SYSTEM DYNAMICS – FAST FASHION CONSUMPTION

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1. PROBLEM IDENTIFICATION

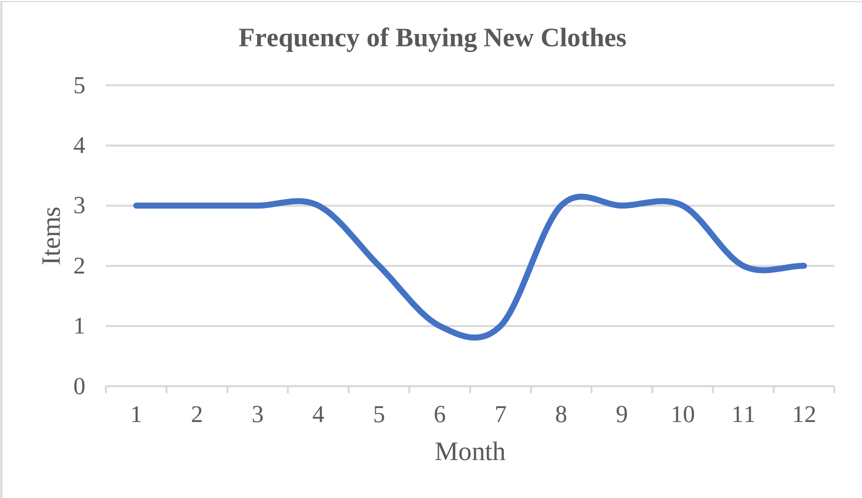
Fashion overconsumption, particularly driven by the rise of fast fashion, has emerged as a significant concern in recent years. As evidenced by alarming statistics, such as the fact that individuals are purchasing 60% more clothes and wearing them for half as long (UNEP, 2022), or "the average Brit spends £980.50 on new clothes annually" (Business Waste, 2023), it is apparent that there is a growing demand for clothing. This need is often met by opting for fast fashion due to its relatively low price. However, the inherent low quality of fast fashion items leads to quicker wear-and-tear, resulting in rapid discarding. Sustainable clothing purchases, on the other hand, although can be considered a good way to address this issue, are not favored due to their high price.

The objective of the model is to understand and explain the tendency to favour fast fashion over sustainable alternatives and how this behaviour could result in a cycle continuous purchasing of low-quality clothing, leading to increased expenditure and waste over time, thereby identifying potential interventions to mitigate this.

To scale down the problem and for the model, this report considers the need for clothes of a person only (referred to as "X", a university student) and her solution decisions to address the problem.

The reference mode, shown in **Figure 1**, illustrates the frequency of buying new clothes for student X. Despite the absence of significant gaps or variations in the graph, she has been always buying more and more clothes every month at a certain rate to make up for clothes being wasted, indicating her need for clothes.

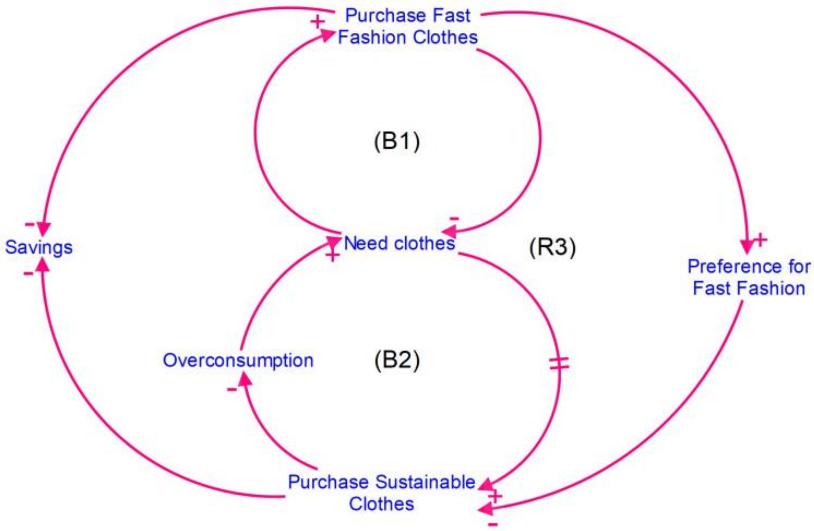
Figure 1. Reference mode



2. MODEL STRUCTURE

The Causal Loop Diagram (CLD) of the problem is shown in the **Figure 2**. The model comprises 3 feedback loops – 2 balancing loops (denoted as B1, B2) and 1 reinforcing loop (denoted as R3).

