

**An Investigation into the New Student Union Building's Public Display Board**

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**November 24, 2011**

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# An Investigation Into:

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**11/24/2011**

**Submitted to: Dr. Carla Paterson  
APSC 261 Section: 101**

# ABSTRACT

The new Alma Mater Society (AMS) Student Union Building (SUB) aims to incorporate functionality as one of the primary buildings at the heart of campus with the promotion and practicing of sustainable living during its operation. This paper explores the methods and the effects of the addition of a public display board to meet this goal. The current projection of the new SUB includes such a display, but its implementation has yet to be decided.

The scope of this paper includes a triple bottom line assessment (TBLA) of the following two products of display boards, both of which are currently offered on the market: Samsung's UE46A Display and Sony's Bravia EX720 Display. These product models have been selected based on economic, environmental, and social benefits, along with feasibility of either implementing a single large display in the atrium, multiple small displays, or a hybrid of the two structures.

This paper will also explore recommendations based on a survey conducted of 100 random University of British Columbia (UBC) students at the existing SUB. Primary research was completed in order to evaluate how effective students felt the display board could be in attaining the goal of raising awareness towards sustainable living, and what specific content would be most effective on the display to meet this goal.

Based on the analysis of obtained primary and secondary data, the recommendation that the display board should be a hybrid of both small displays, and a single large display has been made. Furthermore, the display board should exhibit UBC's PULSE Energy live feed as a visual data representation, a public comment board accessible wirelessly or via the internet, and general information relating to sustainability and global climate change.

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# GLOSSARY

**Watts:** Unit of measurement of power consumption per unit time. A display with higher wattage will require more energy during use.

**Display Size:** The display size denotes the diagonal length of the display, not the height or width.

**Liquid Crystal Display:** A liquid crystal display, or formerly known as LCD display, is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals, although liquid crystals do not emit light directly. Therefore, it often uses LED backlight as a light source.

**Light Emitting Diode Display:** A light emitting diode display, or formerly known as LED display, is a thin, flat electronic display that is made of an array of very small red, green and blue light emitting diodes (LEDs). Each individual red, green and blue LED's intensity can be manipulated, thus adding to be able to create every color of the spectrum.

**Viewing Angle:** The viewing angle is the total angle, normally in degrees, at which a display can be viewed without image distortion or loss of clarity.

**Anti-glare:** The anti-glare layer of a display prevents the reflection of light, thus maintaining a crystal clear image in highly lit areas.

**Bezel:** The bezel is the border around the display.

**Energy Star:** A government-issued rating system for product efficiency.

**Presence Sensor:** A motion sensor used on a display to detect movement. When no movement is detected for a certain length of time, the display will turn off to save energy.

**Light Sensor:** A light sensor is light-sensitive sensor used on a display to detect light. This allows displays to automatically adjust its brightness to the appropriate level.

**Local Area Network Control:** Local area network control is an attribute associated to some displays that allows the control of the display over a local network.

# LIST OF ABBREVIATIONS

**AMS** – Alma Mater Society

**LCD** – Liquid Crystal Display

**LED** – Light Emitting Diode

**UBC** – University of British Columbia

**SUB** – Student Union Building

**TBLA** – Triple Bottom Line Assessment

# 1.0 INTRODUCTION

The UBC AMS is planning to build a new SUB, which is estimated to be completed by 2014. This new building will serve many purposes for the convenience of our student society and will also promote and practice sustainability.

This paper proposes one of the methods of promoting and practicing sustainability by displaying related information on display panels, which will encourage people to participate in creating a greener society. Our hope is that by introducing many sustainability issues through these display panels, the new SUB will have a positive influence to society and the environment.

Based on our research and the conclusions developed from our TBLAs, we recommend that the new SUB should have a hybrid of both small displays and one large, main display in the atrium. It is appropriate to have Sony's Bravia EX720 Display for the multiple small displays around the SUB, based on their performance and multiple Samsung's UE46A Display boards to make one large display board for the atrium in the SUB, due to their wide viewing angle, thin bezels, and relatively cheap price.



