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**Title:** *Creating an Easier Squeeze*

The accompanying research report is submitted to the University of Wisconsin-Stout, Graduate School in partial completion of the requirements for the

**Graduate Degree/ Major:** MS Degree Operations and Supply Management

**Research Advisor:** David Ding, PhD, Professor

**Submission Term/Year:** Fall 2019

**Number of Pages:** 45

**Style Manual Used:** American Psychological Association, 6<sup>th</sup> edition

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**Maier, Brianne C. H. *Creating an Easier Squeeze***

**Abstract**

Company XYZ is a food manufacturing company looking to expand their portfolio of products. The company is focused on delivering product innovation that meets consumers' needs and expectations. The company launched a new squeezable product, with the goal of replicating success of squeezable products in other categories such as mayonnaise, ketchup and jelly. However, the company's squeezable product was not performing well in market. The repeat purchase numbers were very low, and the company was receiving complaints from consumers stating that the product was too difficult to squeeze.

As a response to the consumer contacts Company XZY conducted research to determine how consumers ranked this product, in terms of squeezability, against existing products in the market place to get a better understanding of consumer's acceptable squeeze force range. The company also worked on product improvements to make the product easier to squeeze. The focus of the product improvement was centered on product viscosity and packaging changes. Employee squeeze panel testing was performed, and the data analyzed to determine which changes resulted in an easier to squeeze product. This data was used to guide the recommended product change to result in a product that consumers would be more satisfied with.

### **Acknowledgments**

I would like to thank all my professors at UW-Stout for sharing their knowledge, insights and experience with me during my grad school journey; especially Professor David Ding, my advisor and study aboard professor. The lessons and experiences I have gained during grad school are invaluable.

I would also like to thank my employer for letting me use a real-life problem for this paper and their support of me completing my graduate degree.

Finally, I would like to thank my family and friends for encouraging and supporting me during this journey.

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## Chapter I: Introduction

Company XYZ is a food company looking to expand their portfolio of products. The company has 10,000 employees worldwide. The company is focused on delivering product innovation that meets consumers' needs and expectations. In 2018, Company XYZ launched a new squeezable product, with the goal of replicating the success of squeezable products in other categories such as mayonnaise, ketchup and jelly. This product took almost three years to develop. Work started in 2015 as Company XYZ's Research and Development (R&D) Team began creating a way to make a spread come out of a bottle without sacrificing taste, texture or appearance.

This product is complex and dependent on processing parameters, formulation and packaging interactions. Small changes to the process (such as temperature or shear) affect the performance of the finished product, including squeezability and product texture. Changes to formulation (including what ingredients were used and level of ingredients) impacted taste, product consistency, squeezability and appearance. Finally, the packaging played a role in the total product offering, changes to the bottle shapes, size and material resulted in changes to how much force was needed to dispense product from the bottle.

The Process Research and Development, Packaging Research and Development, and Product Research and Development functions worked closely together to make sure changes made to the formulation or process resulted in a product that could be squeezed out of a container. This necessitated many hours in the pilot plant and production plant trialing different variables. Variables that were tested included but were not limited to: 1.) different formulations, with different ingredients and/or different levels of ingredients, 2.) different processing parameters, including changes to the order of ingredient addition, changes to mixer shear focus,



and changes to cooling rates, and 3.) different packaging types, including shape, size, wall thickness and resin changes.

The final packaging selected for this product was a custom designed, malleable bottle to enable easy product dispensing. The thin walls of the bottle allow it to fully collapse. The side walls can also be squeezed together. When the walls touch, the consumer can squeegee out the product. To save on capital, the company was able to repurpose existing equipment to manufacture the product. The product currently has a patent pending.

The target consumer for this product was the millennial consumer segment currently purchasing within the spread's category. The marketing team launched the marketing campaign in September 2018 to support the new product. The campaign was scoped to include digital marketing and was nationwide. Given the product was a completely new development, the main goal of the campaign was awareness and encouraged people to try the product.

The campaign was successful, resulting in awareness and trial of the product by consumers across a variety of segments. However, since the product launched, Company XYZ has been receiving many customer contacts regarding the product. The majority of the contacts are negative and are in regard to the product being difficult to squeeze. The feedback from consumers is that they enjoy the product flavor and think the offering is relevant, but they will not purchase the product again, unless it is easier to squeeze. This meant that the difficulty of product squeezability was directly impacting consumer's repeat purchase of this product.

Repeat business is critical for a product offering to be successful in the marketplace. If consumers are unwilling to repeat purchase of the product or recommend the product to other people, chances of that product staying on shelf decrease. The situation was made dire by the fact that retailers are continuously changing out products on their store shelves, replacing slower

turning items with products that turn faster on shelf and deliver more profit to the store. If more consumers do not purchase the product, and continue to purchase the product, the store will choose to replace that product with a product that does generate more sales to the category.

### **Statement of the Problem**

The repeat purchase numbers for Company XYZ's squeezable spread are low and unsustainable. This leaves the squeezable spread product at risk of being discontinued. If the product is discontinued, Company XYZ is in jeopardy of not meeting their long-range plan numbers for volume and profit. In addition to not meeting volume and profit goals, the company would not have an acceptable return on investments (ROI) for the resources spent on the project, including dollars for equipment and human resource time.

### **Purpose of the Study**

The purpose of the study was to assess the root cause of the consumer complaints related to squeezability, with the goal of determining if squeezability is improved by changes to the product viscosity, packaging structure, or both. The lack of squeezability ease has caused consumers to have an unpleasant experience with the product and not purchase the product again. This research also examined how Company's XZY squeezable spread compared to other products in the market place in terms of squeezable so that the company could obtain a better understanding of the marketplace and consumers expectations regarding squeezable.

### **Assumptions of the Study**

To ensure the study was well defined, the following assumptions were made about the ability to implement changes to the squeezable spread product offering and determine what factors most improved squeezability. Initiatives applied for this research did not involve any capital contribution, changes to both the product viscosity and packaging needed to be

achievable on current equipment. This initiative utilized available resources in the company, including current manufacturing location, equipment and personal. R&D resources and Product Guidance and Insight (PGI) resources along with additional company employees for internal squeezability testing were also utilized for this study. The product offering sold remained the same during the research, but product with different viscosities and packaging was produced for internal testing.

