The Improvement of Product and Process Design of Sanitary Pads

Judith Nkuna
Department of Quality and Operations Management, Department of Engineering Management
University of Johannesburg, South Africa
jmhlanga@uj.ac.za

Andre Vermeulen
Faculty of Engineering and the Built Environment, Department of Engineering Management
University of Johannesburg, South Africa
avermeulen@uj.ac.za

Jan-Harm Pretorius
Engineering and the Built Environment, Department of Engineering Management
University of Johannesburg, South Africa
jhcpretorius@uj.ac.za

Abstract

The proceeding paper seeks to define and discuss product and process design. In this research study, product and process design will be discussed in regard to feminine hygiene products, namely sanitary pads. This research study will discuss the ways in which the product and process design of sanitary pads can be improved in an effort to become more environmentally friendly, especially in terms of their disposal. The company that will be referred to regarding the sanitary pads will be non-Organic single-use sanitary pads. This paper will also utilize A+ Organic Pads as a form of comparison, as a way to showcase the fact that is possible for companies to manufacture purely organic or environmentally conscious products. A research methodology will also be presented in order to present the methods used to gather the information within this paper. The results and discussion will follow, which will report on the information found, and the discussion will explain and interpret the results, as well as place the information found in context. Recommendations will also be provided as to how companies like non-Organic pads, can improve their product and process design to be more eco-friendly especially in the disposal stage of their sanitary pad products. Finally, the paper will be concluded, and a references page can be found at the end.

Keywords
Product and process design, Feminine hygiene products, Sanitary pads, Environmental sustainability

1. Introduction
In any company the product and process design is extremely important, especially when it comes to ensuring that the company is producing products of sound quality. Product and process design forms part of the life cycle of a product or products, and it is during this phase that decisions such as what the product will be made of as well as how the product will be made are visited (Heizer et al. 2017).

During the product and process design, the overall eco-friendliness of the product or products that are to be produced must be considered. The environmental sustainability of a product when it is disposed of is just as important as when it is being produced and used. It is in the best interests of companies to ensure that their products do not impact the environment negatively when they are disposed of. This body of work seeks to discuss the environmental effects of plastic packaging of feminine hygiene products, while also providing possible alternatives to plastic packaging. It is important for corporate social responsibility to be incorporated into the processes of companies, such as the companies' impact on the environment.

The focus of this body of work is on the improvement of the product and process design of non-Organic feminine hygiene products, namely pads, in terms of their environmental sustainability. This body of work will also compare the company (Non-Organic) to A+ which produces organic and environmentally friendly feminine hygiene products, namely A+ Organic Pads. The improvement of the product and process design of the company's pads will focus on how the company can make better provisions to be more environmentally conscious of the impact that its products have on the environment. This body of work seeks to discuss how pads can be produced through a process that takes the environmental effects into consideration, while also making provisions to make use of more environmentally sustainable products in the future.

2. Literature Review

This was a case study which included quantifying single factor and multifactor factor productivity for the current situation of the company without any changes. Small changes were made to obtain new productivity levels that must be improved, then new productivity levels were calculated using both single factor and multifactor productivity. The productivity change was then estimated by comparing the old productivity results against new productivity results. About 150 workers were involved in the discussion and data collection process. According to Heizer and Render (2014), single and multifactor productivity can be calculated as:

When defining product design, it is important to note that it refers to the process of singling out opportunities within specific markets. Within this process, product design then aims to be able to provide a definition of the issues present. This definition should be understandable and finally, the proposed manner to solve the issues presented should be verified by using the experiences of actual customers or people who would utilise the product (Lo 2020). In line with product design is the product design process. The product design process is a particularly important aspect of companies when they a considering ways in which their products can solve problems. During this phase product designers must ensure that the desired objectives of their product design process are specifies and understandable by all parties involved. It is also during this phase that product designers along with the company must question whether their product is a necessity amongst consumers, as proceeding to develop a product that consumers do not desire will only bear unnecessary or detrimental losses (Lo 2020).