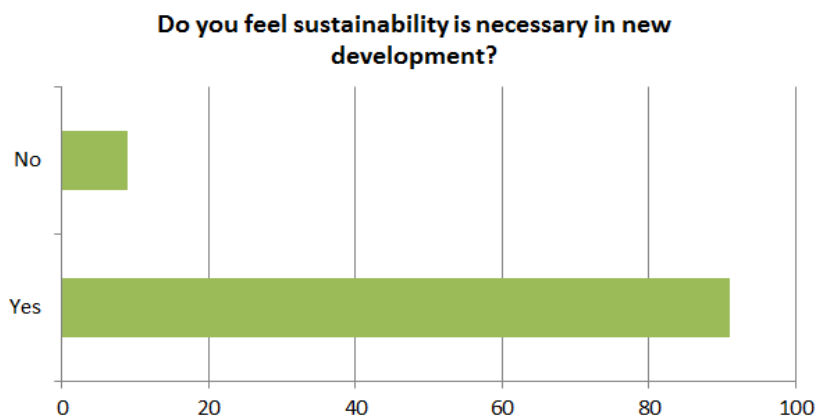
## 2.0 PROCEDURE

In order to obtain analytical data, examination of primary and secondary resources was required. By conducting a public survey offered to 100 random UBC students in the existing AMS SUB, we managed to obtain data to aid in recognizing some social aspects of the proposed display that would otherwise be impossible to acquire, or would simply be inaccurately assumed. Secondary resources, such as product websites, were used to obtain information related to the products' TBLA, along with information based on research conducted, more generally related to sustainable living patterns within communities. The recommendations summarized within the scope of this paper are outlined purely based on this acquired information, with the attempt to nullify any biases or judgement of the writer.

### 2.1 PRIMARY RESOURCES

A survey of 100 random UBC students was conducted in the existing SUB, which contained questions concerning the proposed new SUB's display board and its effectiveness towards meeting the goal of raising awareness of sustainability. It also included a few examples of what the display might show while in use.

Below in figure 1 is the result from question two of the student survey, displaying that a vast majority of students feel that implementation of sustainable design is important in new development.



**Figure 1**

The survey also explored whether or not students felt the display board would be a suitable method to aid in raising awareness towards sustainability. Below in figure 2 are the results, showing that most people have no opinion on the matter.

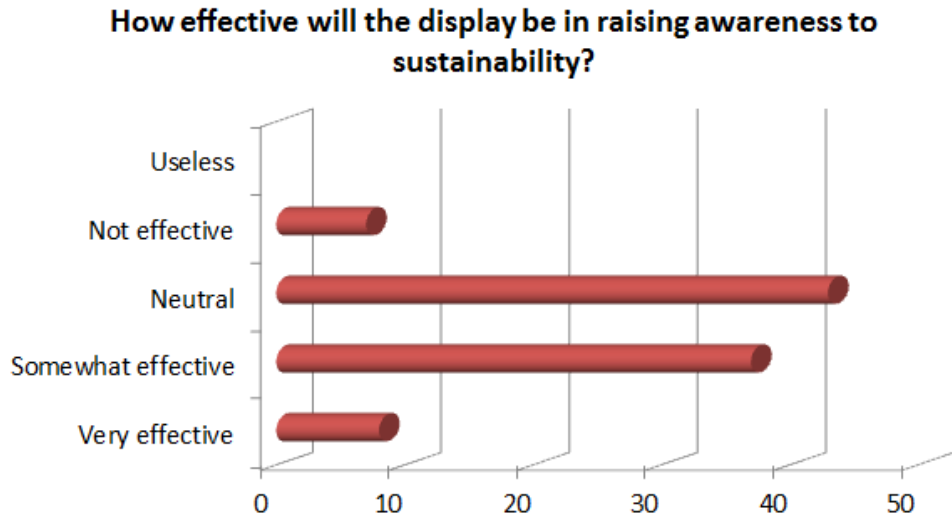


Figure 2

Naturally, one of the most challenging sets of data to acquire was social impact related to possible content that the display board should show. Below in figure 3 are the results from a few examples that students were questioned on.