### **Definition of Terms**

The following are some of the terms used in the study along with their definitions.

**Capital.** Equipment used at the manufacturing location to produce product.

**Consumer affairs.** A work group within Company XYZ that customer and/or consumers contact with praise, questions, or complaints.

**Cross functional team.** A group made up of people from multiple different work groups, working on a project together with a common goal. Company XYZ typically has cross functional teams that consist of members from Marketing, Finance, Sales, Operations, Quality and Research and Development.

**Employee acceptance testing (EAT).** An internal sensory test where employees rate their acceptance of different product attributes.

**Formulation.** The recipe used to create a product.

**High density polyethylene.** A type of plastic resin that is commonly used to create plastic food packaging.

**Packaging research and development.** A work group within Company XZY that is responsible for developing and implementing new packages; their work scope includes selecting

the packaging material, determining package size and shape, conducting package testing and optimizing the interaction between the package and the machinery that runs the package.

**Process research and development.** A work group within Company XZY that is responsible for creating the process that will produce new products; their work scope includes identifying what equipment is needed and correct equipment settings.

**Product guidance and insights.** A work group within Company XZY that is responsible for gathering insights that will guide product development; their work scope includes sensory testing, consumer focus groups, trend monitoring, and home use tests.

**Product research and development.** A work group within Company XZY that is responsible for creating the formulations for new products; their work scope includes qualifying ingredients, creating formulations and scaling formulations.

**Repeat.** A measurement of how often a consumer purchases a product.

**Research and development (R&D).** A more holistic work group that encompasses the individual Research and Development functions such as Packaging Research and Development, Process Research and Development and product research and development.

**Return on investment (ROI).** A measurement used to determine how much an invested gained or lost relative to the total amount of dollars invested.

### **Limitations of the Study**

The limitations to this research were regarding design, cost, time, technical knowledge, and resources. In regard to design, any new packaging design that was developed would have to run on the current packaging lines at both the packaging supplier's and Company's XZY facilities.

There were two different aspect of cost that added limitations to this project. Increasing the cost per unit offering was not in scope of this project. Also, the budget for consumer testing was very small, which limited the scope of squeezability testing to internal employees only.

This project was on a tight timeline due to the serious risk of product being removed from store shelves. Due to this, all consumer testing was done internally and the ability to drive drastic changes to the product was limited to what changes could be made quickly; this reduce the scope of the changes to product viscosity, packaging wall thickness, and packaging resin. Out of scope were new ingredients and changes to packaging shape.

There was also limited technical knowledge within the company related to squeezability standards, testing and measurement. The team was learning a lot of information as they conducted the study and ran plant trials.

## **Methodology**

The purpose of the study was to examine how Company's XZY squeezable spread compared to other products in the market place in terms of squeezability so that the company could obtained a better understanding of the marketplace and consumers expectations regarding squeezability. This research also had the objective to identify the root cause of the consumer complaints related to squeezability, with the goal of determining if squeezability is improved by changes to the product viscosity, packaging structure, or both. The lack of squeezability ease has caused consumers to have an unpleasant experience with the product and not purchase the product again.

Due to the dual objectives of this research, the study was divided into two elements. Part one was to determine how Company's XYZ's squeezable spread compared to other products in

the market place. Part two was conducted was to determine what levers improved the ease of squeeze.

## **Chapter II: Literature Review**

The repeat purchase numbers for Company XYZ's squeezable spread are low and unsustainable. This leaves the squeezable spread product at risk of being discontinued. If the product is discontinued, Company XYZ is in jeopardy of not meeting their long-range plan numbers for volume and profit. In addition to not meeting volume and profit goals, the company would not have an acceptable return on investments (ROI) for the resources spent on the project, including dollars for equipment and human resource time.

Literature was reviewed to determine the value of forming a cross functional team for problem solving, methods for measuring squeezability and acceptable squeeze force for consumer goods products and finally information related to levers that can be modified to improve squeezability. This literature review helped to determine the appropriate next steps and methodology for solving Company XYZ's problem.

### **The Value of a Cross Functional Team to Problem Solve**

A cross functional team was formed at Company XZY to address the issue of squeezability. The company typically operates and makes decisions with critical cross functional team members. Since this problem was such a critical issue, for the company, literature was reviewed to determine if there were any best practices that should be followed, related to team structure, decision making, innovative thought process and speed.

A cross function team is a group made up of people from multiple different work groups, working on a project together with a common goal. Parker (1994) describes a cross functional team as:

Experts ready to move quickly and flexibly to adapt to changing organizational needs.

Such teams are made up of people from different department in an organization. They

typically perform different job functions and bring a variety of skills and experience to their teams. (Parker, 1994, pg. 49)

There are several reasons for creating a cross functional team, Bishop (1999) makes the claim that cross functional teams provide the benefit of speed due to the way they make decisions and reduce sequential knowledge transfer activities (Bishop, 1999). A study conducted by Ferdousi (2012) also notes the importance and benefits of task sequence in cross functional team work. The ability to increase speed by different members conducting different pieces of the work simultaneously is also emphasized by Parker (1994). These three authors complement each other and give credibility to the notion that cross functional teams can improve the speeds of a project; thus, creating a benefit to the organization.

Speed is not the only benefit noted by these authors. Bishop (1999) also claims that cross functional teams benefit the organization by reducing rework, improving the flow of communication, and increasing knowledge at lower levels of the organization (Bishop, 1999). Ferdousi (2012) study indicates that another reason for creating cross functional teams is as a useful approach to corporate entrepreneurship practice (Ferdousi, 2012). Parker (1994) lists even additional benefits of a cross functional team; stating that cross functional teams are able to solve more complex problems, find creative solutions, and provide organizational learnings to individuals on the team (Parker, 1994). Parker (1994) article claims that the ability for a cross function team to provide more creative solutions stems from the fact that cross functional teams bring together a diverse team. The people on the team may have different backgrounds, work styles and work experiences, these differences combine to provide a unique perspective and enable meaningful and creative solutions (Parker, 1994).