Figure 2. Causal Loop Diagram



The problem structure at hand aligns with the "Addiction"/ "Shifting the Burden" archetype, in which the short-term fix is favoured to address the symptom over the longer-term fix to the fundamental issue (Daniel H. Kim, 2000). While this symptomatic solution offers immediate relief, it fails to resolve the root problem and often leads to unintended side-effects that hinder efforts toward implementing the long-term solution.

In this problem context, student X needs clothes, she opts to purchase from fast fashion brands, which in turn addresses the need (loop B1). However, a sustainable, long-term solution would involve purchasing higher-quality, durable clothing (loop B2). Since fast fashion is cheap and often offers a wide variety, it creates a preference for keep buying from fast fashion, overtime leading to addiction and reinforces the underlying issue of "overconsumption" (loop R3). Furthermore, this side effect of favoring fast fashion undermines the pursuit of the fundamental solution, perpetuating the cycle of relying on symptomatic fixes, which also works in concert with the delay in adopting sustainable practices in loop B2. Considering the financial impact, both options – fast fashion and sustainable clothing – reduce student X's savings.

3. SIMULATION MODEL IN STELLA

The causal arrows in CLD leaving the problem symptom "Need for clothes" imply a decision-making process where typically only one path will be chosen. As a result, **two models** are created in Stella: favoring the symptomatic solution "Purchase Fast Fashion Clothes", and the other favoring the fundamental solution "Purchase Sustainable Clothes".

In this simulation, clothes are quantified in terms of items, savings are measured in pounds (£), and time is denoted in months. The simulation period spans five years, totalling 60 months.

The specifics regarding student X (data inputs for the model) are outlined as follows:

- Her current clothes inventory includes 6 t-shirts, and she desires to own 20 in total for reasons such as wardrobe diversity, backup or convenience.
- She will purchase new clothes when her current inventory falls below her desired number of clothes (referred to as "Clothes gap" in the model). However, she cannot make all purchases at once due to budget constraints and time limitations. Therefore, the maximum number of items she can purchase in a month is 3 and their costs cannot exceed her current savings.
- Her current savings amount to £500. She holds a part-time job that earns an average monthly income of £850, of which 5% is saved each month.
- Fast fashion items exhibit a normal distribution of prices with a mean of £9 and a standard deviation (std) of £3, denoted as (9,3). This distribution indicates that approximately 68% of prices will fall within one std of the mean (£6 to £12), while about 95% of prices will fall within two std of the mean (£3 to £15).
- The lifespan of fast fashion items follows a normal distribution with a mean of 7 months and a std of 2 months. This short lifespan is attributed to their low quality and the tendency for rapid disposal associated with fast fashion consumption.
- Sustainable clothes, made from higher-quality materials, thus a higher price, following a normal distribution (£25, £3). Consequently, they boast a longer lifespan, with a normal distribution (36 months, 2 months), reflecting changes in shopping habits towards more mindful consumption.
- The number of clothes discarded is calculated using a DELAY function. For instance, clothes purchased in the 3rd month will be discarded after 36 months, meaning disposal in the 39th month.

Assumption and simplification

- Both models only consider t-shirts as an essential item that can be worn in various situations.
- There is no variation in income (e.g., changes in minimum wage), resulting in consistent new savings every month.
- The simulation does not account for the impact of inflation on clothing prices, as the focus is on observing long-term changes in student X's savings under the two purchase choices.
- Other external factors such as peer influence, or advertising campaigns are not considered in the simulation, focusing solely on the internal dynamics of student X's clothing choices and savings.

4. MODEL DISCUSSION

Potential behaviour

Considering **Figure 3** (clothes inventory) and **Figure 4** (spending on clothes), both show fluctuations in inventory and spending over 60 months, with fast fashion exhibiting a higher degree of variability. This observation aligns with two balancing feedback loops within the system: a decrease in in inventory when student X need clothes and an increase upon purchasing to fulfil this need. As sustainable clothes last longer, their inventory remains relatively constant for a significant duration. This stability is true regarding mindful consumption, where inventory maintains a consistent rate over time.