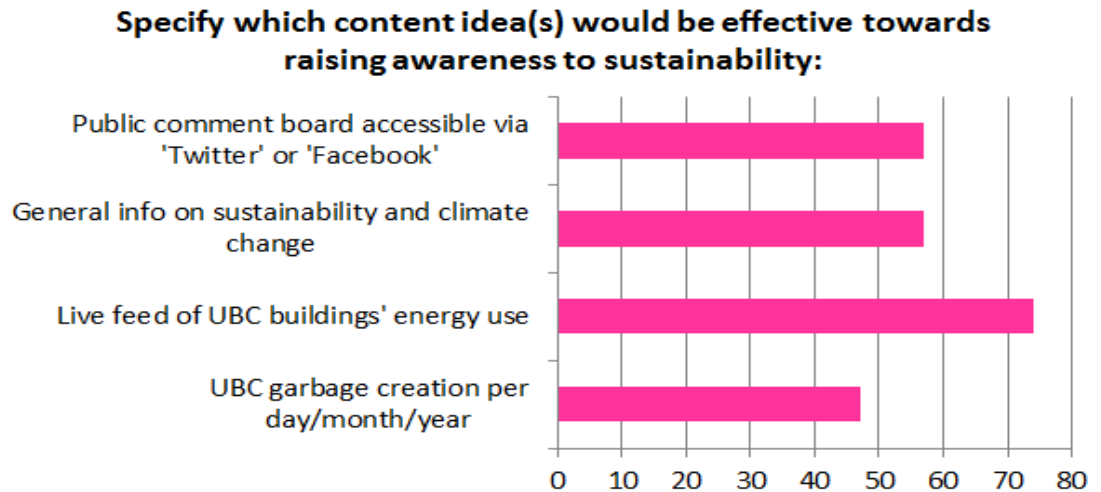


Figure 3

A surprising result from the survey was that 45% of students surveyed felt that multiple, small displays would be more practical, as opposed to only 20% who felt the large display would be favorable; the remainder of students had no opinion, or felt both were equally effective. A few comments received were that the small displays offer a more personalized experience, and have the ability to function as an interactive 'UBC Wayfinder' display, or any other practical method of individual interaction. Furthermore, some students were concerned that the motive of the display was too focused on sustainability, and felt that the display board offers the ability to function in many different ways, such as promoting other campus-related events and important dates.

## 2.2 SECONDARY RESOURCES

In order to be able to narrow down our research and increase the productivity of our investigation, we used the results of our survey. According to results from our student survey, students are more leaning towards a network of smaller screens or a hybrid of small screens and a large central one. Therefore, we directed our investigation towards smaller displays available in the market.

Having set a particular category of products to investigate into, we fixed a criteria to help us look for the most suitable products available in the market. Main criteria were power consumption, price, type, and visibility. Within each criterion, we set our own standard, usually slightly higher than the average.

In the beginning of our investigation, we brainstormed many display types: touch screen, projector, plasma, LCD, and LED display. Touch screens are generally expensive and require heavy maintenance compared to other types. Projectors are not ideal to be used in bright condition, such as the new SUB which is planning to utilize daylight. Plasma usually consumes a lot of power, so it did not fit well in our sustainability project. Hence, we narrowed down to LCD and LED display.

Since the budget for display boards has not been finalized yet, we decided that anything below \$3000 was reasonable.

As the main point of our project is to get information across to as many viewers as possible, we have also considered visibility. Most displays today offer 178 degrees of

viewing angle, so that wasn't too much of a concern. Another feature that was considered was antiglare. Because the new SUB uses daylight, displays without antiglare might not be very visible.

