

**An Investigation into the Impact of the Switch to Liquid Sugar**

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**APSC 262**

**April 4, 2013**

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## ABSTRACT

Over the past year, UBC Food Services has been making a switch from the use of raw sugar in paper sachets to liquid sugar. This has been done to reduce the environmental impact of sugar. It has been noticed that although the paper sachets used to store sugar are recyclable, they are not recycled by customers very often. This has a large impact on the environment, and the switch to liquid sugar was proposed to reduce this impact.

To assess the impact of the switch to liquid sugar, our team conducted a triple bottom line analysis. This was done by doing primary as well as secondary research. Our primary research consisted of several in depth interviews with UBC Food Service staff, as well as customers at UBC Food Service locations. We discovered that while UBC Food Service staff was trained to recycle liquid sugar bottles, and waste from these bottles was very little compared to waste from paper sachets.

We discovered that while there was some social inertia related to this switch, most customers were happy with the switch after being provided some training and education. In fact, by conducting a social experiment, we discovered that more than 60% of the customers at Neville's cafe (a UBC Food Service location) preferred liquid sugar after just 2.5 months of training. We also noticed that environmentally conscious customers applauded UBC for the switch, and were in favor of UBC pursuing similar endeavors in the future. On doing some secondary research, we discovered that the cost of providing liquid sugar is greater than the cost of providing sugar in paper sachets. However, we noticed that the quantity of liquid sugar used was significantly lower (about 20%) per cup of beverage compared to the quantity of sachet sugar consumed per cup of beverage. This is due to the sweetness of the liquid sugar as well as its ability to dissolve quickly as compared to sachet sugar.

While the switch to liquid sugar will increase costs for UBC and cause some initial discomfort amongst customers of UBC Food Service locations, we believe that not only is this switch feasible, but it is very beneficial to society in the long run. It will significantly reduce the ecological footprint of each UBC Food Service location and further UBC's position as a leader in sustainability.

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## 1.0 INTRODUCTION

The average Canadian consumes about 30 kg of sugar annually (Canadian Sugar Institute). A large portion of this is consumed dissolved in beverages such as coffee and tea. UBC Food Services is a primary supplier of such beverages to the UBC population, therefore it is very important that this supply of sugar is sustainable environmentally, economically and socially.

This report studies the impact of the switch from sugar supplied in individual sugar sachets to liquid sugar supplied in 1 liter or 750 ml plastic bottles. This switch was first initiated at the Loop Café in the CIRS building during the building's inauguration last year, and has proven fairly successful there. The report uses the CIRS café's success and tries to understand how switching to liquid sugar as the primary form of sugar across other UBC Food Services locations would affect the economical, social and environmental bottom lines of the campus as a whole.

This report is done as part of the APSC 262 Impact of Technology on Society course offered, under the supervision of Dr. Naoko Ellis, and with the advice of project stakeholder Victoria Wakefield. The contents of this report are fairly non-technical, and can be easily understood by readers of all backgrounds.

## 2.0 SOCIAL IMPACT

One of the metrics for gauging the feasibility of the change from sachet sugar to liquid sugar is measuring the social impact of this change. As part of the triple bottom line assessment, a measurement of the social impact of liquid sugar was imperative. In order to understand the social impact of the change from sachet sugar to liquid sugar, we devised a social experiment and proceeded to conduct the experiment along with interviews of patron and staff of particular cafes around UBC.

In order to truly measure the social inertia associated with the switch from sachet sugar to liquid sugar we had to find a cafe at UBC that met the following criteria. Firstly the cafeteria should have a medium-large size of customer base, so that the experiment can have a significant sample size. Secondly, amongst the patrons that visit the cafeteria, a significant portion should purchase a beverage that required the addition of sugar to it. Finally, it should be a cafeteria that has just very recently switched over to liquid sugar, so that the patrons are not entirely used to the new form of sugar delivery and will have to think about the choice they make. As a result we chose Neville's Cafe in the Neville Scarfe building. This cafe sees a high volume of patrons that visit it to purchase hot beverages, like coffee and tea. It has also just very recently started its switch over from sugar sachets to liquid sugar.

The experiment we designed required us to provide the patrons of Neville cafe with a choice of both packaged sugar and liquid sugar, and observe what choice the patrons made. In other words we counted the number of patrons that visited Neville and bought a beverage that required sugar, and from those patrons that actually bought these beverages, we counted the number of patrons that used liquid sugar as opposed to packaged sugar. This way we were able to quantitatively gauge the social response to the switch in sugar delivery. In addition to simply counting the number of patron choosing either liquid sugar or packaged sugar, we also interviewed these patrons to see what the perception of liquid sugar was in the eyes of the public.