The product in question in this case is a feminine hygiene product, namely sanitary pads. By definition, sanitary pads are highly absorbent items worn by women who menstruate, they are designed to absorb blood flow from the vagina. Considering that there are large numbers of women who menstruate daily, and as a result use and dispose of single-use sanitary, it must be noted that amongst the sanitary pads disposed of daily, most consist of plastic (Peberdy et al. 2019). A global company that produces sanitary pads, is Procter and Gamble's Non-Organic. It is important to note that as the parent company of Non-Organic, Procter and Gamble is listed as one of the worlds biggest contributors of plastic waste (Greenpeace 2017), this is evident even in the packaging of Non-Organic sanitary pads as well of parts of the pads that consist of plastic. The main reason for the need to innovate and popularise new ways of producing sanitary pads is due to the product's "end-of-life stage" (Heizer et al. 2017). This refers to how a product fares once it is disposed of after it has been used.

In terms of process design, this can be defined as the series of actions that an organisation takes in order to achieve its desired or intended objectives in the process of designing its products (Heizer et al . 2017). For businesses, it is considered useful for the business to be aware of changes or movements within society that could force the business to change or become more innovative in the way its products are designed and produced. This could be in relation to the materials or components that are utilised and their possible environmental effects or this could be in terms of gender equality, for example, however, both of which relate to Corporate Social Responsibility. Corporate Social Responsibility or CSR refers to organisations making decisions on the manager level which take into account the negative effects which their products have on the environment, on the company's finances or on society at large (Heizer, Munson and Render 2017). During the process design stage is when the company and its process design professionals will engage in an especially important decision-making process. During this decision-making process, choices are made regarding the how the product will work, as well as how the product is packaged and what is used to package it. During this process decisions are also made regarding where the items that will be used to design and manufacture the product will be purchased from, the planning and organisation of the transportation of the product and its parts, along with additional decisions regarding the manner in which the desired item will be beneficial to its consumer and the various series of actions that will need to be taken in order to achieve the desired result (Petersen, Handfield and Jones 2005).

Corporate Social Responsibility or CSR is a vital aspect to any organisation that is operating today. As such, Corporate Social Responsibility is also an aspect that must be well noted by global companies as they are amongst some of the world's biggest contributors to environmental waste. According to Heizer, Munson and Render (2017), it is in the best interests of a company for it to prioritise acting justly and sustainably. The sanitary pad company Non-Organic, should pay closer attention to its effects on the environment by producing sanitary pads that are packaged more sustainably such as in box or other organic materials that are biodegradable and less or totally unharmful to the environment, as opposed to using plastic packaging. A company such as A+ Organic Pads, can be used as a comparison to Non-Organic in terms of environmental sustainability. This is because the sanitary pads produced by A+ Organic Pads are produced in an environmentally conscious manner, as such the "end-of-life stage" (Heizer et al. 2017) of the product has been taken into account, and it is for this reason that the sanitary pads of this company are produced using "100% biodegradable bio-polly" (A+ Pure Organic Feminine Hygiene 2021).

Quality-related issues may develop as a result of Good Manufacturing Practice (GMP) standards, necessitating the implementation of corrective procedures and even plant closures, resulting in a reduction in production capacity. Both financial and legal constraints may limit the availability of alternative providers who can supply demand in a timely and suitable manner. Conceptually, the motives in arrears the lack of satisfaction or downfall of service delivery can be clarified under the reliability dimension by the rearrangement in the billing process during highest hours due to high demand. (Akilimalissiga et al. 2017).

Production delays Amongst other factors affecting medicine shortages is the production delays by the supplier. Hospital staffs in interviews conducted in the journal entries said they had to wait longer periods of days for orders to arrive from suppliers and that the suppliers fail to fulfill full quantities of orders in several cases. Some of the participants said they received inaccurate stock availability information from suppliers, which resulted in pharmaceutical shortages at their hospitals. (A+ Pure Organic Feminine Hygiene 2021).

