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ANALYSIS OF DISPOSABLE AND REUSABLE HOT BEVERAGE CONTAINERS AT THE MELBOURNE MUSEUM

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This project report is submitted in partial fulfillment of the degree requirements of Worcester Polytechnic Institute. The views and opinions expressed herein are those of the authors and do not necessarily reflect the positions or opinions of Melbourne Museum or Worcester Polytechnic Institute.

This report is the product of an educational program, and it is intended to serve as partial documentation for the evaluation of academic achievement. The report should not be construed as a working document by the reader.

Abstract

The Melbourne Museum, which strives to be an environmentally responsible establishment, has been criticized for using expanded polystyrene foam (EPF) cups in the Balcony Café. The object of this project was to determine the most suitable material to use in the Balcony Café. To do so, we conducted customer surveys, interviewed cup distributors and Peter Rowland's Catering management, conducted on and off-site field studies, and performed cost-benefit analyses of EPF cups and alternatives. We determined that EPF is the least environmentally harmful material and is cost-effective for the Balcony Café. In order to communicate our findings to visitors, we designed signs to be placed in the Balcony Café. Finally, we arranged for the Melbourne Museum to engage in the first EPF beverage container recycling program in Australia.

Executive Summary

Since its inauguration in 2000 the Melbourne Museum has received accolades from both the public and institutions of education, but not without the occasional criticism. One issue that many visitors have expressed their dissatisfaction over is the use of disposable expanded polystyrene foam (EPF) cups to serve hot beverages at the Museum's cafés. The Balcony Café has been targeted in particular because of its proximity to the Forest Gallery, an exhibit promoting environmental awareness. The common assumption is that EPF cups are detrimental to the environment because of their non-biodegradable nature, thereby making them seem like an incongruous choice of container for the Balcony Café.

The first objective of our project was to determine the veracity of this assumption. We performed a thorough investigation of EPF containers and their alternatives, paperboard cups and ceramic mugs. The investigation included environmental, health, and fiscal aspects of each container. The environmental aspect included a complete cradle-to-grave assessment of energy, resource, and water use, pollution from production and disposal, and the ability to biodegrade or be recycled. The health aspect encompassed hygiene issues as well as any chemical residues that a container might harbor. The fiscal component included the container's wholesale price and shipping price, the cost of disposal, and in the case of reusable ceramic mugs, the cost of maintenance and replacement. Most of this information was gathered from pertinent literature and further supported or disputed by interviewing sales representatives of EPF and paper cup distributors.

We ascertained that EPF cups are less environmentally harmful than paper cups. The manufacturing of EPF requires less natural resources, energy, and water, resulting in a lesser amount of overall pollution. EPF cups also take up less space in landfills and are easier to recycle than paper cups. Moreover, EPF cups are great insulators and are both inexpensive and hygienic.

Ceramic mugs are good insulators, aesthetically pleasing, and cost effective. However, they are environmentally beneficial only after they are used 500 to 1800 times. There is also an inherent threat of contamination if the mugs are not washed properly.

Throughout our investigation we examined the feasibility of each material for use by Peter Rowland's Catering, the Museum's contracted catering service. First, we spent two days observing the Balcony Café, noting the number of cups purchased and the availability of recycling bins. We also observed several other cafés around Melbourne and compared their practices to those of the Balcony Café. Finally, we interviewed Steve Richardson, the manager of Peter Rowland's Catering at the Museum, to attain details on their contract with the Museum.

Whereas most of the cafés we observed provided the choice of reusable mugs or disposable cups, the Balcony Café can only offer disposable cups at the present time since the nearest dishwashing facility is two levels below. Reusable mugs would require carting to and from this facility, which may pose noise and sanitation problems. Also, since water lines cannot run through exhibits, pumping water to the Balcony Café is out of question. However, the option of reusable mugs is not futile and will be further investigated by Peter Rowland's Catering.

Finally, we measured the extent of visitor discontent with the Balcony Café's current EPF containers. We designed and administered a survey to one hundred customers and found that more than half did not mind using EPF cups, some even preferring them. A majority of those who disliked EPF cups based their opinion on false assumptions regarding environmental issues. Thus, the Museum's EPF cup problem stems from public perception rather than actual science.

Based on our survey results and the investigation of each material, we have concluded that EPF cups are the best choice for the Melbourne Museum at the present time. We recommend the Museum continue using EPF cups for now and place a sign in the Café explaining the reasons for using this material. We anticipate that this will appease and educate the Museum visitors while simultaneously preserving the Museum's reputation as an environmentally responsible establishment. Based on customer preference and benchmarking observations, we have designed a sign the Museum can use if they choose to implement these recommendations.

In addition, we recommend the placement of recycling bins for plastic bottles, aluminium cans, milk cartons, and possibly even EPF cups in the Balcony Café. EPF cups are currently not recycled in Australia, but we have found an organisation willing to start a trial EPF recycling program with the Museum. If all goes well, the Melbourne Museum could be a pioneer site of EPF recycling in Australia, setting a positive example for other institutions to follow.

Authorship

The following report is a result of the unified effort of equal contribution among Nicholas Godlewski, Rachelle Hayes, Javier Ortiz, and Manuel Zeno.

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Chapter 1

Introduction

Since the mid-twentieth century, many nations have fostered increasingly faster-paced societies. Men who once came home for lunch began eating on the run, homemakers who once spent all day preparing dinner began serving TV dinners, and people who once sat and enjoyed a cup of coffee began ordering it to take-away. These accelerated lifestyles created a huge demand for convenient packaging and disposable goods.

Only in the past few decades have people become aware of the impact that disposable goods have on the environment. What happens when we deplete the resources required in the manufacture of disposable goods? What happens when landfills become full? A recent increase in environmental awareness has caused a number of products to fall under a negative spotlight. Expanded polystyrene foam (EPF), commonly called "Styrofoam", has been a target of such negative criticism because of its nonrenewable source, petroleum, and its inability to biodegrade. Since the 1980s, many environmental activists have decided to boycott EPF products because of their alleged detriment to the environment (http://www.ejnet.org/plastics/polystyrene/mclibel_p6.html).

The Melbourne Museum has been experiencing a public relations problem because of its caterer's use of EPF containers. The Museum's Balcony Café serves hot beverages in EPF cups directly in front of the Forest Gallery, an enclosed temperate rain forest that promotes environmental awareness. Many visitors have found this to be ironic and hypocritical in nature, and have not hesitated to voice their opinions in the form of written complaints.

The main objective of our project was to provide a reasonable solution that would satisfy the interests of the public, the Melbourne Museum, and Peter Rowland's Catering, a private catering company contracted by the Melbourne Museum that maintains the Balcony Café. However, what is best for the Museum in terms of public relations is not necessarily the best for Peter Rowland's Catering in terms of sales. Therefore, the best solution would be one that resulted in the least amount of damage to the environment without increasing costs for Peter Rowland's Catering.

Underlying the EPF controversy was the concept of perception versus science. Disposable cups have gradually developed a negative image amongst consumers. It was difficult to determine how much of this trend was based upon facts and how much was based upon assumptions. Consequently, we thoroughly investigated the environmental, health, and financial aspects of EPF, paperboard, and ceramics.

The environmental and health aspects were examined by reviewing relevant literature and interviewing representatives from EPF and paper cup distributors. The environmental aspect included a complete cradle-to-grave assessment of energy, resource, and water use, pollution from production and disposal, and the ability to biodegrade or be recycled. More specific information was gathered from Steve Richardson of Peter Rowland's Catering to gain understanding of the Balcony Café's waste and energy use. The waste included the disposal and storage of each material. The energy use included transportation of each material and washing of ceramic mugs. The health aspect encompassed hygiene issues as well as any chemical residues that a container might harbor.

The financial aspects were determined through correspondence with Steve Richardson of Peter Rowland's Catering. Expenditures included the cost of a single cup

of each material, the shipping prices, the cost of disposal, and the cost for washing ceramic mugs. With environmental, health, and financial aspects thoroughly examined, we proceeded to perform a cost-benefit analysis to determine the most suitable material for the Balcony Café.

A material can be both environmentally friendly and cost-effective, yet still be rejected by the public. It is for this reason that we decided to further investigate the Museum visitors' perception of EPF cup use at the Balcony Café.

We began by analyzing a customer survey the Museum Victoria's Marketing Research and Evaluations Committee had administered at the Museum's cafés. In order to obtain more specific data regarding the visitors' opinion of EPF cup use at the Balcony Café, we designed and administered a survey to one-hundred customers over the span of three days. The survey included questions asking the customer to rate the importance of several hot beverage container characteristics as well as open-ended questions to determine their opinion of EPF cups.

Throughout our investigation we examined the feasibility of each material for use by Peter Rowland's Catering. First, we spent two days observing the Balcony Café, noting the number of cups purchased and the availability of recycling bins. We also observed several other cafés around Melbourne and compared their practices to those of the Balcony Café. Finally, we interviewed Steve Richardson, the manager of Peter Rowland's Catering at the Museum, to attain details on their contract with the Museum.

After weighing all available options and deciding upon the most suitable material for the Balcony Café, we designed signage the Museum could use to communicate to its visitors the reasons behind using a particular container. The signage has a dual purpose. One purpose is to show visitors that the Museum is an environmentally responsible

establishment and has considered all options for hot beverage containers, hopefully alleviating the public relations problem. The second purpose is to separate the facts from the assumptions. The average person does not have time to research the environmental impact of various container materials, often relying on hearsay to form their opinion. Unfortunately these sources are often unreliable, causing people to base their opinions on false information. Educating the public about the environmental impact of different hot beverage containers coincides perfectly with the Melbourne Museum's mission statement of "improving the understanding of ourselves and the world in which we live".

Chapter 2

Literature Review

We examined literature for important background information about expanded polystyrene foam (EPF) and its alternatives. This chapter is a summary of the points that were pertinent to the topic.

Public Opinion

Consumers have a significant influence on the types of containers that food establishments use to serve their food and beverages. Companies in the past have had to change product materials because of strong consumer opinions against those materials. One renowned example involves the McDonald's Corporation. In the 1970s, the public felt a problem was arising with the paper products McDonald's was using. The public claimed McDonald's was consuming too much paper, and forests could not sustain the clearcutting required to manufacture such an amount of paper. McDonald's responded by commissioning the Stanford Research Institute to conduct an environmental impact study to provide a safe alternative to the paperboard products. Based on the results, McDonald's began using expanded polystyrene foam (EPF) and other plastic-based products for food containers (Pollution Prevention in Corporate Strategy, 1995).

In the late 1980s, EPF was believed to be extremely detrimental to the environment. The McDonald's Corporation again faced public hostility, and was reprimanded by numerous public protests and boycotts. The negative publicity towards McDonald's by the public and environmental groups, such as McToxic and Grassroots, led to a reevaluation of McDonald's food service containers. The negative public opinion caused McDonald's to switch most of the EPF and other plastic-based serving back to paper products. Many other fast food companies such as Wendy's, Burger King, and

Kentucky Fried Chicken also switched from EPF to paper to avoid such negative publicity (http://www.ejnet.org/plastics/polystyrene/mclibel_p6.html).

Also swayed by public opinion, the Starbucks Coffee Company decided to perform a study on its hot beverage containers in 1999. To do so, the Starbucks Coffee Company and Alliance for Environmental Innovation developed a joint task force to evaluate public opinions and satisfy Starbucks' expectations (Alliance for Environmental Innovation, 2000). The Starbucks Coffee Company planned to promote reusable ceramic mugs for in-store use and design a new disposable paper cup to replace the double cup that Starbucks was using in the mid-1990s. The Task Force set up focus groups, in-store surveys, and customer interviews to determine what the public preferred. The Task Force found that the public appreciated the option of choosing ceramic mugs if they wanted to drink their beverage on site. The public also helped the Task Force to evaluate numerous designs of possible disposable paper cups. Starbucks' final decision was a paper cup and sleeve design, a design preferred by the public (Alliance for Environmental Innovation, 2000). For a summary of the Starbucks Report, refer to Appendix C.

Environmental Effects of Expanded Polystyrene Foam Cups

Polystyrene is derived from petroleum, a nonrenewable resource. It is a byproduct of petroleum processing and does not require any extra drilling for its production. Only 0.002 percent of all petroleum used in the United States goes towards the production of polystyrene. The manufacturing of EPF cups uses even less petroleum since EPF products are 95 percent air and only 5 percent polystyrene (PSPC, 1997).

While EPF may have a flawed reputation, there is much evidence in support of it. For example, during the 1980's, environmentalists were concerned about the use of chlorofluorocarbons (CFC's) during EPF production, as CFCs are a well-known ozone-

depleting agent. However, the Polystyrene Packaging Council claims that very few EPF products ever utilized CFC's (PSPC, 1997; National Resources Defense Council et al., 1988). Once the issue was raised, EPF manufacturers negotiated a gradual phase-out of CFC use during the production process. As a result, no CFCs have been used in the production of EPF since the late 1980's (The Ozone Secretariat, 1987; National Resources Defense Council et al., 1988; http://environment.about.com/library/weekly/plastic6.htm). EPF manufacturers in Australia converted from CFCs in 1989, and now utilize recycled carbon dioxide and hydrocarbon gases instead (http://www.psa.com.au/Enviroment.htm).

According to Franklin Associates (1990) the manufacturing process of EPF cups uses less energy and results in less overall pollution than the manufacture of an equal amount of paper cups (Franklin Associates, Inc., 1990). Franklin Associates is a consulting firm providing services in solid waste management and life cycle assessment. The study was conducted for the Council for Solid Waste Solutions, an organisation involved in finding environmentally friendly ways to dispose of materials, such as recycling and reuse. The energy requirements of an EPF cup, a low-density polyethylene (LDPE) coated paperboard cup, and a wax-coated paperboard cup are shown in Table 1. Franklin Associates asserts that an EPF cup requires 30 percent less energy to manufacture than an LDPE-coated paper cup.

Table 1
Energy Requirements by Components for Cups

Containers	ENERGY REQUIREMENTS BY COMPONENTS FOR CUPS (Million Btu per 10,000 cups) 0% recycled Energy	Percent
Foam Polystyrene		
Cup	4.84	88.0
Secondary Packaging	0.61	11.1
Disposal	0.05	0.9
Total	5.5	100.0
LDPE*-Coated Paperboard		
Cup	6.71	93.4
Secondary Packaging	0.47	6.5
Disposal	0.00	0.0
Total	7.18	100.0
Wax-Coated Paperboard		
Cup	8.37	95.3
Secondary Packaging	0.41	4.7
Disposal	0.00	0.0
Total	8.78	100.0

* Low Density Polyethylene

Source: Franklin Associates, Ltd. Resource and Environmental Profile Analysis of Foam Polystyrene and Bleached Paperboard Containers. Franklin Associates. 1990. 4-12.

The manufacturing waste and disposal data for EPF, LDPE-coated paperboard, and wax-coated paperboard cups are shown in Table 2. It displays the pollution impact per 10,000 sixteen-ounce cups of each material consisting of atmospheric emissions, waterborne wastes, industrial solid waste, and postconsumer solid waste. It is also separated into process pollutants and fuel related pollutants. The data shows that the manufacture and disposal of EPF cups results in 46 percent less atmospheric emissions and 42 percent less waterborne wastes than an LDPE-coated paperboard cup. In every

aspect, the manufacture of EPF is less detrimental to the environment. (Franklin Associates, 1990).

Table 2
Waste from Manufacture of Cups

WASTE FROM MANUFACTURE OF CUPS
(Impacts per 10,000 units)

	Atmospheric Emissions	Waterborne Wastes	Industrial Solid Waste		Postconsumer Solid Waste	
Process Pollutants	(lb)	(lb)	(lb)	(cu ft)	(lb)	(cu ft)
EPF	5.0	1.7	5.2	0.1	120.3	13.7
LDPE*-Coated Paperboard	7.4	2.0	28.1	0.6	218.3	7.3
Wax-Coated Paperboard	7.0	3.1	32.5	0.7	266.2	8.8
Fuel Related Pollutants						
EPF	6.8	0.5	13.4	0.3	-	-
LDPE*-Coated Paperboard	10.7	1.0	26.2	0.5	-	-
Wax-Coated Paperboard	14.8	1.4	38.5	0.8	-	-
Total Pollutants						
EPF	1.8	2.1	18.6	0.4	120.3	13.7
LDPE*-Coated Paperboard	18.1	2.9	54.3	1.1	218.3	7.3
Wax-Coated Paperboard	21.8	4.5	71.0	1.4	266.2	8.8

* Low Density Polyethylene

Source: Franklin Associates, Ltd. Resource and Environmental Profile Analysis of Foam Polystyrene and Bleached Paperboard Containers. Franklin Associates. 1990. 4-19.

Single EPF cups are capable to hold hot beverages, but paperboard must have an extra form of insulation. Two types of paperboard insulation are double cupping and a cup and sleeve. However, this means that even more material must be used. Per use, paperboard has even more waste from manufacturing and disposal than Franklin Associates (1997) reports because of this extra needed material.

EPF food packaging is unable to biodegrade, and thus is a noticeable source of litter. Even though it is unable to biodegrade and is usually disposed of, EPF packaging

occupies only a small fraction of landfill space. As shown in Figure 1, polystyrene accounts for less than 1 percent by weight of total solid waste in United States' landfills every year, and EPF constitutes an even smaller portion (PSPC, 1997; Franklin Associates, 1997; Rathje, 1997). In contrast, paper products account for almost a third of all discards in United States' landfills.

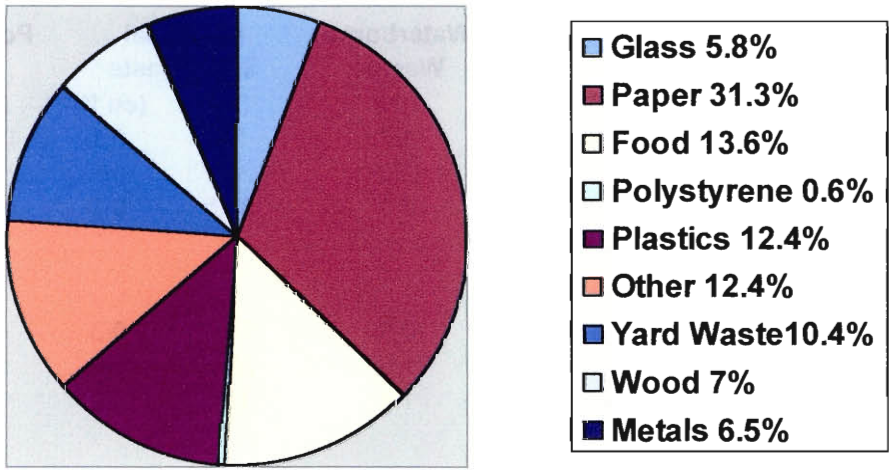

Figure 1. Discard in Municipal Solid Waste, 1997, *Source*: "Waste Management and Reduction Trends in the Polystyrene Industry, 1974-1997", 1999.

The recycling of EPF is possible and becoming more common. In 1997, an estimated 12 thousand tons of EPF were recovered for recycling, and that number is steadily increasing every year (Franklin Associates, Ltd., 1990). However, a problem arises when EPF food and beverage containers are targeted for recycling. Whereas glass and metal containers can be sterilized by burning off food and bacteria, EPF cannot (Franklin Associates, Ltd., 1990). Currently, the majority of EPF recycling is limited to items not associated with food.

EPF can also be used for energy recovery through its incineration. Even though all carbon-based materials such as paper products and plastics create noxious fumes such as carbon dioxide and carbon monoxide when burned (http://www.psa.com.au/Enviroment.htm), modern incinerators can burn such materials including EPF safely. The energy content in EPF is very high at around 16,000 Btu/pound, approximately twice that of paperboard (Franklin Associates, Ltd., 1990). The burning of EPF aids in the complete combustion of other waste materials inside the incinerator. Since EPF has a very low moisture level, wet garbage and waste burn more efficiently in its presence (Franklin Associates, Ltd., 1990).

Health Concerns Associated with Expanded Polystyrene Foam Cups

EPF consists of basic chemical units produced through the polymerization of styrene. The Foundation for Achievement of Science and Education (FASE) found that long-term exposure to small quantities of styrene could cause neurotoxic[1], hematological[1], cytogenic[1], and carcinogenic effects[1] (Institute for Local Self-Reliance, 1988; B.J. Dowty et al., 1976). Styrene was found in 100 percent of human tissue samples and 100 percent of nursing milk samples tested (Institute for Local Self-Reliance, 1988). The FASE study found that with the 100 percent frequency of styrene found in human tissue, the levels ranged from 8 to 350 nano-grams of styrene per gram (ng/g) of tissue. This maximum level of 350 ng/g is one-third the level known to cause neurotoxic symptoms in adults (Polystyrene Fact Sheet, 1988).

