

Prospectus

Solving Inefficiencies in the Circularity of Consumer Packaging
(Technical Topic)

**Incorporation of Environmental Corporate Social Responsibility
(CSR) with Traditional Management Strategies**
(STS Topic)

By

Ryan Crosser

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Technical Project Team Members:

Wyatt Black
Alec Brewer
Cutter Grathwohl
Tilden Winston

On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

Signed: 
Ryan Crosser

Technical Advisor: James M Fitz-Gerald, Ph.D.
STS Advisor: Sean Ferguson, Ph.D.

Introduction

Each year the United States produces an increasing volume of single use packaging that contributes to our waste production. Our group has chosen to tackle the challenge of increasing the circularity of consumer packaging through the creation of a new biodegradable or recyclable element to an existing consumer product that can increase its recovery rate by replacing a previously contaminated piece. This work aims to solve a specific problem in the packaging industry while also setting a precedent for future packaging design to be 100% recoverable to reduce the consumption of virgin materials in packaging production.

While the capstone is aimed at creating more circularity and increasing recovery rates within packaging, the STS research aims to expand on the debate of Shareholder vs Stakeholder theories and address the social question of "How can we incorporate more environmental conservation efforts into CSR initiatives?". Furthermore, the STS research looks into what are the driving and limiting factors in companies partaking in more corporate social responsibility (CSR) initiatives and their effectiveness.

Technical Topic

The paper and plastic industries produced 420 and 360 million metric tons respectively in 2018 (Chen et al., 2021, Paper and Cardboard Production Worldwide, n.d.). The large scale and rapid growth of these industries, in conjunction with the National Sword Policy, have exposed

some major holes in the current recycling infrastructure in the United States. In recent years we have seen the highest recycling rates recorded, but a major change was made in the market with the passing of the National Sword Policy. The policy was enacted by the Chinese government on January 1st of 2018 and constrained their material imports in response to dissatisfaction with material quality (Katz, n.d.). Because of this policy, and because China used to handle 50% of the world's recyclable waste, there is now an increasing demand for domestic recycling infrastructure and better recycling practices. Thus, our capstone focuses on solving problems that exist within current packaging recovery, specifically looking towards holes in circularity of packaging caused by contamination.

Containers and packaging account for 29.9% of the total municipal solid waste (MSW) generated annually. In 2017 that volume was 80.1 million tons [of MSW]. The EPA defines containers and packaging as "products that are assumed to be discarded the same year the products they contain are purchased" (US EPA, 2017a). Almost all products sold at stores utilize single use packaging that has a 50% chance of ending up in a landfill. When looking at the material used in consumer packaging, we predominantly see paper and plastic being used. Plastic has a lower recycling rate at just 8.4% while paper boasts a 73.3% recycling rate (US EPA, 2017a, US EPA, 2017b). However, both of these materials face a serious contamination problem that significantly decreases their recycling rates.

Since the passing of the National Sword policy the acceptable contamination rate for material shipments to be recycled is 0.5% contaminated or less, but the average contamination rate [curbside] within the United States is currently 25% which leads to a significant amount of recyclable materials in the landfill or being incinerated (Bell, 2018).

Under the guidance of James Groves, Ph.D., P.E., and in partnership with Kombucha Biomaterials LLC and Transfoam LLC, Wyatt Black, Alec Brewer, Cutter Grathwohl, Tilden Winston, and I will develop a packaging product or subproduct that serves to reduce the contamination rate of curbside recyclables.

We have begun this process by broadly defining sustainability goals of increased recovery rate, increased recovery volume, decreased curbside contamination percentage, reduction of virgin material consumption, and in the case of new product development the ability to integrate with existing manufacturing practices with minimal cost and infrastructure changes to promote adoption. The second set of metrics that will be used are dependent on the specific item/packaging that we identify as our specific problem space. More quantifiable metrics will be used at this point to determine material properties and constraints that need to meet current product and Food and Drug Administration (FDA) standards. These properties and their respective American Society for Testing and Materials (ASTM) or Technical Association of the Pulp and Paper industry (TAPPI) standards have been pre-

researched and laid out in a table for use as needed. Additionally, we will continue to update our broader sustainability goals to match quantitative market size upon selection of a specific material product or problem.

Rather than assigning specific roles to each individual we recognize the experience and knowledge brought to the table by everyone, and have an adaptive structure that maximizes each's knowledge in certain areas and lack of information bias in other. For myself, I have a stronger background on the business side thus I am taking lead on corporate adoption efforts. At the same time, I am not as well versed in material properties of Polyhydroxybutyrate (PHB) and Bacterial Cellulose (BC), which are our potential material, so I serve as an unbiased consultant for those functions of our project.