Bishop (1999) concludes that the benefits of a cross functional team do not just apply to the project they are currently working on; the increase of knowledge, from the experience of working on a cross functional team, additionally improves future decision making (Bishop, 1999). The improved decision making helps to better align operation level decision with corporate strategy and objectives (Bishop, 1999). The idea of continued benefit to the organization is also echoed by Parker (1994) due to the fact that cross functional team members will have a better understanding of work conducted in different parts of the organizations which provides breath of organizational knowledge and job skills (Parker 1994).

However, just because a cross functional is formed it doesn't mean that the organization will automatically start to see all the benefits. In a study conducted by Proehl (1996), it was found that over half of members from cross functional teams felt that the cross functional team's work was unsuccessful. Proehl's study (1996) had both a qualitative and quantitative phase. The qualitative phase address three questions related to participates experience leading and working on a cross functional team after they had undergone leadership training conducted by their employer (Proehl, 1996). Another element of Proehl (1996) qualitative research was a 59-item questionnaire, to the same participants, to identify what factors were related to successful teams (Proehl, 1996). From this survey, Proehl (1996) identified four factors significantly contributed to the team success. The four factors identified by Proehl (1996) were:

- Team which succeeded had leaders, members, and sponsors who viewed the project as a priority.
- These team were task-oriented, maintaining their momentum and accomplishing their objectives in a timely way.

- The leaders took an active role in keeping members informed and providing support and recognition to members.
- Respect, open communication and mutuality among members were factors to success.

(Proehl, 1996, pg. 5)

These factors were identified based by responses from both members of who identified their teams as successful and unsuccessful (Proehl, 1996).

Respect and open communication were highlighted as a success factors in Proehl's 1996 research and communication was also highlighted by Drach-Zahavy and Somech (2001) as a driver of innovation. The researchers found that open dialogue enhanced the creative process and lead to innovation (Drach-Zahavy & Somech, 2001). Drach-Zahavy and Somech (2001) research data was collected through questionnaires that went to participants during a training program (Drach-Zahavy & Somech, 2011). For their research fifty-two self-managing teams were recruited randomly among a list of elementary and secondary schools that enrolled for educational training programs; 48 teams completed the questionnaire. The data from the questionnaire was them analyzed using descriptive statics, including reliabilities and intercorrelation (Drach-Zahavy & Somech, 2011). The researchers' methodology and questionnaire were robust.

Team members needed to overcome their fears of being vulnerable and share their thoughts, opinions, and data with others to improve the outcome of the team. Innovative thought and problem solving are critical for most organizations, so the findings from Drach-Zahavy and Somech (2001) should be taken into consideration as well when creating team operating principals.

The information from the literature review reinforced my perceived benefits of implementing a cross functional team and highlighted that special considerations be taken to select team members and setting team norms for cross functional project teams. The cross functional team should focus on open, honest, and transparent communication and to share updates with key stakeholders regularly. These steps will help ensured that both team members and their leaders had all information necessary to make a decision and are looking at the problem holistically.

### **Acceptable Squeezability of Consumer Goods Products**

To set the success criteria for the squeezability improvement, one needs to first understand what an acceptable squeeze force is to the consumer and how to measure the amount of force required to evacuate product from the container. There are multiple factors to consider when trying to understand optimal squeeze force. Literature was reviewed to determine industry methods for determining squeeze force, acceptable ranges, grip styles and methods for improving squeezability.

A relevant article was found related to different researchers trying to understand the ease of squeeze of multiple eye drop brands. For this study the squeezability was a subset of multiple functions and attributes of the eye drop brands they were comparing (Al-Jumaian et al., 2016). To understand ease of squeeze a previously develop survey questionnaire was used and each variable was measured using a five-point Likert rating scale (Al-Jumaian et al., 2016). Participates in the study were patients and healthcare providers and were randomly selected, with the requirement that they were literate. The participates answered the questionnaire for six brands total; three international brands and three local generic brands. Results from the survey

were analyzed using a two-sided t-test to compare local and international brands (Al-Jumaian et al., 2016).

The questionnaire was completed by 120 participants who rated ability to squeeze the bottle on a five-point Likert scale with 1= very poor, 2 = poor, 3 = neutral, 4 = good, and 5 = excellent (Al-Jumaian et al., 2016). With this data, the researchers were able to determine that local brands provided offerings that patients and health care professionals found to be more squeezable (Al-Jumaian et al., 2016).

With this information, additional literature reviews were conducted to determine what makes some bottles more squeezable than others.

### **Levers that can Improve the Ease of Squeezability**

A literature review was conducted to better understand the blow molding process and effects of resin changes and wall thickness on squeezability. In addition to packaging literature, information was also gathered and reviewed related to product viscosity and its impact on squeezability.

The package used for Company XYZ's squeezable spread was made using the blow molding process. In an article written by Throne in 1998, he describes blow molding as:

The process of forming a hollow object by placing a softened or molten thermoplastic preform or parison inside a cooled metal mold, inflating it against the mold until the plastic retains the mold shape, and then removing it and trimming the formed part from the non-part flash or trim. (Throne, 1998, Paragraph 2)

Blow molding is a very common process for producing parts within the packaging industry.

The bottle made for the squeeze spread was made out of high-density polyethylene (HDPE). This is a common resin used for food products and within the blow molding process.

It is very thermally stable. However, despite being widely used in the blow molding process, the interaction of HDPE material properties and optional process conditions is not fully understood (Throne, 1998). This was witnessed during the project for Company XYZ; when conducting plant trials at the packaging supplier's plant the set-up of the machine was subjective and more of an art than a science. This limited our ability to control wall thickness and experience with different resin material blends.

After much trial and error, the supplier was able to produce bottle with 4 different resins with multiple wall thickness and wall profiles; the overall result was thirteen different bottle variables that could be tested and measured to determine if any of them resulted in better ease of squeeze.

Literature reviewed suggested that testing bottles with different resin (material) and wall thickness was a good step to take when trying to improve squeezability, the analysis presented in an article *Squeezability Part 1: A Pressing Issue* by Blakey, Rowen and Tomlinson (2009) suggested that the bottle material, shape and nozzle impact squeezability.