The manufacturing process of polystyrene is not completely efficient, resulting in some residual styrene that may be dissolved by certain foods. The FASE study found that

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[1] See Glossary, Appendix L, for definition.

EPF cups reduce in mass when they are being used (Institute for Local Self-Reliance, 1988). Drinking tea with lemon creates the most significant reduction of mass. The mixture of citric acid from lemons and tannic acid from tea is the cause for the loss of mass (http://newton.dep.gov). Since styrene is soluble in oil and ethanol, some of it can be absorbed by foods that are in direct contact with polystyrene packaging. For instance, a 1985 Cuban study found that styrene diffused from polystyrene packaging into water, milk, yogurt, and alcohol solutions (Matos et al., 1985). The study also found that styrene was more likely to be leached into hot water than cold water, as shown in Table 3. In the columns titled "Total Amount Leached", notice the increase of leached styrene from cold water to hot water.

Table 3
Leaching of Styrene with Cold and Hot Water (24 hours)[a]

Polystyrene sample	Internal surface area, cm2	Volume of H20 added, ml	[Styrene], PPM	Total amount leached, µg	Amount leached per unit area, µg/cm2
EPF Cup (Cold Water)	199	255	0	None detected	0
EPF Cup (Cold Water)	109	120	0	None detected	0
EPF Cup (Hot Water)	199	251	0.0307	7.69	0.0387
EPF Cup (Hot Water)	109	110	0.0202	2.22	0.0204

a The limit of detection for aqueous solution was 0.00045 ppm.

Source: D. Marcias Matos et al., "Sanitary Evaluation of Containers or Milk Products." Cuba: 1985

In 1987, the National Institute for Cancer Research in France resolved to classify styrene as a material that may cause cancer. Styrene was moved from Group 3 – "Not

classifiable as a cancer-causing agent", to Group 2B – "Possibly carcinogenic[1] to humans". There exists evidence that styrene causes cancer in some animals, yet it has not been proven to cause cancer in humans (http://www.epa.gov). Styrene acts as a neurotoxin[1] by attacking the central[1] and peripheral[1] nervous systems. The accumulation of these very lipid[1]-soluble materials in the lipid-rich tissues of the brain, spinal cord, and peripheral nerves is associated with acute or chronic impairment of the nervous system (http://www.epa.gov).

However, styrene is naturally present in many foods, such as wheat, beef, strawberries, and even coffee beans. Since styrene is very similar in molecular structure to the chemical that gives cinnamon its flavor, it is often added to foods with permission of the United States Food and Drug Administration (PSPC, 1997). This fact may or may not have interfered with previously mentioned studies since some foods being tested may have inherently contained styrene.

Many companies, including Starbucks and McDonald's, have decided to use paperboard cups or reusable ceramic mugs as alternatives to EPF cups because of public perception and pressure (Alliance for Environmental Innovation, 2000; http://www.ejnet.org/plastics/polystyrene/mclibel_p6.html). The following sections compare and contrast the environmental and health impacts of these alternatives with those of EPF cups.

Environmental Effects of Paperboard Cups

McDonald's and Starbucks reports reveal that the public prefers paperboard cups because they believe these cups to be less environmentally hazardous than EPF.

[1] See Glossary, Appendix L, for definition.

However, there is mixed evidence regarding the assumption of paper's environmental superiority (http://www.ejnet.org/plastics/polystyrene/mclibel_p6.html).

Paper cups are manufactured from a renewable resource. If properly maintained, forests will provide the paper industry with an infinite supply of lumber (Saltman, 1978). David Saltman (1978) argues that selective cutting, seeding, and even occasional clearcutting is beneficial to a forest because it creates room for new growth and minimizes forest disease infestation. However, opposition to clearcutting is widespread. Clearcutting can result in soil erosion, which simultaneously leaches nutrients from the soil and increases the turbidity of stream water (Lamb, 1990; Thomson, 1992).

Paper is biodegradable since it is comprised mainly of cellulose, which can be broken down by bacteria and enzymes in the soil. EPF is made from petroleum, which bacteria cannot digest (http://newton.dep.anl.gov/). Therefore, paper products are easier to biodegrade and recycle than EPF products, making them more desirable to environmentalists.

In spite of its ability to biodegrade, paper usually remains unchanged for years in landfills. A certain level of moisture and exposure to air is needed for degradation of paper to be at full potential, but since landfills cannot always provide these conditions, the breakdown of paper is almost halted (Rudolph, 1989). In these conditions, paper products are almost as un-biodegradable as EPF. Furthermore, paper cups are lined with a waterproof layer of low-density polyethylene (LDPE), a compound similar to polystyrene. Even if the paper layer biodegrades, the plastic layer persists just as long as an EPF cup (Rudolph, 1989).

The recycling of paper has become commonplace in many developed countries, including Australia. Australian Paper claims that 56 percent of all paper and paperboard

products in 1995/1996 were made from recycled waste paper (http://www.apg.com.au/paperr/prwpu.htm). According to Williams in Trash to Cash (1991), food service paperboard accounts for less than 10 percent of the total paper waste. However, problems arise when recycling paper cups. The LDPE coating or lamination on such containers must be removed prior to recycling. Paper cups must be cleaned thoroughly so that less than 10 percent of the coating and lamination remains in the recycling mixture. Due to this fact, food service paperboard requires more time and energy to recycle than other paper products (Williams, 1991).

Many environmental problems are caused by the manufacture of paper products. Water pollution occurs at several stages during the papermaking process. Debarking, chip digesting, and pulping lead to an effluent stream of white water, so named because the water contains suspended solids such as wood particles, creating a whitish appearance (EPA, 1995). These processes result in a high biochemical oxygen demand (BOD), meaning that so many bacteria are utilizing oxygen to digest the organic material that there is little free oxygen left in the water for other organisms.

The Starbucks Task Force measured the environmental impact of container alternatives and obtained the following results for a double cup design: Every 10,000 sixteen ounce paper cups produced result in 6,000 gallons of total effluent flow, 3 pounds of suspended solids, and 2 pounds of BOD (Alliance for Environmental Innovation, 2000). These values are shown in Table 4 as well as the values for a paperboard cup and sleeve design.

The production of paper also contributes considerably to air pollution (Alliance for Environmental Innovation, 2000; EPA, 1995; Saltman, 1978). The Starbucks Task Force found that with every 10,000 sixteen ounce paper cups produced, power boilers

and chip digesters release 3 pounds of course and fine particulates and 5 pounds of nitrogen oxides into the atmosphere. Also, chip digesters and chemical recovery evaporators discharge 2 pounds of volatile organic compounds (Alliance for Environmental Innovation, 2000). These values for a paperboard double cup and paperboard cup and sleeve design are shown in Table 4. With millions of paper cups being used every year a massive pollution problem develops.

Table 4
Environmental Comparison of Paperboard Cups

	Double Cup	Cup and Sleeve
Energy Usage		
(Mbtu/10,000 16 ounce cups)		
Total	11.1	7.1
Purchased	5.0	3.7
Fossil Fuel Derived	4.0	3.0
Air Emissions		
(LB/10,000 16-ounce cups)		
ENERGY RELATED		
Total Greenhouse Gases	4053	2479
Net Greenhouse Gases	1577	1066
Nitrogen Oxides	5.2	3.5
Particulates	3.3	2.1
Sulfur Oxides	7.3	5.1
PROCESS RELATED		
Hazardous Air Pollutants (HAPs)	0.7	0.4
Volatile Organic Compounds (VOCs)	1.6	1.0
Total Reduced Sulfur	0.1	0.1
Water Emissions		
(LB/10,000 16-ounce cups)		
Biochemical Oxygen Demand (BOD)	1.7	1.1
Chemical Oxygen Demand (COD)	22.8	12.3
Suspended Solids	2.8	1.6
Effluent Flow		
(gal/10,000 16-ounce cups)	5778	3288
Solid Wastes		
(LB/10,000 16-ounce cups)	619	386

Source: Alliance for Environmental Innovation, Report of the Starbucks Coffee Company / Alliance for Environmental Innovation Joint Task Force. Alliance for Environmental Innovation. 2000. 27.

During the pulping process, sodium hydroxide is used to digest wood fibers, releasing sulfur oxides along with other foul-smelling reduced sulfur gasses into the atmosphere (EPA, 1995; Saltman, 1978). If a paper mill burns fossil fuels to provide power for the manufacturing process, sulfur dioxides are also released. An estimated total of 4,000 pounds of greenhouse gases are discharged per 10,000 sixteen ounce paper cups produced (Alliance for Environmental Innovation, 2000). As previously stated in the section entitled "Environmental Effects of Expanded Polystyrene Cups", these figures are nearly twice that of EPF production.

Paper mills generate energy for the manufacturing process in part by burning paper waste products, but must turn to other resources to fulfill the remainder of their energy demands (EPA, 1995; http://www.eia.doe.gov/emeu). These resources include coal, oil, and gas. This can be problematic since these are nonrenewable resources, and their combustion contributes to such problems as air pollution, acid rain, and ozone depletion. A United States EPA study conducted in 1990 found that 14 percent of an average paper mill's energy comes from coal, 6 percent from fuel oil, and 16 percent from natural gas (EPA, 1995).

Regardless of the fuel used, paper production requires a great deal of energy. The Starbucks Task Force calculated that the production of one ton of virgin bleached paperboard consumed 40 million Btu of energy from tree harvesting to landfill disposal (Alliance for Environmental Innovation, 2000). This makes the forest product industry the third largest industrial consumer of energy, petroleum and chemicals being first and second. Within the forest products industry, the pulp and paper industry uses the vast majority of the energy (http://www.eia.doe.gov/emeu).

Health Concerns Associated with Paperboard Cups

One health issue associated with paper cups is the indirect production of carcinogens resulting from the process of bleaching wood pulp. Bleaching requires chlorination, which creates a series of chlorinated organic byproducts, such as dioxins[1] and furans[1]. These compounds are infamous for their non-biodegradability and toxicity (EPA, 1995; Thomson, 1992). In the North American industry, analysis of pulp mill wastes showed significant levels of chlorinated organic compounds present in pulp. These levels ranged between 3 to 120 parts per quadrillion of dioxins and 7 to 2,200 parts per quadrillion of furans (Johnston, 1996). According to the United States Environmental Protection Agency, dioxins are known carcinogens that may seep into the air, water, plants, livestock, and eventually into our bodies, potentially increasing the risk of cancer (http://www.epa.gov/opptintr/pbt/dioxins.htm).

Environmental Effects of Reusable Ceramic Mugs

Numerous establishments sell hot beverages in reusable ceramic mugs. The Starbucks Task Force found that people preferred reusable ceramic mugs to paper cups if they were drinking their coffee within the store. They also determined that serving hot beverages in reusable ceramic mugs is financially, socially, and environmentally beneficial when compared to paper and EPF alternatives (Alliance for Environmental Innovation, 2000).

The environmental benefits of reusable mugs are significant considering the amount of materials and energy saved in the production and consumption of goods. The Alliance of Environmental Innovation (AEI) conducted an environmental analysis of the

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[1] See Glossary, Appendix L, for definition.

full life cycle of ceramic, paper, glass, and polyethylene terephalate (PET) plastic cups from the extraction of raw materials to their manufacture, use, and disposal. AEI found that the breakeven point beyond which environmental benefits began to accrue was approximately seventy uses for ceramics. Since a reusable mug can be utilized about one thousand times or more, the environmental benefits of lowered pollution and solid wastes are substantial. The savings of water and the reduction of both greenhouse gas and solid waste by using ceramics instead of paper cups is shown in Table 5 (Alliance for Environmental Innovation, 2000).

Table 5
Environmental Benefits of Reusable Ceramic Mugs

No. Of reusable mugs used per hour	Annual water Savings (gal.)	Annual greenhouse gas reduction (lb.)	Annual solid waste reduction (lb.)
2	1,631	226	252
4	3,262	452	504
10	8,155	1,130	1,260

Source: Alliance for Environmental Innovation, Report of the Starbucks Coffee Company / Alliance for Environmental Innovation Joint Task Force, Alliance for Environmental Innovation. 2000. 12.

Ceramic mugs are not without their consequences. The manufacturing process utilizes a much larger amount of energy than EPF or paperboard per cup. The large amount of energy in the manufacturing of ceramics is due to mining of clay, feldspar, and flint, the crushing and blending of each container, the forming and cutting of each container, and the drying, glazing, and baking of each container. Assuming that each container is approximately one pound, the total energy used for the manufacture of 10,000 containers is 85 million Btu and the transportation energy for the containers is 3 million Btu (Franklin Associates, 1992). The total process and transportation energies for 10,000 ceramic mugs are shown in Table 6.

Table 6
Energy Use for the Manufacture of 10,000 Ceramic Mugs

	Thousand Btu
Process energy	
Distillate Oil	470
Residual Oil	29,480
Gasoline	40
Coal	410
Natural Gas	40,160
Electricity	14,490
Total	85,050
Transportation	
Truck	
Diesel	2,320
Rail	
Diesel	680
Barge	
Diesel	40
Residual	10
Total	3,050
Grand Total	88,100

Source: Franklin Associates, An Energy Study of Plastics and Their Alternatives in Packaging and Disposable Consumer Goods, Franklin Associates. 1992. B-55.

Ceramic mugs are reusable, unlike their alternatives EPF and paperboard. The cost breakeven point for ceramic mugs is approximately fifteen to twenty uses in comparison to paperboard cups (Alliance for Environmental Innovation, 1999). In other words, the cost for buying fifteen paperboard cups is equal to cost of one ceramic mug.

The environmental aspect of ceramic mugs has a higher cost breakeven point. The total energy use of 88.1 million Btu for 10,000 units of ceramic mugs is much larger than the total energy use of 7.18 million Btu for 10,000 units of LDPE-coated paperboard

and the total energy use of 5.5 million Btu for 10,000 units of EPF cups (Franklin Associates, 1990; Franklin Associates, 1992). The breakeven point of energy consumption for ceramic mugs is thirteen uses compared to LDPE-coated paperboard and sixteen uses compared to EPF cups. Also, with the manufacturing of ceramics, the clay, flint, and feldspar must be mined, which damages the environment in the process (Franklin Associates, 1992).

Another environmental factor of ceramic mugs is water pollution. Ceramic mugs must be washed after every use. The detergents and other washing materials used to clean ceramic mugs contaminate wastewater. The cost breakeven point for water pollution is between 500 and 1800 uses (personal communication with Melissa Huff, April 15, 2002; Porter, J. Winston, 1996).

According to the AEI study, using ceramic mugs in place of disposable cups reduced energy use by 98 percent, solid waste by 86 percent, water pollution by 99 percent, the amount of air particulates released by 86 percent, and the amount of greenhouse gases released by 29 percent (Alliance for Environmental Innovation, 2000). These numbers apply to the equivalent of one million beverages served and are more than the cost breakeven point for financial, energy, and water pollution costs. The more times that ceramic mugs are reused, the less environmental damage they will cause.

Health Concerns Associated with Reusable Ceramic Mugs

The United States Food and Drug Administration recognizes ceramic ware as a lead-leaching agent (http://www.fda.gov, "Reducing Exposure to Lead from Ceramic Ware"). Lead is used as an ingredient in glazes to produce the smooth, lustrous coatings in ceramic ware. If a glaze is improperly formulated or applied, or if the piece is not properly fired during the production process, large quantities of lead may leach from the

glaze into food. Even in properly glazed pieces, some lead may transfer (http://www.fda.gov, "Reducing Exposure to Lead from Ceramic Ware").

Lead is a biological toxin. Lead poisoning has no obvious symptoms, but it can cause stomach pains, nausea, vomiting, headaches, lethargy, poor attention span, irritability, and insomnia. Most lead toxicity is caused by multiple exposures over time (http://www.ohd.hr.state.or.us. Ceramic and Pottery Cookware May be Hazardous to Your Health).

Lead poisoning from ceramic glazes is uncommon in Australia. Australian regulations are similar to those of the U.S., and steps are being taken by the Organization for Economic Cooperation and Development (OECD) to further restrict the leaching of lead from ceramic-ware (http://www.lead.org.au/).

Chapter 3

Methodology

The main objective of this project was to determine the most suitable material to use as a hot beverage container at the Balcony Café within the Melbourne Museum. Also, we created signage for the Café to educate the public about the selected material and found ways that the Café could be more environmentally friendly. To do so, we administered questionnaires, held informational interviews, did an economic and environmental cost-benefit analysis, on and off-site field studies, and evaluated options for determining what type of display the Café should use.

Questionnaires

The first objective of our project was to determine the extent of museum visitors' concern about the use of expanded polystyrene foam (EPF) cups in the Balcony Café. We obtained and analyzed a survey that had been conducted by Market Research and Evaluations at the Museum's four eateries in October of 2001. A small portion of this survey was dedicated to questions about the general environmental friendliness of each venue. We used the data from this survey to establish the scope of visitor discontent with the Balcony Café's current practices. To start, we compared the overall satisfaction percentage of the Balcony Café to those of the other three venues. To put things in perspective, we compared the satisfaction index for pertinent characteristics, such as environmental friendliness, to that of irrelevant characteristics, such as cleanliness. In doing so we determined how the Café's environmental friendliness compares to its other aspects.

Although the existing survey elucidated the general scope of the problem, it did not specifically address the issue of EPF cup use in the Balcony Café. Under the supervision of Market Research and Evaluations, we designed and conducted our own survey to gather more detailed data. See Appendix B for an in-depth description of the social science methods used to design and conduct the survey.

We administered our survey over the span of three days during the Melbourne school break, when the museum was very busy with family outings. There were always at least two surveyors on the floor, sometimes three during the peak hours of business. The sample population consisted of any adult customer dining at the Balcony Café. Out of respect, we approached people only after they were done with their meal. Upon approaching a potential subject, we would introduce ourselves and ask if they would take part in a three to five minute survey. If they agreed, we would administer the survey verbally and record their answers verbatim. If they refused, we would record the refusal and proceed to the next person. We continued in this manner until one hundred surveys were completed.

Our one-page survey consisted of three multiple-choice questions, six open-ended questions, and four demographic questions. We designed it as such to obtain both quantitative and qualitative data. For a copy of the survey documents, see Appendix J.

The first question listed nine aspects of hot beverage containers, such as its appearance and ability to be recycled, and asked the interviewee to rate each aspect in importance. The order in which we read from the list was rotated with each interview to reduce interviewee fatigue bias. The aim of this question was to establish which aspects of a hot beverage container are most important to the museum visitors.

Questions two and three asked specifically what the customers thought of the Café's EPF cups, as well as the reasons behind their opinions. The questions were left open-ended so that the interviewees could fully express themselves.

Questions four and five asked whether or not the customers considered themselves to be environmentally responsible consumers and why. The goal of these questions was to determine how the museum visitors perceive themselves in terms of environmental awareness.

Questions six asked what the visitors would think if the Café were to continue using EPF cups. Question seven asked what the Café should change to in place of EPF, if anything. These questions, although somewhat redundant in regards to questions two and three, provided further strength to the interviewees' opinion and allowed them to suggest options that we may not have considered.

Question eight, which is further explained in the Exhibit Plans section of the methodology, listed a number of methods that the Museum and Peter Rowland's Catering may use to educate visitors about the selected material. Interviewees were asked to select their preference.

The last five questions were dedicated to additional comments and demographics. The demographics included age, gender, education level, and parental status.

The coding scheme varied for each question, open-ended questions had multiple responses and demanded multiple codes in order to interpret and analyze the data. With the coding scheme, key words and phrases were looked for. For the coding schemes of the open-ended questions, refer to Appendix K.

Interviews

Another objective of our project was to compare EPF cups and their alternatives in terms of cost, environmental, and health effects. One of the methods that we used to achieve this objective was to interview representatives of both EPF and paper cup distributors. Heeding the advice of our liaison, we maintained a somewhat informal and semi-structured interview plan to ensure the comfort of our subjects. Prior to the interview, we met as a team and decided what type of information we wished to acquire. We arrived at the interviews with a written agenda of topics we wanted to discuss. The interviews began with the representative giving the background information on his or her respective product. Next, we asked a series of open-ended questions regarding environmental impact, health concerns, and any other questions that had formed during the course of the representative's speech.

With permission from the interviewees, we tape-recorded the interviews to ensure that the data collected was accurate. The recordings were transcribed and summarized immediately after the interviews, assuring that all the necessary facts were recorded. Since the information gathered was general and not particularly sensitive, we believed there was no need for an explicit contract of confidentiality.