Figure 3. Student X's clothes inventory throughout 5 years

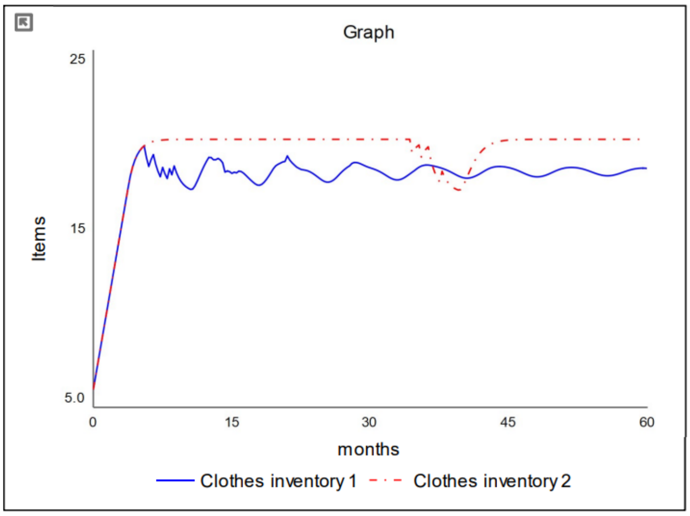


Figure 4. Student X's spending on clothes by purchase choices in 5 years

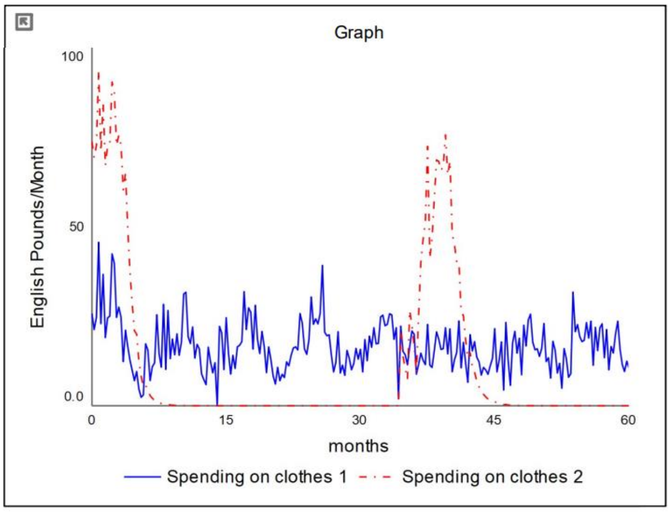
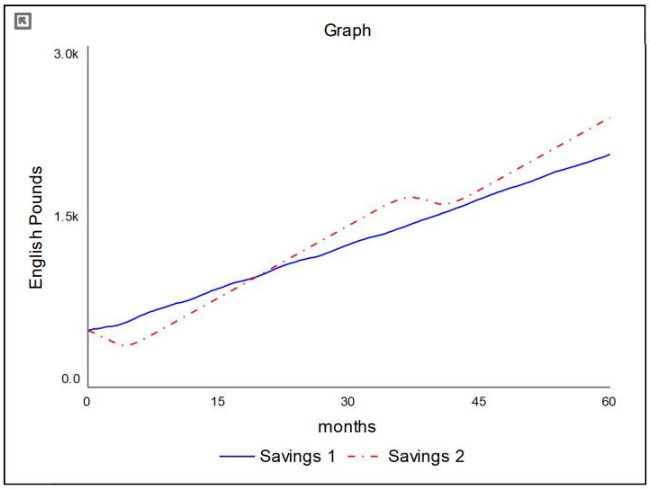


Figure 5 details student X's accumulated savings in 5 years. Savings in the case of purchasing fast fashion items are higher compared to the scenario of purchasing sustainable clothes for the first 20 months. However, as the simulation progresses, savings from sustainable purchases begin to surpass those from fast fashion, indicating that while fast fashion may offer short-term cost savings, sustainable items prove to be the more financially advantageous choice in the long run. Extending the simulation time in Stella, for instance, to 10 years (120 months), could provide even greater insight into the long-term impact of these purchasing decisions.