This information was echoed in additional literature that was reviewed, the following is a quote from a journal article title *Wide Variation of Squeezing Force and Dispensing Time Interval among EyeDropper Bottles* by Kashiwagi (2019), "Many factors may influence the squeezing force, such as the viscosity of the ophthalmic solution, surface tension of the ophthalmic solution, design of the eyedropper tip, and the shape of the eyedropper bottles. The current study showed the shape of the eyedropper bottles and the presence of filter membranes were significantly associated with squeezing force. Eyedropper bottles with center-dimpled shapes showed significantly lower squeezing force and smaller squeezing force variation than other shapes, regardless of drug categories" (Kashiwagi, 2019).

### **Adjusting Product Viscosity by Cooling Rate**

Company XYZ has experience using processing conditions, such as cooling, to impact final product viscosity and texture. A literature review was conducted to determine if this is a viable way to make the product easier to squeeze. Operating conditions, mainly cooling rate and thermal history have significant effects on the kinetics and physical properties of the crystallised systems (Baldino, Gabriele & Migliori, 2010). A controlled cooling step is necessary to have the proper crystalline forms (Baldino, Gabriele & Migliori, 2010).

### **Chapter III: Methodology**

The repeat purchase numbers for Company XYZ's squeezable spread are low and unsustainable. This leaves the squeezable spread product at risk of being discontinued. If the product is discontinued, Company XYZ is in jeopardy of not meeting their long-range plan numbers for volume and profit. In addition to not meeting volume and profit goals, the company would not have an acceptable return on investments (ROI) for the resources spent on the project, including dollars for equipment and human resource time.

The purpose of the study was to examine how Company's XZY squeezable spread compared to other products in the market place in terms of squeezability so that the company could obtain a better understanding of the marketplace and consumers' expectations regarding squeezability. This research also had the objective to identify the root cause of the consumer complaints related to squeezability, with the goal of determining if squeezability is improved by changes to the product viscosity, packaging structure, or both. The lack of squeezability ease has caused consumers to have an unpleasant experience with the product and not purchase the product again.

Due to the dual objectives of this research, the study was divided into two elements. Part one was to determine how Company's XYZ's squeezable spread compared to other products in the market place. Part two was conducted to determine what levers improved the ease of squeeze.

#### **Subject Selection and Description**

Two different research studies were conducted as part of this overall research. For both research elements, panelists were employees of Company XYZ who were already members of the pool of taste panel participants. Panelists self-selected to be part of the study. Employee

information was not recorded. There was a requirement that the panelists not be part of the business unit that launched the squeezable product, so that they did not have as much familiarity with the product. There were 18 employee panelists who squeezed all six in-market products and there were 45 panelists were part of the Company XZY Squeeze Panel.

### **Instrumentation**

For the squeeze panels, employees used their hands to squeeze the product and recorded their experience on a paper ballot or computer screen. For part one, Company XYZ's squeezability vs. in-market squeezable condiments, panelist completed a ballot as they squeezed product (ballot in Appendix A). The comparison panel took place over two days to measure the impact product viscosity and packaging changes on likability.

For part two, Company XZY's Squeeze panel was used to determine the impact of product viscosity and packaging changes on likability. Panelist completed a ballot as they squeezed product in the Squeeze panel (ballot in Appendix B). The Squeeze panels took place over three days to measure the impact product viscosity and packaging changes on likability.

The study design and ballots were created specifically for these research elements.

### **Data Collection Procedures**

All samples given to the panelists were unbranded and given blind codes. The objective of part one was to determine qualitative differences in squeezability between Company XYZ's product and in-market squeezable condiments. Panelists completed the squeeze qualitative panel ballot as they squeezed the products. Mean panelist scores were used to generate a summary profile of ratings for each variable. Qualitative observations and comments were also captured regarding panelist's experience with the various bottled products. All products were served and



squeezed at refrigerated temperatures (38-42 degrees F). The following table was created for sample identification and attribute description.

Table 1

*Sample Identification for Employee Squeeze Panel*

<b>Evaluation Order (blind code)</b>	<b>Sample ID</b>	<b>Vanes (cP)</b>	<b>Squeeze Force (lbs)</b>	<b>Product Net Weight</b>	<b>Closure Opening</b>	<b>Valve</b>	<b>Bottle Material</b>
1. 519 Full	Company A	149	51	14oz	Round	Yes	PETE
2. 694 ¼ full			36				
3. 748 Full	Company B	249	56	20oz	Ribbon	No	Other
4. 802 ¼ full			30				
5. 934 Full	Company C	167	26	12oz	Round	No	HDPE
6. 006 ¼ full			16				
7. 157 Full	Company XYZ	846	54	12oz	Round	Yes	HDPE
8. 214 ¼ full			22				
9. 308 Full	Company D	110	53	14oz	Small Round	No	HDPE
10. 446 ¼ full			37				
11. 171 Full	Company E	182	34	22oz	Ribbon	No	PETE
12. 224 ¼ full			10				

The second research element that was conducted was to determine what levers improved the ease of squeeze. Company XYZ wanted to determine if changes to the packaging (including resin type, gram weight, and wall profile) should be made or if changes to the product viscosity (measured by vanes method) should be implemented. The objective of this study was to determine if viscosities ranging from Low (500-800), Medium (1000-1300), and High (1500-1800) are noticeably different and meet expectations differently via Company XYZ Employee

Squeeze Testing and to determine if any of the bottle prototypes are noticeably easier to squeeze and/or dispense product from and meet expectations better than current bottle via small panel Company XYZ Employee Squeeze Testing.

All samples given to the panelists were unbranded and given blind codes. Employees completed a ballot while squeezing the products. They rated each product and package using a 5-point Likert scale.

### **Data Analysis**

For part one, Company XYZ's squeezability vs. in-market squeezable condiments, panelist completed a ballot as they squeezed product (ballot in Appendix A). The data collected in the ballot was then analysis to determine the mean difference, or difference in means. This measures the absolute difference between the mean value in two or more different groups. In sensory tests, it gives you an idea of how much difference there is between the averages of the experimental and control groups. Analyze was completed using the Sensory team's CompuSense Program, Stat Method: GLM - Tukey.