Cost-Benefit Analysis

To determine which material was ideal for use within the Melbourne Museum and the Peter Rowland Catering service, we performed a cost-benefit analysis of paper cups EPF cups, and reusable ceramic mugs. The criteria that we considered during this analysis included the economic, environmental, and health factors of each material.

The economic factors encompass the cost of each cup to be manufactured, possible screening and printing costs, shipping costs, and disposal costs. We contacted

manufacturers, distributors, and disposal companies to find the exact costs. Also, when considering reusable materials, we took into account the costs of washing, transporting, and replacing broken mugs. We found this information by contacting the appropriate Melbourne Museum or Peter Rowland representatives.

Environmental factors included the amount of energy and chemicals used to manufacture each material, water and air pollution caused by each materials production, the material's ability to biodegrade, and whether or not each material could be recycled in Melbourne. Most of this information was gathered by reviewing pertinent literature. Performing interviews and contacting personnel of manufacturers and recycling companies reinforced information from the literature review.

The health aspects consisted of the chemicals inherent to the container, whether or not the chemicals could leach into the beverage, and what effects they have on the consumer's health. Also, we considered the possibility of bacterial contamination of each container, reusable mugs in particular. We were able to find a majority of this information in scientific articles. Again, we fortified some of our findings by performing interviews with personnel of beverage container manufacturers.

Field Studies

There were two components to our field studies, an on-site study within the Balcony Café, and an off-site study at various locations around Melbourne. Within the Café, our objective was to determine the extent and distribution of EPF cup use. We observed the Café on two separate weekdays, one when school was in session and one during school break. From 9:30 AM to 4:00 PM, the Balcony Café's hours of operation, we rotated hour-long shifts to monitor EPF use at the Café. In fifteen-minute intervals,

we noted how many people bought a hot beverage in an EPF cup and how many brought their own mugs.

This study was conducted for two reasons. First, we wanted to determine the magnitude of the problem. Are only a few EPF cups used per day or hundreds? Second, we wanted to assess the feasibility of switching to reusable mugs. If sales were distributed evenly throughout the day, it might be reasonable to have an employee cart the mugs to and from the kitchen for washing. However, if all the coffee purchased was done so in the first hour, then the Café might run out of clean mugs.

The other component of our field studies consisted of observing similar organisations and cafés in and around Melbourne to note which type of container or containers were used to serve hot beverages. Similar organisations include other educational establishments, such as Scienceworks, the Immigration Museum, the Melbourne Zoo, and the Melbourne Aquarium. These studies were of particular importance because they represent the Melbourne Museum's competition. Other cafés that we investigated were Starbucks, McDonald's, and the Olive Snackbar.

The procedure used to gather field data was the same for every establishment. We visited each business and noted the type of cups used to serve hot beverages, the proximity of kitchens, and the presence or absence of recycling bins. We obtained this information through observations.

Display Plans

To finalize our project at the Melbourne Museum, we proposed an educational campaign that attempts to inform museum visitors about the material selected for use as a hot beverage container. Keeping with the museum's mission statement, our campaign aims to help visitors better understand the impact of their decisions upon the world.

More specifically, it shows visitors that the Museum and Peter Rowland's Catering have considered all possibilities and have made the best choice. The ultimate goal of our campaign is to ease the minds of the Museum visitors while simultaneously strengthening the image of the Museum.

Since the campaign is targeted toward Museum visitors, we thought their participation in its design was necessary. Question eight in the aforementioned survey asked which method would be most effective in educating the public about the Café's selected container material. The results from this question were used in determining the method for our educational campaign.

We also examined the signage of a similar style café called Viva Juice as to design an effective education campaign. Viva Juice has thoroughly investigated different beverage containers and currently educates the public about their choice of EPF cups. To observe how they display their information, we studied their website, http://www.vivajuice.com.au/, and read the section entitled "Viva Juice & the Environment".

Chapter 4

Results

Surveys

In October of 2001, the Market Research and Evaluations (MRE) team at Melbourne Museum conducted a survey to determine the visitors' opinion of the museum's four eateries. Table 7 shows their overall ranking in percentage of "good" and "excellent" scores. According to this data, the Balcony Café is favored by visitors in comparison to the Theatre Café and Tuckshop.

Table 7
Overall Satisfaction Index for Melbourne Museum's Four Eating Locations

Venue:	Percent Positive Rating
Brasserie	90
Balcony Café	85
Theatre Café	79
Tuckshop	72

The MRE team also asked the visitors to rate a series of eighteen characteristics in both importance and performance. The results shown in Table 8 are sorted by the difference between the importance score and the performance score. Ideally, the gap between the importance of a trait and its actual performance is very small. Although such traits as environmental friendliness and availability of recycling bins appear to be fairly important to the visitors, they do not score very high in terms of performance.

Table 8
Rating of Various Balcony Café Characteristics

Characteristic	Importance	Performance	Difference
Take Away Option	5.2	5.7	-0.5
Staff Presentation	8.4	8.6	-0.2
Nutritional Value	7.6	7.5	0.1
Quality of Coffee	8.5	8.0	0.5
Presentation of Menu	7.2	6.7	0.5
Presentation of Food	8.3	7.7	0.6
Quality of Containers	7.5	6.9	0.6
Staff Friendliness	8.9	8.2	0.7
Service Efficiency	9.0	8.1	0.9
Pleasant Eating Environment	8.9	7.7	1.2
Quality of Food	9.2	7.9	1.3
Environmental Friendliness	**7.6**	**6.3**	**1.3**
Info to Locate Outlet	7.9	6.5	1.4
Variety of Food	8.2	6.7	1.5
Cleanliness	9.5	7.7	1.8
Info About Food	7.6	5.3	2.3
Value for Money	9.0	6.4	2.6
Availability of Recycle Bins	**7.3**	**3.6**	**3.7**

Since the opening of the Melbourne Museum in 2000, the MRE team has received several written complaints regarding the use of EPF cups in the cafes. Visitors completed the written complaints on a Museum comment sheet. The visitor then completed this sheet in his or her own time. The following are a few of the more extreme cases:

> Serving coffee in polystyrene cups is not acceptable. A classy establishment like this museum should insist that the catering do something about it.
>
> Why is it impossible to buy a hot drink in a proper cup? I have been on the road with a group of school children since 6:30 and will never attend anything here again if you cannot provide proper cups. I will also discourage all my tea and coffee drinking friends!! (They number many.) So much for service and improvement.
>
> The museum is terrific but coffee served in polystyrene cups is not acceptable. I sent my coffee back and I won't be coming to the museum for breakfast until they replace the cup with real cups or at least paper cups.

> …I thought that the use of non-recyclable polystyrene cups for coffee, etc., was quite reprehensible, considering that one sat down so close to the point of purchase, and considering the environmental focus of the rainforest gallery which I was viewing from the Balcony Café…Personally, I would award the contract to someone other than Peter Rowland, or insist on cheaper food and reusable cups, etc., in their contract. I think the museum should be setting the standard in this regard.
>
> This is an absolute outrage!- Some of the worst coffee I have had in Melbourne at a hugely inflated price- with no service and no crockery- not to mention the child's juice at the cost of daylight robbery!

The MRE survey and the written complaints from visitors justified that there was a public relations problem at the Balcony Café, but did not illustrate the extent of the problem. Therefore, we administered our own survey at the Balcony Café to obtain a greater understanding of the public perception of hot beverage containers.

The first question on the survey asked visitors to rate the importance of various hot beverage container characteristics. Table 9 shows the percentage of combined "Important" and "Very Important" responses for each characteristic. The health and environmental aspects of the containers are the most important to the visitors, while aesthetic traits such as appearance and feel are less important.

Table 9
Importance Ratings for Hot Beverage Container Characteristics

Characteristic	Percent
Cleanliness	100
Biodegradability	95
Recyclability	88
Insulative properties	86
Type of material	80
Feel on mouth	67
Cost	59
Feel in hands	51
Appearance	43

Visitors were also asked for their opinion of EPF cups as well as the reasons behind their opinions in questions two and three. We received a variety of responses, which we categorized as positive, negative, or neutral. These responses are summarized in Tables 10 and 11. The majority of people, 56.5 percent, did not mind using EPF containers at the Balcony Café while 39.2 percent disliked using them. It should be noted that the negative response, "concerned about environmental friendliness", is based on false information about EPF and could be resolved by educating the public.

Table 10
Customer Opinion of EPF Cups

Positive Responses	Percent
It's fine	42.6
It's standard	9.6
It's strong	4.3
Total	**56.5**
Negative Responses	**Percent**
Don't like it	16.5
Disappointed	6.1
Surprised at EPF use at museum	0.9
Rather have paper or china	6.1
Concerned about environmental friendliness	7.0
Too small	2.6
Total	**39.2**
Neutral Responses	**Percent**
Hadn't thought about it	3.5
Hadn't used cup	0.9
Total	**4.4**

Table 11
Reasons for Opinion of EPF Cups

Positive Responses	Percent
Keeps drink hot	13.9
Does the job	13.0
Standard	10.4
Thick/strong	8.7
Recyclable	5.2
Clean/hygienic	3.5
Total	**58.2**
Negative Responses	**Percent**
Feels awkward	12.2
Not environmentally friendly	11.3
Rather have proper cup	8.7
Too small	3.5
Add taste to coffee	3.5
Total	**39.2**

Question six of the survey established whether or not the visitors would mind if the Café continued to use EPF cups. When given this choice, 47.2 percent supported the continued use of EPF cups and 52.8 percent were opposed. While the majority of people do not mind using EPF cups, as determined by questions two and three, most people would rather use a different material for a container if given a choice.

For question seven, we asked what kind of containers the Café should consider changing to. Reusable mugs were by far the most frequently suggested option at 55.4 percent, but even when asking people to suggest an alternative to EPF, 9.9 percent still felt that EPF was adequate. Table 12 summarizes the visitors' suggestions in descending order of frequency.

Table 12
Visitor Suggestions for Alternative to EPF Cups

Suggestion	Percent
Ceramic mugs	55.4
Paperboard cups	20.8
Keep EPF cups	9.9
Anything environmentally friendly	9.9

The following charts display the demographics of our survey sample. The average Museum visitor was middle-aged at 40 – 44 years of age, as shown in Figure 2. They were also well educated as the majority had some form of university degree, as shown in Table 13. In addition, 32 percent of those surveyed were male versus 68 percent female and 62 percent were parents or guardians of children under the age of 18 versus 38 percent of people who were not. Of the 105 people approached, five refused to take part in our survey, resulting in a non-response rate of 5 percent.

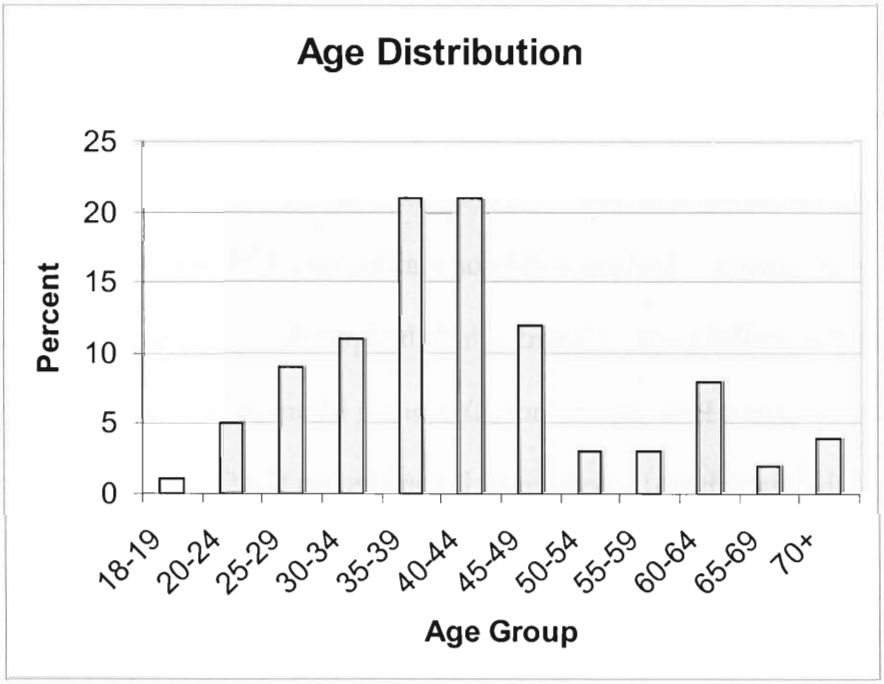


Figure 2
Age Distribution of Beverage Container Survey Sample

Table 13
Education Levels of Beverage Container Survey Sample

Education Level	Percent
None/some secondary school	10
Finished/now studying HSC/VCE/Yr 12	17
Diploma from TAFE/C.A.E	11
Graduate degree from Uni or C.A.E.	38
Post-Graduate degree	24

Interviews

We conducted four interviews to obtain information about the different materials for hot beverage containers and the operations of the museum and catering services. The interviewees were Steve Richardson, the manager of Peter Rowland's Catering at the Melbourne Museum, Carolyn Meehan of the Museum Victoria's Marketing Research and Evaluations, Andrew Robinson, sales representative for DART Container Corporation, and David Bywater, sales manager for Carter Holt Harvey Packaging. All transcripts of these interviews can be found in the Appendices D through G.

The interviews with David Bywater, sales manager of Carter Holt Harvey Packaging, and Andrew Robinson, sales representative for DART packaging, verified findings from the literature review. Andrew Robinson claimed that EPF is less environmentally harmful overall than paperboard, which had previously been determined with our literature review. David Bywater did not offer much information to refute these findings. He explained that paperboard's popularity is founded on the false perception that it is more environmentally friendly than EPF.

We also raised the issue of taste during our interview with Andrew Robinson. A study conducted by DART packaging found no difference in taste in coffee with respect

to the material it was served in. This study used spectrometers and cuppers, select people who have a distinguishable taste for coffee, to determine the difference in taste between EPF and paperboard. The spectrometer tests found no difference of chemicals found in coffee between the EPF cups and paperboard cups. To determine the taste difference between EPF and paperboard, cuppers would taste coffee out of the two different materials. The cuppers noticed no difference in taste when served in EPF or paperboard. Although this evidence indicates that EPF does not alter the taste of coffee, there is no hard evidence regarding other types of beverages, such as tea and hot chocolate.

In the Andrew Robinson interview, the issue of recycling EPF was raised. In Australia there are no current recycling programs for small bead EPF, the current container material at the Balcony Café. Through phone correspondences with Kathryn Fisher, the EPF Business Manager of the Plastics and Chemicals Industries Association (PACIA), it was brought to our attention that PACIA has an interest to start a trial recycling program for small bead EPF at the Balcony Café. The reason for using the Balcony Café and the other catering outlets at the Melbourne Museum is that a mass quantity of EPF cups are disposed of monthly. To profit from recycling small bead EPF, such an amount of EPF is needed. Since Peter Rowland's Catering has this amount of EPF, the Melbourne Museum is essential to the commencement of PACIA's recycling program.

Cost-Benefit Analysis

For the cost-benefit analysis, we examined the environmental, fiscal, and health aspects of EPF, paperboard, and ceramics. The environmental aspects include these elements for each container: manufacturing, packaging, shipping, disposal, and recycling. This allowed for an understanding of the energy consumption and pollution for low-

density polyethylene (LDPE) coated paper cups, wax-coated paper cups, expanded polystyrene foam (EPF), and ceramic mugs. The only difference between LDPE and wax-coated paperboard is the material used to coat the container. LDPE is a low-density plastic that is capable of keeping the container flexible and waterproof. Wax coating serves the same purposes. High temperature wax is used so that it will not melt into the beverage. The fiscal aspects consider any payment that Peter Rowland's Catering must make in direct regards to the selected material such as maintenance and cost per cup of each material.

Pollutants in the cradle-to-grave cycle of each material are detrimental to the environment. They contaminate water and air, and can be hazardous to flora and fauna. The environmental impacts of each material are shown in Table 14. The total environmental impact consists of the process pollutants and fuel related pollutants for the manufacturing of each material.

Table 14
Environmental Impact Data of Selected Container Materials

	LDPE-Coated Paper Cup*	Wax-Coated Paper Cup*	EPF Cup*
Environmental Impact Data			
Total Pollutants (*Impacts per 10,000 units)*			
Atmospheric Emissions (*lb)*	18.1	21.8	11.8
Waterborne Wastes (*lb*)	2.9	4.5	2.1
Industrial Solid Waste (*lb / cu ft*)	54.3 / 1.1	71.0 / 1.4	18.6 / 0.4
Postconsumer Solid Waste (*lb / cu ft*)	218.3 / 7.3	266.2 / 8.8	120.3 / 13.7
Total Environmental Impact (*lb*)	293.6	363.5	152.8

* Based on 16-oz serving size cups

Source: Franklin Associates, LTD., "Resource and Environmental Profile Analysis of Foam Polystyrene and Bleached Paperboard Containers." Franklin Associates, LTD., 1990. 4 – 19.

Table 14 is separated into atmospheric emissions, waterborne wastes, industrial solid waste, and post-consumer solid waste. Atmospheric emissions include particulates, sulfur oxides, carbon monoxide, nitrogen oxide, and hydrocarbons (Franklin Associates, 1990). Waterborne waste includes emissions discharged either into the sewer system or a body of water after in-house wastewater treatment. The typical waterborne wastes monitored in the study were total suspended solids (TSS), biological oxygen demand (BOD), chemical oxygen demand (COD), dissolved solids, chromium, chlorides, fluorides, and iron (Franklin Associates, 1990). Industrial solid waste includes sludge from wastewater treatment, solids remaining from air pollution control devices, non-recycled waste materials from manufacturing processes, fuel combustion residues such as wood or coal, and extraction waste. Post-consumer solid waste refers to the container itself and the secondary packaging, such as boxes in which the container was shipped, since both will be discarded into the municipal waste stream (Franklin Associates, 1990).

Ceramic mugs were not present on Table 14 because the total pollution of ceramic mugs changes with respect to the total number of times they are used. Ceramic mugs must be used between 500 and 1800 times before becoming less environmentally harmful than disposable cups. This is because after each time a ceramic mug is used it must be washed. The food particles and detergents contaminate the water in which the mug is washed. Only after 500 to 1800 washes does the water pollution from washing a ceramic mug become less than the water pollution created through the manufacture of 500 to 1800 disposable cups. If the number of uses per ceramic mug were even greater, the pollution from this material would be much less than that of disposables. According to the AEI (2000) study, using ceramic mugs in place of disposable cups reduced energy use by 98 percent, solid waste by 86 percent, water pollution by 99 percent, the amount of air

particulates released by 86 percent, and the amount of greenhouse gases released by 29 percent. These numbers apply to the equivalent of one million beverages served and are more than the cost breakeven point for financial, energy, and water pollution costs. The more times that ceramic mugs are reused, the less environmental damage they will cause.

We also considered the energy required to manufacture each material. The energy profile for different energy sources is displayed on Table 15. These energy sources encompass the complete life cycle of each material, including secondary packaging. The data also accounts for the current level of post-consumer waste incineration, which is about 15 percent. The total energy of each material assumes it will not be recycled (Franklin Associates, 1990).

Table 15
Summary of Energy Profiles of Selected Container Materials

	LDPE-Coated Paper Cup*	Wax-Coated Paper Cup*	EPF Cup*	Ceramic Mug*
Energy Profiles (*Million Btu per 10,000 cups*)				
Natural Gas	2.47	1.07	2.04	40.16
Petroleum	1.47	3.45	2.42	0.04
Coal	1.25	1.81	0.61	0.41
Hydropower	0.04	0.07	0.03	-
Nuclear	0.26	0.43	0.21	-
Wood	1.69	1.95	0.20	-
Electricity	-	-	-	14.49
Distillate and Residual Oil	-	-	-	29.95
Total Energy	7.18	8.78	5.51	85.05

* Based on 16 ounce serving size cups

Sources: Franklin Associates, LTD., "Resource and Environmental Profile Analysis of Foam Polystyrene and Bleached Paperboard Containers." Franklin Associates, LTD., 1990. 4 – 13; Franklin Associates, LTD., "An Energy Study of Plastics and Their Alternatives in Packaging and Disposable Consumer Goods." Franklin Associates, LTD., 1992. B – 55.

The energy profile is also broken down into components for the manufacture of each material. This is displayed on Table 16 in three segments: cup, secondary packaging, and disposal (Franklin Associates, 1990).

