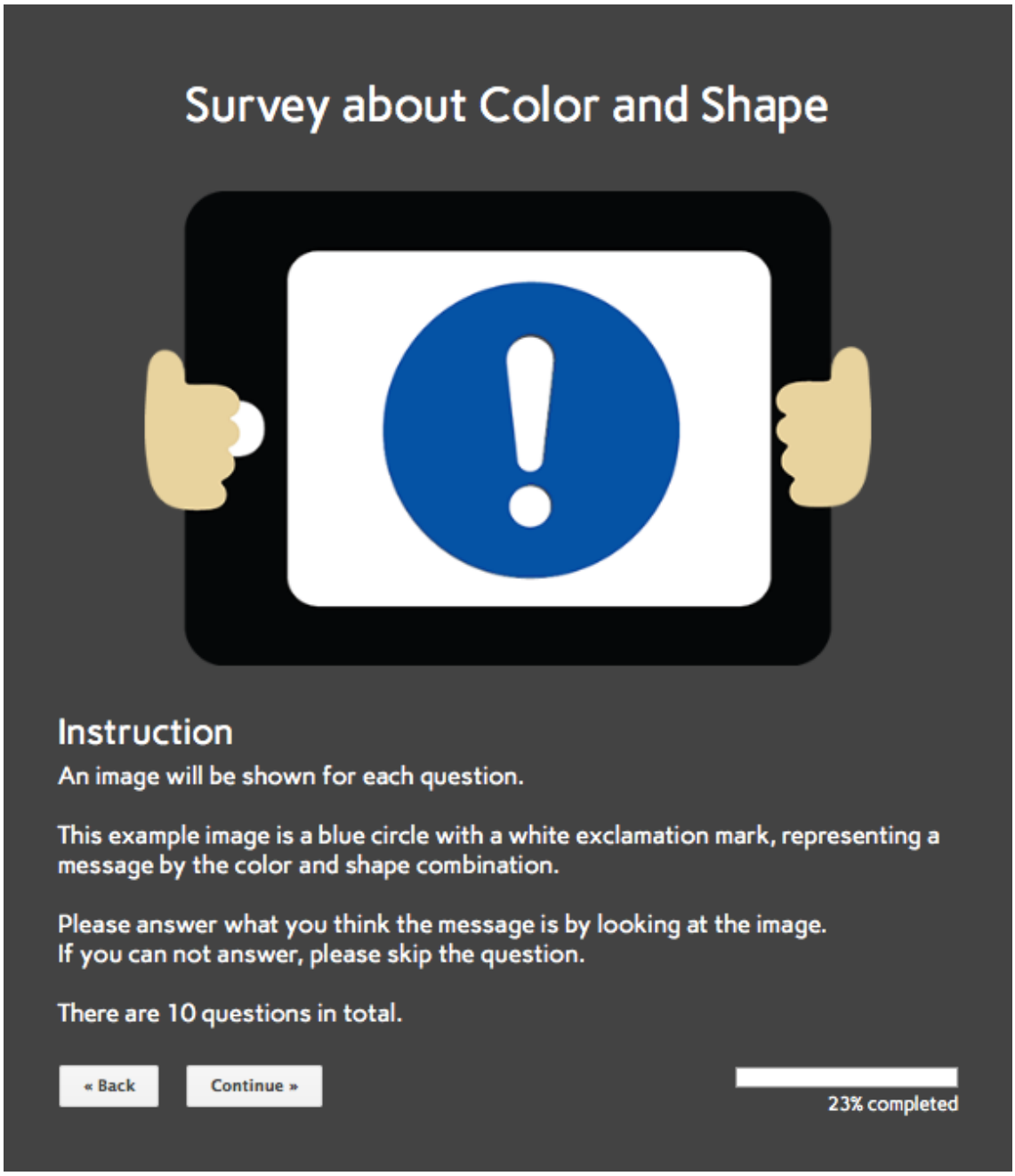


Figure C.3: Design Survey Page 3

Figure C.4: Design Survey Page 4

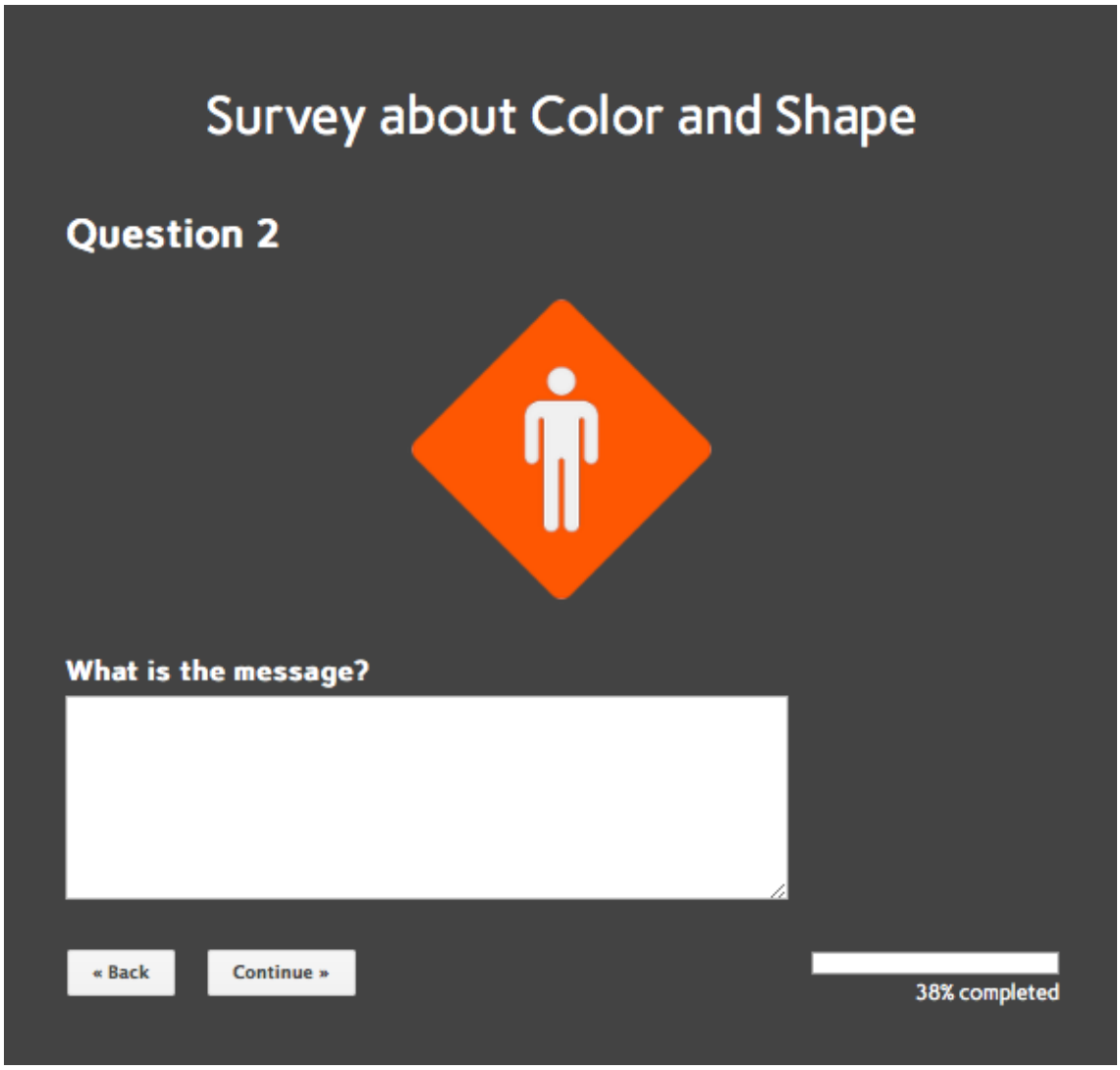


Figure C.5: Design Survey Page 5

Figure C.6: Design Survey Page 6

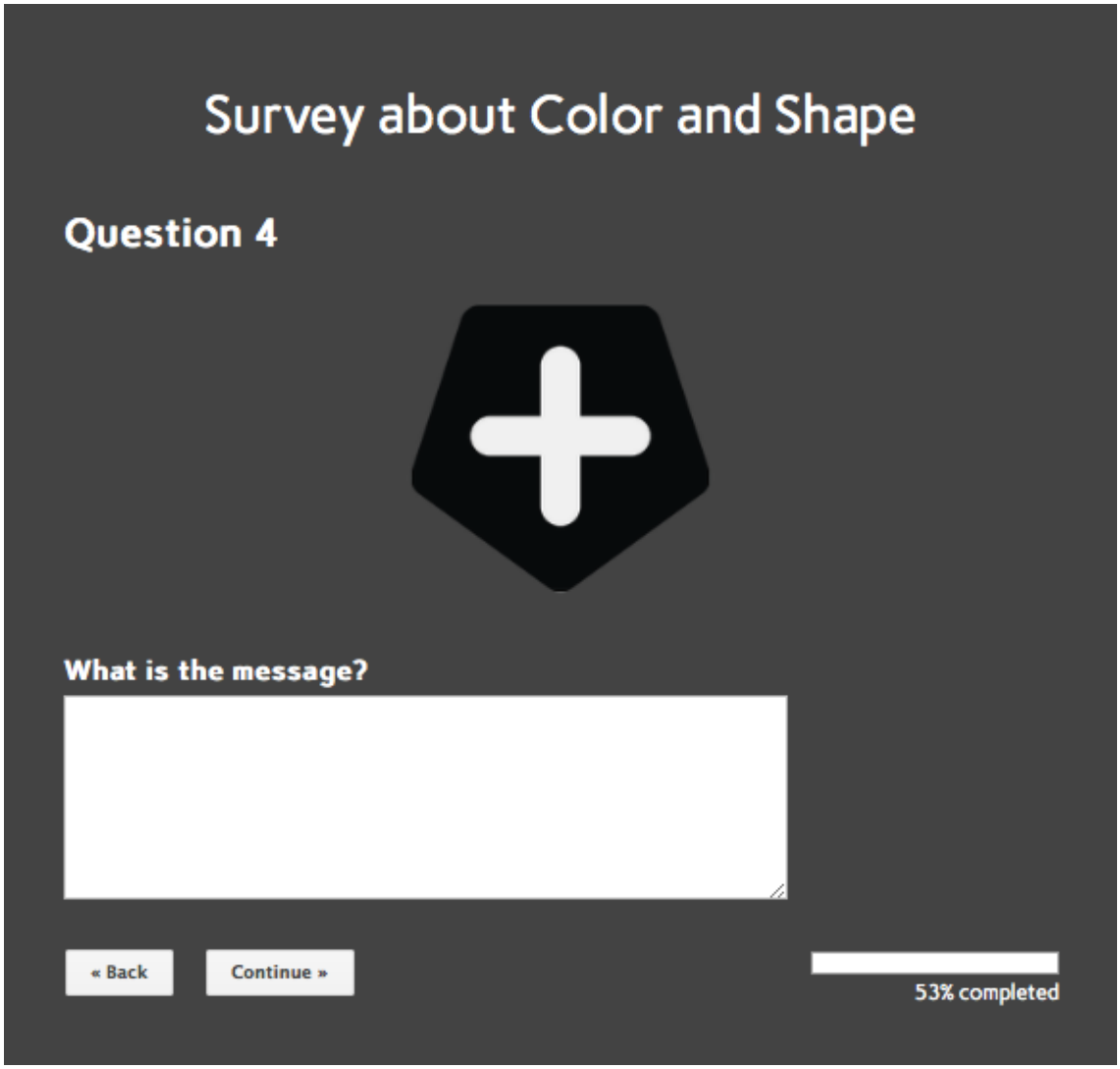


Figure C.7: Design Survey Page 7

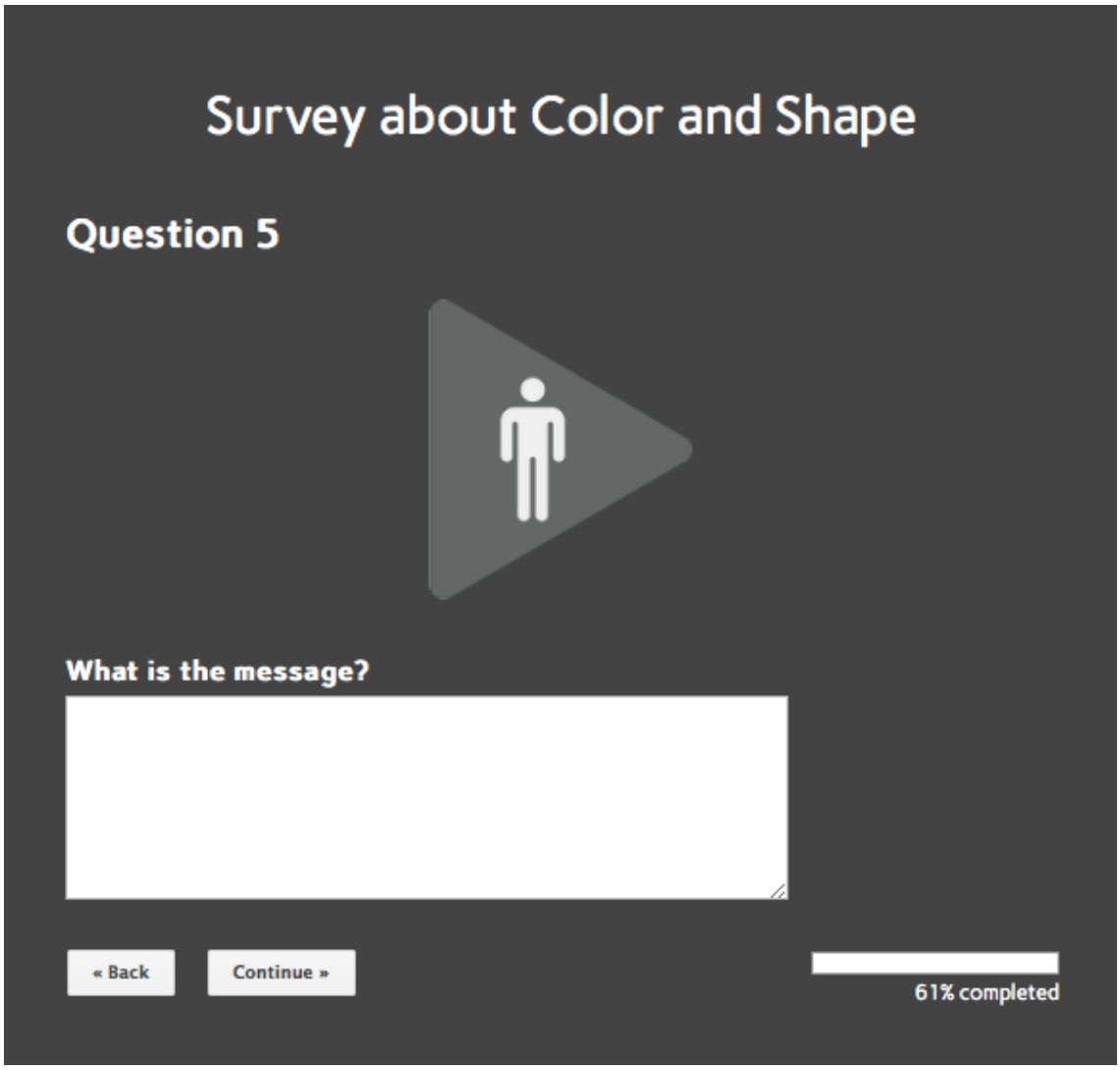


Figure C.8: Design Survey Page 8

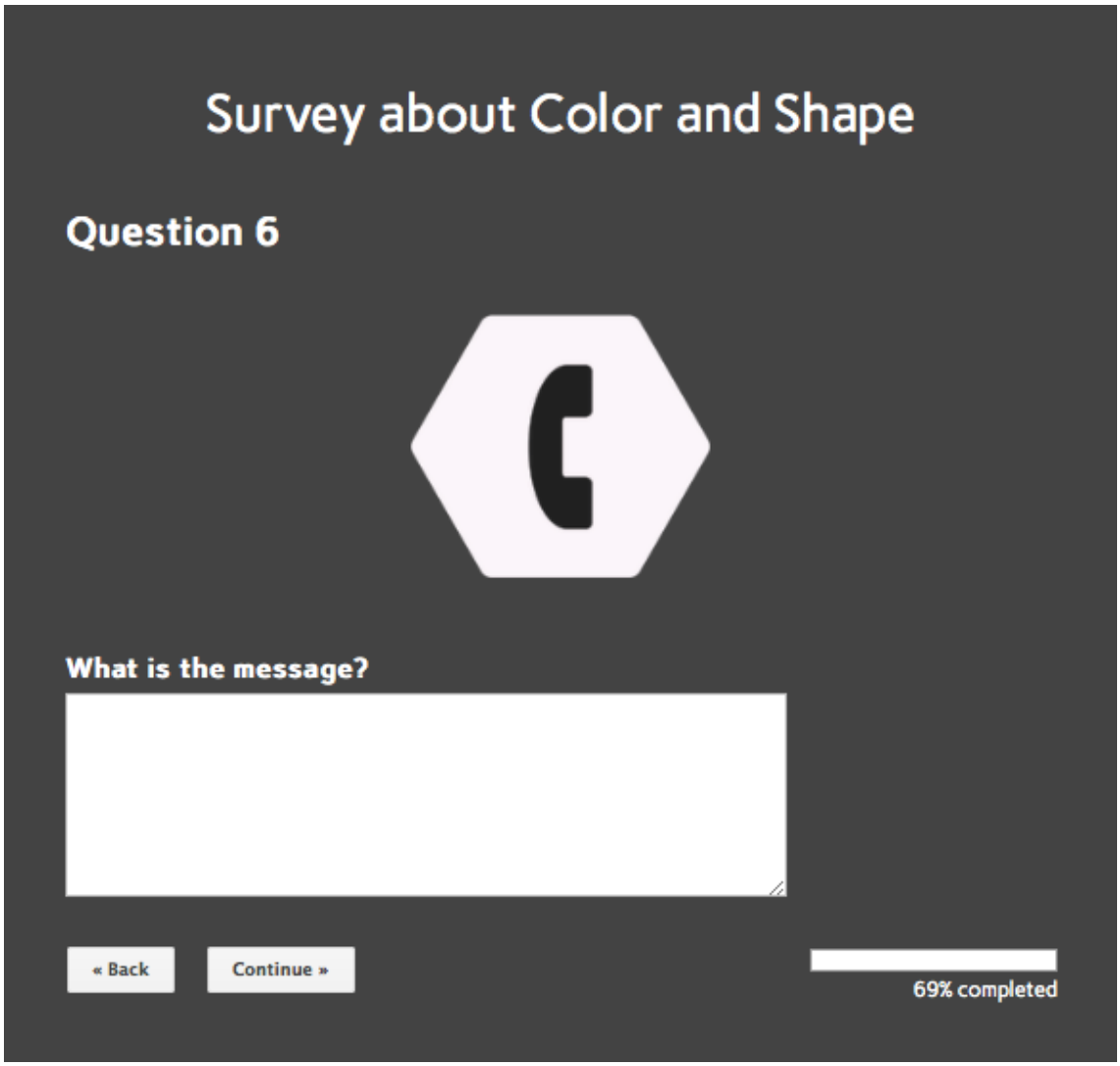


Figure C.9: Design Survey Page 9

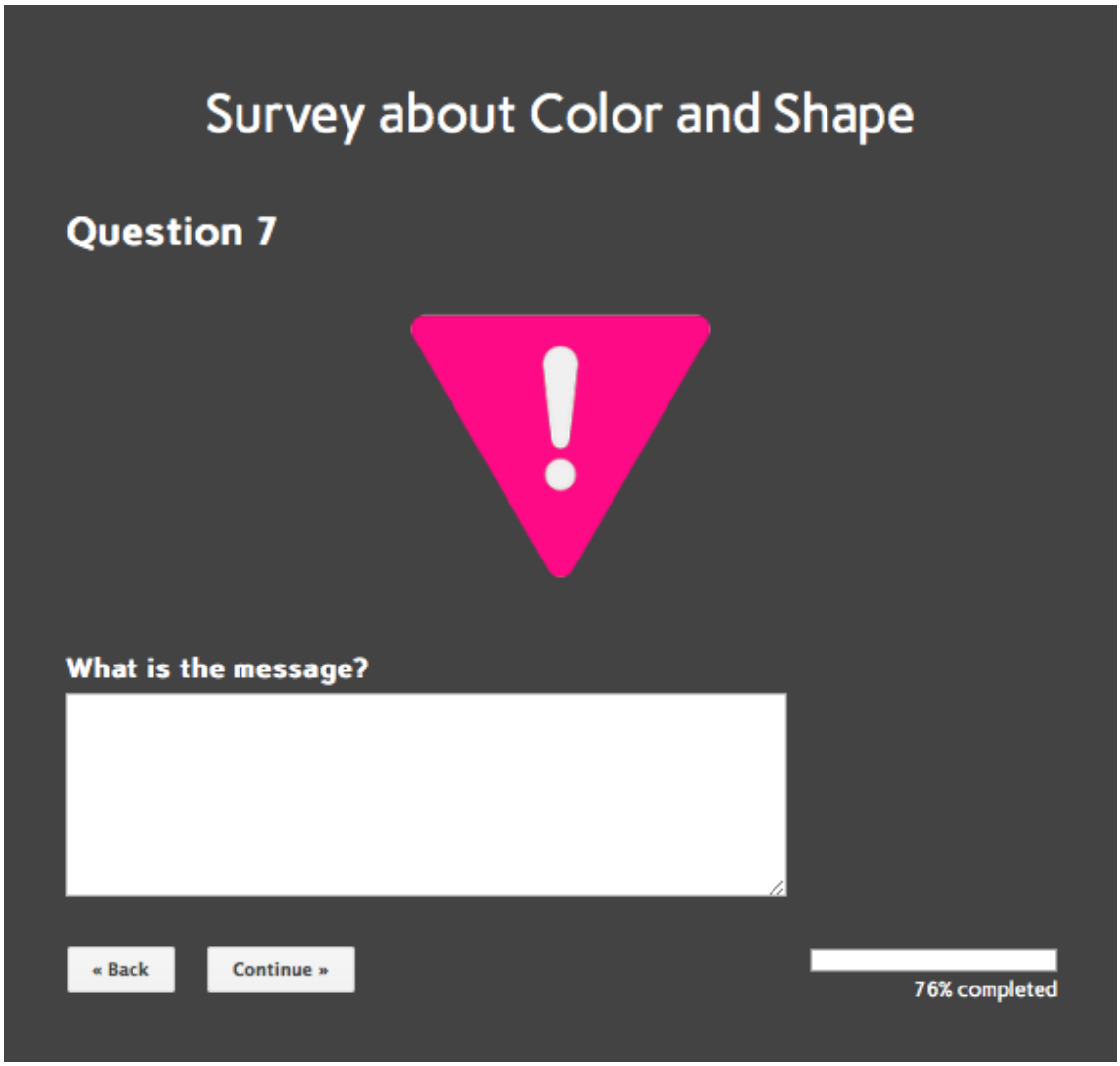


Figure C.10: Design Survey Page 10

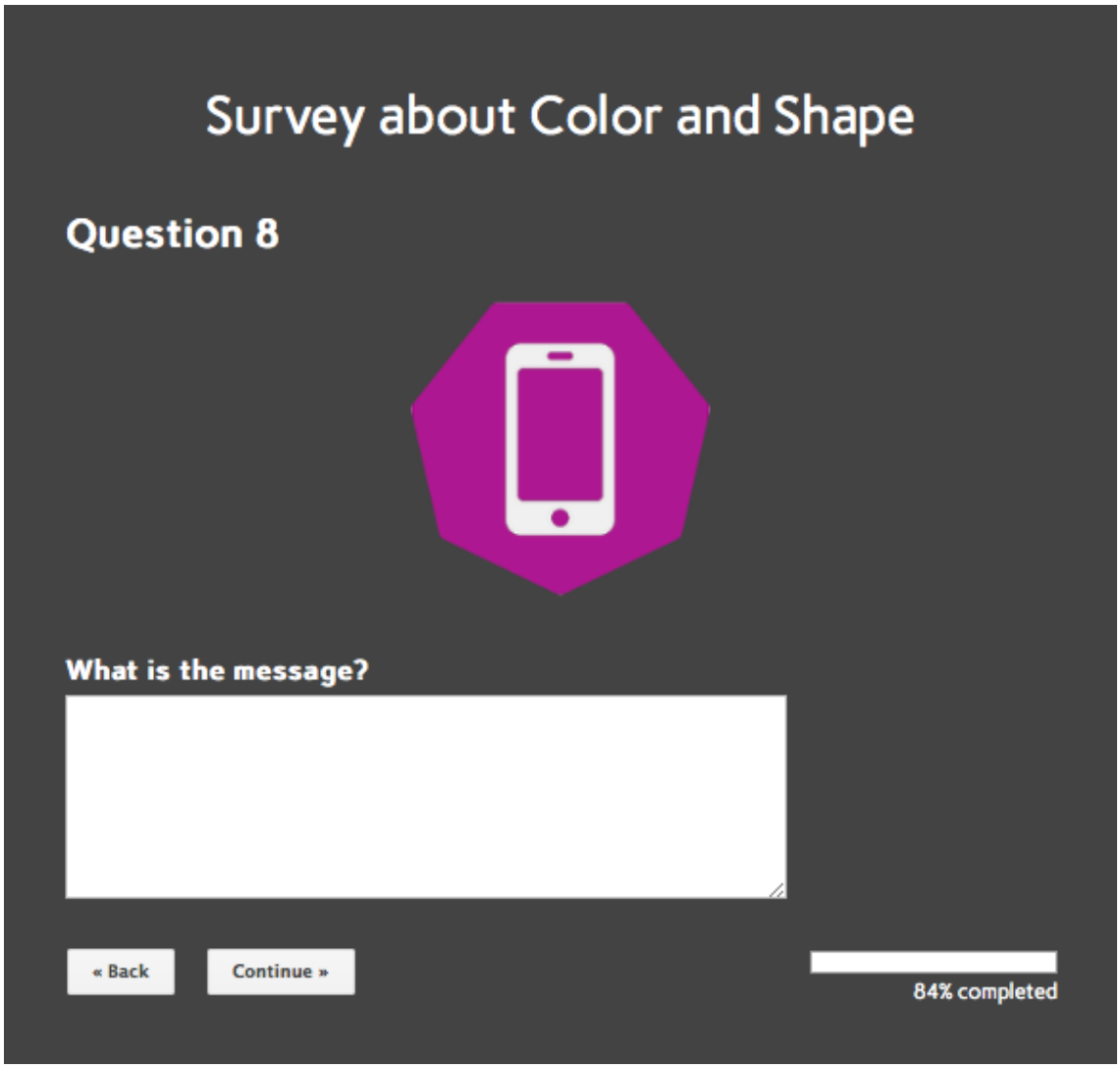


Figure C.11: Design Survey Page 11

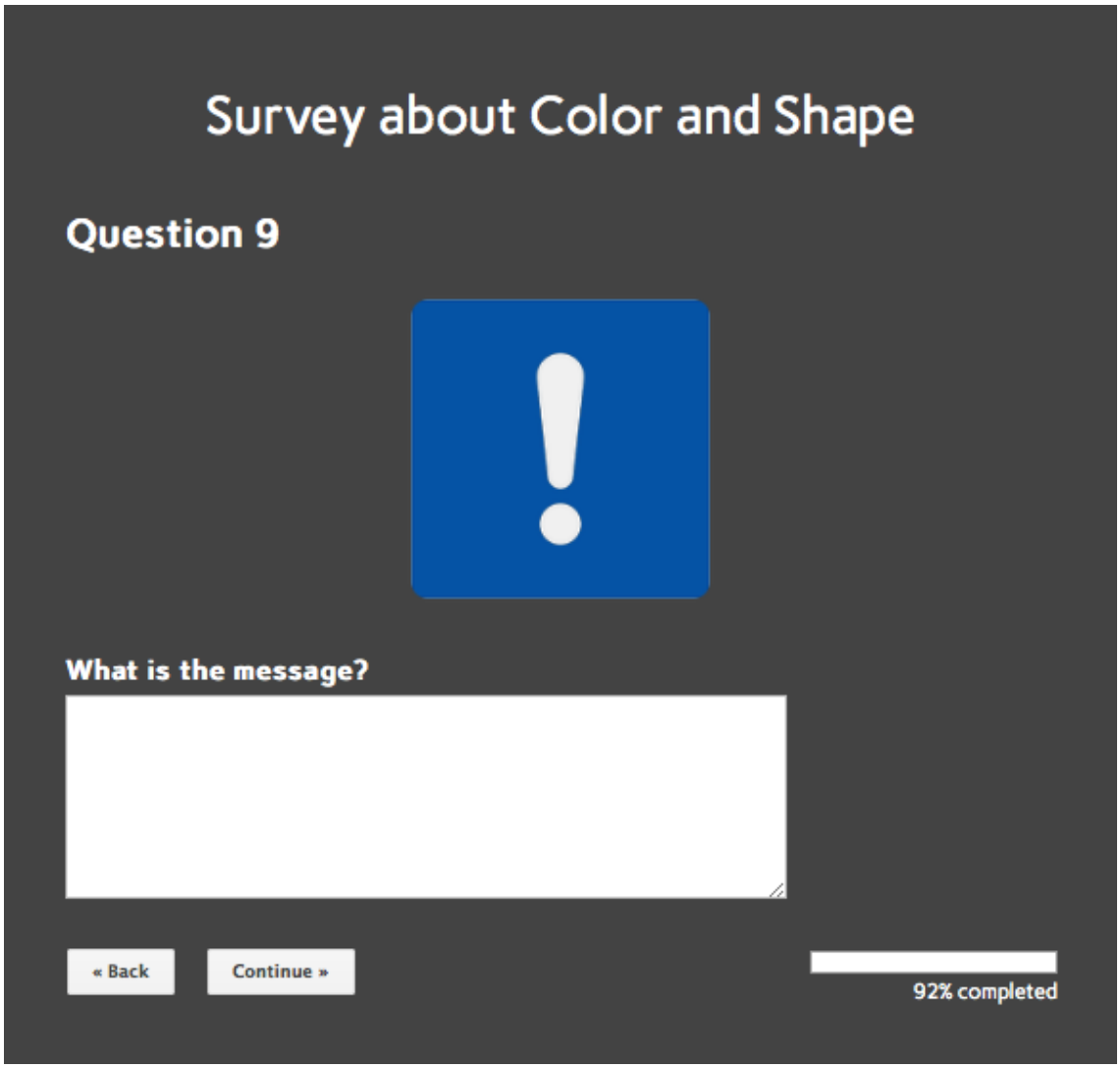


Figure C.12: Design Survey Page 12

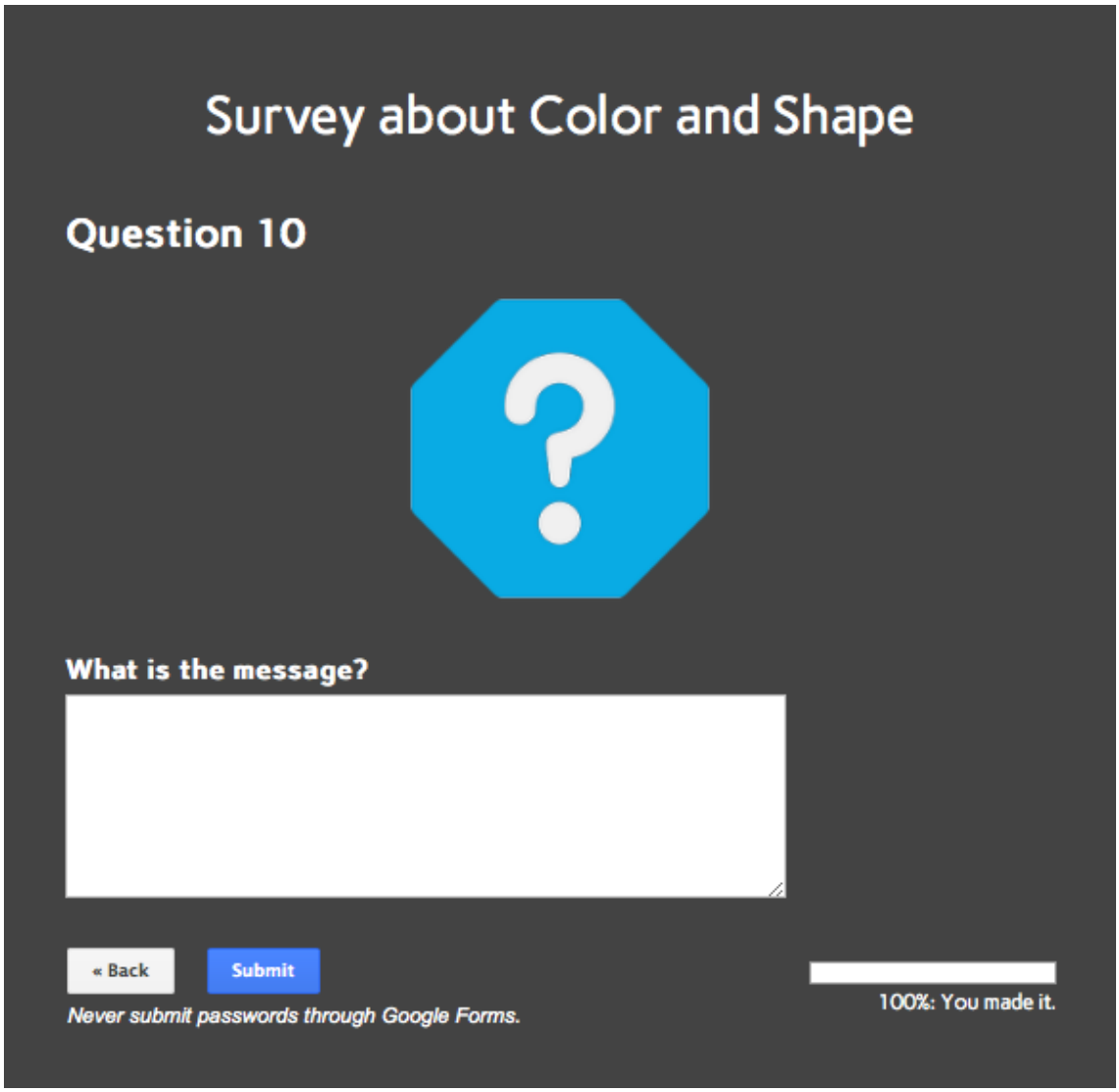


Figure C.13: Design Survey Page 13

D. Design Survey Result

D.1 Frame Color: Red

Table D.1: Result for Red 1-1

1	No parking	Danger Watch out	Women on the right	This side up	Place where many people forget things
2	Do not enter	Caution Warning		Look up	No mobile phone
3	Stop	Careful		Up	Do not use mobile phone
4	Stop	Caution		Going up on elevator	Can call using mobile phone
5	Stop No entry	Danger		Continue forward	Caution for smartphone