For part two, Employees completed a ballot while squeezing the products with current viscosity, lower viscosity and new packaging. They rated each product and package using a 5-point Likert scale. The data was then analyzed and compiled to reflect results in the top two boxes (Very easy and somewhat easy), neutral, and bottom two boxes (somewhat difficult, and very difficult). Data was analyzed using the Sensory team's CompuSense Tukey's exact test (95% CI) program.

### **Limitations**

The budget for consumer testing was very small, which limited the scope of squeezability testing to internal employees only. The project team engaged the internal sensory team to help

with the testing, data analysis and to use employees that were already part of the company's taste panel pool of employees.

### **Summary**

The purpose of this chapter was primarily to discuss the various methods, data collection and analysis that were completed as part of this research to help inform a recommendation to Company XYZ regarding what steps they should take to improve squeezability of their product.

Two separate squeeze panels were conducted by internal employees; one to determine how the company's product compared to other in market products and the second to understand what levers improve squeezability (product viscosity or packaging changes). A detailed data analysis will be presented in the next chapter.

## Chapter IV: Results

Company XYZ is a food company looking to expand their portfolio of products. The company is focused on delivering product innovation that meets consumers' needs and expectations. In 2018, Company XYZ launched a new squeezable product, with the goal of replicating the success of squeezable products in other categories such as mayonnaise, ketchup and jelly.

The repeat purchase numbers for Company XYZ's squeezable spread are low and unsustainable. This leaves the squeezable spread product at risk of being discontinued. If the product is discontinued, Company XYZ is in jeopardy of not meeting their long-range plan numbers for volume and profit. In addition to not meeting volume and profit goals, the company would not have an acceptable return on investments (ROI) for the resources spent on the project, including dollars for equipment and human resource time.

This research examined how Company's XZY squeezable spread compared to other products in the market place in terms of squeezable so that the company could obtain a better understanding of the marketplace and consumers expectations regarding squeezable. The main purpose of the study was to assess the root cause of the consumer complaints related to squeezability, with the goal of determining if squeezability is improved by changes to the product viscosity, packaging structure, or both. The following chapter will go over the results.

### **Demographic**

Demographics were not gathered as part of this research. All panelists were Company XYZ employees and they self-selected to be part of the study. Employee information was not recorded. There was a requirement that the panelists not be part of the business unit that

launched the squeezable product, so that they did not have as much familiarity with the product. Company XZY is located in Minnesota.

### **Item Analysis**

Company XYZ had concerns regarding long-term repeat for consumer target due to potential issue with squeezability, especially when the package was less than half full. To help assess and contextualize Company XZY's product squeeze performance, an internal employee squeeze panel was conducted. The panel consisted of eighteen (18) Company XYZ employees; panelists squeezed the six (6) products in common applications for each product and rated their experiences. Qualitative observations of panelists squeezing were also recorded by the project team. Results will help inform team recommendation regarding further consumer testing or product-package interaction development work.

### **What Product Characteristics Should be Adjusted to Improve Squeezability**

Company XYZ had concerns regarding long-term repeat for consumer target due to potential issue with squeezability, especially when the package was less than half full. To help assess and contextualize Company XZY's product squeeze performance, an internal employee squeeze panel was conducted. The objective of this research was to determine what product characteristics should be adjusted to improve squeezability.

**Research question 1: How easy is Company's XYZ product to squeeze compared to other products in the market place?** Researched was conducted with employees at Company XZY to understand how the product compared to other squeezability product that is in market. The results were that Company XYZ's product is in the middle of the competition for squeezability. The findings are shown below.

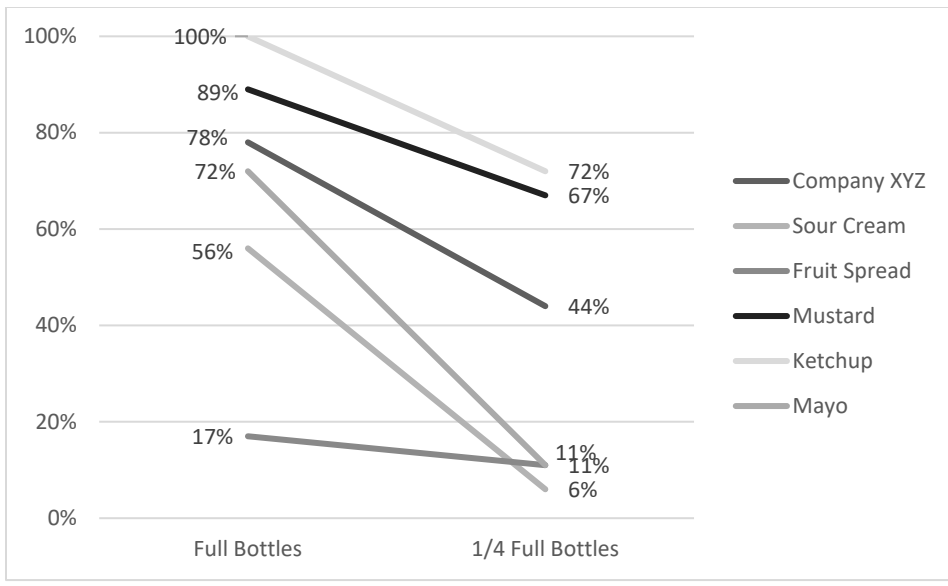
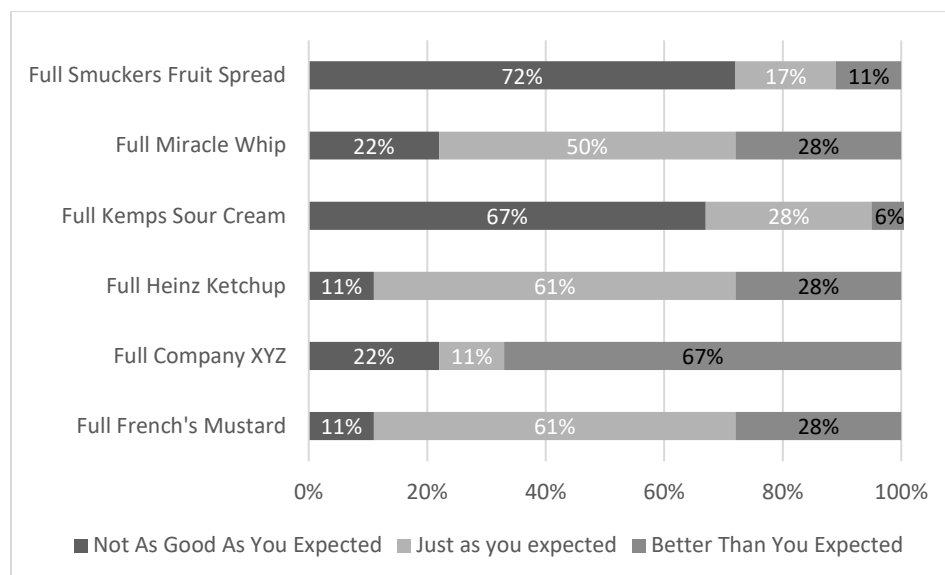