Table 16
Energy Requirements by Components of Selected Container Materials

	LDPE-Coated Paper Cup*	Wax-Coated Paper Cup*	EPF Cup*	Ceramic Mug*
Energy Requirements by Components				
(*Million Btu per 10,000 cups*)				
Cup	6.71	8.37	4.84	85.05
Secondary Packaging	0.47	0.41	0.61	-
Disposal	0.00	0.00	0.05	0.00
Total Energy	7.18	8.78	5.50	85.05

* Based on 16 ounce serving size cups

Sources: Franklin Associates, LTD., "Resource and Environmental Profile Analysis of Foam Polystyrene and Bleached Paperboard Containers." Franklin Associates, LTD., 1990. 4 – 13; Franklin Associates, LTD., "An Energy Study of Plastics and Their Alternatives in Packaging and Disposable Consumer Goods." Franklin Associates, LTD., 1992. B – 55.

As illustrated in Tables 15 and 16, ceramics require the most energy to manufacture, 85 million Btu to produce 10,000 mugs. However, these mugs can be reused. The energy use of one ceramic mug is equivalent to that of ten to fifteen paperboard cups and twenty EPF cups. Therefore, if a ceramic mug is used twenty times, it will have used less energy to manufacture per number of uses than an EPF cup, which can only be used once.

Of the three disposable cups, EPF uses the least amount of energy to manufacture. It uses 23 percent less energy than LDPE-coated paperboard and 43 percent less energy than wax-coated paperboard. Thus, EPF is a better material with respect to energy requirements during manufacturing.

We also examined the monetary costs of each material. The least expensive material was EPF, costing $0.04 per cup. A single paperboard cup costs Peter Rowland's $0.09, and both EPF and paperboard require a plastic lid costing $0.05 each. Each ceramic mug costs $3.00, and if a saucer is to be used, each one costs $2.80. To meet the financial startup breakeven cost, a ceramic mug with no saucer must be used thirty four times in comparison to EPF and twenty-two times in comparison to paperboard. This is only if ceramic mugs are to be reused at the Balcony Café. If they are to be sold as souvenirs, the price of the mug with coffee can be greater than the normal coffee price so that the monetary costs for each ceramic mug are met.

The cost of disposal for EPF and paperboard are relatively the same since they are close in mass and weight. Peter Rowland's Catering currently is paying $180 per month for waste disposal for EPF cups alone. If materials were to be recycled, the cost for disposal would be much less. The cost for disposal packaging, such as trash bags, would remain the same, but the cost for the pickup of the disposed containers would be much less. At this time, PACIA has not informed our team, the Melbourne Museum, or Peter Rowland's Catering of its proposed costs for recycling EPF.

For ceramic mugs, we also took into consideration the cost of washing. Peter Rowland's Catering must clean the grease traps on their dishwashers every month, costing them $825. The washing of ceramic mugs add to the amount of grease. The total capacity of the grease traps is 55,000 litres, and ceramic mugs currently comprise approximately 10 percent of the wash load at the Museum. If souvenir mugs are to be sold at the Museum, they will need to be washed prior to their sale. The costs of detergent and water used for the washing of ceramic mugs were unable to be determined

before this report was written. Even so, the total washing costs including the detergent and water used can only add to the $825 per month.

EPF is the best material in regards to health. The chemical structures of this type of plastic do not allow bacteria on EPF's surface. Also, since it is a single use cup, there is little to no chance for outside contamination. There are no harmful chemicals in the containers themselves. In current manufacturing, carbon dioxide, hydrocarbon gases, or steam as a blowing agent to expand the polystyrene. These compounds are natural and are not dangerous to ones health.

The health aspects of paperboard are also good. Paperboard has either a wax or low-density polyethylene (LDPE) coating to hold liquids. These coatings, like EPF, cannot harbor bacteria. Like EPF, it is disposable and there is little to no chance of outside contamination. There are harmful chemicals in the paperboard, however. The manufacture of this material uses chlorination processes to bleach the paper. The chemicals used in this process are known carcinogens and can cause cancer, but this is highly unlikely and no reports of cancer caused through contact with paperboard were found in the literature review or otherwise.

Ceramic mugs can be a health hazard. Since they are reusable, contamination is likely due to multiple uses. Even though each mug is thoroughly washed, not all bacteria is killed. This increases the probability for a health problem. The materials used in the manufacture of ceramic mugs are also hazardous. Lead is commonly used as a base for glaze. There have been known cases of lead poisoning traced to the glazes of ceramics. However, these cases were due to ceramics bought in countries that did not have regulations on the amount of lead used in the glazing process.

On-Site Field Studies

To determine the quantity and distribution of EPF cup sales in the Balcony Café, we observed and noted all sales for two separate days. This is to determine if Peter Rowland's has the capability of serving coffee in reusable ceramic mugs and carting them to the kitchen for washing. The two days consisted of a weekday during the school year and a weekday during school break. The weekday during the school year would have an average visitor attendance of 1,500 to 2,000 people each day, most of them school children, teachers, and chaperons. The weekday during school break would have about the same visitor attendance, but it would be more family oriented. Each day was separated into fifteen-minute intervals, starting at 9:30 AM and ending at 4:00 PM, the hours of operation for the Balcony Café. Figures 3 and 4 show the trends of sales throughout the day at the Balcony Café with respective days, and Figure 5 shows the average trend of sale for the two days.

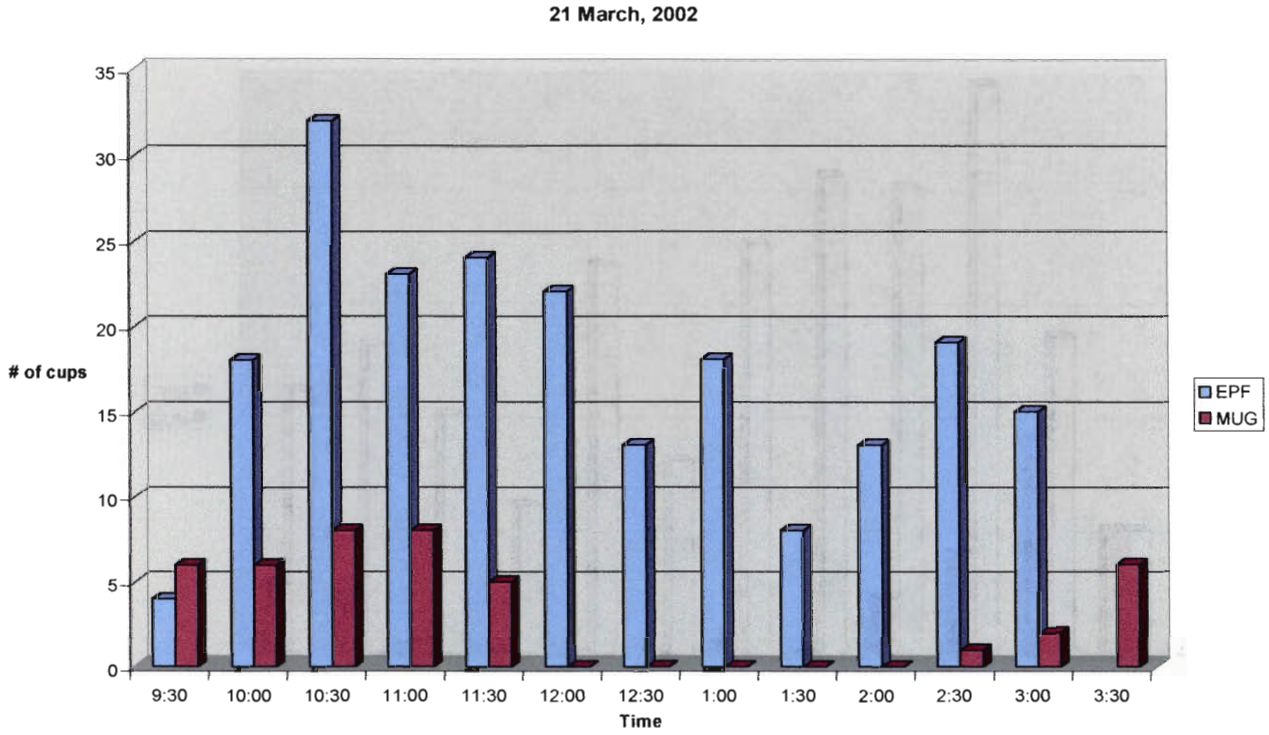


Figure 3. Cup Use at the Balcony Café - Weekday with School in Session

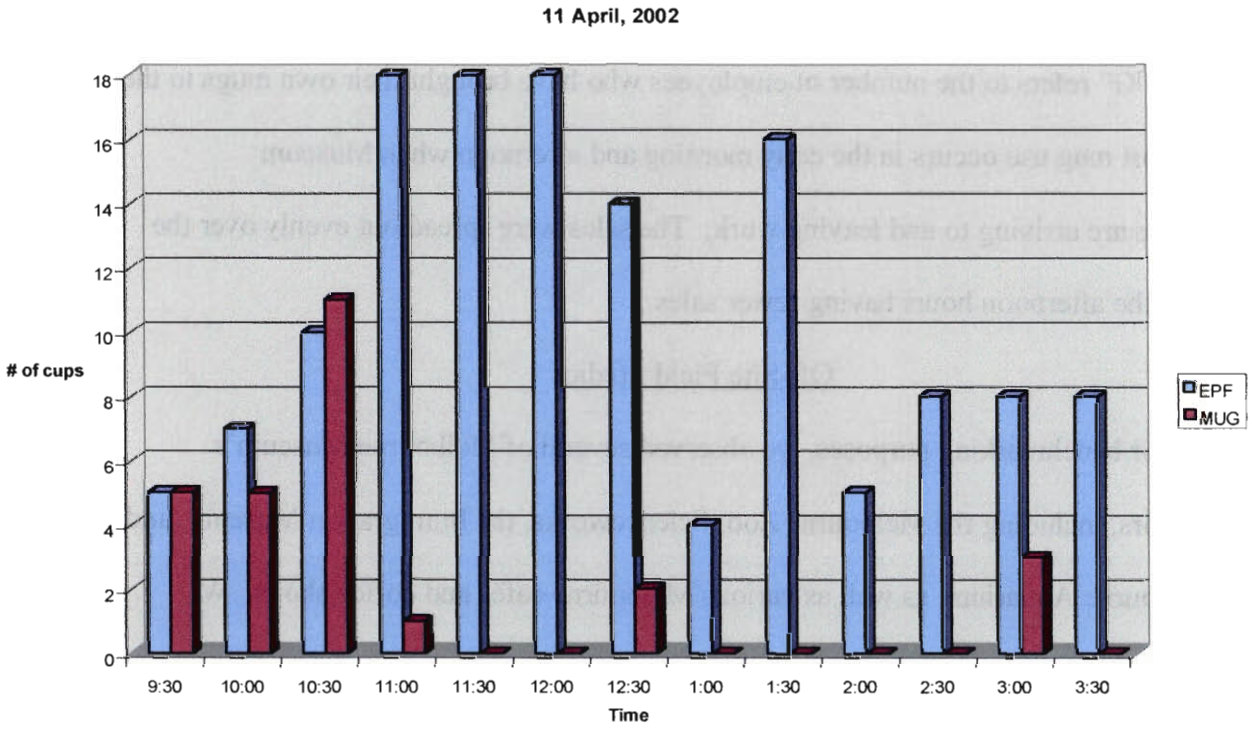


Figure 4. Cup Use at Balcony Café – Weekday During School Break

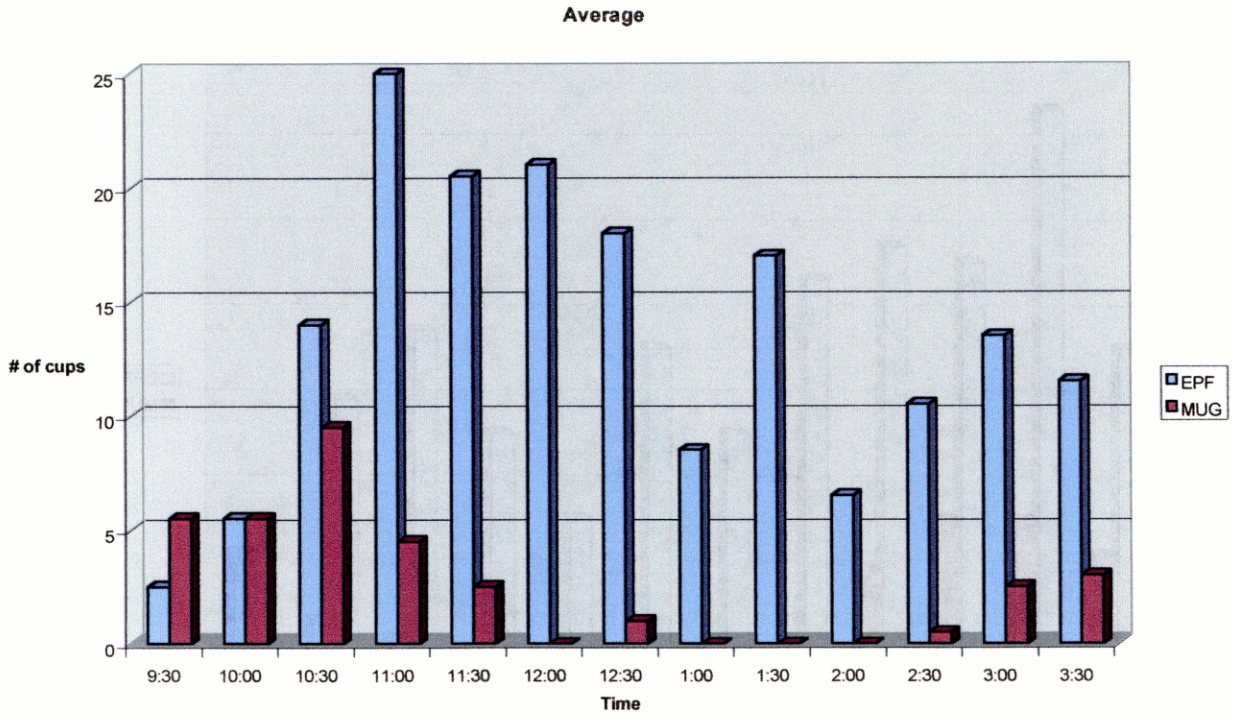


Figure 5. Cup Use at Balcony Café - Average

The peak hours of business for the Balcony Café are from 10:30 AM to 12:30 PM. "MUG" refers to the number of employees who have brought their own mugs to the Café. Most mug use occurs in the early morning and afternoon when Museum employees are arriving to and leaving work. The sales were spread out evenly over the day with the afternoon hours having fewer sales.

Off-Site Field Studies

For benchmarking purposes, we observed several of Melbourne Museum's competitors, including the Melbourne Zoo, Scienceworks, the Immigration Museum, and the Melbourne Aquarium, as well as various Melbourne cafés and coffee shops. We noted their respective choice of eat-in and take-away hot beverage containers, the proximity of kitchen facilities, accessibility of recycling bins, and the availability of

souvenir mugs. The various take-away cups and ceramic option for each establishment are displayed in Table 17.

Table 17
Take-Away and Ceramic Options for Various Food Establishments, Melbourne 2002

Organisation	Type of Take-Away Cup	Reusable Mug Option?
Melbourne Museum	EPF cups	No
Melbourne Zoo	EPF cups	Yes
Scienceworks	LDPE- coated paper cups w/handles	Yes
Immigration Museum	LDPE- coated paper cups	Yes
Melbourne Aquarium	LDPE- coated paper cups w/foam covering	Yes
Starbucks	LDPE- coated paper cups w/sleeve	Yes
McDonald's	EPF cups	No
Olive Snackbar	EPF cups	Yes
McCafé	LDPE-coated paper cups w/foam covering	No

Melbourne Museum

The Melbourne Museum's catering service consists of four venues, the Balcony Café, the Theatre Café, the Tuck Shop, and the Brasserie. There are two kitchens with dishwashing capabilities within the museum. One kitchen is adjacent to the Brasserie and Tuck Shop on the ground floor, and the other is located on the sub-ground level. The latter would be used if ceramic mugs were ever implemented at the Balcony Café. The Brasserie is the only location that serves hot beverages in reusable ceramic mugs. The other three cafes use EPF cups. There are a few recycling bins throughout the museum,

but they are not placed in the general vicinity of the cafes, and none of them recycle EPF cups. Souvenir mugs are available in the gift shop.

Melbourne Zoo

The Melbourne Zoo has two eateries, one for eating in and one for taking away. In their bistro, they serve hot beverages in reusable ceramic mugs. The mugs are washed in the kitchen, which is situated directly behind the bistro. In the take-away café, EPF cups are used. EcoRecycle bins for bottles, cans, and paper are scattered throughout the zoo, but there are no bins available for EPF cups. Souvenir mugs are available in the gift shop.

Scienceworks

Scienceworks also provides the option of eating in or taking away. In their cafe, customers have the choice of buying their hot beverages in reusable ceramic mugs or paper cups. The mugs are washed in the kitchen, which is situated directly behind the café. The paper cups are waterproofed with a low-density polyethylene (LDPE) lining. To provide comfortable handling, the cups have foldout paper handles. Recycling bins for bottles, cans, and paper are located in the café. However, the paper bins do not accept the disposable paper cups. Souvenir mugs are available in the gift shop.

Immigration Museum

Geared towards an older and more leisurely clientele, the Immigration Museum uses ceramic mugs as its primary hot beverage container. The mugs are washed in the kitchen, which is situated directly behind the café. For the rare take-away customer, LDPE-coated paper cups are provided. The Museum does not show evidence of recycling bins, and the gift shop does not offer souvenir mugs.

Melbourne Aquarium

The Melbourne Aquarium maintains cafés on all three floors, with each establishment having its own dishwashing capabilities. The cafés on the ground level and first floor offer the choice of reusable ceramic mugs or paper cups. The paper cups are waterproofed with a layer on plastic on the inside and insulated with a layer of foam on the outside. The sublevel café only offers the disposable cups for hot beverages. There are no recycling bins on the premises. Various plastic and ceramic mugs are sold both in the gift shop and at the two upper level cafes.

Starbucks

Starbucks is an international coffee shop chain. Each shop has its own dishwashing capabilities. The atmosphere at Starbucks is one where customers can drink a coffee on the premises in a ceramic mug or order a coffee to take-away in an LDPE-coated paper cup. The LDPE-coated paper cups are insulated with a cardboard sleeve, which uses 45 percent less material than a second cup. Starbucks has not considered using EPF cups because of the negative public perception. Reusable mugs are also available for sale for the customer to take home and reuse. Starbucks is developing an incentive program to promote the use of reusable ceramic containers, which is detailed in Appendix C.

McDonald's

McDonald's is a fast food organisation geared towards take away service. Thus, McDonald's does not offer the availability of reusable ceramic mugs, even thought they are all equipped with dishwashing capabilities. McDonald's serves its coffee at 190°C. Since this is such a high temperature, McDonald's has decided to use EPF for its

insulative properties so customers do not burn their hands while they are holding their coffee.

McCafé

McCafé is a café style subsidiary of McDonald's. It is more upscale in style, yet still utilizes a take-away oriented foam covered paperboard cup. McCafé's are usually situated within the same area as a McDonald's.

Olive Snackbar

Olive Snackbar is a café in the middle of Melbourne's Victoria Market. There are dishwashing capabilities adjacent to the serving area, and they offer the use of a reusable ceramic mug. However, there were no reusable ceramic mugs available as souvenirs. As a take away option, they also offer EPF cups.

Display Plans

After thoroughly researching EPF cups and their alternatives, Viva Juice determined that EPF cups are the least environmentally damaging and most cost-effective option for their purposes. In order to communicate these findings to their environmentally aware clientele, they have dedicated a page on their web site named "Viva Juice and the Environment". This page, which is shown in Appendix H, explains why Viva Juice has decided to continue using polystyrene packaging. This model was recommended by Andrew Robinson, a sales representative for the DART Packaging Company, as a model for signage that the Melbourne Museum could use to educate the public.

This type of signage can be helpful to the Museum. Viva Juice is similar in style to the Balcony Café and the signage was developed to explain to customers as to why Viva Juice is using EPF. With the sign available for customers to read, they have become

more educated about EPF. This has lowered the number of customer complaints at Viva Juice about the use of EPF.

Since the display would be geared towards Museum visitors, we obtained their feedback. Question eight on our Beverage Container Survey gave a choice of six possible methods of display. Visitors were asked which method they preferred for an educational promotion of the selected material. The methods included a sign in the Café that customers could read from the service queue, a small exhibit within or next to the Balcony Café, small table tents on each table, a brochure at the register for customers to take, information at the Museum's InfoZone website servers, and information on the Melbourne Museum's homepage. The visitors' choices by percentage are displayed in Table 18. The greatest amount of visitors recommended that the Museum display a sign in the Balcony Café.