Finally, the most important criterion was power consumption. During the investigation, we noticed that most displays uses about 200W~300W, some even using over 400W. We decided that green building such as the new SUB should have higher standard to demonstrate the sustainability awareness, and set the standard to below 200W.

Eventually, and taking into account all of the counted factors, we chose five different products to be further assessed and compared against each other. Table 1 outlines the products we chose to consider and their relevant specifications:

	<b>Samsung 460UX-3</b>	<b>Samsung UE46A</b>	<b>Mitsubishi LDT 551V</b>	<b>Sony Bravia EX720</b>	<b>Christie LCD flat panel tiled display</b>
<b>Size</b>	46 in	46 in	55 in	55 in	55 in
<b>Price (approx.)</b>	\$2000	\$2600	\$1900	\$1400	\$2800
<b>Type</b>	LCD	LED Display	LCD	LCD	LED
<b>Visibility</b>	178 degrees Antiglare	178 degrees Antiglare	178 degrees	178 degrees	178 degrees
<b>Power Consumption (Max)</b>	250W	160W	344W	166W	275W
<b>Estimated Yearly Energy Cost*</b>	\$63.3	\$40.5	\$87.1	\$42.0	\$69.6
<b>Thin Bezel</b>	No	Yes	Yes	No	Yes
<b>Energy Star</b>	5.0	5.0	Qualified	5.0	-
<b>Other notable features</b>	-Dust resistance -Optional protection glass	-Low heat -LAN control	-Light sensor	-Presence sensor/Light sensor -LAN control	-

\*yearly energy cost: 11 cents per kWh, 15 hours per day

**Table 1**

A quick glance at the products' specifications reveals that the most two efficient displays in terms of power consumption are the Sony Bravia EX720 and Samsung UE46A. Not only smaller power consumption reduces the yearly energy cost - about \$20-\$50 per year (Federal Trade Commission); more importantly, the small power consumption of displays can be an example of sustainability in the new SUB, impacting students and visitors by showing them how small changes can lead to a more sustainable lifestyle.

Additionally, we see that Sony Bravia EX720 is the least expensive product of all, despite its low power consumption and good set of utilities (BRAVIA 55" EX720 Series HDTV).

In order to be able to systematically compare the products with each other in terms of power consumption and price, we have used the following ranking scheme:

1. Each product is given a rank in two main criteria: price and power consumption (high to low: e.g. the least expensive product is ranked 5 and most expensive one)
2. Since power consumption is a more important factor for us, we give this criterion a weight of 2 by multiplying the ranks by two.
3. We add up the weighted ranks and find the top two scores.

Table 2 illustrates the rankings and final score for each product:

	Samsung 460UX-3	Samsung UE46A	Mitsubishi LDT 551V	Sony Bravia EX720	Christie LCD flat panel tiled display
Power Consumption (unweighted)	3	5	1	4	2
Power Consumption (weighted)	6	10	2	8	4
Price	3	2	4	5	1
Antiglare	1	1	0	0	0
LAN Control	0	1	0	1	0
Light/Presence Sensor	0	0	0	1	0
Dust Resistance	1	0	0	0	0
Ranking	11	14	6	15	5

**Table 2**

From our comparison, based on price and power consumption, we can see that Sony Bravia EX720 and Samsung UE46A are the best two options available.

Knowing our top two options in terms of power consumption and price, we then considered other factors those were important in recommending the final product. In order to have a good measure, the ranking for each product gets incremented by one for each additional feature that we are looking for.

By comparing the total score of the products under investigation, we can say the two most suitable displays for our purposes are Sony Bravia EX720 and Samsung UE46A monitors.

## 2.3 TRIPLE BOTTOM LINE ASSESSMENT OF PRODUCTS

Below are the conclusions drawn from our triple bottom line assessments, outlining social, economic and environmental pros and cons.