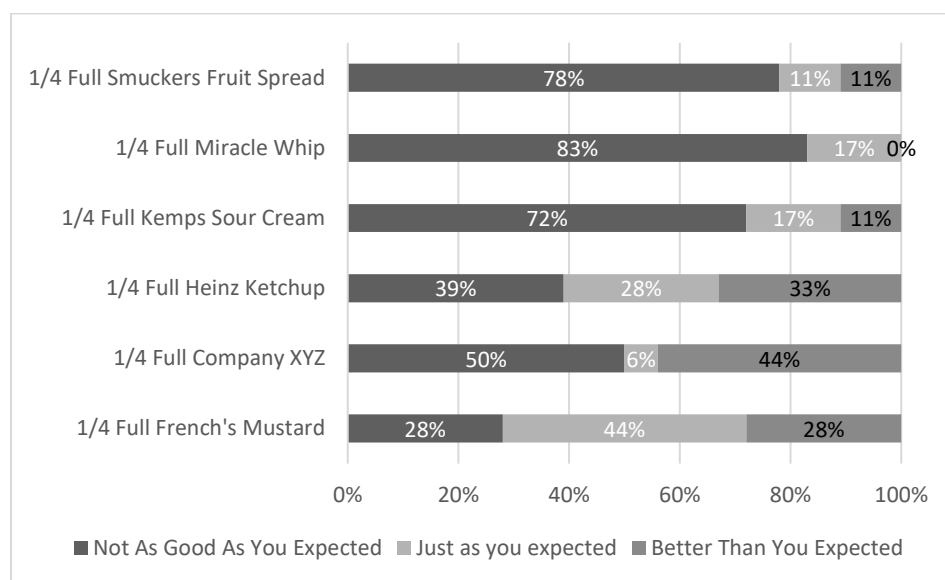
Figure 1. Percentage top two box, ease of squeezing product out of the package.

78% of respondents rated Company XYZ’s product as Easy to Squeeze product out when the bottle was Full, but only 44% said the same when bottle was ¼ Full. Ketchup and Mustard were easier to squeeze both when Full and ¼ Full, Mayo, Sour Cream and Jam were all more difficult.

**Research question 2: Does employees’ experience dispensing product from the bottle match their expectations?** It was determined through the research the Company XZY’s product meets expectations for squeezability when the bottle is full of product. However, when the bottle is only ¼ full, product was rated Not as Good as Expected by 50% of panelists.



*Figure 2.* Experience dispensing product was better than expected when bottle is full.



*Figure 3.* Company XYZ's product has opportunities for improvement when bottle is 1/4 full.

Dispensing a full bottle of Company XYZ's product was Better Than Expected for 67% of panelists; 1/4 full bottles of Company XYZ's product was rated Not as Good as Expected by 50% of panelists, as compared to 28% Not as Good for Mustard and 83% Not as Good for Miracle Whip.

### Research question 3: Does the new bottle result in an easier squeezing experience?

Testing was also conducted to determine if changes to the packaging made the product easier or more difficult to squeeze. The results are shown in the figure below.

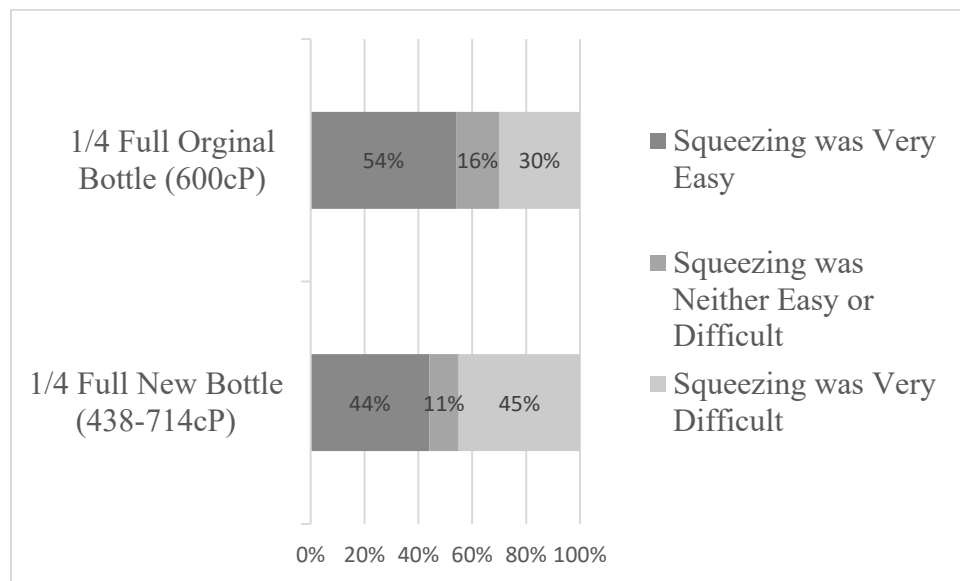


Figure 4. The original bottle was easier to squeeze than new bottle.

A significantly higher proportion of panelists rated the Original bottle as Very Easy to Squeeze compared to the New Bottle.

**Research question 4: Which bottle delivers better against employees'/consumers' expectations?** To understand which bottle best met employees'/consumers' expectations, panelists were asked to about their experience squeezing each package. A significantly higher proportion of panelists rated the Experience of Squeezing the New Bottle as Not as Good as Expected.