Table 18
Preferred Methods of Display

Method of Communication	Percent
Sign in Café	33
Small exhibit in Café	32
Table tents	27
Brochure at register	6
InfoZone	1
Info on web site	1

Chapter 5

Analysis of Results

We performed a total analysis of the financial, environmental, and social aspects of several hot beverage container materials. For the financial aspect of each material, a monetary cost-benefit analysis was completed. The most inexpensive material per cup is expanded polystyrene foam (EPF). Paperboard can be up to five times more costly than EPF. The paperboard cups available for use at the Balcony Café are only twice as expensive than EPF. Since paperboard cups are poor insulators, methods of additional insulation must be accounted for when using the cups to serve hot beverages, such as a sleeve or second paperboard cup. These create extra costs of $0.09 or more per cup.

Ceramic mugs are the most expensive material per cup because they are reusable. However, ceramic mugs only need to be used twenty two times before becoming more financially cost-effective than paperboard and thirty four times to be more cost-effective than EPF. The Café could offer ceramic mugs as souvenirs. This would require the cost of coffee to be greater since the cost of the ceramic mug would be included. Even though the price would be much higher, visitors may be inclined to have a souvenir from the Museum and would not mind the price increase. Also, others would prefer the qualities of a ceramic mug and buy the souvenir mug.

The disposal costs of both EPF and paperboard are much less than the cost for washing ceramic mugs. The disposal cost of EPF is 22 percent of the cost of cleaning the grease trap due to the washing of ceramic mugs. If a recycling program is implemented, the costs for EPF disposal will be even less. In almost every aspect, EPF is more cost-effective than the other materials.

The environmental aspects of each material were evaluated through literature review and correspondences while on-site at the Melbourne Museum. We found that the least environmentally detrimental disposable material is EPF. It creates the least amount of waste and pollution and uses the least amount of resources and energy to manufacture.

If ceramic mugs are offered as a reusable, then they could be less environmentally harmful than any disposable material. As long as ceramics are used approximately 1000 times, they will be less environmentally harmful than EPF. At this time, the Balcony Café is unable to offer reusable ceramic mugs because it does not have a water source available for washing them. However, our on-site observations found that if the Balcony Café did install running water for washing ceramic mugs, staff would have the time and capacity to wash them. Thus, EPF is the least environmentally harmful material for use at the Balcony Café at this time, but reusable ceramic mugs should be further considered.

Interviews with Andrew Robinson, Steve Richardson, and David Bywater also gave further evidence that EPF is the least environmentally harmful material. Through interviews and phone correspondences, we also discovered that there are no current programs in the state of Victoria or Australia to recycle low-density polyethylene coated paperboard or EPF. However, the Plastics and Chemical Industry of Australia, also known as PACIA, is interested in starting a trial recycling program for EPF at the Melbourne Museum. This would be the first EPF recycling program in Australia and would not only help the Balcony Café's image, but also the Melbourne Museum and Peter Rowland's Catering if the program were implemented.

The interview with Andrew Robinson gave insight to the taste discrepancy with EPF. He claims that chemicals cannot leach from EPF containers into beverages to alter their taste. The difference in "taste" is actually a difference in texture. People do not like

the feel of EPF on their mouths and interpret this as a taste difference. This problem was minor at the Balcony Café, with only 3.5 percent disliking the taste of EPF. Still, it should not be overlooked, and these customers should have an alternate choice to EPF.

By observing various cafés around Melbourne, we found that there was a mix of containers used for hot beverages. EPF and paperboard cups were almost used equally. Also, most places gave customers the option of purchasing coffee within a ceramic mug. However, the cafés that had the ceramic mug option also had an adjacent kitchen with washing capabilities.

The Museum Victoria's Market Research and Evaluations Department's survey of the catering facilities at the Melbourne Museum confirmed that there was public concern with the beverage containers. Our more specific Beverage Container Survey revealed the negative opinion some museum visitors have about the use of EPF cups, but it also revealed that many of them approved of the use of EPF for various reasons. The most prominent reasons for disliking EPF cups were their lack of environmental friendliness and their awkward feel. While not much could be done to remedy the awkward feel, visitors could easily be educated about the environmental superiority of EPF cups over paper cups.

The survey data reveals that the current approval rating of EPF cups at the Museum is approximately fifty six percent. The negativity surrounding EPF cups can be traced to its perceived lack of environmental friendliness and currently nonexistent recycling programs for EPF cups. These problems could easily be addressed by introducing a comprehensive EPF recycling program in Victoria and an educational display at the Melbourne Museum.

Upon being asked what they would suggest as a possible replacement for the EPF cups, fifty-three percent of the people surveyed opted for ceramic cups. Visitors prefer ceramic mugs because of their aesthetic qualities, the taste of coffee within the mug, and the feel of the mug. Peter Rowland Catering will not consider the use of ceramic mugs at the Balcony Café at the moment. Yet, the use of ceramic mugs at the Tuckshop is still an option and should be considered.

If dishwashing facilities were made available and ceramic mugs could be guaranteed to last for more than 1000 uses, then reusable ceramic mugs would be a reasonable solution for the Balcony Café. For the current situation, EPF cups are the best type of container for use at the Balcony Café. They are inexpensive, hygienic, less environmentally hazardous than other disposable cups, and accepted by a majority of the Museum visitors.

Chapter 6

Conclusions and Recommendations

We found that EPF cups are the most environmentally friendly and cost-effective option for the Balcony Café at this time. The Balcony Café should keep this material as its primary hot beverage container material. The public must be educated as to why the Balcony Café is using such a material. This will lower the number of complaints towards the Balcony Café. In order to communicate to Museum visitors, we suggest that a large sign be placed at the entrance to the service queue and smaller laminated signs placed on each table. The Theatre Café and Tuckshop also use EPF cups, so signage would be appropriate in these locations as well. A model layout for the signage can be found in Appendix I. Andrew Robinson of the DART Container Company has offered to help with the cost of printing the signs.

We advise that the Museum consider switching to ceramic mugs in the Tuckshop, since it is directly adjacent to a kitchen with dishwashing facilities. The switch could serve as an experiment for future changes throughout the Museum. After the initial purchase of the mugs, Peter Rowland's could determine the payback period and the amount of labor and energy required to wash the mugs. It would also be wise to administer another survey to determine what the visitors think of the new mugs. If the mugs quickly pay for themselves, are easy to maintain, and are preferred by customers, then Peter Rowland's Catering may want to consider ways of employing mugs in the other two cafés.

Although reusable ceramic mugs may never be feasible for the Balcony Café, Museum visitors could be encouraged to bring their own mugs. Currently, employees

who bring their own mug get their coffee for $2.00 instead of $2.80. A similar arrangement could be established for the general public and posted on the menu. Museum members and frequent visitors would hopefully take note and remember to bring their own mug on their next visit.

Many of the cafes that we visited around Melbourne offered souvenir mugs at the counter, but the Melbourne Museum currently only offers "Phar Lap" mugs in the Museum Shop for $15.00. We suggest that Peter Rowland's Catering purchase some less expensive mugs adorned with the Melbourne Museum logo to be sold at the cafes. By doing so, visitors could receive a discount on their coffee and a souvenir at the same time. Currently, there are clauses in Peter Rowland's contract with the museum that conflict with the sale of souvenir mugs at the cafes. However, the manager of Peter Rowland's, Steve Richardson, alleged that these conditions could be changed with an amendment to the contract.

Ceramic mugs could become the primary source for beverage containers in the Melbourne Museum's cafés, but the public should have an option for take-away. We recommend that if dishwashing facilities ever become available for the Balcony Café, ceramic mugs are used as a reusable, but EPF should still be offered as a take-away option.

Another method of enhancing the Museum's reputation as an environmentally responsible establishment would be to place recycling bins for EPF cups in each of the cafés. EPF cups are not currently recyclable in Australia, but the Plastics and Chemical Industries Association (PACIA) desires to initiate a trial program with the Museum. If the program is successful, the Melbourne Museum will be a pioneer site of EPF recycling in Australia. This would undoubtedly result in positive publicity, and may spark similar

practices in other establishments around Victoria and Australia. It would also help to dissolve the negative public perception that surrounds EPF.

Six months after implementation of these previous recommendations, the Museum should compare the number of independently written complaints about the cups prior. We also recommend that a follow-up survey be conducted six months after implementing the use of signage. The follow-up survey could be based on the Beverage Container survey that was executed for this project. Certain questions could remain the same, such as question one and the demographic questions, but others must be changed accordingly or taken out, such as question eight with regards to what type of display visitors would like to see as an educational tool. We recommend six months because it is an adequate amount of time for the programs to develop and be recognized, but not too much time that if it is found that there has been little to no improvement, there can be corrections or improvements to the aforementioned changes to better the educational program and satisfy all customers. Hopefully, negative attitudes about EPF cups based on false environmental information will decline.

At the very least, the Museum needs more general recycling bins available to visitors. Each café within the Museum sells cold drinks in bottles, cans, and cartons, but instead of being recycled they all end up in rubbish bins. This is very frustrating to environmentally conscious consumers, which 96 percent of Museum visitors claim to be. Recycling bins can be implemented quickly and easily and should be done immediately. If this is done, the Museum and Peter Rowland's Catering will be seen as a more environmentally responsible establishment, thus promoting better public relations.

The Museum has infinite opportunities to increase its environmental sustainability. We attended an Environmental Management Committee meeting to

determine other areas that the Museum could use improvement. The Committee brainstormed various methods of decreasing energy use and waste, including putting motion sensor lights in the toilets, reusing computer paper, and installing solar panels to harness the sun's energy. Future research projects could focus on facilitating the Museum's attempt at minimizing its negative environmental impact.

We also recommend that Peter Rowland's Catering perform an on-site evaluation between the use of EPF cups and reusable ceramic mugs. This will determine exactly which material is less environmentally harmful through analysis of washing facilities, disposal techniques, storage, purchasing, and any other environmental, health, or financial costs. It may be found that EPF is less environmentally harmful than ceramic mugs no matter how many times ceramic mugs are used. This is due to differences at each site, such as amount of water and detergent used for each wash, capacity of mugs per wash, and disposal costs of EPF. The on-site evaluation would give specific results instead of rough estimates.

In today's fast-paced world, it is often difficult to make environmentally responsible decisions. Most people rely on hearsay or common sense to form their opinions about different products, but these sources are often inaccurate. The environment ultimately suffers from the public's lack of valid knowledge. There needs to be more scientific information readily available in an easy-to-understand format so people can make well-informed decisions. Education is the first step in making a change in the world, which is why we are so strongly advocating the implementation of educational signage at the Balcony Café.

In truth, no amount of knowledge can completely eliminate negative environmental impact. Nearly everything we do in our day-to-day lives inflicts some

kind of damage on the environment. Often times, one must resort to choosing between the "lesser of two evils". For example, reusable mugs may be the best option environmentally, but may not be feasible for some establishments. In this situation, the best one can do is choose the disposable cup with the least amount of environmental impact, and based on our results EPF is such a cup.

Chapter 7

Appendices

Appendix A – Mission and Organisation of the Melbourne Museum

Mission Statement

Improving an understanding of ourselves and the world in which we live.

Overview

Museum Victoria is a Melbourne based institution and is Victoria's state museum. The Museum Victoria cares for Victoria's social history, science, and technology collections. These collections are estimated to contain approximately 16 million individual items. Museum Victoria maintains four museums in three separate locations: the Melbourne Museum and Royal Exhibition Building within Carlton Gardens, the Scienceworks Museum in Spotswood, and the Immigration Museum in the Old Customs House of Melbourne.

The Melbourne Museum is the flagship campus of Museum Victoria. It is a broad-based State museum with a national focus that covers the natural and physical sciences as well as social history and cultures. Exhibitions cover six major themes: Australian society, indigenous cultures, the human mind and body, science, technology, and the environment. The Melbourne Museum campus of Museum Victoria is home to eight educational galleries: the Mind and Body Gallery, the Evolution Gallery, the Australia Gallery, the Pasifika Gallery, the Science and Life Gallery, Bunjilaka (the Aboriginal Centre), the Children's Museum, and the Forest Gallery.

The Forest Gallery includes a "living exhibition" called Forest Secrets which displays the essence of Victoria's tall mountain forests with trees, plants, and wildlife.

The Forest Secrets exhibit attempts to provide insight into the interconnected and multi-layered nature of forest life (http://melbourne.museum.vic.gov.au/forestgallery/index.html).

Organisational Structure

On the following page, Figure 6 is the Museum Victoria Organisational structure. The Museum Victoria is operated by the state of Victoria and is overseen by the Minister for the Arts, the Honorable Mary Delahunty MP. This structure also displays the three major museums within Melbourne: Scienceworks, the Immigration Museum, and the Melbourne Museum.

The Melbourne Museum Organisational Division is presented on the following page as Figure 7 and displays James Dexter, the Acting Director, as the head of the Melbourne Museum. The Acting Director position has directly beneath it six positions relied upon to maintain the Museum. Two positions this project is reliant upon are the Commercial and Education and Visitor Programs. The Commercial position oversees commercial contracts including that of Peter Rowland's Catering, the organisation responsible for selling hot beverages in EPF containers at the Balcony Café. The Education and Visitor Programs position is responsible for educating visitors both within and outside of the Museum.

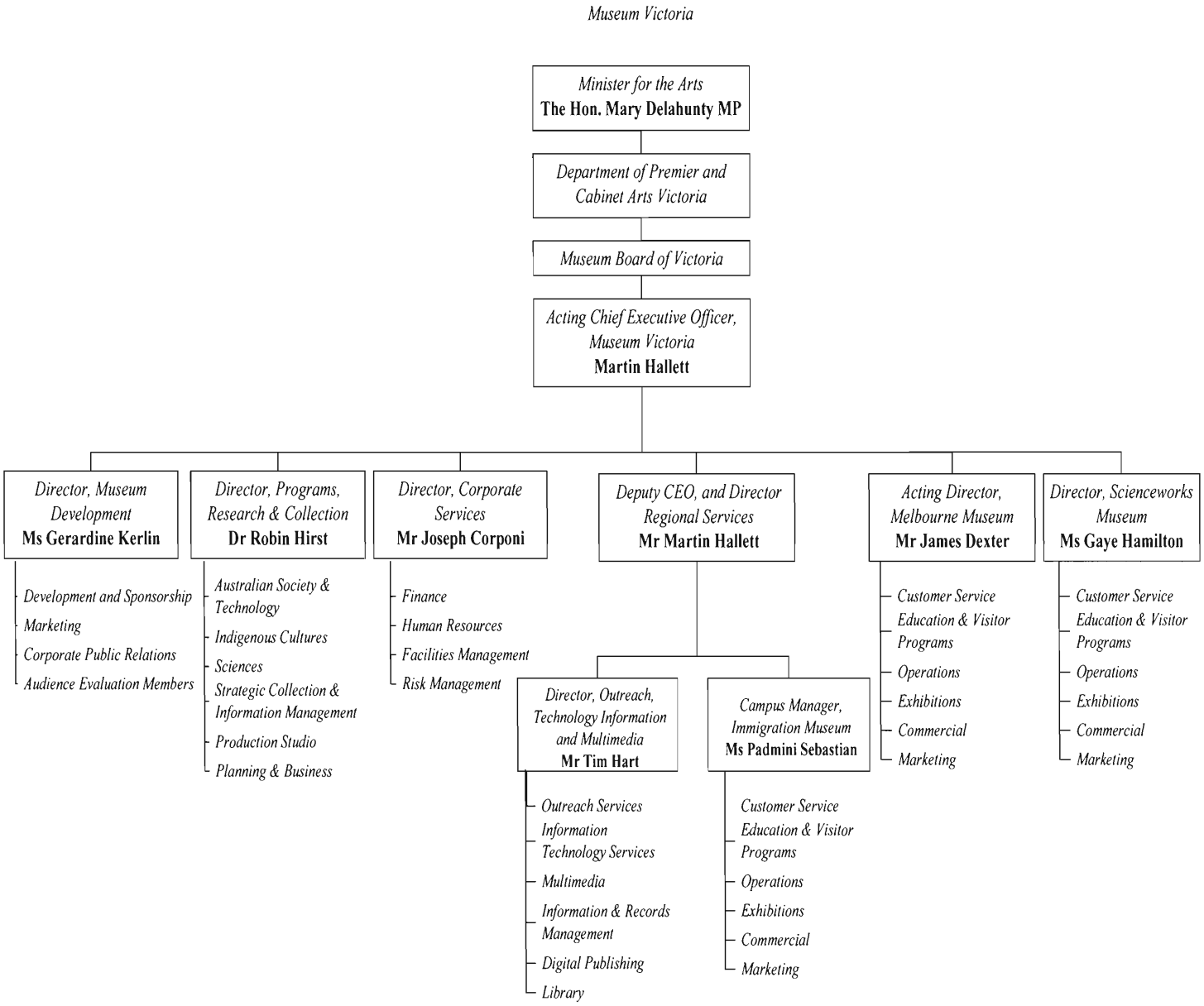


Figure 6. Museum Victoria Organisational Structure, *Melbourne Museum Volunteer Program: Volunteer Induction and Orientation Manual*, 2001.

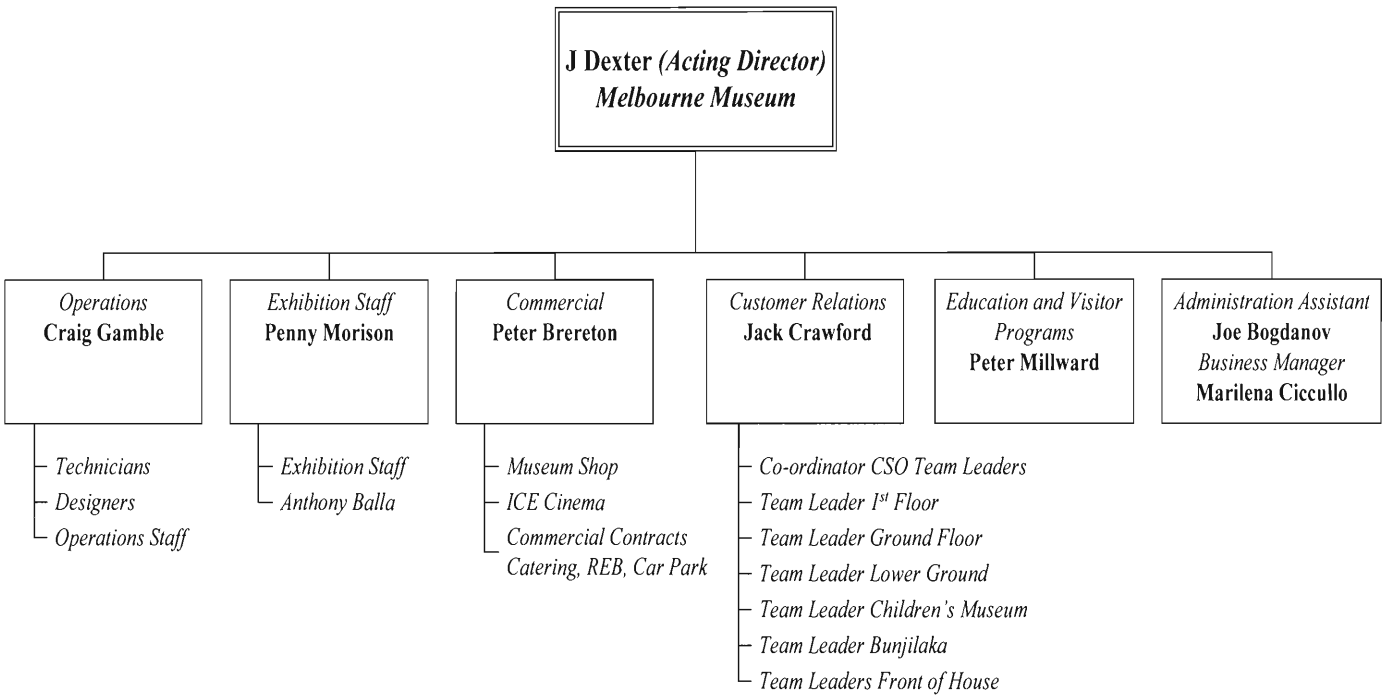


Figure 7. Melbourne Museum Organisational Division, *Melbourne Museum Volunteer Program: Volunteer Induction and Orientation Manual*, 2001.

Figure 8 on the following page is the Education and Visitor Programs Organisational Structure. It displays the Group Manager of the Educational and Visitor Programs as the head of this structure along with six positions directly underneath. Greg Hunt, the project liaison, is the head of Schools Education.