From the social experiment mentioned in the previous section, we observed that more than 60% of the patrons that visited Neville's preferred liquid sugar over sachets of sugar. The point to be noted here is that these patrons had already been exposed to liquid sugar for about 2 and a half months. Along with that we noticed that, on average, the sugar consumption had decreased by 20-25 percent. These results provide some valuable insight into the social inertia

that is involved with the switch from sachets of sugar to liquid sugar. The insight is that there is still some inertia to the change from sugar sachets to liquid sugar, but people tend to learn and adapt rather quickly to the change. Moreover, from interviewing patrons we realized that people who have made the switch tend to appreciate liquid sugar more and stand by the benefits of it. It was also noticed that because of the fact that liquid sugar is in liquid form it dissolves in the beverage quickly and evenly, this leads to a decrease in the usage of sugar.

In addition to the social response of the patrons, we thought that the social response of the staff that has to work with this new method of sugar distribution was equally as important. As a result we conducted interviews with the staff of the CIRS and Neville's cafe. They were asked questions about what their perception of the switch from sachet sugar to liquid sugar was and generally what their thoughts were about the switch.

From the interviews it was apparent that staff of these cafeterias was in favor of the change from sachet sugar to liquid sugar. They expressed that liquid sugar was much easier to handle for three main reasons. Firstly, the amount of theft associated with liquid sugar was practically nonexistent as compared to sugar sachets, since it is difficult to steal something that does not come in discreet packaging. Secondly, the amount of time and effort put into cleaning the condiments station with liquid sugar is far less than that with the sachets sugar. There is a lot more spillage associated with sachet sugar that leaves not only the table on which the packets are kept but also the floor around the table, sticky and dirty. While in the case of liquid sugar, there is minimal spillage and if there is any it is only near the bottles themselves. This leads to less time spent by the staff in maintaining cleanliness of the cafeteria. Finally, they noticed that only 2% of the paper sachets that are used actually end up in the recycling. People who use the sachets are usually in a hurry or do not care enough to put the empty packages in the correct bin. On the contrary the, in the case of the liquid sugar bottles, the staff is trained to put the used bottles into recycling and hence significantly reducing the garbage load of UBC.

In conclusion it is clear that there are social benefits to make the switch from sachets of sugar to liquid sugar. Though there is some social inertia mainly from the front of patrons, this is easily overcome, as seen by the Neville's cafe. Patrons require to be trained to use liquid sugar but this is an obstacle easily overcome.

### 3.0 ECONOMIC IMPACT

The economic impact refers to the effect on the economy of UBC Food Services and its customers due to the switch to liquid sugar. To investigate this, we had to gather data about how much UBC paid for sachet sugar and liquid sugar, and estimates of how much sugar was consumed before and after the switch.

We started collecting data by contacting our project stakeholder Victoria Wakefield. She provided us the names of the suppliers, as well as the prices that UBC paid per bottle of liquid sugar, and per sachet of raw sugar. We had been told by Victoria that each pump of sugar was estimated to add the same amount of sweetness as 1 sachet of sugar. However, it was difficult to estimate exactly how many pumps each bottle could provide. For this reason, we decided to gather more information about the bottles themselves.

Victoria had provided us the name of the liquid sugar suppliers- Monin. We visited Monin's website and found some very useful data. We confirmed that liquid sugar was available in 1 liter bottles as well as 750ml bottles. From primary research at UBC Food Service locations we knew that UBC uses 1 liter bottles. The website also contained data about the pumps that were used to dispense the liquid sugar. We found that each pump for the 1 liter bottles dispensed about 0.25 ounces of sugar per pump, or 7.4 milliliters of sugar per pump. Using that information, we calculated that each bottle of Monin sugar would be able to provide about 140 pumps of sugar before it ran out and needed to be replaced or refilled.

From the data that Victoria had provided to us, we knew that each sachet of sugar costs UBC Food Services about \$0.02. Victoria had also provided us information that showed that each bottle of liquid sugar costs UBC between \$11.50 and \$12.75. As mentioned above, since each bottle of liquid sugar would provide about 140 pumps of sugar, each pump of sugar costs between \$0.082 and \$0.091. This is significantly more expensive than a sachet of sugar. In fact, its 4-5 times more expensive. Given that the switch to liquid sugar would have to be sustainable not just from an environmental perspective, but also from an economic and social perspective, we knew that this discovery might raise questions about the feasibility of the switch.

From conversations with Victoria and other UBC Food Services staff, we knew that the consumption of sugar had reduced with the introduction of liquid sugar. This was mainly due to the increased sweetness and solubility of liquid sugar, compared to raw sachet sugar. This would



have a big effect on the economic aspect of the switch, as it could tilt the scale in favor of the switch.