6	Stop Danger	Caution	Men	Do not go up	Phone Smartphone
7	No entry	Caution	Exit	That way	Smartphone
8	No trespassing	Danger	Go right	Go up	Caution for smartphone
9	No entry	Caution	Authorized personnel only		Mobile phone
10	Do not enter	Warning	Men's restroom on the right	Go straight	Can use phone here

Table D.2: Result for Red 1-2

11	Stop	Caution	Direction to men's room Place for men	Going up	Caution not to forget smartphone
12	Stop	Warning	Stop	Go up	Cellphone area
13	Warning Causing disadvantage if not read	Danger Caution	Men's restroom on the right	Go forward	Smartphone
14	No entry	Danger Warning	Men's restroom	Straight ahead	Refrain from using cellphone in this area
15	Stop	Danger	Women's restroom	Something dangerous straight forward	
16	Forbidden Do not enter	Caution Stop	People not allowed to play	Dangerous to proceed	
17	Stop	Danger Caution	Men's bathroom to the right is unavailable	No uploading	Smartphone
18	Stop Cancel	Danger	Dangerous for human	Go up	Smartphone
19	Do not enter Something wrong	Danger	Man on the right side	Proceed carefully	Do not use smartphone here
20	No thoroughfare	Warning	A stalker on the right		No cellular phone