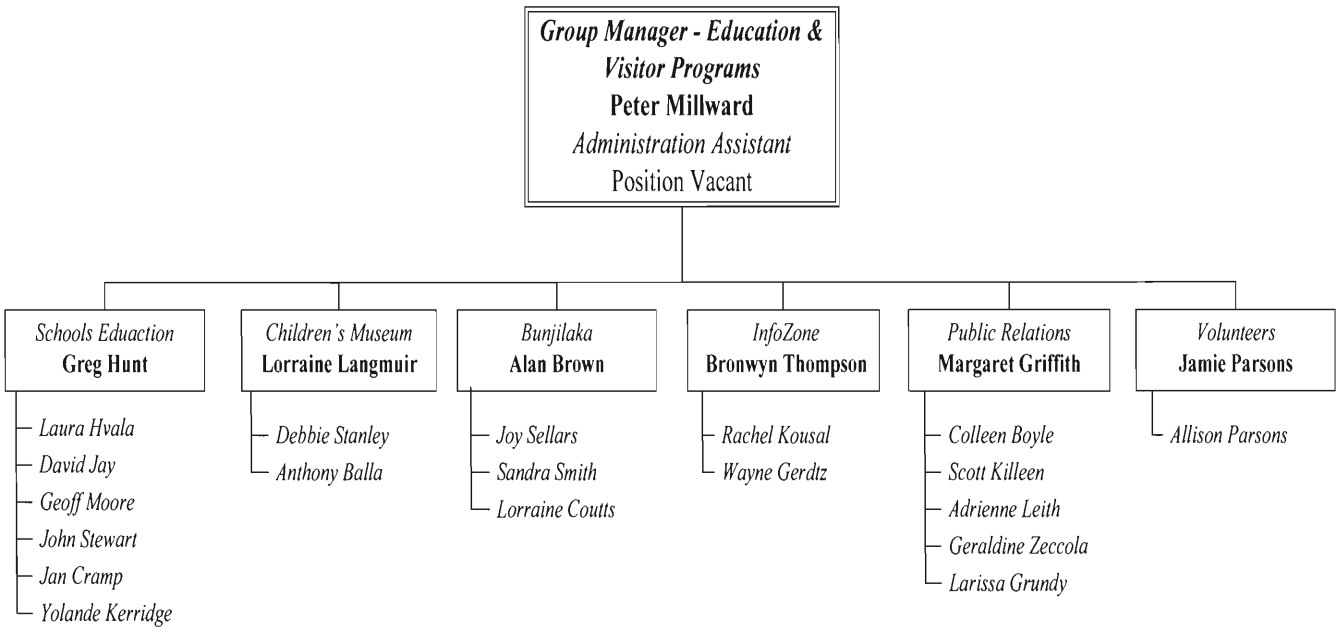


Figure 8. Education and Visitor Programs Organisational Structure, *Melbourne Museum Volunteer Program: Volunteer Induction and Orientation Manual*, 2001.

Appendix B – Social Science Research Theory

Modern social science theory relies on an exchange of information between researcher and respondent. The researcher explicitly intends to gather data from the respondent, interviewee, or subject. Social Exchange Theory, otherwise known as SXT, proposes that the actions of people be motivated by a desire to maximize benefits and minimize costs in a social exchange. Social exchange can be described as a conversation, an interview, a survey, or a focus group. It is important to take heed of the theory behind SXT, as respondents who perceive the costs as outweighing the benefits will either lie, retain information, or simply not respond.

The Total Design Method (TDM) may be used to maximize benefits and minimize costs for the respondent. TDM is a conceptual framework that allows researchers to engineer a project. It identifies all the processes and seeks to remove any weaknesses by testing and correcting in a continuous feedback mechanism. Pre-testing provides important input about the methods designed that will insure a favorable social exchange for the researcher. Pre-testing establishes the demographics of the group to be studied, allows for a sub-set of people to be administered the survey/interview beforehand in order to assess the possible weaknesses in the questions or general layout of the study.

Questionnaires

We designed our questionnaire according to the format provided by Museum Victoria's Market Research and Evaluation (MRE) department. Carolyn Meehan, manager of MRE, facilitated the design process by providing advice about question order and wording. For example, in the first question we listed a series of nine beverage container characteristics and asked customers to rate their importance. We were

concerned that interviewee fatigue bias would occur if the respondent tired of the question and began to answer hastily. In order to reduce interviewee fatigue bias, we rotated the order of the list. In doing so, each characteristic had an equal chance of being last on the list, thus minimizing the effects of interviewee fatigue bias.

With the aim of maximizing social exchange, we kept our questionnaire as concise as possible. We realized that Balcony Café customers would not want to be bothered with lengthy surveys, especially those that were looking after small children. Our final questionnaire design, shown in Appendix J, consists of one page of questions and two cards that are referred to during the survey. The questionnaire took about three to five minutes to administer, depending on the length of the respondent's answers.

We included both quantitative and qualitative questions in our survey. The quantitative questions were designed to gather precise statistical data regarding customers' preferences. However, we realized that there might be opinions, which we had not thought of beforehand. We therefore included qualitative questions to provide respondents the opportunity to fully express their ideas.

Once Carolyn Meehan approved our questionnaire, we commenced the pre-testing phase. We administered ten surveys at the Balcony Café to ensure that the questions were comprehensible and evoked the proper response. If there had been any problems with the questionnaire, we would have revised it accordingly and tested it again until it was sufficient. Since we did not detect any major issues, we proceeded to administer the remaining ninety questionnaires.

Appendix C – Starbucks Report

The entirety of this case study was taken from the Alliance for Environmental Innovation's "Report of the Starbucks Coffee Company / Alliance for Environmental Innovation Joint Task Force" (2000). We think that it is pertinent to our proposal because of its similar goals of pleasing the customer and finding the most environmentally sound container.

In August 1996, the Starbucks Coffee Company engaged in a partnership with the Alliance for Environmental Innovation (AEI), referred to as the Task Force, to reduce the environmental impacts of serving hot beverages in Starbucks retail stores. The two main objectives of the partnership were to develop a new single-use container for coffee to replace the two nested paper cups Starbucks originally had, and to promote the use of reusable ceramics and glassware. The research and testing lasted for three years, and in the end, both goals the Task Force declared had been achieved.

Starbucks and AEI began research and testing with reusable coffee containers, such as ceramic coffee mugs. Between July and August 1997, the Task Force conducted a pilot-test in three Boston-area stores. Employees were told to ask customers if the coffee was to be consumed at the point of sale or elsewhere. If the coffee was to be consumed at the place of sale, then the customer was given their coffee in a ceramic mug unless they requested otherwise. Customers were also encouraged to use reusable ceramic mugs through cup displays and signage. The pilot-test also observed labor, dishwashing, and reusable cup usage.

The Boston-area pilot-test showed that the use of reusable ceramic mugs resulted in significant environmental and economical benefits from even slight changes in store operations. The use of reusable ceramics and glassware in test stores increased from eighteen percent to fifty-seven percent during the pilot test. Since the reusable containers were well accepted, Starbucks decided to make these types of containers available at all its stores in North America.

The Green Team, consisting of Starbucks regional managers with environmental responsibilities, administrated a similar study in the summer of 1998. This study was conducted to determine if the Green Team could replicate the results of the previous pilot-test. The Green Team studies were performed in thirteen Starbucks stores over a period of eight-weeks. Customers ordering coffee after 10:00 A.M. were asked if they would like their drink "for here," and like the pilot-test, if the customer was to consume the coffee at the place of purchase, unless otherwise specified, the coffee would be served in a reusable ceramic mug. The Green Team tracked all reusable drinks served along with the paper cup inventory, and assessed the employees'' morale and customers' satisfaction.

The results of the Green Team study found that customers were more satisfied with the availability of a reusable mug, and also proved that using even three or four reusable ceramic mugs per hour could save an average Starbucks store hundreds of dollars in paper cup expenses per year alone. As a follow-up to this finding, Starbucks confirmed the savings of the reusable mug with a posttest audit. The savings are shown on Table 19, "Reusables Analysis: Universal Coffee Shop." As you can see, switching to reusable mugs can save thousands of dollars per year.

Table 19
Cost Analysis of Reusable Cups versus Paper Cups

Reusable Analysis: Universal Coffee Shop

ASSUMPTIONS:

$0.15	Cost of disposable packaging (cup, lid, and insulating sleeve)
$1.25	Cost of 16-ounce reusable ceramic mug (cup only)
1,000 uses	Lifetime of reusable ceramic mugs
12 hours	Number of hours the coffee shop is open per day

RESULTS:

No. of reusable mugs used per hour	Daily cost savings*	Annual cost savings^
2	$3.57	$1,285
4	$7.14	$2,570
10	$17.85	$6,426

CRITICAL SUCCESS FACTORS:

Excess Washing Capacity: The Starbucks-Alliance research indicated that the system had unused dishwashing capacity.

Storage: The store needs to have storage space for a small supply of cups near the service area and additional storage for dirty dishes before they are washed.

* = no. of reusable cups used per day (cost of disposable packaging (cost of reusable servicew are / 1000))

^ Multiply by 360 days.

Source: Alliance for Environmental Innovation, Report of the Starbucks Coffee Company / Alliance for Environmental Innovation Joint Task Force, Alliance for Environmental Innovation. 2000. 12.

The other aspect of the Starbucks study was to develop a new disposable hot cup. The goal of the study was to develop a single-use cup that did not have a second cup in the design. The Task Force decided on environmental performance, functional attributes of the cup and lid, performance in retail operations, market appeal, and economic and production feasibility as criteria for evaluating the different designs for a new disposable hot cup.

For preliminary designs, Starbucks encouraged interested parties to submit prototype designs of a single use paper cup. The Task Force evaluated approximately twenty-five designs from individuals, organizations, and companies. The evaluation meetings served as a preliminary screening of the different designs. Candidates were encouraged to present the entirety of the cup, including the cup itself, lids, prototypes, and drawings as well as environmental impacts and economic feasibility.

After final presentations, the Task Force rated all the cup designs, narrowing the options to seven designs plus the cup and sleeve that Starbucks was currently using. The designs were then shown and explained to focus groups composed of Starbucks' core customers in Seattle, Chicago, and Boston. The purposes of these focus groups were to brainstorm an ideal disposable cup and to review and comment on the current eight design options. In the designs for an ideal cup, all focus groups desired a recycled or recyclable design within the top three choices of the design. Numerous customers in each focus group expressed discontent with Styrofoam.

The single design that was favored by each focus group was the Saleni cup. The Saleni cup uses a standard paper cup wrapped with an embossed second layer of paper. The second layer of paper creates a thin layer of air between the paper cup and the embossed layer, allowing for safe handling. The embossed layer could also be made of a different material than the paper cup, and could create an aesthetically pleasing appearance.

The first market tests for the new designs took place between July and October 1997. The Task Force tested several different designs, including the Saleni cup and a design incorporating a second layer of expanded polystyrene for insulation. All the designs were made of paper with polyethylene linings. The Task Force also discussed

using a tan or brown outer layer or an all-brown cup for aesthetics, but the manufacturer was unable to make such a design in the limited amount of time.

Customers were selected at random in select Starbucks stores to participate in the survey and were asked to evaluate the cups appearance and performance. A second group of customers dubbed the "Star Panel" also participated throughout the field tests and evaluated all the different cup designs. Once again, the Saleni cup was favored. Customers saw the design as an environmentally friendly alternative to the double cup design.

After the first market test, Starbucks senior management asked the Task Force to follow up with another market test. The second market test took place in thirty stores in San Francisco and Washington, D.C. over a period of three weeks. The tests were designed to find an appearance for a cup that was pleasing to the consumer and to test the cup's thermal performance.

The testing was executed using two elements: a self-administered survey to be returned to the store and an in-store "imagery" interview comparing the current cup and sleeve, a white Saleni cup, and an all-brown Saleni. The Saleni cups that were used had a defect that was not discovered until after the testing which cause leakage with certain cups, causing the data for the thermal performance to be erroneous. The appearance was still, however, critiqued. The majority of consumers found the unbleached brown Saleni cup to be environmentally friendly, but the defect may have created some negative feedback with customers finding the design to be too hot. The results of the "imagery" interviews found that the consumer appreciates a more natural and unbleached look of a cup, as shown in Figure 9.

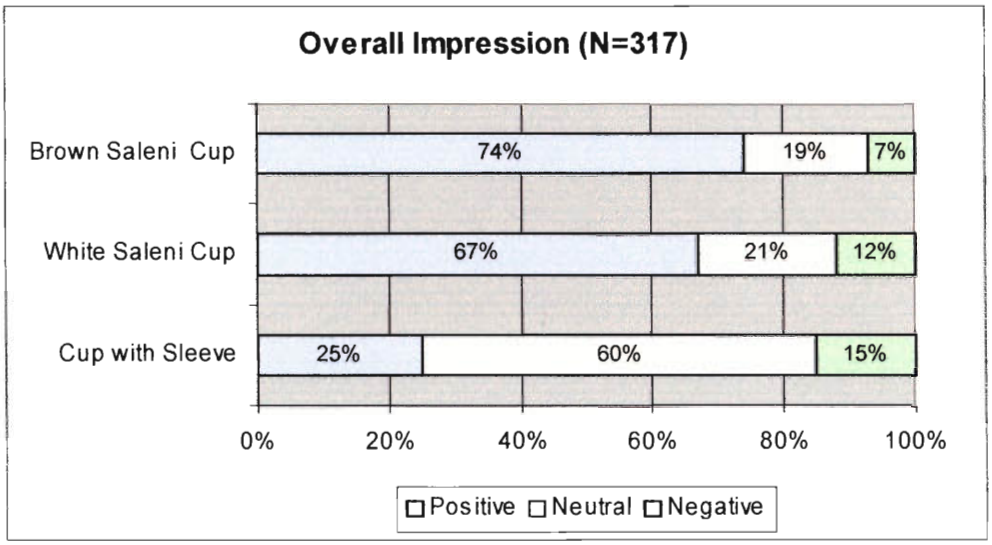


Figure 9. Customer Evaluation of Starbucks Cup Designs. Source: Alliance for Environmental Innovation, Report of the Starbucks Coffee Company / Alliance for Environmental Innovation Joint Task Force, Alliance for Environmental Innovation. 2000. 22

As a result, the Starbucks Coffee Company used the results of the market tests to design a new cup. Even though there was an overwhelming positive response towards the Saleni cup, the Starbucks Coffee Company felt that it would be difficult to manufacture and economically detrimental. Starbucks did do away with the double cupping, however, and is currently using a cup and sleeve design, as it is both eco-friendly and thermally safe. The design also shifted to a more natural look, changing cups from a white and bleached appearance to a recycled, natural brown appearance.

As a result of this study, Starbucks and AEI found environmental, economical, and socially acceptable alternatives. The option of reusable ceramics has now become a mainstay with Starbucks, and anyone desiring a ceramic mug for hot beverages can request it while ordering. The design of the single use paper cup was also advanced, allowing for less consumer waste. The appearances of the single use cups are now more environmental with the natural look, and the morale of the employees and attitude of the

customers enhanced. The Task Force was able to promote environmentalism, appease the consumer, and allow for economical advances of the Starbucks Coffee Company.

Appendix D – Andrew Robinson Interview

Andrew Robinson – DART Plastic Company Representative
18 March 2002
Others present were Nicholas Godlewski, Rachelle Hayes, Javier Ortiz, and Manuel Zeno

AR – Andrew Robinson
NG – Nicholas Godlewski
RH – Rachelle Hayes
JO – Javier Ortiz
MZ – Manuel Zeno

AR – Two things I guess to start with. One is that I work for a company called DART, a US company, DART container who manufacture polystyrene foam food packaging containers. It would be the world's largest manufacturer of those types of food containers and a number of manufacturing sites around the world. I guess polystyrene really came into its own about forty years ago as a plastics derivative of petrochemical by-product and since then has grown in popularity for, I guess, its ease of production, its relative cost effectiveness, and also its excellent insulating capacities whether you're talking hot or cold foods and drinks. A couple of things have happened in the last forty years. One is, in the western world at least, a higher disposable income where traditionally in western society, women were at home back in the Fifties and now they're not. Now you have a lot of two income families which gives you less time which means more take away food. People don't sit at home and make their lunch so much anymore. They'll just grab it on the run. And what that's come down to is an escalation in the use of disposable packaging. You can't help that, and so what we get to do when we go in to universities and talk to their environmental committees and so on is to say, "You know in an ideal world you might think it'd be nice to sit down and have ten or fifteen minutes to have your latte in a glass with a spoon and a napkin wrapped around and so on and Italian Biscotti on the side with the waiter falling all over you." Not everyone has that time so you grab a coffee and go. And pretty much when you do that you've got to make some choices of the people selling it, or the people supplying then have to make the choices of what you're going to supply. And it's come down to a choice of… There's not a lot of options. You would think that there might be more but there really isn't a whole lot. It's come down to pretty much a choice of plastic and plastic derivative type products. That [paper cup] is obviously no good for hot food. You put boiling water in there and you'll still burn through the cup so you not only get the cup to warp, you probably end up spilling on you anyway. There's a range of paper. We'll look a couple of them in a little while. That [paper cup] is also a plastic cup as are all paper cups. That's a plastic cup with a paper coating around the outside. If you have fingernails, you can actually peel the plastic from it. If you soak it over night it shows up a lot better, and when we do some of the big food expos we actually do that and we have a couple you can see in there with the plastic peeled off. And you can see the shine. Have a look at it.

NG – Is that the low density polyethylene coating?

AR – Yes it is polyethylene that is used on the insides of those cups. You're exactly right. Similar to supermarket carry bags. Here is another standard take-away cup [Bubble Cup]. That's filled with air bubbles.

MZ – …A question about the recyclability of these.

AR – You're so far ahead of me it's unbelievable. We'll get to it in a little while. OK? People are doing all sorts of fun stuff with paper cups, like putting two lots of paper on them, but still coating them with plastic to try and stop people's hands from burning. In the US, "Java Jackets" are popular at Starbucks. They grew up around the timber country with all of their mates and so they went paper cups early on in bed with all the timber goers and have kept that relationship pretty close ever since. We're trying for their business with them a little bit. But certainly no grounds from their point of view to argue on the environmental benefits. There are other companies trying to put like a plastic bubble wrap around the outside to insulate your hand from the heat. It doesn't work and we have a lot of fun at some of the shows where we fill all of these [cups] with boiling water and say pick a couple of them up and put down which ever one is too hot to hold. And you know people are just doing this. (Puts down paper cup and keeps polystyrene cup in hand). So insulation-wise there's just a huge percentage of air bubbles in there which is why it's so light. And no one argues insulation capabilities. What gets argued are more of the environmental points. And when you're talking hot drinks we've got to take that one out of the picture (takes away clear plastic cup) which leaves you with a plastic cup with air bubbles, which we call foam or Styrofoam. But the correct name is EPS, expanded polystyrene. Or a plastic cup with paper wrapped around the outside of it. Both plastic cups using different technologies to house some food or drink. There are, as you guys are aware, a number of ways to be environmentally friendly. I guess you can start at the outset of your source materials and from there we're using a petrochemical by-product. A product that comes from the manufacture of oil and the mining and exploration of ore. So as it, [the paper cup] is just another plastic based product. So it's not a bad thing to start with. However, as soon as you go to do that you've got to chop down some trees to wrap around the outside of it. Now this is from Solo Cup Company in the USA who is sourcing plantation timber in the USA, which is nice. They don't have to. They could bring timber in from Malaysia or the Philippines, and as soon as you do that you've got some pretty serious question marks about what sort of timber you're using as a plantation timber or as an old growth forest and so on. And today as we speak there are some pretty serious issues with the paper and timber and furniture manufacture industries in some of those countries because of their source of timber.

RH – So you wouldn't be able to actually argue that Styrofoam uses up the natural resources since it's just a by-product of something that would already be used anyway?

AR – Exactly right.

RH – And it's 95% air.