We decided to follow a two-pronged approach to measure the reduction in consumption of sugar. The first approach was to approach Victoria, our project stakeholder directly and ask for past data about how much sugar was consumed before and after the switch at any given location, in a set time frame. This would enable us to get exact numbers about past consumption details, and enable us to project the economic impact better. The other approach we decided to take was to do some primary research on our own and estimate how much liquid sugar each person is consuming per cup of coffee/tea. This would be done through observation as well as in person interviews.

Initially, we thought that our project stakeholder Victoria would have the required data available at hand. However, this was a mistake as it turned out that she would have to dig up the data and perform some calculations in order to provide us the data in the right format. For this reason, we severely underestimated the time frame of obtaining the data. We should have expected this, but since we did not, we were unable to acquire the data at the right time. However, it was this very reason that we had decided to follow a two-pronged approach, and conducting the primary research ended up paying up handsomely.

The methodology of our primary research is discussed in detail in the section about social impact. The results of our primary research showed that on average, each consumer at Neville's was using two sachets of raw sugar per cup of coffee or tea, and 1.6 pumps of sugar per cup of coffee or tea. This showed that the usage was in fact greatly reduced with the switch to liquid sugar. To take this reduced consumption into account, we decided to quantify the cost of the switch via the cost of sugar per cup of coffee or tea, instead of the cost of sugar per sachet or pump. As shown in the appendix, with liquid sugar, the cost of sugar per cup increases from \$0.04 to \$0.13. This increase in cost is still far lower than the 4-5 times increase as previously estimated based solely on cost per sachet or pump.

These calculations however miss a significant factor. While talking to UBC Food Services staff, we realized that there was an added benefit of switching to liquid sugar. Raw sugar in individual sachets was very easy to steal. Consumers could walk away with far greater than the required number of sugar sachets every time they visited the coffee/tea station at UBC Food Service locations. Since UBC is primarily a student community, this led to significant

losses. Due to the size and nature of the liquid sugar bottles, it is very difficult to steal them, and UBC Food Service staff has not noticed significant amounts of theft with these bottles in place. It is very difficult to estimate the exact dollar wastage due to theft, so we have left this out of our calculations. But if taken into consideration, it would favor the switch to liquid sugar.

From our analysis, it can be seen that from an economic perspective the switch to liquid sugar will be an expensive one. It is significantly more expensive to provide liquid sugar as compared to raw sugar in sachet packaging. Given that UBC Food Services, like most other coffee and tea providers does not charge its customers directly for sugar, it will add to UBC Food Service's operating costs. However, if UBC is determined to become a leader in sustainability, this is a very small price to pay for such a large environmental benefit.

## 4.0 ENVIRONMENTAL IMPACT

Switching to liquid sugar will have a significant positive impact on the environment. Sugar sachets, due to their very nature are packaged individually. While these sachets are recyclable and sometimes compostable, getting end users to sort them while disposing off them is a significant social challenge. Although UBC is considered a fairly sustainable society, very few sachets are actually recycled or composted on campus. This ratio is even worse off campus. Switching to liquid sugar will have a direct impact on this and help avoid this problem altogether (Subramaniam, 2000).

Liquid sugar is stored in glass and plastic bottles. These bottles are maintained by UBC Food Services staff, and are replaced on average a few times a month (depending on consumption levels). Exact replacement rates are provided below in Table 1. The staff is trained to recycle each bottle, thus ensuring no increase in garbage. Controlling the actions of the staff is of course much easier than influencing the actions of customers.

Bottle Replacement Frequency		
Condiment	Replacement Frequency (Bottle per Week)	Bottles per Month
Cane Sugar	2	8
Sweetener	0.5	2
Honey	0.25	1

**Table 1: Bottle Replacement Frequency of Loop Café's Condiments**

On interviewing several staff across UBC, we discovered that there was another source of wastage with sachet sugar. Customers, while tearing open individual sugar sachets, would spill small but cumulatively significant amounts of sugar granules in the surrounding area. While not noticeable by individual customers, this is definitely noticed by staff as the floor around the area gets stickier as the day progresses. While liquid sugar has some spillage, it is not nearly as much as spillage from sachet sugar.

While talking to some coffee shops off campus, we heard another complaint of using sachet sugar. If there's a significant amount of moisture in the environment, sugar tends to spoil regardless of individual wrapping (Ergun, 2010). This also occurs during coffee spills. All of this

spoilage is avoided with liquid sugar, since bottles are much more impermeable (Arvanitoyannis, 2004).

Another fact to note is that Monin, the supplier of UBC's liquid sugar, provides the school with recyclable bottles. Monin has its own recycling program (Monin, 2010), which shows that it is an environmentally conscious company, and strengthens its case as a suitable partner for UBC Food Services. UBC waste management sends these bottles to various recycling plants around Vancouver where they can be processed and bid on to be reused in other products (Metro Vancouver, 2004). It must be remembered that the liquid sugar bottles last a while in use before replacement. Going back to the Loop Cafe, waste produced by the bottles is low. There are four bottles per case in any flavor. To replace all three cases of the liquid condiments at the Loop it would take a cycle of 4 months. The table above displays this replacement frequency according to the interview.