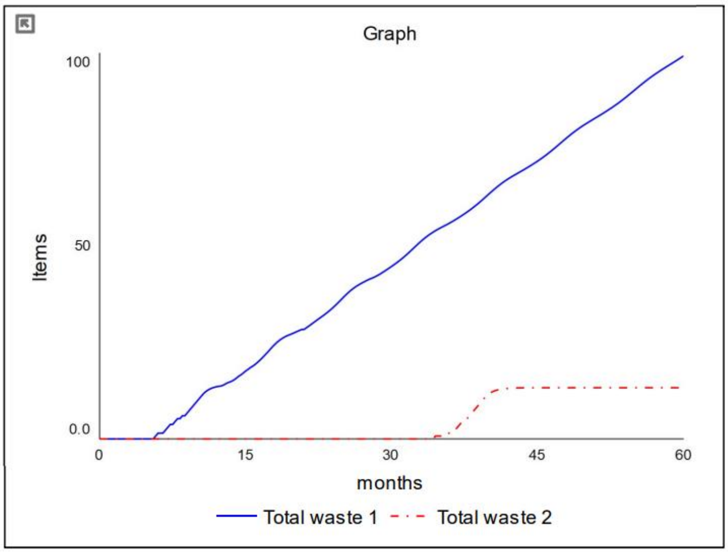
Figure 5. Student X's total savings by purchase choices in 5 years



Another critical point of consideration is the cost-effectiveness of clothes, defined as Price/Lifespan. In the model, the cost-effectiveness of fast fashion is calculated as 1.28 (9÷7), while that of sustainable clothing is 0.69 (25÷36). This comparison reveals that the cost per month for sustainable clothing is significantly lower, underscoring its economic efficiency over time.

Figure 6 illustrates the total waste generated over time, with a stark contrast between fast fashion and sustainable clothing. Fast fashion items exhibit an exponential growth in waste generation, while sustainable clothing follows a more gradual s-shaped growth curve. Considering the environmental implications, while not explicitly incorporated into the current model, environmental factors associated with fast fashion consumption are a concern that could affect student X's decision.

Figure 6. Student X's total waste of clothes in 5 years



Intervention

To influence the consumer's behaviour towards favoring sustainable alternatives over fast fashion, structural changes targeting systemic consumption drivers are imperative. One possible strategy is to implement Extended Producer Responsibility (EPR) legislation within the fashion industry.

EPR mandates that fashion companies manage the end-of-life of their products, lessening the burden on consumers. By mandating take-back programs and offering financial incentives for sustainable practices, EPR encourages companies to prioritise durability and recyclability in their production processes.

As manufacturers embrace these sustainable practices, a wider range of sustainable clothing options becomes available in the market. This increased availability makes sustainable clothing more accessible to consumers. Moreover, through the provision of financial incentives (tax breaks, subsidies), governments can help lower production costs for manufacturers. Consequently, these savings can be passed on to consumers through lower prices, making sustainable clothing more affordable and competitive with fast fashion alternatives. This can influence customers (such as student X) to be more inclined to choose sustainable clothing solutions for her clothes need over fast fashion. Over time, such shifts in consumer preference can diminish the demand for fast fashion products, as individuals increasingly opt for more sustainable alternatives, ultimately accelerating the transition towards a more sustainable fashion industry.

Limitations and reflection

The models have certain limitations. Firstly, both models (one for fast fashion and one for sustainable clothes) only consider the purchase of a single type of clothing. However, it is more realistic that people buy both fast fashion and sustainable clothes or opt for fast fashion for short-term transitional fix until the fundamental solution (sustainable) can be applied. Secondly, the desired level of clothes should increase over time as consumers, such as student X, continue to purchase from fast fashion, a factor not accounted for in the models.

In essence, the CLD and models in stella were the result of a lot of trial and error. While they may appear relatively simple, understanding the intricacies of what I have modelled is essential. This understanding also enhances my systems thinking, fostering a holistic comprehension of the modeling issue. For instance, in this report, understanding why people choose a particular solution over others involves recognising numerous influencing factors, which could require significant time to incorporate into the models.

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