3. Research Methodology

The methodological approach used for this paper was utilised in an effort to research the topic of product and process design. The methodological approach also sought to provide insight into the discussion of the environmental sustainability of pads that rely on plastic packaging or plastic components, while also comparing this to pad companies that take a more organic approach to their products and their packaging. The research methodology of this paper consists of qualitative data and research, which was analysed and further utilised to bring about a more holistic understanding of various concepts that are discussed and reviewed throughout this paper. In an effort to attain a more clear view of the topics discussed and researched existing data was utilised, analysed, and inferred upon. The existing data consists of journals, internet articles and textbooks. The journals, internet articles and textbooks were read, analysed, and inferred upon for greater understanding of the topics discussed in this paper.

The objective of this qualitative methodological approach that was utilized throughout the paper, was to assist in providing better understanding and comparisons through data that is already existing, in order to show the effects of

issues that are long-standing but have existing solutions. The environmental impacts of sanitary pads that are packaged in and consist of plastic are well-known within this industry, however, global companies such as non-Organic continue to package their products in plastic packaging and produce their products with elements of plastic that are harmful to the environment. The research methodology utilized in this paper sought to assist in analyzing these harmful effects, comparing them to other environmentally friendly companies and therein finding various solutions or recommendations to this issue.

A qualitative approach was used to conduct this study as online journal articles were used to gather information. A research article which spoke about medicine shortages and challenges with the procurement process among public sector hospitals in South Africa were used as a base of this study. Only secondary data from different sources on the internet was used to get more information and insight about the shortage of medication in hospitals. All the articles which spoke about challenges faced by hospitals which led to medicine shortages, were compared to each other to determine whether they were similar or caused by the same problem. Comparing the reasons of medicine shortages of hospitals, concluded that the problem was underlying in the inventory management.

4. Results and Discussion

Corporate Social Responsibility refers to companies taking on and adhering to the rules and regulations that have been set in an effort for the companies to address the necessities at a societal level, while being inclusive of the environment, all people within the public as well as finances (Jones and Robinson 2012). The product and process design that companies decide to employ, must be in line with Corporate Social Responsibility, for example adhering to environmental sustainability.

The feminine hygiene company, Non-Organic, produces multiple feminine hygiene products, namely pads. The environmental effects of pads have been a running topic amongst environmental activists, especially when it comes to their disposal. Through the research conducted throughout this paper, a common aspect repeatedly arises amongst non-organic pads that cannot be reused, which is a form of plastic that is known as polythene (Peberdy et al. 2019). This poses a significant problem within the environment as polythene is not a substance that can be successfully identified by the microbes in nature that are responsible for decomposing substances and materials. As a result, the polythene will take years to be successfully broken down (Peberdy 2019). A better, more environmentally conscious option would be organic cotton, as this is biodegradable and possess the added benefit of being more "absorbent properties" (Pinera and Bayani 2020) when compared to the more commonly used non-biodegradable pads.

When it comes to creating more environmentally friendly feminine hygiene products, namely pads, companies must prioritise their evaluation of the product and process design of their products. It is through this action that companies like Non-Organic can take note of areas within the product and process design that can be improved upon or further innovated to be more environmentally sustainable. A recommendation for feminine hygiene company Non-Organic, would be for the company to consider opting to use more organic packaging for their pads, such as box, as opposed to their current plastic packaging. By doing this, Non-Organic would also in turn be creating a solution for the "end-of-life stage" (Heizer et al. 2017), as the pads would be more bio-degradable than the common single-use pad that is not.