This data just concerns the Loop cafe. We can safely assume that busier cafes that have implemented liquid condiments have a higher replacement frequency. Also, consumer interest may vary by cafe thus condiment replacement frequency may differ according to type. In other words, honey may have a higher frequency than the sweetener in other restaurants.

How does this compare to the waste packet sugar produce? Currently, there are no trash audits provided by UBC. To estimate the waste produced by sugar packets, the data provided in the social impact experiment will be used. Results from the experiment showed that on average each person used about two sugar packets.

A similar study was conducted by Eliza Parsons of Smith College in 2008. Parsons discovered that Smith College produced over 104000 sugar packet waste during the year (Smith, 2008). This was due to the school's high consumption of hot drinks such as tea and coffee. Smith College has an undergraduate population of about 3000 students. UBC's undergraduate population of 37000 dwarfs this number. According to a study concerning Fair Trade Coffee in 2005, 65 percent of adults drink coffee (McLean, 2005). Doing the calculations, and assuming the statistic is true for the present, UBC would produce about 48000 wastes from packet sugar. This also includes the ratio taken from the experiment.

From our research, we could not find any evidence suggesting that the manufacture and transportation of liquid sugar had a significant impact on the environment when compared to the manufacture and transportation of sugar sachets.

## 5.0 CONCLUSION AND RECOMMENDATIONS

In conclusion, the triple bottom line assessment of whether liquid sugar is indeed better than packaged sugar points to the result that liquid sugar is better. Though liquid sugar turns out to be more expensive per unit use as compared to the packaged sugar, this increase in the price is justifiable since the liquid sugar is a premium product. It is also better as it discourages theft of product. In the way of environmental benefits, liquid sugar also gains the upper hand. As compared to the sachets of sugar, from which only 2% of the empty packages make it to the recycle, liquid sugar bottles are disposed of by trained staff that is trained to put the bottles in for recycling. Not only is that, but the sugar itself manufactured in a sustainable way. In addition to the economic and environmental benefits, liquid sugar poses as a better choice in terms of social perceptions. Though there is a training curve associated with the adoption of liquid sugar, patrons who have already adopted liquid sugar stand by it and believe that it is far better than packaged sugar. All in all, we recommend that UBC Food Services make the switch from packaged sugar to liquid sugar.

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## **APPENDIX I - Calculations to Assess Economic Impact of Switch**

### **Comparing cost of 1 sachet of raw sugar with cost of 1 pump of liquid sugar:**

Cost of one sachet of raw sugar: \$0.02

Cost of one 1 liter bottle of liquid sugar: \$11.50\*

Each pump dispenses 0.25 ounces of sugar. Converting to liters, this equals 0.0074 liters.

Therefore, each 1 liter bottles can be pumped about 140 times.

Since each 1 liter bottle contains 140 pumps, and costs \$11.50, each pump would cost about \$0.08.

\*sugar free bottles cost \$12, and honey bottles cost \$12.75, however we have excluded these from our calculations for brevity

### **Comparing cost of sugar per cup of coffee or tea for raw sugar against liquid sugar:**

Number of customers who preferred to use liquid sugar: 20

Total number of pumps of liquid sugar used by these customers: 32

Average number of pumps per cup of coffee/tea: 1.6

Cost of sugar per cup of coffee or tea:  $0.08 * 1.6 = \$0.13$

Number of customers who preferred to use raw sugar from sachets: 12

Total number of sugar sachets used by these customers: 24

Average number of sugar sachets per cup of coffee/tea: 2

Cost of sugar per cup of coffee or tea: \$0.04

## APPENDIX II – Interview with Loop Café’s Manager

How do you feel about the switch to liquid sugar?

- Liked it. The amount of sugar used was decreased.

Do you believe the change was necessary?

- Yes, mainly because the amount of sugar was decreased
- Packaging is easier to deal with
- People use less sugar in their drinks

Why was the change necessary?

- Theft was a problem

Were there disturbances in the queue to obtain the liquid sugar?

- They were at the advent of the CIRs Cafe but eventually got used to it

Who placed the “1 pump = 1 packet” sign on the bottles?

- The Manufacturer placed it as a sticker

How have operations changed since you’ve switched to liquid sugar?

How many bottles do you receive per case?

- There are 4 bottles per case

How often do you change the pumps?

- Honey is changed once every two weeks
- Sugar is changed once every 2 to 3 days
- Sweetener is changed once per week

Are you recycling or throwing away the bottles? How often?

- Recycling
- All the time.