Table D.3: Result for Red 2-1

1	Go right	Up	Prohibited		Caution above
2	Go right	Caution above	Forbidden No entrance	Dangerous area	Straight only
3	Right turn only	Hurry this way	Blood	Stop here	Go up
4	Next go right	Go straight			Can go forward but needs extra care
5	Direction Guide	Caution above	Cannot enter this form		Dead end
6	Go right	Something funny ahead	Stop		Construction ahead
7	Right turn only	Bump into it and bounce back	Stop	Cannot go further	Existing above
8	Turn right	Proceed forward with caution	Warning Caution	Stop	Keep going
9	Important Turn left now	Go straight	Remove		Go up
10	Go right to be safe	Caution for going straight Do not go straight	Stop Do not enter	Caution for rocks	Caution ahead

Table D.4: Result for Red 2-2

11	Turn right	Bumps ahead	Stop		
12	Turn right Detour	Go straight	No entry	The road is straight	Look up Information above Scroll up
13	Danger Caution Move or look to the right and be careful	Go straight	No entry	Dangerous here	Go forward slowly
14	Right	Something dangerous ahead	No entry		Go forward
15	Do not go right	Forward	Stop	Stop	Keep going forward
16	Go right		Stop	Please wait	Go forward
17	Follow the emergency exit right Urgency Danger	Go straight ahead	Access denied	Stop Caution Approach slowly	This way
18	Go right Proceed		Dead end road	Coin slot	Up
19	Go right Follow the arrow this way	Move forward		Money slot	Danger up
20		Forward	No Negative	Stop	Warning above

D.2 Frame Color: Orange

Table D.5: Result for Orange 1-1

1	Warning	Refrain from smartphone use		Something exists below	Stop
2	Warning	Smartphone use is prohibited	Information desk over there	Cipher	Stop
3	Warning	Wi-Fi area	Something mysterious exists Pay attention	What?	Human
4	Caution in this area	Smartphone in danger	Forget about the past		Entrance for men
5	Good idea	Do not use smartphone		Help	
6	Caution	Refrain from smartphone use	Information center	Would come up with a question here	Stop
7	Caution	Smartphone is hot and dangerous	Something mysterious here		Pedestrians only
8	Question mark Pay attention and look carefully	Warning for smartphone in use	Ongoing question	Help	Restroom or changing room for men
9	Warning Wrong	Smartphone use prohibited		Question Information	Men
10	Warning	No smartphone	Information desk Questions about playing music backwards	This is a quiz	