### 2.3.1 SAMSUNG UE46A



**Figure 4:** Samsung UE46A Display Board (Samsung Corporation)

#### **Social:**

First of all, Samsung is one of the world leading companies in electronics. They have populated many advanced technologies, including display technologies, to the general public. Most people would like to know that their

tuition fee has been spent on a product from a trustworthy and reliable manufacturer.

Regarding the type of this display, LED display is relatively new technology, and it is known to be the most power saving type of display yet. Longer history and more data are needed, but many manufacturers say that LED display has longer lifespan than any other type of display. The drawback is that this type of display is generally expensive, although it has many exceptional attributes to make up for the price. The characteristics of LED displays, such as low power consumption and long lifespan, make this type of display an ideal choice to promote sustainability.

**Economic:**

As mentioned above, low power consumption is one of the key features of LED display. Since there will most likely be multiple displays throughout the new SUB, UBC will be saving a lot of money for electricity. However, Sony's Bravia EX720 has similar power consumption rate and almost half in price, so it will be difficult for Samsung's display to make up for its price during its lifespan.

The case where this display will be price-efficient is when the design team decides to implement a main display panel. Samsung's UE46A has amazingly narrow bezel, so by cascading a few of these displays, it will be just as good as having a large display. Usually, large displays or display walls are expensive or have low video quality. Also, they would not be LED display, but possibly LCD, plasma, or projector. We believe that cascading Samsung's UE46A is the most price-efficient way of having a high quality main panel.

**Environmental:**

Again, low power consumption saves energy required to operate these displays. Since these displays will be powered on for almost entire day, the amount of energy saved by having low power consuming display will add up.

Also, Samsung claims that UE46A emit much smaller amount of heat compared to other displays. We're not sure if the effect of this is significant, but it is something to consider about.

Finally, the fact that the type of this display is an LED display, and its low heat emission, this display is expected to have a very long lifespan. Most electronics are generally more stable in low heat condition. Longer lifespan means less e-waste, which is becoming a huge environmental problem.

### 2.3.2 SONY BRAVIA EX720



**Figure 5:** Sony Bravia EX720 (BRAVIA 55" EX720 Series HDTV)

#### **Social:**

As per the other display, the fact that this display is being manufactured by a well-established and known company can bring a sense of reliability to the visitors. Also, the fact that a well-known company produces an energy-efficient display with a reasonable price can be a strong motive for the visitors to think about affordable options for a sustainable lifestyle.

#### **Economic:**

As we showed in our comparison chart (see Table 1), Sony Bravia EX7200 screen is the least expensive product among the displays under investigation. Additionally, it has a low energy consumption compared to its competitors, which aside from the environmental benefits, reduces the energy costs during its life span. Finally, the fact that the screens are capable of turning themselves off automatically during low-peak periods can lower the energy



costs; also increasing the life-span of screens (BRAVIA 55" EX720 Series HDTV).

Overall, we see that this product gives us a very good power consumption to price ratio; as well as providing key additional features for our purposes.

**Environmental:**

As it was mentioned in the previous part, this screen has a very low power consumption compared to the similar products in the. Since we will have multiple small displays in the new SUB, low power-consumption will be significant in the long term.

Additionally, the light and presence sensors will cause the displays to turn themselves off during less crowded periods; leading to the smallest power consumption possible.

## 3.0 RECOMMENDATIONS

Based on all of the above information, we concluded some recommendations of which product to use, where the display should be located and which content ideas would be most effective on the display to meet the goal of raising public awareness towards sustainability.

### 3.1 DISPLAY PRODUCT RECOMMENDATIONS

Based on the product comparison and triple bottom line assessments, we recommend both of Samsung's UE46A and Sony's Bravia EX720, but for different purposes and uses.

First, Samsung's display is leading in almost every aspect except for the price. It also has a narrow bezel, giving us the option of having a big main panel. If budget allows, and if main display method or hybrid method is chosen, Samsung's display would be an overall better choice.

However, Sony's display is far better in price to power consumption ratio than Samsung's display. It also has presence sensor which automatically turns the display off when no one is detected nearby after a certain amount of time, and light sensor which automatically adjusts the display's brightness depending on the surrounding lighting.