AR – And I would not be able to use that argument either on this [paper cup] if they're just sourcing renewable forest. Ok, so I'm not trying to bias it too heavily in that way but be aware that there are paper cups out there and we now get a flood of very cheap ones in from some of the Asian nations and… Yeah, you've just got a question of the source material because that cost and not imported into the US of timber from a pine plantation to make this. Once you got your source material going to manufacturing and there's a few ways you can be environmentally friendly in manufacturing. I guess once again your materials in manufacturing can be, you can manufacture from recycled materials. I have a friend with a plastics injection factory down in Seaford who, you know the big wheely bins for rubbish? He makes them, and milk crates and bread trays, and that sort of stuff. You know witches hats? The bright orange things or the cones in the middle of the road. He can buy recycled pellets, recycled plastic pellets to include with his new virgin material that he uses so that a portion of everything he makes can include some post-consumer or some recycled waste. That's very expensive for him to do that, but he likes to think that he's doing something. No one can afford to manufacture completely from that and compete in the open market. But a lot of companies out there, and my friends the same, a lot of companies out there feel that we should do something. So if there's not a lot of money in something he uses little or none of the recycled product in it if he's after a big contract where he has to really shave his margins. Or a product that's something that he can make a bit on and he can include a bit of [recycled material] he does so. That seems to be a mentality. I mean you got the two extremes of the "Who gives a stark about the environment" to the, you know, people who start hugging trees and go and then, shoot, drink their coffee out of a wet sock or whatever. So somewhere between the two extremes, you know, people are trying to find a balance and go, you know, a day and age of increasing disposable mentality everything we use gets chucked away. How can I economically rationalize some of that into my manufacturing process. I'm doing some good and I feel like people [would] buy the product at its cost. So you can use some waste or some recycled product. And then there's another interesting part in manufacturing as well that says, let's assume we're using a similar amount of plastic. We're actually using a bit more [in the polystyrene cup]. But the energy required in manufacturing to produce the paper on that is somewhere around three to four times the amount that's used here [for the polystyrene]. The chemicals, something like about eight times in waste emissions and toxic waste products produced somewhere around five to ten times depending on who's doing it. So all of a sudden in the middle of the manufacturing process we've got to go "Oh, I thought that it was friendly for the environment. I might use that one"… Just on the amount of cooling water used, on the amount of carbon dioxide and carbon monoxide is produced. And you can see on here the amount of wood that's used and bark that's used, and lo, a fair bit. And so on and so on. So all of a sudden in your manufacturing process there's a big question as to how environmentally friendly you are in the process itself. We were at a conference up in Brisbane last year when one of the manufactures of one of these three [paper] cups nominated themselves for an environmental award for their cup, and won. Yes, we have some suspicions about who was actually sponsoring that part of the conference actually. So you've got companies that go "It's paper. It must be environmentally friendly, and they call that a paper cup." So when Fred's van services calls on Joe's café, Fred goes to Joe, "Do you want foam cups or paper cups?" And if Joe's next to university and has been getting a bit of flack from some science students, he might go "You know, are the

paper one's much dearer, because some of the students are asking questions about the foam." And that's invariable where the questions will occur. We have hospitals and universities. Places of learning, maybe secondary schools, and colleges, tech colleges and so on. And then some of the cafes, the inner-city cafes, we are attracting preps and more educated market clientele who might be a little bit yuppie but also want to feel like they're doing their bit. So they might go "You should be using paper cups", because you work in the stock market you're all of a sudden qualified to make comments on recycling materials. And these guys are going "Ok, can you check out the price difference for us"? And they'll go well these [polystyrene cups] are about 3 cents each and these [paper cups] are about 10 to 12 cents each. Why? Why is it? What's the go here? Well, see what's happening is there's just a whole lot more material there that's taking a whole lot longer and harder to manufacture, and with the chemicals and glue you're putting in there as you go at it, and it comes out as a more expensive price. So then a lot of them go, ok, I'll just stick with these and I'll just wear their comments if I have to. Later on down the track we have the possibility of recycling once the product has been used. And two things happen, it can't be recycled. No one's going to sit there and do that (peels plastic coating from paper cup) and peel the plastic off the inside of it and then wash it and try to recycle it. That [polystyrene cup], with the recycling logo on the bottom, can be and is recycled. Recycled actively in the US and Canada. Actively meaning we do our recycling, a lot of it. Full credit to the US for bringing in some legislation where in some of the states you cannot manufacture now unless you recycle some of your own product, and a lot of other countries are following suit. In Australia we've had a weird sort of situation. We put out a recycling bin next to our waste bin and you can put steel cans, aluminium cans, PET bottles, milk cartons, and other weird sort of things that you can put in there and some things you can't. And our expectation is to the government, you should be recycling this stuff for us. So it gets picked up in a separate waste truck and it gets put on belts, and people sit there and pull off aluminium cans, and steel cans, and plastic bottles and that sort of thing, and portions of that get recycled. We have a scan every now and then where we find that some particular local waste tip that the stuffs just been plowed into the rest of it, you see. But generally most of the counselors are doing their bit to do something about it. The funny thing when it comes to foam, people say to us you should be recycling foam, so we go to the guys putting out Coke cans, well the government should be recycling your Coke cans… It's just a weird shift of mentality, and maybe they're right. Maybe down the track we need more legislation to force back on the manufacturers, some of the responsibility to take in hand some of their own recycling. A little bit one sided right now. Very happy to say in the US we do a lot of recycling. We have some very innovative recycling methods. We have a thing called reverse shipper where when this [box] goes out full of cups like that you are able to restack your waste cups in there with a plastic liner and then you fold it back down there and it's addressed to us when you do that. So we are able to take those back and recycle. Also in high use areas, Universities, hospitals, and so on where you've got a captive population we permanent loan the compactors where people can put all of there polystyrene foam and only polystyrene into these particular ones, and it compacts it down. I've actually lifted a block of these, like 18 inch square blocks, cubes and they're quite heavy by the time it's compacted down and you wouldn't believe that foam could weight that much. We take those back and we make them into things like the handle on the coffee jug there, the back of that [dry board eraser], McDonald's food trays, video cassette covers. Can't

be made back into food packaging once it's been used as food packaging and become food packaging waste. Now that's not a terribly profitable side of the business, of anyone's business, the enormous amount of expensive () used in cleaning and recycling that. However, as some of our brochures are quick to point out, we have numbers of awards from Greenpeace and Friends of the Earth and these sort of guys who are really pushing some of those recycling type programs and being responsible there. If you can close the loop like that, if you putting out a product into the environment that could end up just as landfill… You know the old cliché of reduce, reuse, and recycle. Well it's true. I think most businesses are able to do some of that at different stages.

MZ – So in Australia there is recycling?

AR – In Australia we've joined a mob called REPSA – Recycling Expanded Polystyrene Australia, who are a division of PACIA, the Plastic and Chemical Industry Association. What we've done so far, what they've done and we've been a little bit backward. Not we as a company but Australia… There is no provision in Australia for polystyrene foam recycling as we speak. However, what we've done is we've joined REPSA, and REPSA are sending product offshore to be recycled. So all of our factory waste is going there now. You know the big foam fruit crates they use in the markets… That's a lot of foam there. So all of that gear is heading offshore to be recycled…

(stop tape)

We had one of our marketing guys up from the US and he said "I want to see a University, and a hospital, and a 7-11, and a service station." So I took him around to all these places and we got to Melbourne University and outside the food court of Melbourne University is a big sign that says polystyrene is eating up the earth. It's got a picture of a foam cup munching on a globe of the world… So we went inside to see some girl hanging up posters… So I said "What's the thing with the posters?". "You know, the environment and stuff". "So, what stuff?" "You know, landfill and that". "No, what about it?" "Go and buy one of our cups"… What's your alternative? "Well you buy one of our cups," and it came down to instead of paying two bucks for a cup of coffee you paid four dollars for one of their cups and you refilled it later for a dollar a time. So you save money and you're reusing a cup, and everyone's happy. And I said to the marketing guy from DART US, "Well, what do you do about stuff like that?" And he said, "Well first of all you should know that the brand of picnic type insulated mug that they're using would take about fifty to eighty recycled foam cups to make, and the little lid for it, about another twenty or thirty." So if you're going to use it 100 times throughout the year, maybe. I said, "Ok, you've come up with a good argument for their product. Well what else?" He said, "Take it home and cut it in halves." So I bought a four dollar coffee with one of these cups, drank it, drove around with the cup, and got home and got out the hacksaw and cut it in half. In between these two layers of the soft plastic coating, polyethylene of some kind, is the insulating material used, and it was polystyrene foam… I was up to the University the next week, and said "I would really like to speak to your environmental committee." And they said, "Would you like to speak to them or like to try and sell them foam?" I said, "I would just like to speak to them about your whole program and what you're doing." And they said, "Well, we're not interested." And I

said, "Well we're going to put a letter in your newspaper saying you've got posters saying 'Don't buy foam' and you're charging people 4 bucks for a foam cup. Or do we speak to the environmental committee?" And they said, "You can speak to them"... And that's what the environmental committee should be doing, raising that sort of awareness. Good on them. But be informed and know what you're talking about. So that [polystyrene cup] can be and is recycled, and that [LDPE-coated paper cup] can't be and is not... And that brings us to the next point – if it can't recycled, will it biodegrade? No, [polystyrene foam will] not [biodegrade] in 4 million years. Nobody's lying about that. It will not biodegrade. That's a very common way of making cups now. They don't always have the bubble thing in the foam, but some of them just do a heavier coat of plastic on the outside. That can't biodegrade either. That's encased, the paper in there is encased in plastic. People go, "You should use a paper cup because that can biodegrade." And that's the danger is that most paper cups can start to biodegrade, and if they do the plastic's not going anywhere. But some of the bleaches that have been used, and the toxins in the printing process will, if that [paper] biodegrades, leach off into soil and waterways. So, do we want that to partial biodegrade or not?...And what they've [garbologists] found is that to biodegrade you need light, air, and water. But when you have a landfill, and you're putting layers of stuff and compacting it down, it's having a mummifying effect instead and it's preserving things...Maybe we should even line some of these landfills so things deliberately don't biodegrade anymore, and that way we get out of poisoning the environment. Which is clever, but all of a sudden any argument that you had for that and biodegradation has gone out the window...This [polystyrene] cup has the same environmental impact as a brick being thrown away. It will lie there. It will crush down because foam is mainly air bubbles. It will crush down to a fraction of its original size, something like 8 percent over time. But there's no CFCs being released, there's no toxins, there's no fumes, there's no poisons, there's no leaching. That's inert in a landfill. It has proven itself. It has as the same environmental impact as if you pulled a stone out of the bottom of your shoe and threw it off into the bush. It does nothing to the environment. Incidentally, in landfill right now, polystyrene packaging makes up something like .8 of the percent of the world's landfill space, and paper and cardboard products about 33 percent...It's just a perception that paper cups are [more environmentally sound]...A lot of people trip over on just the basics. People who feel that they are radical environmentalists haven't often done their homework. These [polystyrene] cups can't be made with CFCs and never have been. They're actually made with a process called steamed chest molding where the foam particles go into a mold and are hit with hot steam to expand...[Martin Hocking] was walking back to his office one day thinking "Gee this coffee's hot. Why has the University Café switched from foam to paper?" And he went back and went "I can make it back, it's too hot to hold." And they said, "Oh, it's an environmental thing." He happened to be associate professor of chemistry, so he gave his students an assignment of doing some research here to go "Are they doing something environmentally friendly or not?", and kick started a lot of research in that area. Incidentally with that hot cup thing, a lot of you'll notice Hudson's, if you go to a Hudson's coffee store an ask for a long black, you'll see it all the time at the airport as you walk past, they'll automatically double cup the thing. As do the McCafés , the McDonald's McCafés , like the trendy thing. In fact they'll use one of these [paper cups with a light foam exterior] that is still too hot to hold. So when you ask for a long black, which has no milk in it to cool it down, they'll automatically use two

cups. Whatever impact you're having on the environment, it's just been doubled by doing that because it's too hot to hold...In fact, in an increasingly take-away society where we're using more disposable packaging, if you're not going to sit down and use a permanent cup, for a hot cup your choice is foam or paper. The environmentally responsible choice of those two at this stage would have to be foam, overwhelmingly would have to be foam…What's happening there [at juice bars and cafés] is these [customers] get some questions and [the juice bars and cafés] have done some interesting stuff like coming up with brief versions of some of that [information of EPF] to say to the customers, and they use like table tents or little brochures…

MZ: I have a question about the environment as well as health. We've read about leaching of styrene in polystyrene. We've also read about the tea in the lemon juice with the eating of the styrene.

AR: Yeah. If you put hot tea and put lemon juice in it, it can because it's acidic and it tends to float on the top more around that rim on the top and can eat into it. It's not actually imparting anything into the foam. All it does is pop those bubbles. There's nothing melting into your coffee and making you sicker, it's impossible. Nothing leaches from polystyrene into a drink…

(stop tape)

AR: With our manufacturing process now, we have more of a waxy finish than a chalky finish. If you feel that [cup], you'll feel that it's more shiny than dull. That means that you're using good quality bead and you're filling up your molds nice and full which gives you a good structural sound cup and also at the same time gives you a nice shiny finish…

RH: What about tea? Is there a difference with tea?

AR: It's not the tea that does anything to foam. It's the acidity of lemon juice. So it's citric acid…

NG: Does Peter Rowland use DART?

AR: Yes, yes they do. In fact we print it for them. And something that I wonder about, in super markets, if something looks white and plastic it gets called into question. So at super markets all of a sudden, you'll notice that their packing bags have gone from white to green. What happens when you do that is you will halve the amount of questions you get. All of a sudden people don't see that as so white and it doesn't stand out anymore…So it's like a psychological thing as well. If something looks white, and shiny, and plastic: a super market bag or a white foam cup, it attracts more comments.

RH: So is that actually worse for the environment since it uses dyes?

AR: No. We actually have our own propriety inks, which are a plastic ink. They're not like a solvent ink. They're actually laid on and the queued on there, and that will never

come off. In 200 years time the cup's still there and the ink's still on it…We do some focus groups and stuff some times, and what we do is get people in and talk about coffee…and they have no idea what the purpose of the group is…and we have a stack of foam cups and a stack of paper cups. One hundred percent of the people make themselves a coffee in a foam cup…If you say, "Would you like your coffee in a foam or a paper cup?", still over half will still choose foam…One of our big selling points while we're out there is to say to people, "Hey, we're going to protect your hand from getting hurt, but going to give you a nice warm coffee as well."

Appendix E – Carolyn Meehan Interview

Carolyn Meehan – Marketing Research and Development for the Museum Victoria
27 March 2002
Others present were Nicholas Godlewski, Rachelle Hayes, and Manuel Zeno

1. There is a contract clause between Peter Rowland's Catering and the Melbourne Museum that states that if there is customer dissatisfaction, then the Melbourne Museum can intervene with Peter Rowland's Catering if Peter Rowland's does not ensure customer satisfaction.

2. The expectations of the four locations of the catering services within the Melbourne Museum each have different expectations by museum visitors. The Brasserie uses crockery and the Balcony Café, the Tuckshop, and the Theatre Café all use EPF. The most problematic area for the use of EPF is the Tuckshop followed by the Balcony Café. There is a need to examine and determine these problems and expectations for the Tuckshop and the Balcony Café by surveying their customers.

3. The environmental aspect was not the most important factor within the Balcony Café. It was the fourth most important aspect of the Balcony Café, preceded by the expense of the food, the quality of the service at the Balcony Café, and the variety of food at the Balcony Café.

4. The Marketing Research and Evaluations Committee (MREC) uses visitor profiles as its main source of demographic information and data collection. The visitor is given the survey (visitor profile) and is asked further comments in response to the survey. The visitor profiles and further comments are then documented by MREC. The MREC is responsible for the collection of data for Sciencworks, the Immigration Museum, and Melbourne Museum. Also, MREC uses one-on-one surveys with visitors instead of having visitors completing the survey themselves as to lower the non-response rate.

5. MREC executed the Melbourne Museum Catering Outlets Survey in October 2001 to obtain information from the Museum's visitors on their satisfaction of Peter Rowland's Catering services, practices, and products. The surveys were given to visitors at random leaving the respective eating areas (Balcony Café, Theatre Café, Brasserie, and the Tuckshop) as exit interviews, and were done by interviewers selected and employed by the Museum Victoria. The interviewers worked in four hour shifts and the survey was completed in three days. The number of people approached was recorded as well as the number of people participating in the survey so that a non-response error could be recorded. If a visitor did not wished to be bothered with a survey, they were left alone.

6. The topics within the MREC report pertinent to the project were "Quality of Containers / Cutlery" and the "Environmental Friendliness of Containers /

Cutlery". The Tuckshop received the worst responses of these two topics. The demographics for the negative responses for the "Quality of the Containers / Cutlery" were mainly groups with adults and 40 years of age and older. The demographics for the negative responses for the "Environmental Friendliness of Containers / Cutlery" were mainly groups with children, groups with adults, and people with non-tertiary qualifications. This shows that there is a wide negative response towards the use of containers within Peter Rowland's Catering, and is not related to a single demographic.

7. It is possible to perform surveys at the Tuckshop and Balcony Café as long as it is scheduled beforehand, and the questions are accepted by MREC. The recommendations given for the survey were that it should be close to one page in length, take no more than ten minutes total for a visitor to complete, and to have a sample size between 100 and 150 visitors. The proposed dates for the survey to be executed are 5 April and 8 April. The problem found for these dates is that most of the demographics will be families and may perhaps bias the surveys in some way. However, it was noted that most families eat at the Tuckshop and not at the Balcony Café. If both places are to be interviewed, there will be a better representation of the total visitor population.

8. MREC is planning a survey comparable to the Melbourne Museum Catering Outlets Survey, but for the Melbourne Museum's employees. Surveying the employees for this project was recommended against since it was observed that they already have negative opinions about Peter Rowland's Catering service. These opinions could bias the results of the survey and would not be helpful for this project.

9. The Melbourne Museum has a focus towards the environment while Peter Rowland's Catering has a focus business. Even though both are separate entities within the Melbourne Museum complex, both need to reach an agreement upon what should be done. This includes the proposed exhibit or signage, or if the material changes, an explanation as to why the cost of hot beverages at the Balcony Café, Theatre Café, or Tuckshop has increased.

Appendix F – Steve Richardson Interview

Steve Richardson – Manager of Peter Rowland's Catering at the Melbourne Museum
7 April 2002
Others present were Nicholas Godlewski, Javier Ortiz, and Manuel Zeno

1. Reasons for using Expanded Polystyrene Foam (EPF): The balcony café has no running water, bottled water was used for the first twelve months of operation. As of 29 March 2002, the balcony café is using one way plumbing for the coffee machine. Dishwashing of mugs from the Balcony Café at the Brasserie and loading bay facilities is unfeasible. The initial menu design for the Balcony Café called for an insulation material for both hot and cold items. Since the museum is primarily aimed at families and elderly visitors, hygiene was also an issue. It was found that the manufacturing, recycling, safety, health, and materials of paper cups compared negatively to EPF. This included the fact that paper cups are lined with polyethylene and thus are similar in composition to EPF, save for the paper lining. EPF is also known for its universal usage within the Catering services, as it fulfils the needs of the caterer in serving soups, salads, pasta, and any other food that requires a sealed container. The only down side of using EPF as of now is the unavailability of recycling bins. The Catering service was notified of the possible existence of an EPF recycling company in the area.

2. Materials used at other Peter Rowland Catering Facilities: The majority of catering is for private or venue events, such as weddings and corporate and do not use disposable materials. Peter Rowland caters at Flemington and uses recycled corrugated paper that can be disposed of. The manufacturer is Richard Pratt, and the product is called Visy Board. The nature of the menu is different, serving hot dogs, chips etc. Flemington has different needs and specifications for the products used. The museum currently uses lined paperboard "wings" for serving sandwiches and pastries. There is a need for sealed containers and the material of choice is EPF. Peter Rowland has looked into paperboard products and is currently reviewing their choice of materials.

3. Awareness of visitor responses: Peter Rowland monitors visitor response in questionnaire sheets. The data from Peter Rowland is the same as provided to us by the Market Research and Evaluations Dept. at the Museum. The Museum performs quarterly interviews with visitors about the catering.

4. Number of EPF cups used: Not available at this time. It will be provided later.

5. Cost of purchasing, screening, and shipping and supplier.

   EPF: Dart is supplier, 20k-50k units bought in bulk. The last units ordered have not been screened. Reason: internal reviewing within Peter Rowland Catering.

Ceramic mugs: Cart began as a temporary food establishment, but became a permanent fixture due to its success. Water cannot be directed into the cart because Curators do not allow water to run through or near galleries within the Museum for safety purposes. Therefore, ceramic mugs are currently not feasible in the Balcony Café.

6. Consideration of other materials: Peter Rowland Catering has considered using various materials for serving foods and beverages. Cornstarch cutlery and paper products were considered. These materials were abandoned because of various aesthetic and health issues. Cornstarch cutlery dissolved in hot foods, while the paper products suffered from leakage. Plastics at Peter Rowland Catering are currently being partially recycled back of house. Plans are in motion to include the front of house in the recycling program within the Museum. In 3-6 months the front of house recycling program should be applied fully.