Table D.6: Result for Orange 1-2

11	Warning Be careful	Do not use smartphone	Information desk	Uncertainty lies ahead	Men's restroom Watch out for workmen
12	Alert Caution Be aware	No smartphone	?	Help desk here	Human centered Men
13	Warning Caution This is important	Smartphone	Error	What is under here?	Stop
14	Warning	Do not use smartphone	Question	Place for questions	Red signal Stop
15	Beware of something		Go to the left for questions	Question	Men's restroom
16	Surprise	Smartphone in dangerous state	Where you can find help or ask questions	Contains mysterious objects	Men
17	A point of interest Safety warning	Do not use phone	Ask your questions here or now		Restroom Men only
18	Danger	Stop using smartphone while walking		Confused	Men Men's restroom
19	Danger Important Take notice	Cellphone charging station	Replay Confused	Information point	Men's room
20	New hot topic	Attention smartphone holders	Questions welcome	Questions Inquiry	Men only Men's restroom

Table D.7: Result for Orange 2-1

1	Men	Go down	Stop	Safe phone	Stop
2	Men's restroom	Scroll down	Switzerland	Make a call	No parking
3	Men's restroom	Something exists here	Another medical station	Phone available	Block something
4	Stop	Back	Medical assistance	Phone box	No entry
5	Caution for human	Attention below	Healthcare	Phone	Do not enter
6	Men	Go down	Multiplicative	Phone calling	One way route
7			Special hospital	Call	
8	Stand here	Go underground in the building	Something is allowed Danger	Emergency phone	No entry
9	Caution for human	Caution ahead	Share with	Make a phone call	Stop
10	Watch out for people		Health corner	Emergency call	Stop

Table D.8: Result for Orange 2-2

11	Human exists	Pull it down	Serious sickness	Phone available	Stop
12	Human only	Caution for falling rocks	Hospital	Emergency telephone	Do not enter
13	Men's room Men at construction work	Something exists below	First aid	Call icon in mobile application	Denied Error
14	Possibility to harm human body Warning	Something lowering	Health point in video game	Call center Cellphone friendly area	Stop
15	Men at work	Can scroll down	Public first aid box	Emergency phone	Minus
16	Pedestrians stop No entry	Look down	Crossroad		Stop
17	Caution for men	Go down		Phone booth	No entry
18	Be careful of bad people	Can go underground	Plus	No driving while speaking on the phone	Warning No entry
19	Stop	Go downstairs	Medical help available	Emergency phone	Stop
20	Man	Danger to go down	Add something against someone's wishes	Hazardous phone area	Stop

D.3 Frame Color: Yellow

Table D.9: Result for Yellow 1-1

1	Go up Go forward	Danger	Go left	Danger	Cellphone prohibited
2	Go forward	Caution	Caution when going left		Caution for cellphone
3	Going up in elevator	Caution Danger	Go left	Direction to go	
4	Go up	Danger	Turn left	Construction on right	Can use smartphone here
5	Go forward and be careful	Danger	Go to the left	Caution right	Warning Smartphone
6	Go straight	Caution	Attention down Attention left	To the right	Using cellphone is acceptable
7	Look above carefully	Caution	That way	Turn right	
8	Straight ahead	Caution	Go to the left	One way only	Caution for smartphone use
9	Go forward	Dangerous here		Something about direction	Can find cellphone here
10	Go forward	Caution Be careful	Route is left	Beware Go to the right	Smartphone

Table D.10: Result for Yellow 1-2

11	Go forward with caution	Warning Give more attention to a matter	Turn left	Smartphone	Smartphone Warning
12	Go straight	Danger	Mark rotated 90 degrees	Warning Careful to the right	Caution when using smartphone
13	Forward Up	Be careful	Go left	Showing a direction	Orange phone
14	Go forward	Attention Warning	Keep left	Caution on the right side	Handphone in orange box
15	Go ahead	Caution	Warning about something on the left	Caution to the right	Smartphone
16	Go straight	Caution	Browser back	Go next	Smartphone
17	Guide to the upper floor	Important Warning Read carefully	Back	Make a right turn	Cellphone
18	Pay attention ahead	Caution Danger	Back	Construction in that direction	Cellphone
19	Go straight	Warning	Wrong direction	Go right Caution below	Call
20	Up	Warning	Warning Must go back	Caution with this route	Warning about smartphone

Table D.11: Result for Yellow 2-1

1	Emergency phone	Crosswalk that needs caution	Phone available	Warning	
2	Phone available here		Emergency phone	Caution	Downloading
3	Public phone Calling permitted area	Danger signal	Phone signal is weak here	Something dangerous exists	Caution for leak
4	Phone	Crossroad on the right	Telephone	Careful of something important here Watch out	Download warning
5	Calling prohibited	Donald duck	Telephone box	Caution Stop	Look down
6	Emergency phone here	Crossroad exists	Important phone here	Danger	To the bottom floor
7	Caution for calling	Hospital exists	Telephone booth available	Caution	Downhill way
8	Phone is located here		Pubilc phone Phone box	Warning	This way only
9	Phone	Add something	Phone Emergency phone	Attention	Caution below
10	Public phone on the road	Hospital in future world	C	Caution for everything	Attention below

Table D.12: Result for Yellow 2-2

11	Caution for phone box		Phone here	Alert Danger	One way
12	Emergency phone		Phone booth	Important Caution Pay attention	Caution below
13	Phone	Warning	Public phone available	Being surprised	Under construction
14	Phone area Information		Phone available	Caution for dangerous thing	Going down
15	Payphone	Screw hole	Telephone box	Caution	Go straight Beware
16	Calling prohibited Caution calling	Do something in addition	Emergency phone	Pay attention	Construction below
17	Public telephone	Health bonus	Phone available for use	Be careful Be alert	
18	Place for emergency phone		Do not call	Urgent Important	Look down
19	Telephone box near by	Screw	Emergency telephone	Questions	Down
20	Emergency telephone		Phone booth Phone number	Warning	Caution down

D.4 Frame Color: Yellow Green

Table D.13: Result for Yellow Green 1-1

1	Invisible biohazard	Caution about smartphone use	Caution to the left	Green tea sweets here	Public phone here
2	Human here	Watch out for smartphone users	Caution to the left	Stop and calm down to think	Public phone
3	Men's restroom	Do not use smartphone	Be aware of left		Emergency phone
4	Universal design	Can use smartphone with caution	Be careful		Make a call
5	Men's restroom	No support for access from smartphone	Caution to the left		Telephone booth
6	Can enter	Smartphone use permitted area	Modern art Caution	Stop	Call button
7	Men's restroom			No entry	Public phone
8	Person	No need to charge smartphone because of pyramid power	Pay attention when turning left		Public phone
9	Men only Men's restroom	Be careful while using cellphone	Unstable	Scroll down	Public phone
10	Signal Proceed	Something regarding a cellphone	Caution to the left	No danger	Phone available here

Table D.14: Result for Yellow Green 1-2

11	For people use	High magnetic fields and radiation cause damage to mobile phone	Pay attention to something towards the left		Public phone available
12	Can enter	No smartphone	Caution when going left		Can call
13	Men	Smartphone prohibited	Caution to the left	Stop	Public phone can be used here
14	Men's restroom	Do not use smartphone	Caution to something on the left side		Phone booth
15	Restroom for me	Caution for cellular phone usage			Public telephone area Answer phone
16			Back Rewind		Telephone box close by
17	Men's restroom	Caution for cellular phone usage	Caution		
18		Cellphone service available	Falling things ahead		Telephone
19		Cellphone use allowed	Go back and save the planet	Clear straight ahead	Telephone
20	Washroom for men	Electronic devices can be used	Caution for slippage		Call center

Table D.15: Result for Yellow Green 2-1

1	Go left	This is a question	Dangerous place in hospital	Upload	Forest ahead
2	Go back	Mission available		Go straight	Stop
3	Go left	Report quest			Advise
4	Go left	Unknown	Under construction	Go straight	Danger
5	Rest space on the left	If you have any questions	Add	Up	
6	Back Go to left	Random stuff	In addition	Go ahead	Biohazard Scientific symbol for caution
7	Go back	Question	Medical equipment for emergency like AED		Attention
8	Go left	Do something	Expand	Go forward	Read
9	Go to the left	Indicates a question written down somewhere		Pointing up	
10	Go left	Inquiry corner	Add	Up	

Table D.16: Result for Yellow Green 2-2

11	Back to previous step			Up Upload	Caution
12	One way	Question mark	Add	Go here	
13	Turn left	Question		Upload file Scroll up	Danger Warning
14	Go back Rewind	Question	Open space available	Up direction	Caution
15	Go back		Danger	Up	Caution
16	Turn left Go back	Look here when having trouble	Turn up volume	Look up	Warning
17	Go left	Q&A		Go in that direction	Caution
18	Go left	Help	Control button on a game	Upstairs	Attention Warning
19	Go to left	Information	Screw Screwdriver	Go up 7 spaces	Something is wrong
20	Go left with caution	Notice Information Warning	Safe in all directions	Go up	Caution for poison

D.5 Frame Color: Green

Table D.17: Result for Green 1-1

1	Insert coin	Telephone available here	Men has priority to escape in emergency		Go up
2	Power turned on	Payphone	Men's restroom here		Proceed ahead
3		Payphone	Men to the right		Go straight
4	Kindness	Payphone	Men's restroom to the right	Emergency rescue team member	
5		Payphone	Restroom to the right	Medical assistance	This way
6		Payphone here	Men should go to the right	Go down to hospital	Go straight
7	Power switch	Payphone			Can proceed
8	Can enter park	Telephone Telephone box	Men should go to the right		Go
9	Screw hole	Emergency phone	Direction associated to men	Flag	
10	Insert coin	Phone available	Next person	Hospital	