If hybrid method is chosen, we would recommend using Sony's display for multiple small panels, and use Samsung's display to create main panel. This method is also dependant on the budget of the project, which has yet to be decided.

### 3.2 DISPLAY LOCATION RECOMMENDATIONS

For the locations for display boards, the main thing we considered is how effectively we can show the displayed information to people. We regarded the duration of people staying at the same spot where they can see or watch the display, which is important so that there is enough time to catch the people's attention. Also, we considered where the most people pass by throughout the day.

Based on this, we recommend putting a main display in the atrium, which is the heart of the new SUB. We assume that it will be the place where the most people gather together and people will sit there or stand by for some time.

For the multiple small displays, we recommend them to be placed around the first and the second floor of the SUB at the main passageways and where people line up for food, wait for friends, or sit down to eat. When people line up for the food, they do not really have something to do rather than watch some displays. Also for eating areas, many people will definitely watch the display boards since people stay the longest time there in the SUB.

We think placing some of the small displays at the entrances will be very effective. By doing so, we can ensure that almost every visitor will encounter the display panel at least once, regardless of their purpose of visit. However, since most people would not stand at the entrance to carefully view these displays, they should consist of minimum amount of information and provide only the most important facts and data directly related to sustainability. Also, most of the data that is displayed here should be graphical so that people can quickly get the general view without having to pay close attention. Below in figure 6 are the possible location options on the second floor for the displays.

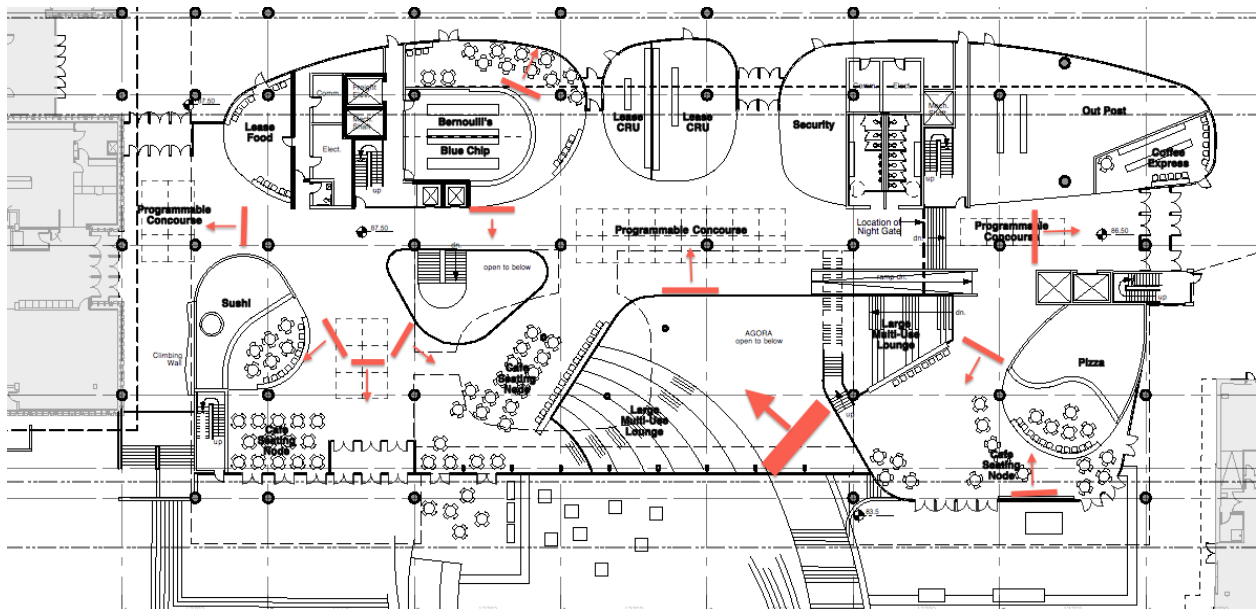


Figure 6 (Chris Karu)

The large red rectangle is the possible location for the main display, whereas the small rectangles signify possible locations for small the displays.