7. Feasibility

   Ceramic mugs: The use of ceramic mugs as a reusable material in the Balcony Café is not feasible for Peter Rowland's Catering since they are not able to be efficiently washed. However, the sale of coffee in souvenir ceramic mugs is a possibility. As a past promotion, the Museum held a coffee exhibition, which offered visitors to try numerous types of coffee over a few weeks. Peter Rowland's had an agreement with the Museum Shop to allow for visitors to purchase mugs from the shop and then use the mugs at the Balcony Café and receive the $2.00 discounted price. The problem now is that the promotion is over, and visitors can no longer receive the discounted price. Also, Peter Rowland's is not allowed in their current contract with the Museum to sell souvenir mugs to visitors, as it infringes upon the rights of the Museum Shop. However, as long as only mugs were sold, and the sale was in the designated areas, the contract may be amended so that Peter Rowland's can sell the souvenir mugs.

   Paperboard: The use of paperboard materials for hot beverage containers is currently under review.

   Other: Peter Rowland's is currently looking at other materials for stirrers and utensils, but not for hot beverage containers.

8. Staff availability for ceramic mug handling and transportation: not viable.

9. Recycling bins within the Café area: Peter Rowland's Catering has placed recycling bins in the back of house of the Museum over the past 6 months, separating glass bottles, plastic bottles, paperboard packaging, and organic products from the rubbish. The materials that are recycled in the back of house are only from that area, and there are no materials from the front of house recycled in that location. Peter Rowland's Catering also started a recycling program in the Museum offices at the end of March. The reason that the recycling program started in the back of house was so that the employees could

become acquainted with the program, and when the program finally is introduced in the front of house, the employees will be well adjusted to it. The Museum has organised groups for recycling, and is currently moving the recycling program from the back of the house to the front of house as well. The expected time for this move to happen is three to six months (July to October).

10. Other Comments: The temperature of the coffee is held between 64°C to 69°C. Coffee is sold for $2.80 at the Balcony Café. With the Museum identification badge, employees receive a ten percent discount and can purchase coffee for $2.50. If a mug is brought to the Balcony Café, coffee can be purchased for $2.00. Most of the disapproval is from the staff of the Museum, since they are here almost every day. An idea to help relations with staff is to allow for dispense and retrieval of utensils and mugs. This would require Peter Rowland's to gain the right of access to kitchens within the Museum offices, and would require an amendment to the current contract Peter Rowland's holds with the Melbourne Museum.

11. Recommendations from Steve Richardson: The education of the visitors is very important for the success of the recycling program, and to do so several ways were proposed. The first is to have a flier on trays that people bring to their seats. The next is to have a two-sided laminated menu, one side with the actual menu items and the second side with environmental facts of the selected material(s). The menu can either be placed on a wall so it can be seen by customers, or at the beginning of the queue, and the customer can place the menu in a box at the end of the queue so it can be used again. The last way is to use an exhibit and signage. This would allow for visitors to receive more of a visual aide in the understanding of the environmental impacts of each material.

Appendix G – David Bywater Interview

David Bywater - Sales Manager Carter Holt Harvey Packaging:
23 April 2002
Others present were Rachelle Hayes, Javier Ortiz, and Manuel Zeno

1. Foam is the least expensive option for serving a hot beverage. It also has the best insulation qualities in the market. However, it is difficult to print a quality image on foam. Customers usually view foam cups as a cheaper product.

2. Paper is the mid-cost option. Aesthetically, paper cups may be printed with an image of better quality than foam. In business terms, the graphical interfaces in the paper cup industry are preferred by many businesses to promote their logo.

3. Paper's poor insulation is not a problem for sit-down establishments, but in take-away scenarios it quickly becomes uncomfortable. A few solutions for this lack of insulation are to add a sleeve, add a layer of corrugated cardboard, or develop a way to aerate the paperboard.

4. Foam is not biodegradable. Paper cups have a polyethylene lining to waterproof them. It also prevents the chemicals in the paper from leaching out into the beverage. If you place a paper cup in a compost pile it will break down in a couple of weeks, but the thin layer of plastic will remain. Paper is better than foam in terms of biodegradation, but still not ideal.

5. Foam cups require less energy to produce than paper cups if you only consider the manufacturing process of each. If you consider the whole process of extraction and refining of petroleum, then the energy consumption of foam cup manufacturing process is much more.

6. Paper cups are not commonly recycled, as they are more of a disposable product. In reality, paper can only be recycled about seven times. Fibers break down each time paper is recycled until the paper will no longer hold together. Milk cartons are a similar product to paper cups and are recycled. Australia does not seen to have any facilities that would remove the polyethylene lining in paper cups in order to recycle them.

7. The Packaging Covenant, an agreement between Australian manufacturers, has been in effect for the past 12 months. It aims to streamline energy use and reduce waste.

8. Food establishments with a high customer turnover usually prefer disposables because they are less expensive and require less work since they do not need to be washed.

9. The shipping costs for foam and paper are more or less the same as they are charged by volume, not weight. For small cups it is cheaper to buy foam, but for larger cups, paper becomes the less expensive option.

10. People perceive paper cups to be more environmentally friendly than they actually are. The general public does not know about the polyethylene lining.

11. Anything that comes in contact with food is not allowed to contain toxic chemicals. Therefore any chemicals that may leach into the ground when paper breaks down are probably not dangerous.

12. The latest development is aerated paper cups, which have almost the same insulative qualities as foam cups.

13. The paper cup manufacturing process results in much waste. Currently, it can be recycled by making energy for the plant. The waste can be combusted to drive turbines. Waste can also be returned to the mix, but it must be sent back to the beginning of the process.

14. The Australian Carter Holt Harvey Packaging company is a sister company to that of the United States. Both companies receive all of the same base materials.

15. Perception is everything when it comes to business. It is important to give the customer the best product. Hot beverages do not taste differently when served in foam or paper cups, as proven by taste tests. However, the public has a negative perception of foam cups, and many food establishments have chosen paper cups for this reason.

Viva Juice and the Environment (www.vivajuice.com.au)

We not only care for the health of our customers, but also for the health of Mother Earth. That's why careful consideration went into all decisions about packaging.

Viva uses polystyrene packaging. Isn't that bad for the environment?
It's a good question. But rest-assured Viva Juice's decision to use this type of packaging was based on research that proved it was environmentally friendly.

Doesn't polystyrene packaging deplete the ozone layer?
No. Viva Juice's polystyrene cups are not manufactured with chlorofluorocarbons (CFCs) or any other ozone-depleting chemicals.

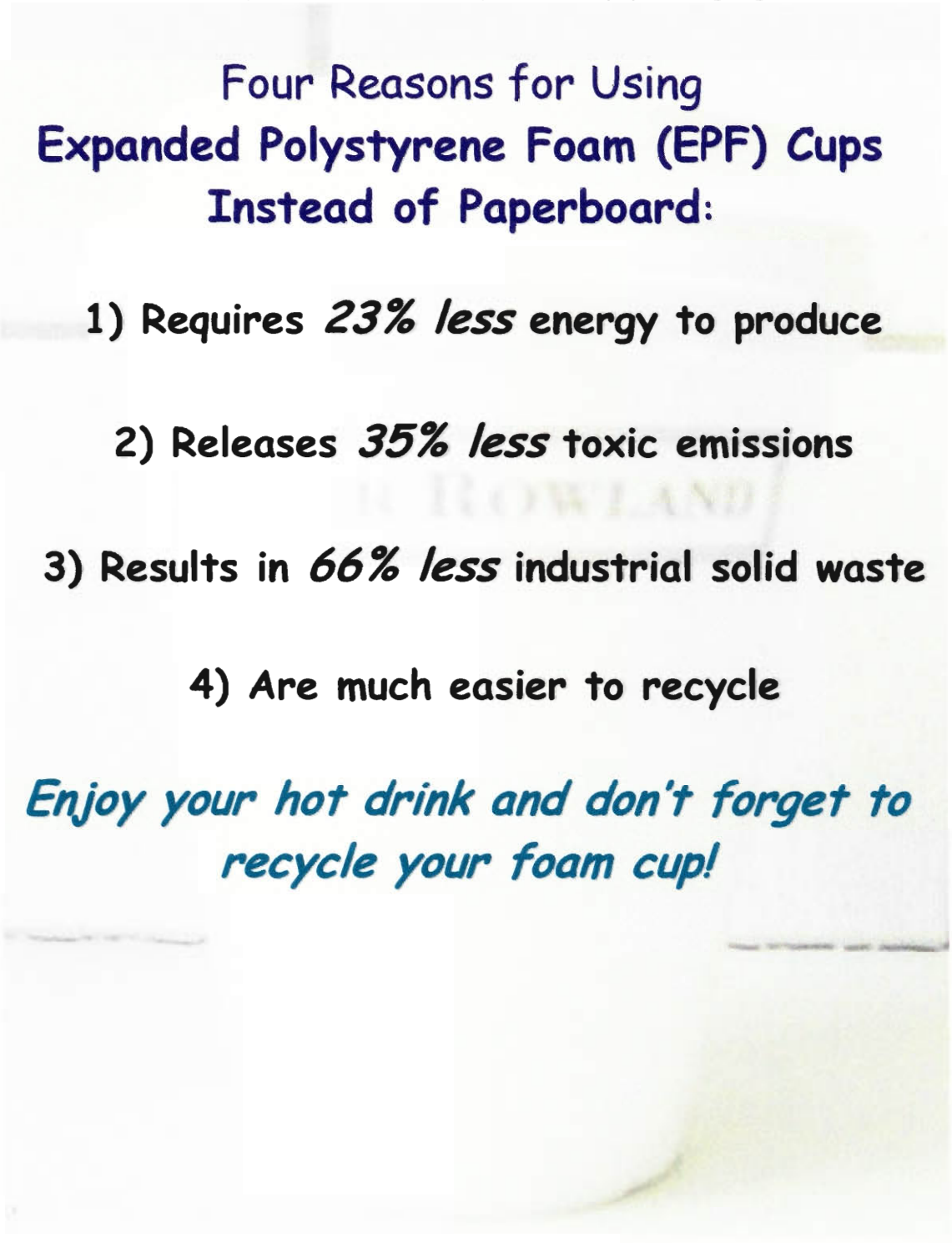
Aren't paper cups better for the environment?
Not necessarily. During manufacturing, every paper cup wastes more than 3 times the amount of chemicals than polystyrene cups and about 580 times more water. To add to this, most paper cups that are used in the food industry are coated with wax, polyethylene or other non-biodegradable sealants.

So, why does Viva Juice use Polystyrene cups?
Polystyrene is better on energy consumption than paper.
Polystyrene production is less resource and chemically demanding.
Polystyrene produces safe and stable landfill material.
Polystyrene can be converted to heat & light energy.

Appendix I – Signage Layout

Why Use Foam Cups?

Melbourne Museum and Peter Rowland's Catering are committed to using environmentally friendly packaging.



Four Reasons for Using Expanded Polystyrene Foam (EPF) Cups Instead of Paperboard:

1) Requires *23% less* energy to produce

2) Releases *35% less* toxic emissions

3) Results in *66% less* industrial solid waste

4) Are much easier to recycle

Enjoy your hot drink and don't forget to recycle your foam cup!

Appendix J – Survey Documents

The following three pages include our survey questionnaire, Card A, and Card C. Card A was given to the interviewees for the first question to help them rate the importance of several hot beverage container characteristics. Card C included age ranges and educational levels, as well as our six methods of display.

Beverage Container Survey – April 2002

Hello, my name is SAY YOUR NAME from Melbourne Museum. We are asking people what they think about the Balcony Café's hot beverage containers. Would you mind answering some questions? The information is strictly confidential and will be used for research purposes only. It should take about 3 mins.

1 Thinking about types of containers you use for hot drinks, which of these characteristics are important in your decision to use a particular kind of container? Number 1 for very important, 2 for important, three for not important and 4 for not at all important.

ROTATE

					can't say
[ ] appearance of the container	1	2	3	4	5
[ ] ability to keep your drink hot	1	2	3	4	5
[ ] cost of the container	1	2	3	4	5
[ ] feel of the container in your hand	1	2	3	4	5
[ ] feel of the container on your mouth	1	2	3	4	5
[ ] ability to be recycled	1	2	3	4	5
[ ] ability to break down in land fills	1	2	3	4	5
[ ] materials used to make the container	1	2	3	4	5
[ ] cleanliness of the container	1	2	3	4	5

2 What do you think about the hot drink containers at the Balcony Café?

_____

_____

_____

3 And why do you think that?

_____

_____

_____

_____

4 Would you consider yourself to be or not to be an environmentally responsible consumer?

responsible 1
not responsible 2

5 And why is that?

_____

_____

_____

6 The Museum is considering a number of options regarding drink containers. One option is to keep the current hot drink containers. What do you think about that?

_____

_____

_____

7 Another option is to change the type of hot drink containers. What kind of hot drink container would you suggest we use?

_____

_____

8 The following are a number of ways the Museum may use to communicate to visitors their final choice of hot drink containers. Looking at the top of CARD C, please select the method you most prefer.

A _____
B _____
C _____
D _____
E _____
F _____

9 Do you have any other comments about the hot drink containers at Melbourne Museum?

_____

_____

_____

_____

10 Looking at the middle of CARD C. Would you mind telling me your approximate age? Just say the number.

18-19	1	45-49	7
20-24	2	50-54	8
25-29	3	55-59	9
30-34	4	60-64	10
35-39	5	65-69	11
40-44	6	70+	12
		REFUSED	13

11 Are you the parent or guardian of any children aged 17 years or younger?

yes 1
no 2
REFUSED 3

12 Looking at the bottom of CARD C. What is the highest level of education you have reached to date? Just say the number.

none or some secondary school 1
finished/now studying HSC/VCE/Yr 12 2
diploma from C.A.E./TAFE 3
graduate degree from uni or C.A.E. 4
postgraduate diploma/degree (Grad.dip/Masters/PhD) 5
other (*specify*) _____ 6
REFUSED 7

13 RECORD

Female 1
Male 2

CARD A

IMPORTANCE RATING

very important 1
important 2
not important 3
not at all important 4

CARD C

METHODS OF COMMUNICATING

A a small exhibit or display in the café

B a sign in the cafe

C a brochure available at the register

D a small sign on each of the tables in the cafe

E information on the computers at InfoZone

F posted on the Museum's website

AGE

18-19 years 1

20-24 years 2

25-29 years 3

30-34 years 4

35-39 years 5

40-44 years 6

45-49 years 7

50-54 years 8

55-59 years 9

60-64 years 10

65-69 years 11

70+ years 12

EDUCATION LEVEL

none or some secondary school 1

finished or now studying H.S.C./V.C.E./Year 12 2

Diploma from C.A.E./TAFE 3

Graduate degree from university or C.A.E 4

Postgraduate diploma/degree (Grad.Dip/Masters/PhD) 5

Appendix K – Coding Schemes for Beverage Container Survey

For the survey, open-ended questions were asked as to probe the customer. These open-ended questions needed to then be analyzed through coding schemes. A different coding scheme was devised for each open-ended question. The following are the information on the coding schemes that were used in the analysis of the Beverage Container Survey.

The first open-ended question, question two, the customer was asked what they thought about the EPF container use at the Balcony Café. The coding scheme for this question resulted in ten key words or phrases to be looked for in the customers' answers. The coding scheme for question two is shown in Table 20. Also, the meaning behind the particular words and phrases were then determined as positive, negative, or neutral towards EPF.

Table 20
Coding Scheme for Beverage Container Survey - Question Two

Key word or Phrase	Positive / Negative / Neutral
Didn't think about it	Neutral
Don't like	Negative
It's fine	Positive
Standard or average	Positive
Disappointed	Negative
Commented on strength	Positive
Surprised at EPF use	Negative
Rather drink out of paper or china	Negative
Concern for biodegradability / recyclability	Negative
Wanted bigger cup	Negative

As a follow up to question two, question three was devised to determine why the customer had given their answer for question two. There were twelve key words and

phrases in the coding scheme. It was also divided into negative and positive comments. The coding scheme for question three is shown in Table 21.

Table 21
Coding Scheme for Beverage Container Survey - Question Three

Key word or Phrase	Positive / Negative / Neutral
Not environmentally friendly	Negative
Added taste to coffee	Negative
Not big enough	Negative
Feels awkward	Negative
Commented on cup top (it was good)	Positive
Thick or strong	Positive
Standard or average	Positive
Rather drink out of ceramic	Negative
Does the job	Positive
Clean / Hygienic	Positive
Recyclable	Positive
Keeps the drink hot	Positive

Question five is the third open-ended question of the survey. It is a follow up question to question four, in which the customer states if they are environmentally responsible or not. There were nine key words and phrases for the coding scheme and are shown on Table 22.

Table 22
Coding Scheme for Beverage Container Survey - Question Five

Key word or Phrase
Recycle
Buy environmentally friendly products
Reduce waste
Think about the future
Try to be environmentally conscious / aware
Rather use china
Don't care
Time constraints / limited choices
Costs

Question six gave the customer the option to say what they felt about the Balcony Café keeping EPF as the hot drink container. The coding scheme of this question only looked if people wanted to keep EPF or wanted it to be changed. The two categories given for the coding scheme were "Change cups" and "Stay the same".

In question seven, the customer was asked what they suggested the hot beverage container material should be switched to. There were coding scheme was for the three proposed materials and another category, "Something environmentally friendly". The coding scheme for question seven is shown in Table 23.

Table 23
Coding Scheme for Beverage Container Survey - Question Seven

Key word or Phrase
Reusable / Ceramics
Paper
EPF
Something environmentally friendly

The last open-ended question, question nine, gave customers the chance to give additional comments with respect to the hot drink containers at the Melbourne Museum. There were eight key words and phrases to look for, as shown in Table 24.

Table 24
Coding Scheme for Beverage Container Survey - Question Nine

Key word or Phrase
Small
Boring look
Desired real cup / china / ceramic
Lid is good
Hygiene
Not strong / flimsy
Expensive
Recycling bin availability

Also, with every question, the non-responses were recorded. Questions could have more than one key word or phrase in them, sometimes giving more than 100 total responses. All other questions were multiple choice and rating with only one answer per person given and no coding schemes were necessary.

Appendix L – Glossary of Terms

(in alphabetical order)

British Thermal Unit (Btu) - The quantity of heat required to raise the temperature of one pound of water from 60° to 61°F at a constant pressure of one atmosphere.

Carcinogenic - Cancer causing.

Central nervous system – The portion of the vertebrate nervous system consisting of the brain and spinal cord.

Chlorofluorocarbon - Any of various halocarbon compounds consisting of carbon, hydrogen, chlorine, and fluorine, once used widely as aerosol propellants and refrigerants. Chlorofluorocarbons are believed to cause depletion of the atmospheric ozone layer.

Cytogenic - Of or pertaining to cytogenesis or cell development.

Dioxin - Any of several carcinogenic or teratogenic heterocyclic hydrocarbons that occur as impurities in petroleum-derived herbicides.

Furan - One of a group of colorless, volatile, heterocyclic organic compounds containing a ring of four carbon atoms and one oxygen atom, obtained from wood oils and used in the synthesis of furfural and other organic compounds.

Greenhouse effect - The phenomenon whereby the earth's atmosphere traps solar radiation, caused by the presence in the atmosphere of gases *(Greenhouse gases)* such as carbon dioxide, water vapor, and methane that allow incoming sunlight to pass through but absorb heat radiated back from the earth's surface.

Hematological - Affecting the blood and blood-related organs.

Lipid - Any of a group of organic compounds, including the fats, oils, waxes, sterols, and triglycerides, that are insoluble in water but soluble in nonpolar organic solvents, are oily to the touch, and together with carbohydrates and proteins constitute the principal structural material of living cells.

Neurotoxic - Damaging to nerve tissue.

Neurotoxin – A toxin that damages or destroys nerve tissue.

Nitrogen oxide- Any of several oxides of nitrogen formed by the action of nitric acid on oxidizable materials.

Ozone layer - A region of the upper atmosphere, between about 15 and 30 kilometers (10 and 20 miles) in altitude, containing a relatively high concentration of ozone that absorbs solar ultraviolet radiation in a wavelength range not screened by other atmospheric components.

Peripheral nervous system – The part of the vertebrate nervous system constituting the nerves outside the central nervous system and including the cranial nerves, spinal nerves, and sympathetic and parasympathetic nervous systems.

Quadrillion – One thousand, thousand, thousand, thousand, million or 1,000,000,000,000,000

Sodium hydroxide - A strongly alkaline compound, NaOH, used in the manufacture of chemicals and soaps and in petroleum refining. Also called caustic soda, lye.

Sulfur oxide - Any of several oxides of sulfur.

Chapter 8

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