Table D.18: Result for Green 1-2

11		Can use cellphone here		Hospital	Able to go straight down
12	Go	Public phone here	Tourist information	Medical or health related	Can go forward
13	Turn the key to open	Public phone available	Direction to men's restroom	Download file	Pay attention above
14	Switch on Go ahead	Telephone	Pedestrians crossing	Add	Go
15	Go	Public telephone	Rest place	Hospital	Can go straight Turning right or left is prohibited
16	Power button	Phone number Public phone	Human on the right	Crossroad	Up Increase Increment
17	Extra information	Calling allowed	This way	Hospital	Go Upload
18	My position	Telephone	Safe to cross the road	Medic	Up
19	Word 'l'	Emergency phone near	Men should go to the right	Choose one out of four choices	Safe space there
20	Closed	Poor signal	Men this way	Intersection ahead	Going up

Table D.19: Result for Green 2-1

1		Go left	Information corner here		First aid
2	Watch out for something	Animal hospital	Be calm and go straight	Stop	Any hospital
3	Caution	Plus	Road in forest which can be used	Stop	Four leaf clover
4	Falling branches due to strong wind	Crossway	Safe to walk		Crossroad
5	Some errors occured	Hospital Emergency center		Minus	Crossroad
6	Caution	Emblem for knights	No problem	Power button	Crossroad ahead
7	Something to be cautious about	Button to add something	There is a guide	Stop	First aid
8	Caution Read the instructions below carefully	Church		Do not enter forest	Red cross
9	Caution	Relieve Safe Insurance		Static	Medical equipment is here
10	Urging wariness but not quite danger	Heros gathering in guild		Pay attention	Can heal

Table D.20: Result for Green 2-2

11	Be careful			Passage is wide	Positive In addition
12	Something strange to beware of	Emergency center to the left	Something opens when clicked	Caution	Intersection
13	Caution	Crossway exists	Which way to go	Cannot pass here	First aid Hospital Help or support
14	Attention	Grave	Power		
15	Caution Attention	Hospital		Something prohibited Stop	Health center Place to rest
16	Announcement or warning to prepare for something	More information		No entry	
17	Notification of an event or occurrence		One way This way		Health care facilities Safety
18	Beware	Four leaf clover			Red cross Hospital Church
19	Warning Caution	Mathematics done here	Insert coin	Stop	Medical service
20	Warning	Medic	Straight passage ahead	?	Add person

D.6 Frame Color: Cyan

Table D.21: Result for Cyan 1-1

1	Public phone Phone available	Caution	Randomly rewinds song		Men's restroom
2	Can use telephone here	Look around	Something exists	Caution for using smartphone while walking	
3	Phone	Be aware		Smartphone for men	Men's restroom
4	Can use IP phone	Be careful	Information center	App download	Restroom for men
5	Click to phone someone	Stop Caution		Cellphone	Men's restroom
6	Calling permitted area	Not important caution	Contact information	New mobile phone device	Men's restroom exists
7	Public phone Place for phone	Not important warning		Mobile phone use permitted	Men's restroom
8	Phone available	Caution	Go left for information	Mobile phone use permitted	Blue signal
9	Can make phone calls	Caution	Question	Timing to use smartphone	Restroom here
10	Marker for the location of a phone booth on the map	Caution	Information counter	Mobile phone necessary	Men's restroom

Table D.22: Result for Cyan 1-2

11	Public telephone here	Caution	Information available to the left	Mobile phone use permitted	Men's restroom
12	Can use phone here	Warning	Question	Smartphone	Boy's restroom
13	Phone	Warning ahead	Question to something on the left	Using phone is allowed here	Men's restroom
14	Phone	Caution for something	Information corner exists	Mobile phone allowed	Men
15	Call Phone box	Alert	Important question	Information people can get through gadget	Men's restroom
16	Phone contact information	Danger	Place for asking questions	Smartphone available	Men's restroom
17	Make phone call Access phone app	Caution Be careful	Information desk	Blue sign of a cellphone	Men here Men only
18	Telephone service is here	Caution	Question	Men smartphone	Men
19	Answer call	Cold weather warning	Confused	Cellphone zone	Men
20	Phone call	Caution Warning Danger	Any questions?	Cellphone here	Private message

Table D.23: Result for Cyan 2-1

1	Add	Fund raising Bank	Go back	Caution for tsunami	Help
2			Go left	Stop Read the message carefully	
3	Medical station			Hints Tips	What is this?
4	Medical assistance	Stop	Road goes left	Caution	Information counter is here
5	Healthcare	Minus	Left	Caution	Problem
6	Positive		Turn left to get to target location	Caution not related to human body	Information
7	Hospital		Turn left	Attention	
8	Something good	Narrow	Go left	Point	Information assistance
9			Turn left	Can stop	Question
10	Medic		Left arrow		Open page for trouble shooting

Table D.24: Result for Cyan 2-2

11	Hospital		Go back Turn left	Attention	Listen
12	Plus button on calculators	Do not pass	Go left		
13			Go back	Items which should be checked	Information
14	Hospital	No entry	Right direction	Caution	Inquiry corner
15	Hospital		Left	Caution Stop	Questions
16	Crosswalk		Go left	Warning	Place where questions are asked
17	Hospital		Go in that direction	Caution	Open help page
18	Hospital		This way	Warning Attention	Explanation
19	Resting place	No entry	Go left	Can be interesting	Inquiry
20	Add or create something new	No entry	Go left	Treasure chest exists	Any question

D.7 Frame Color: Blue

Table D.25: Result for Blue 1-1

1	Can use cellphone	Men only in vehicle	Phone this way	Go left	
2	Use smartphone	No men	Phone box on the right	Go backwards	Caution Warning
3	Use of smartphone allowed	For men		This way	
4	Use phone to access something	Unknown	Public phone on the left	Go back	Came up with an idea
5	Smartphone	Triangle restroom	Telephone	Can enter from here	Information
6	Phone	Men's	Go right to get to the public telephone box	Turn left	Caution
7	Mobile phone	Rest space	Telephone	One way	
8	Smartphone allowed Smartphone here	Men	Public phone	Turn left	Information Notification
9	Can use mobile phone	Relate to men	Telephone booth here		Here is the point
10	Can use smartphone	Private space	Right arrow		Warning

Table D.26: Result for Blue 1-2

11	Blue smartphone	Men's restroom	Phone booth	Attention Look left	Attention
12	Allowed to use cellphone	Boy's place	Telephone booth	Go left	Fright
13	Mobile phone use permitted	Men's restroom	Phone call	Recommend left choice	Warning Danger Caution
14	Cellphone	Men's restroom	Call	One way	Notice for something
15	Can use smartphone	Men only	Phone	Left only	Information
16	Can use smartphone Information available on smartphone		Public phone	Left	
17	Smartphone	Restroom	Payphone	Go back	Information center
18	Smartphone	Men's restroom	Telephone	Left Back	Be careful
19	Using mobile devices from this point is permitted	Men's restroom	Call	That way is good	Tips
20	Use your phone	Men	Public phone to the right	Go back	

Table D.27: Result for Blue 2-1

1	Stop	'l' area in airport	Caution	Can use phone	To the right
2	Release	Be quiet and go straight slowly	Caution	Any public phone	Can go to the right
3			Pay attention	Emergency contact	Go right
4			Hint	Phone available	One way
5			Exclamation	Phone	Turn right
6			Caution	Public phone available	Go right
7	You cannot go this way		Warning	Phone box	Good
8	No entry		Water is cold	Public phone box	Go right
9	Stop		Caution	Phone is here	Go right
10	Stop	Safe to open door	Pay attention	Can call	One way

Table D.28: Result for Blue 2-2

11	Pause Caution Slot to insert something Safety		Caution	Telephone booth	Turn right
12	Stop talking		Be careful	Phone in the area Payphone	Right is the suggested route
13	Stop	The pattern of keyhole to unlock something	Attention please	Some kind of phone or communication functionality	Turn right
14			Be cautious	Phone	Go right
15			Warning Pay attention	Phone box here	To the right
16	One way street		Caution	Payphone	Go right
17			Exclamation mark	Positive message about phone usage	Go Turn right
18			Proceed with caution	Incoming call	One way
19	Cold food	Confuse	Caution Warning	Phone service	Turn right
20	No entry		Warning	Dialed calls	Turn right

D.8 Frame Color: Purple

Table D.29: Result for Purple 1-1

1	Person cannot see	Can call			
2	Pedestrians only	Talk by using mobile phone here	Rewind and stop	Instruction for vertical line	
3	Stand here Line up here	Lend phone	Go back one	USB	This is locked with key
4	Men	Phone station		This is a straight road	Power
5	Men's restroom	Telephone			1
6	Men	Smartphone use permitted	Power	One way	
7	Men's restroom	This is a phone	No entry to the left		Poison type
8	Men	Phone Telephone stand available to use here	Stop or wait when going left		Power button for sleep mode
9		Phone		Alien Stay alert for new stimuli	
10	Men's restroom	Place of phone	Typing mistake	Caution	Go straight

Table D.30: Result for Purple 1-2

11	Men	Telephone available	Narrow path	Down	Straight road
12	Feminine side of men	Phone number Call button Contact button			
13	Caution for surrounding	Refrain from using phone	Focus on looking ahead		1
14		Location of public phone		Road	Gate 1
15		Location of phone booth	Information Confused		
16	Men's restroom	Telephone	Telegraph pole on the right		
17	Men only	Telephone service	Letter 'l'	Numerical marker	
18	Men	Phone	Letter 'l' Border	No activity	
19	Men's bathroom	Make call		Enter with permission	Straight road ahead
20	Men	Cellphone use permitted here	Rewind	Other topic	Coin slot