### 3.3 DISPLAY CONTENT RECOMMENDATIONS

Based on our survey and feasibility, we recommend the following content ideas to be displayed on the new display board. Graphically showing the energy consumption from each building in UBC and from each specific area within the SUB will help students to be aware of how UBC is using energy and to raise students' interest. In order to give more explicit information for the new SUB, we recommend showing tangible amounts of energy usage, such as barrels of oil used per minute. It will also be meaningful and convincing to display the result in monthly costs and savings from the new SUB. That will give students clear understanding of how the sustainable building can contribute to money saving. Besides, it is necessary to show how it is vital to be aware of environmental problems and also to make some effort to solve the problems. For this purpose, we recommend playing short videos and slides of pictures which arouse people's attention to this issue.

For example, we can play *Addicted to Plastic* by Bullfrog Films, which is about how plastic influences our lives and the Earth, or any other provocative videos that could impact students' attitude towards sustainability. We also can display how UBC has done specifically towards practicing sustainable living. Moreover, we encourage advertising sustainability groups on campus in order to promote their activities and also to increase student participation.

According to the survey conducted, many students are interested in participating and want to be aware of what is going on with the new SUB. Students themselves suggested interactive displays. A trendy and effective way to satisfy their desire is "Online Access." What we mean by "Online Assess" is allowing students to freely access the display panel information from their personal devices, such as mobile smart phones. For example, students can use 'UBC Wayfinder' and also be able to listen to the videos played on each panel. Also, a live, public comment board is recommended to be implemented within the main display panel. Through the comment board, students can share their ideas about the displayed content or they can share events,

student deals or their own ideas and opinions on sustainable living. As more students participate on the display, they will be more interested and gain a sense of interaction with the school, which may also make students feel affection for UBC.

Since we recommend having the hybrid method for installing display boards around the SUB, the purpose of the main display at the atrium and the multiple displays around the SUB should be different for better result in effectiveness. For the main display, we recommend to have illustration with a little bit of numerical values with the energy consumption. In addition to displaying energy consumption illustrations, we recommend having a brief presentation on the result in saving and cost of the last month in the beginning of every month. During the presentation, the live, public comment board would be displayed as well so that students can add their comments on the result and recommendations about how we can improve next month. Also trailers of the short video can be showed on the main display with the time of playing.

Multiple small displays can be used in many different ways and offer the opportunity to reach out to a bigger audience. In addition, more detailed information on energy consumption, monthly reports and instructions on how we can contribute to the sustainability can be included. They can also be used to promote any campus related activities and upcoming events.

## 4.0 CONCLUSION

The new SUB's design is largely focused around sustainable living and development, and the motivation to include a public display board is mainly based on that inducement. The display board will offer an effective way to publicize UBC's incentive to evolve our community's patterns of behaviour towards less wasteful and considerate practices of living. In order to maximize the display board's effectiveness to meet this goal, consider the recommendations outlined within the scope of this paper. Our analysis concluded which type of display arrangement should be used, which products offered on today's market should be implemented, what content should be included on the display during operation and how it should be presented. Based on the analysis of obtained primary and secondary data, the following three recommendations have been made:

1. The display board should be a combination of a single large display and multiple small displays, mainly due to the popularity of the small displays and the exceptional functionality the large display offers, but this option is budget-permitting.
2. Due to comparison of price versus performance, the Sony display board is a better option for the small displays, however, the Samsung display is a better option for the large display due to its narrow bezel, allowing for multiple displays to form a seamless grid appearing to be a single, larger display.
3. The display board should display individual building's live energy use via UBC's PULSE Energy infrastructure, a public comment board accessible through social media providers, in which users may post their strategies towards sustainable living, and general information relative to sustainability and global climate change.

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