STS Topic

In the 1960's and 1970's the precedent for business CSR was the idea of shareholder theory. Stating that businesses only social responsibility was to maximize financial return for shareholders, within legal limitations (Friedman, 2020). There was no consideration for anyone outside of the company, and this standard is still prevalent today in many companies. This narrative partially changed in 1984 when Professor Edward Freeman published the idea of stakeholder theory. This theory focused on how individuals, despite not being stakeholders, can be impacted by the company's actions, and how those individuals can impact long term success

of the company (Freeman, 2010). This idea ushered in a new wave of CSR ideals where companies are supposed to consider consumers, distributors, local communities, etc. due to a connection between the businesses and communities surrounding them. Additionally, this ideal was valuable because it was backed by the financial incentive that companies should perform better in the long term by upholding the ideals of stakeholder vs shareholder theory. This idea of driving longevity and success for companies through expanded stakeholder considerations has always been a balance because it is hard for companies to stray from the feeling of making shareholders happy, as this was such a long-term ingrained mindset for business. Ideally, your shareholder, company mission, and CSR efforts are aligned for best results, but this can be difficult and seen in many different forms.

The Harvard Business Review groups these companies and their CSR efforts in 3 different types. First, there are those that focus exclusively on CSR in the form of donations, community engagement, and other philanthropic effort support. Philanthropy events of this style are fairly common, such as a blood drive or donation drives, but have little alignment and effect between the company and philanthropic group. The second type focuses on operational improvement that reduce the companies carbon footprint or provide some societal benefit. An example of this would be reducing air pollution or raw material consumption in their production line. These efforts often provide societal/environmental benefit, but are

frequently driven by the companies cost reduction or profit increase. Lastly, the third type of CSR focuses on redefining business models directly to tackle environmental and societal issues. These companies often are the most impact because their success is predicated on achieving these philanthropic results (Rangan et al., 2015). The value in these three groups is that we can have a better understanding of what defines success for each of them. This is important because they each have such different metrics based on how their philanthropic efforts align with their business model. Additionally, they allow us to get a better understanding of what companies are and aren't up to standards in CSR, and how to better help those companies improve their current CSR initiatives. Lastly, it is known, based on these metrics, that companies perform the best when their company mission, stakeholders, and C-suite executives align on their issues because without proper effort and alignment from the top these philanthropic missions are often much more aimless and less impactful overall.

Now that we know about current and previous CSR practices, how they can be measured, and how to improve them, I want to address future CSR practices with specific focus on environmental considerations. The major change between shareholder and stakeholder theory was the idea of benefitting from the consideration of more individual and groups than those strictly financially invested. Additionally, it touches on the concept that without those stakeholders your business would never be able to survive

long term. A further extension of this thinking is that without the environment, natural resources, and healthy individuals where do we make product? What do we make products with, and who do we make them for? This idea in itself is extremely philosophical, but some examples of its application can be seen in how businesses conduct valuation on the world around us. For example, the federal government owns about 24% of the land in the United States which is valued at \$1.8 trillion, and likely higher if it was able to be developed (New Estimates of Value of Land of the United States | U.S. Bureau of Economic Analysis (BEA), n.d.). The main issue with this is that there is no accounting for the fact that we can never get this land back. There is an extremely finite volume of land available and by the principle of supply and demand we will eventually hit a point where the demand for land has grown with our population, and we no longer have adequate supply. Areas can be undeveloped and trees replanted; however, it will take hundreds and thousands of years to restore them to their original state, again time that is unaccounted for in the initial valuation. Additionally, potential future industries can't be accounted for if we take the environment for what it's worth now. For example, the National Parks Service who generates \$41.7 billion annually in ecotourism (National Park Service Visitor Spending Generates Economic Impact of More Than \$41 Billion - Office of Communications (U.S. National Park Service), n.d.). We can't keep applying traditional valuation models to our environment and exploit it like it is

infinite when it is not. Another example of this is in biodiversity and extinction. When an animal goes extinct it cannot be brought back, yet we hunt them and destroy their habitats as if they can, all because we can profit from making exotic food and garments in the short term.

The Royal Society conducted a study in 2019 and found that “Governments, private sectors and civil society invested approximately US\$21.5bn between 2001 and 2008 into global conservation efforts” (Barbosa & Tella, n.d.). This issue is that even with this investment we failed to reduce the rate of biodiversity loss because the investment was insufficient and the implemented solutions had a poor cost effectiveness ratio (Barbosa & Tella, n.d.). This is important because it tells us that there is potential here. First, we need adequate investment, because without it there isn't much that can be done. Second, just like with businesses we need that top-down alignment to adequately use those funds to solve our problems. This makes it the perfect space for the overlap between companies that need to strengthen their holistic CSR initiatives and environmental agencies that desperately need money and great financial efficiency, which businesses are really good at.

Going forward, I plan to analyze the comparative impact of companies, with and without top-down alignment, on their CSR objectives using the metrics from the Harvard Business Review model. In addition, I plan to looking at conservation efforts and their financial inefficiencies to try and not

only address their shortcomings, but to potentially find mutually beneficial alignment between these groups and companies that have similar missions or are looking to expand their CSR initiatives.

Next Steps

- Conduct analysis on companies CSR effectiveness for companies that see alignment from their executives and shareholders to those that don't have this alignment.
- Compare large vs small companies, do startups have a higher affinity for CSR? Is this due to their small size, or because of their ability to align?
- Identify holes in environmental conservation efforts. Frequently there is debate of public vs privatization of the environment. What are the pros and cons of this? Can we reach greater heights by privatization?
- In relationship to the technical research, is there an overlap? How can I apply that work to the three buckets method? I already see a connection between the second company type and the product improvements that we are trying to make.

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