Table D.31: Result for Purple 2-1

1	Marsh in this direction	Download	Drugstore exists	Smartphone	Pops when touched
2	Turn right	Something exists below	Add an item	Do something with smartphone	
3	Caution			Can use smartphone	Explanation
4	Go right	Look down	Hospital Medical office	Can charge smartphone	Repeat
5	Right	Down	Add	Use smartphone	
6	To the right	Go down	Medicine	Phone	Warning
7	Turn right		More	Can call	Information
8	Go			Smartphone can be used here	Caution this is perishable
9	Something about direction	Walk backward		Smartphone available	Point to pay attention
10	Turn right	Elevator		Smartphone available	Important information

Table D.32: Result for Purple 2-2

11	Go next	Down Download	Toxic	Can use mobile phone	Important point to remember for woman
12	Move to the right	Go here			
13	Showing a direction	Download	Remedies	Permitted to use cellphone	Caution
14	Turn right only	Under	Medical	Smartphone available Smartphone repairing service	Attention Warning
15	Proceed right	Down	Hospital	Phone usage	Danger
16	Go next	Go down	Increase Up Increment	Place where people can receive special things for smartphone	Men only
17	Next	Go in that direction	Add		Notification
18	Direction to make a right turn	Down Under here	Add	Do not forget smartphone	Fun proposal
19	Go to the right	Go down	Add something	Smartphone area	Warning
20	Safe route	Something is below Going down	Many deaths	Can use phone	Enter inside with caution

D.9 Frame Color: Magenta

Table D.33: Result for Magenta 1-1

1		Stop	Unknown road to the right	Dangerous thing below	Stop
2	Hang up call	Mysterious things ahead	Click for asking questions		Stop
3	Phone		Information desk		Women
4	Phone	What is this?		Caution	
5	Phone	Question	This way for any questions		Women only
6	Calling	Ambiguous location		Caution	Men
7	Calling	Question Statement	Question		Girl's restroom
8	Phone	Information center		Alert	For girls
9	Make a phone call Relate to women	Dangerous unknown problem		Attention	Men's restroom
10	Phone call to boyfriend or girlfriend	Transportation		Warning	Stop

Table D.34: Result for Magenta 1-2

11	Phone	Important question	Help desk		Place for men
12	Telephone	Mystery		Falling in love	Men's restroom
13	Phone	Error	Question Inexplicable point	Caution Warning	Men's restroom
14	Telephone booth	Question mark		Notification	No pedestrian access
15	Call to special person	Warning Notification	Unclear if the person can proceed	Risky	Girl's restroom
16	Hang up call	Under construction	Who?		
17	Make a phone call	Helpdesk or a general query section	How to use	Caution for nonage	Girl's restroom
18	Telephone booth		Q&A	Take care not to hurt others like animals or children	For women
19	Phone Phone booth Can make phone calls in this area	Question	What is this	Caution	Gentlemen
20	Phone boot area	What?	Do not know what exists ahead		Playground

Table D.35: Result for Magenta 2-1

1	Attention		Go forward	Pink question mark	
2	There might be a wonderful surprise	New smartphone	Get higher	What is coming?	
3	Suspicious store	Smartphone for women	Suggested route	Something is set	Ice cream shop
4	Notice Important message Place requiring extra attention	Cleaner of smartphone screen	Something fun exists ahead	Do not know anything	Caution for keyhole
5	Caution	Cellphone	Guide to fun place	Surprise box	Lip
6	Caution	Use mobile device	Proceed	Let's think of something funny	One way only
7	Something exists	New model of smartphone	Caution above Caution up		
8	Something special here Be aware or careful		Desired thing is above	Question space	Mouth of character
9	Attention	Timing to use smartphone	Stay positive		
10	Caution Danger	Use smartphone	Something exists when going up	Here is a quiz	Step one in some process

Table D.36: Result for Magenta 2-2

11	Notice something about women	Smartphone use permitted	Look up		Care when going straight
12	Important Pay attention	Handle smartphone	Way to store	Any questions?	
13	Be careful	New app advertisement	Move forward or up		Go
14	Caution for something	Mobile phone is not allowed	Up	Information	
15	Beware	Gadgets Funky Fun Casual	Go straight on this lane or road	Question	
16	Alert	Wi-fi area	Up	Link to Q&A page	
17	Caution	Cellphone	Entrance or other important directional point Gateway Entryway	Any questions?	Straight road
18	Urgent Important	Women smartphone	Proceed Go north		
19	What girl!	Cellphone	Forward Up	Information station	
20	Important notice Pay special attention to something	Cellphone this way	Go to the top	Question	

D.10 Frame Color: White

Table D.37: Result for White 1-1

1	Down	Go down	Go right	Cross	Go left
2	Go down	Something to be careful of below	Push		Go to the left here
3	Go underground	Go back	Contradiction	Hospital Clinic	Go back
4	Down arrow Move down to next section Move down a place	Road is under construction	Right is the suggested route	Hospital	Footprint of bird
5	Downstairs Go down	Hole	Guide	Hospital Drugstore	Back
6	Go down	Scroll down	Go right	Weird bar exists	Can turn left
7	Something exists down	The opening of the package is below		Set an aim	Something to pay attention on the right
8	Look down Go down Do something downward		Turn right	Plus side down	Back button on browser
9	Under	Something exists below or down			Go to the right
10	Down At the back	Attention below or down		Hospital Medic	Something to the left

Table D.38: Result for White 1-2

11	Down	One way	To the right		Left
12	Look down See below Scroll down	Caution below or down	Go this way Not emergency		Go left
13	Going down	Look out the downside place Something to pay attention	Move to the right	Hospital	One way to the left
14	Look down	Going back	Direction	Hospital Place with AED	Turn left
15	Go down	Read this part			To the left
16	Down	Caution below			Go back
17	Located here	Down arrow	Go Right	Hospital	Go left
18	Down	Look down	Do not go right		Go this way
19	Down	Down	Go right	Speed up	Go this way
20	Proceed downward Something is going downward	Look down	More missed calls	Crossing	Go left

Table D.39: Result for White 2-1

1	Setting	Can use smartphone	Can call	Phone exists	Only one person allowed
2	Crossing	Smartphone available	Public phone		Men's restroom
3		Mobile support	Public phone	Phone	Employee at pentagon
4	Crosswalk Caution	Can use smartphone	Phone here	Phone exists	People
5	Intersection	Smartphone use permitted	Phone exists	Free phone call	Men's restroom
6		Wi-Fi environment	Phone	Telephone	Men's restroom
7	Hospital	Smartphone	Phone here	Phone number	Men's restroom
8	Crossroad		Public telephone	Public phone available inside building	Men
9	Crossroad	Smartphone use permitted	Public phone	Can call here	Stand here
10	Hospital	No cellphone allowed	Public phone exists	Put someone on hold	Only one person

Table D.40: Result for White 2-2

11	Intersection	Place to charge smartphone	Public phone exists	Public phone sign	Men's restroom
12	Increase	Can use smartphone in the area	Telephone	Public phone	Traffic signal
13	Add something new	Can browse from smartphone	Telephone booth Area where one can use mobile phone	Public phone exists	Get together
14	Add	Smartphone	Phone exists Can use phone here	Phone available here	People
15	Add	Can use smartphone Charge area	Telephone booth	Phone exists	Something for men
16	Screw hole	Mobile	Public phone		For men
17	Some sort of road sign	Smartphone	Phone box exists	Make a call	Men
18	Positive	Mobile phone	Phone booth somewhere	Public phone	People
19	T intersection	Smartphone zone	Phone area	Phone	Restroom
20	Intersection ahead	Can use in manner mode	Call	Phone available inside	

D.11 Frame Color: Gray

Table D.41: Result for Gray 1-1

1		Go straight	Men should move to the right	This side	Subtract
2	Can control using smartphone	Go straight		Scroll down	Minus
3	There is a smartphone	Go carefully	Red signal	Here Down Below	Hyphen
4	Place where people can use smartphone	Go	Turn right	Go back	Minus
5	Smartphone	One way only	Men's restroom		
6	Limitation of using cellphone	Something exists above Caution for falling rocks from above	Men Right	Slow down	-
7	Phone home	One way	Caution for men		Not that way
8	Mobile phone	Caution above	Stand over to the right	Go down	Something neutral
9	Phone out of battery	Go straight	Growing human	Press here	
10	Smartphone		Men's restroom	Bring down	Dead end

Table D.42: Result for Gray 1-2

11	Smartphone	Go straight down	Human on the right		Nothing
12	Smartphone	Go forward	Guide to meeting place	Tunnel	No entry
13	Phone	Go back up	Men's room to the right	Go down	Minus
14	Handphone	Go	Men should go to the right path	Go downstairs	Not available
15	Smartphone	One way	Men at work on to the right	Can go down	
16	Smartphone	Up Increase	Men to the right		Suspended
17	Designated cellphone usage area	Caution ahead	Something for men here	Cannot go down	Minimize
18	Cellphone	Go up	Be careful of accidents		Minus
19	Smartphone Cellphone	Go that way	Be careful of street at night	Down arrow	Approaching dead end
20	Something regarding smartphone	Detour	For men in the right	Can go down	Remove

Table D.43: Result for Gray 2-1

1			Started repairing smartphone	Caution	Go left
2	Hint		Allowed to use smartphone here	Watch out Pay attention	Go left
3	Question corner	Dead end	Smartphone available	Caution for falling rocks	Turn left
4	Help	Ground is flat	Can charge smartphone	Gray zone Do not know what happens	Turn left
5	Question mark		Can use smartphone		Go left
6	Problem	Stop	Smartphone available	Obstacle exists	Exit on the left hand side
7	Quiz channel		Smartphone is disconnected		Go back to the previous page
8		Road	Something related to smartphone here	Old message	Go left
9			Smartphone use prohibited	Information	Go back to the previous page
10	Mistake in input		Smartphone exists	Important piece of information in a manual or booklet	Turn left