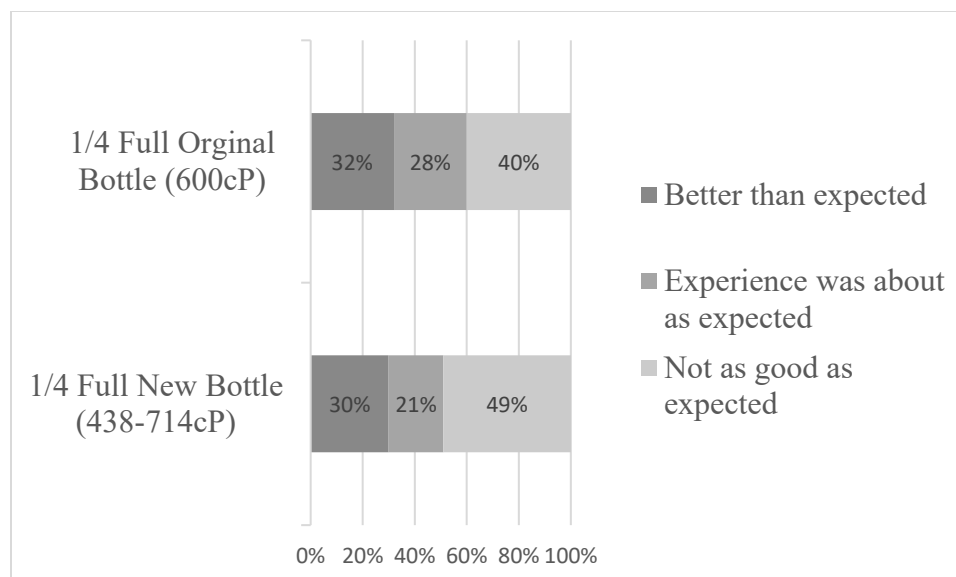


Figure 5. Original bottle met expectations better than the new bottle.

Results are a significantly higher proportion of panelists rated the Experience of Squeezing the New Bottle as Not as Good as Expected.

**Research question 5: Is product produced with low viscosity (200-400cP) noticeably different and/or better at meeting expectations than product produced with current viscosity (700-900cP)?** The goal is to determine if product produced at with low viscosity (200-400cP) are noticeably different and meet expectations differently than current viscosity product (700-900cP) via Company XYZ Employee Squeeze Testing. If significant differences in 'meets expectations' ratings result, they will help establish target viscosity ranges.

Table 2

*Proportion of Respondents Ratings – Ease of Squeeze (EAT) 5-Point Scale*

Response	1. Full Bottle (700- 900cP)	2. ¼ Full Bottle (700-900cP)	3. Full Bottle (200- 400cP)	4. 1/4 Full Bottle (200- 400 cP)
Squeezing was Very Easy	27%	24%	62%*	66%*
Squeezing was Neither Easy or Difficult	7%	14%	10%	17%
Squeezing was Very Difficult	66%**	62%**	28%	17%
Squeezing was Very Easy	27%	24%	62%*	66%*

## Table Notes

- Ease of squeeze scores rated on a scale where 5=Very Easy; 3= Neither Easy or Difficult; 1=Very Difficult
  - \*A significant proportion of panelists rated this sample's Squeeze-ability as Very Easy, using Tukey's exact test (95% CI).
  - \*\* A significant proportion of panelists rated this sample's Squeeze-ability as Very difficult, using Tukey's exact test (95% CI).
- Neither easy or difficult - Target ≥ 75%.

Table 3

*Proportion of Respondents Ratings – Experience vs. Expectation (EAT) 5-Point Scale*

Response	1. Full Bottle (700- 900cP)	2. ¼ Full Bottle (700-900cP)	3. Full Bottle (200- 400cP)	4. 1/4 Full Bottle (200- 400 cP)
Experience was Better than expected	21%	10%	31%	45%*
Experience was about as expected	24%	24%	35%	38%
Experience was Not as good as expected	55%**	66%**	34%	17%

## Table Notes

- Expectation scores rated on a scale where 5= Much better than expected; 3= As expected  
1= Not nearly as good as expected
  - \*A significant proportion of panelists rated this sample's Experience as Better than Expected, using Tukey's exact test (95% CI).
  - \*\* A significant proportion of panelists rated this sample's Experience as Not as Good as Expected, using Tukey's exact test (95% CI).
- As Expected Target  $\geq 75\%$ .

## Summary

This chapter focused upon the analysis of data collected regarding the possible ways to improve squeezability of Company XYZ's new product as well as understand how it compares to other squeezable products in the market place. Data collected using the methodology presented in Chapter 3, and Tables 1 through 6 present the data to answer the research questions. The data was gathered from the employee squeeze panels that were part of this research. This data was used for the evaluation of the various options for addressing squeezability. The outcome of the data analysis showed Company XYZ product was in the range of other squeezable consumer products in the market place today and that product viscosity changes have the biggest impact squeezability. The next chapter discusses the results of the study and future recommendations.

## **Chapter V: Discussion, Conclusion and Recommendation**

Company XYZ is experiencing low repeat purchase of their new squeezable product, the low volume of product sold is putting the product at risk of being discontinued. Consumers are contacting the company with complaints that the product is too hard to squeeze. This product is complex and dependent on processing parameters, formulation and packaging interactions.

If the product is discontinued, Company XYZ is in jeopardy of not meeting their long-range plan numbers for volume and profit. In addition to not meeting volume and profit goals, the company would not have an acceptable return on investments (ROI) for the resources spent on the project, including dollars for equipment and human resource time.

The purpose of the study was to assess the root cause of the consumer complaints related to squeezability, with the goal of determining if squeezability is improved by changes to the product viscosity, packaging structure, or both. The lack of squeezability ease has caused consumers to have an unpleasant experience with the product and not purchase the product again. This research also examined how Company's XZY squeezable spread compared to other products in the market place in terms of squeezable so that the company could obtain a better understanding of the marketplace and consumers expectations regarding squeezable.

### **Discussion**

The budget for consumer testing was very small, which limited the scope of squeezability testing to internal employees only. The cross functional project team engaged the internal sensory team to help with the testing, data analysis and to use employees that were already part of the company's taste panel pool of employees.