5. Recommendations

In order for the feminine hygiene company, Non-Organic to become more environmentally friendly in terms of the product and process design of its pads, it should place a focus on innovating the ways in which the products are packaged as well as "the disposal of products at their end-of-life" (Heizer et al. 2017). A recommendation for Non-Organic to improve the product and process design of their pads, could be to refrain from utilising plastic when manufacturing the pads. The company can instead opt to use more organic or biodegradable products instead, such as organic cotton, which is what A+ Organic Pads makes use of. Another recommendation would be for Non-Organic to also refrain from utilising polythene, as although this might be a plastic that is of a lighter weight, it still presents issues for the environment. One of these issues is that it is not possible for decomposition to take place where polythene is concerned as a considerable amount of "microorganisms do not recognize this material as food" (Peberdy et al. 2019). In the long run this becomes problematic as the amount of time that it takes for the plastic to breakdown enough for it to no longer pose a threat to the environment might take longer but with the amount of people disposing of the pads containing this plastic defeats the purpose, as it still becomes a pollutant. Therefore, opting for more organic replacements such as organic cotton or "plant-based protective layers" (A+ Pure Organic Feminine Hygiene 2021)

would in turn result in the pads being less of a threat to the environment as these are products that are able to be consumed by microbes.

6. Conclusion

It is important for companies to make provisions to include and adhere to Corporate Social Responsibility, this is especially the case for global companies as they are leaders in their respective industries and sectors. The product and process design of products is a major aspect to consider when companies are looking for ways to make their products more environmentally conscious. It is no secret that plastic is amongst the biggest pollutants in the world today, and companies such as, Non-Organic contribute to this pollution as their products consist of elements of plastic while also being packaged in plastic. To remedy this, it is important that innovative ways are created within companies that produce feminine hygiene products, so that they can find other ways to produce and package their products in a less environmentally harmful fashion. A company such as A+ Organic Pads, which also produces feminine hygiene products, does so in a completely environmentally friendly manner, while still being able to cater to the needs of their customers.

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Biography / Biographies

Judith Nkuna is currently a fulltime Lecturer and a prospective PhD student under the Department of Engineering Management at the University of Johannesburg, South Africa. she received Masters in Operations Management from University of Johannesburg, her research interests include Production Engineering, Production Planning, Lean Manufacturing, Production Management, Inventory Management, Scheduling, Linear Programming, Simulation, Process Improvement and Sustainable Management.

Andre Vermeulen is a Senior Research Associate at the Post-Graduate School of Engineering Management in the Faculty Built and Engineering Management at the University Johannesburg, South Africa. He earned DPhil Engineering Management from University Johannesburg and presently supervise numerous doctoral and master's students. Dr. Vermeulen completed research project in An Analytical Instrument to Measure the Status of An Organisation Business Process Capability. His research interests include manufacturing, simulation, optimization, reliability, scheduling, manufacturing, lean, Lean-Six Sigma, and Business Process Capability. He has presented numerous papers and articles over the years at IEOM, IAMOT, PICMET and IEEE.

Jan-Harm Pretorius obtained his BSc Hons (Electrotechnics) (1980), MIng (1982) and DIng (1997) degrees in Electrical and Electronic Engineering at the Rand Afrikaans University and an MSc (Laser Engineering and Pulse Power) at the University of St Andrews in Scotland (1989), the latter cum laude. He is a trained Baldrige (USA) and South African Excellence Foundation (SAEF) assessor. He worked at the South African Atomic Energy Corporation (AEC) as a Senior Consulting Engineer for 15 years. He also worked as the Technology Manager at the Satellite Applications Centre (SAC) of the Council for Scientific and Industrial Research (CSIR). He is currently a Professor and Head of School: Postgraduate School of Engineering Management in the Faculty of Engineering and the Built Environment. He has co-authored over 240 research papers and supervised 50 PhD and over 260 Master's students. He is a registered professional engineer, professional Measurement and Verification (M&V) practitioner, senior member of the Institute of Electrical and Electronic Engineering (IEEE), fellow of the South African Institute of Electrical Engineers (SAIEE) and a fellow of the South African Academy of Engineering.