Table D.44: Result for Gray 2-2

11	Do not know what happens	Do not enter	Set to manner mode	Careful	
12	Error	Be aware of something Slow down	Explanation about smartphone nearby		Turn left
13	Fake Keio Media Design		Mobile phone	Information guide	Go left
14	Question		Disconnected area		Go to the left side
15	Help	Do not go in or through here			
16	What is in the box?		Launch smartphone app	Notice to check something	Cancel
17	Question mark	Minus	Smartphone area	Notification of event	Go to the left
18	Important question	No activity			Go left
19	Help Help desk Information desk	Empty room	Cellphone charger near by	Alert	No going back to the left
20	What	Unread Not important	Use smartphone here	Be careful	Left

D.12 Frame Color: Black

Table D.45: Result for Black 1-1

1	Men's restroom	Can call	-		Go right
2	Men's restroom	Phone for the night		Can use a telephone here	Go right
3	Men	Phone box	No Trespassing Detour	Phone connecting to hell	Turn right
4	Person in dark room	Phone exists here	Play button	Public phone unavailable	Turn right
5	Restroom	Can use phone	Stop		Go right
6	For men	Phone available	Turn left	Public phone available	Face right Go right
7	Men's restroom	Calling permitted area	Smartphone hole for charging	Public phone Place where people can call	Go right
8		Phone exists here	Minus to the left	Calling here would cause death	Go right
9	Men's restroom	Phone here		Telephone booth available here	Direction Guide
10	People in midnight	Refrain from calling	Wall	Phone booth	Go right

Table D.46: Result for Black 1-2

11	Pedestrian exists	This is a telephone booth		Telephone here	Turn right Go right Look right Press forward
12	Men's restroom	Phone in the area Payphone		Special call area	Path leading to light on the right
13	Men's restroom	Location of telephone Option to use telephone	Fish	Phone box	Go right
14	Stop	Public phone	Open space that is not used	Missed call	Go to the right side Something on the right side
15	Men's restroom	Telephone box here		Call here	Turn right
16	Men's restroom	Payphone		Phone booth at this location	Next step
17	Men	Telephone services available here	Do not do	Phone app	Go to the right
18	Caution for men	Call has dropped		No telephone service in this area	Go right
19	Men's restroom, bedroom, anything for men	Switch off phone Put phone on silent		Hang up call	Go this way to the right
20	Men Men's restroom	Canceled call	Do not pass	Telephone	Right

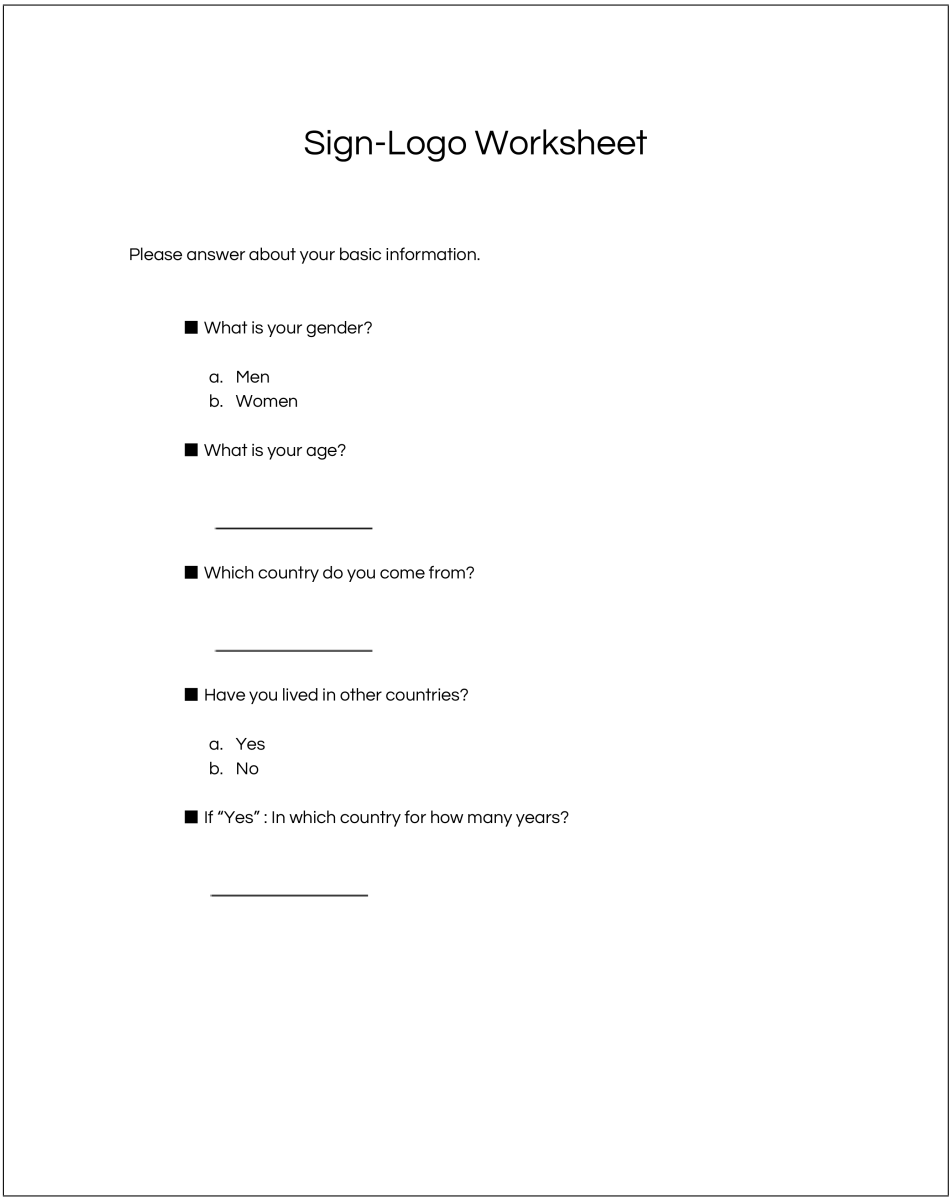
Table D.47: Result for Black 2-1

1	Stop	Shield Plus	Wait	Jump	Do not know
2	Notice		Caution for aliens	Go down	Help
3	Attention	Hospital	Caution Warning	Down	
4		Funeral	Attention	Straight ahead	Information center
5		Funeral	Toxic substance	Go back	Help
6	Power button		Watch out	Go this way	Question
7	Power on		Caution	That way	Help Information center
8	Caution	More	Be careful of contents in the box	Go down	Information
9	Straight road	Addition	Pay attention		Wondering Question
10		Helmet of knight	High level warning	Go back to suggested road	Q & A

Table D.48: Result for Black 2-2

11	Do something vertically, not horizontally		Softer warning Warning with low level of caution	Going down	Help
12		Hospital	Caution for falling rocks	Go down	Have any questions?
13	Explanation about demerit	Hospital Medical services	Be careful	Go down	Unknown question
14		Crossroad ahead	Truck carrying dangerous chemicals	Underneath	Information booth
15	One way	Hospital	Attention		Unknown
16	Power on	Contains medicine and equipment for first aid	Stop	Scroll down	Unclear point
17	Stop	Public facilities	Stop	Download	Something inside
18		Tomb Christianity	Important point	Go down	What is that? Ask questions
19	Straight road	First aid	Warning	Follow the white line	It is unknown
20	Coin		Dead end		Unknown

E. Worksheet Question



Sign-Logo Worksheet

Please answer about your basic information.

■ What is your gender?

a. Men
b. Women

■ What is your age?

_____

■ Which country do you come from?

_____

■ Have you lived in other countries?

a. Yes
b. No

■ If "Yes" : In which country for how many years?

_____

Figure E.1: Worksheet Page 1

Please answer what you think about each Sign-Logo.

■ Do you think the Sign-Logo is “Girl’s place”?

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

■ If “Disagree” or “Strongly Disagree”: Which part do you feel is wrong?
This is a multiple choice question.

Frame

a. Color

b. Shape

Object

c. Color

d. Shape

Message

e. “Girl’s place” → _____

■ Do you think the Sign-Logo is "Women's place"?

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

■ If "Disagree" or "Strongly Disagree": Which part do you feel is wrong?
This is a multiple choice question.

Frame

a. Color

b. Shape

Object

c. Color

d. Shape

Message

e. "Women's place" → _____

Figure E.3: Worksheet Page 3

■ Do you think the Sign-Logo is “Boy’s place”?

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

■ If “Disagree” or “Strongly Disagree”: Which part do you feel is wrong?
This is a multiple choice question.

Frame

a. Color

b. Shape

Object

c. Color

d. Shape

Message

e. “Boy’s place” → _____

Figure E.4: Worksheet Page 4

■ Do you think the Sign-Logo is “Men's place”?

a. Strongly Agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

■ If “Disagree” or “Strongly Disagree”: Which part do you feel is wrong?
This is a multiple choice question.

Frame

a. Color

b. Shape

Object

c. Color

d. Shape

Message

e. “Men’s place” → _____

Figure E.5: Worksheet Page 5

F. Created Sign-Logo Images

F.1 Topic: "This Drink is Hot."

Figure F.1: Sign-Logo Images Created for Hot

F.2 Topic: "This Drink is Cold."

Figure F.2: Sign-Logo Images Created for Cold

F.3 Topic: "This Book is New."

Figure F.3: Sign-Logo Images Created for New

F.4 Topic: "This Book is Old."

Figure F.4: Sign-Logo Images Created for Old