Product improvements tested in this research did not involve any capital contribution, changes to both the product viscosity and packaging needed to be achievable on current

equipment. This initiative utilized available resources in the company, including current manufacturing location, equipment and personal. R&D resources and Product Guidance and Insight (PGI) resources along with additional company employees for internal squeezability testing were also utilized for this study. The product offering sold remained the same during the research, but product with different viscosities and packaging was produced for internal testing.

## **Conclusions**

Given these constraints and limitation, the researcher could apply all the learnings from the literature review, for example the literature review indicated that squeezability could be improved by changing the shape and size of the package. However, to change the shape or size of the package the company would need to invest in a new mold, this was out of scope give the constraint on capital and tight timeline. This was also true of the closure dispensing design, capital would be required to change the diameter or material of the valve, so that was out of scope for this research.

Several learnings from the literature review were able to be used in this research. A cross functional team was formed to tackle the issue and create product that could improve squeezability. The team operated with respect and open communication and focused on decision making speed. Next, the packaging resin and wall thickness were modified to try to improve squeezability. Finally, the cooling parameters were adjusted to provide a lower viscosity product with improved flowability to address squeezability.

The internal squeeze panels confirmed information learned in the literature review, changes to packaging resin to have an impact on squeezability and product viscosity has an impact on squeezability. For Company XYZ's product, product viscosity had the larger impact on squeezability. This research recommends a change to processing parameters as soon as

possible to create a lower viscosity product and adjusting the specification to lower the acceptable viscosity range.

### **Recommendations**

Based on the results of the research conducted the following recommendations are recommended for Company XYZ's product.

**Recommendations for product improvement in the market.** The project team has identified process parameter that can be executed on the current equipment that create a product with lower viscosity. The recommendation is that these processing changes be implemented immediately, and that product created with these parameters is released for sale. The company should track lot codes and manufacturing dates so that there is an understanding of what product is the higher viscosity product and what product is the lower viscosity product. The product specifications should be revised to reflect the new, acceptable viscosity range and product higher than that range should not be released for sale.

Company XYZ should monitor continue to monitor consumer contacts and analyze the data to determine if complaint rate of the lower viscosity product is lower than the higher viscosity product. If repeat increases, these changes provided a meaningful change and benefit to consumers. If Company XYZ is still getting complaints with the lower viscosity product it is indication that additional product or packaging improvements need to be made to improve squeezability.

**Future testing.** Company XYZ should develop equipment to measure squeeze focus. The objective of this equipment would be to put a quantitative value to the amount of force required to dispense product from that bottle. This method could then be used on future product

or packaging modifications to see if the changes increase or decrease the amount of force required to dispense product.

It is also recommended that Company XYZ does additional squeeze testing with actual consumers in the target demographic. The testing completed as part of this research was limited by time and budget. Therefore, it only used Company XYZ's employees. Future testing with real consumers would be beneficial for future product optimization.

**Additional levers to improve squeezability.** If capital allows, different bottle shape and cap should be explored. The literature that was reviewed showed that packaging geometry and the dispensing nozzle of the cap greatly impacted squeezability. Unfortunately, since capital was out of scope for this research those modifications were unable to be explored. If capital is allowed in the future, these two changes should be explored.



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## Appendix: Research Ballots

### Part 1: COMPARISON SQUEEZE PANEL BALLOT:

<b>Package &amp; Dispensing Evaluation - Sample #</b>							<b>Comments</b>
<b>Cleanliness of Cut-Off</b> Using both hands to dispense product, rate: how quickly, completely, and cleanly the valve closes after you are done squeezing. For a 'Clean' rating the valve should cut product off immediately and be clean, with no product remaining on the valve. A 'High' rating indicates that the valve remains very messy after closing (a high degree of product remaining on valve), valve does not cut off product.							
	High Amt. of Product on Valve	Mod-High Amt. of Product on Valve	Moderate Amt. of Product on Valve	Low Amt. of Product on Valve	Trace Amt. of Product on Valve	Clean	
Cleanliness of Cut-Off							
<b>Package Recovery</b> How quickly the bottle returns to original form after squeezing. A 'Fast' rating would be if the bottle returns to its initial width almost immediately. A 'Slow' rating would be if the bottle recovered very slowly or recovered to only a fraction of its initial width. If bottle does not recover at all, rate as not present).							
	Not Present	Slow	Slow-Mod	Mod	Mod-Fast	Fast	
Package Recovery							
<b>Ease-of-Squeeze</b> Using both hands to dispense product, rate how easy it is to dispense product from the package. A 'Very Easy' rating would be if the package is very easy to dispense, with minimal effort. A 'Very Difficult' rating would be if the package is very difficult to use/squeeze.							
	Not Squeezable	Very Difficult	Somewhat Difficult	Neither Difficult nor Easy	Somewhat Easy	Very Easy	
Ease-of-Squeeze							
<b>Dispense Amount</b> The amount of product dispensed with a normal squeeze (can use the amount dispensed from above evaluation), <b>compared to the expected dispense amount for [relevant application, e.g., hotdog for Mustard]</b> . A 'Just About Right' rating would be if a single squeeze provided the volume intended to be dispense for that application. A rating above or below 'JAR' would be if a squeeze provided either too much or too little product, compared to the expected amount.							
	Not Present	Much too Little	Somewhat too Little	Just About Right	Somewhat too Much	Much too Much	
Dispense Amount							
<b>Additional Observations:</b> For example: angled stream while dispensing, spattering, makes sounds during dispensing, etc.							

## Part 2: Employee Squeeze Panel Ballot

The screenshot shows a web browser window with the following content:

Projects | Support: | Previewer x +

surveys.redjade.net/previewer/questionnaire

How easy or difficult was it to squeeze the product out of this package? Select one

Very easy      Somewhat easy      Neither difficult nor easy      Somewhat difficult      Very difficult

Would you say the amount of the product that came out while you dispensed was... Select one

Much too much      Somewhat too much      Just about right      Somewhat too little      Much too little

Would you say your experience using this packaging to dispense the product was...

Much better than you expected      A little better than you expected      Just as you expected      Not as good as you expected      Not nearly as good as you expected