

# Individual Assignment 3

MECHENG 4B03

Alex Bartella

400308868

2025-04-06

## The Part

The part is a chalk roller, meant to be a convenient alternative to traditional chalk application methods like chalk bags and balls. The roller stores chalk powder and allows the user to evenly apply it to their hands, quickly and easily. It utilizes a print-in-place design composed of a knurled roller, dovetail door, container, and carabiner hook.

## Business Canvas Analysis

There are a few key partnerships that need to be established to ensure the success of this product. Connections to Prusa and other 3D printer manufacturers will be greatly beneficial to the manufacturing process, as acquiring printers in bulk is key to reducing costs. Also acquisition of high-quality printers ensures the quality of the product. Rock climbing gyms are the habitat of the main demographic the product is targeting, so establishing good relationships in order to run pop-up shops and advertisements is essential to the growth of the product. Most climbers shop at outdoor equipment retailers like MEC and REI, so getting our product on their shelves is an important step in becoming established in the industry.

Marketing is an essential activity to ensure the growth of our product. In a market full of established giants, allowing people to see and use our products in action would be a great benefit. Word of mouth spawned from pop-up shops and free demos at climbing gyms is a perfect way to establish the product, as well as influencer marketing.

The product presents a unique value proposition compared to chalk bags, whereas this is a solid product with a rolling part which makes application faster, easier, and more ergonomic. Tried and tested for top rope climbing, it works flawlessly. While the main target audience is rock climbers, this product also targets gym-goers and bodybuilders, who also use chalk regularly. Summer camps and other outdoor childcare facilities who use rock climbing as an activity are also a potential customer for our product.

The cost structure is primarily composed of fulfillment and shipping costs via amazon. Marketing and advertising is a key cost to the growth of our product, as will be

demonstrated in the next section. Manufacturing via injection moulding and 3D printing is makes up the bulk of the remaining cost structure. Revenue includes solely product sales. Alternative revenue streams should be explored in the future.

## Financial Analysis

Some key assumptions were made when constructing the financial model. It is assumed that the cost of manufacturing facilities (i.e. where all the printers are located) is negligible, since this quantity is highly variable and location dependent. Base quarterly growth is 5%, while the use of social media advertisements will boost growth to 20% per quarter. All printers will be running non-stop 24 hours per day 7 days per week, and up to 4 hours of print time is lost to maintenance or downtime. Therefore, each printer can produce 5 chalk rollers per day. Assume change in Amazon storage and fulfilment cost over time is negligible.

The main takeaway from my financial analysis is that when 3D printed, the product is profitable short-term, however it is heavily held back by storage and fulfilment costs as well as labour for printer maintenance. These costs together make up the overwhelming majority of the total costs associated with manufacturing. Even more concerning, 60% of the total cost is due to these two components in year 1 quarter 2, which steadily increases to 77% in year 2 quarter 4. This business model may not be sustainable, as at very high volume these costs may outpace sales revenue, reducing the profitability of this product in the long term.

In terms of the injection moulded approach, the product is much more profitable, especially when manufacturing all at once in year 1 quarter 1. Costs associated with labour and materials is significantly reduced as it becomes static. Fulfillment is still a major cost with this approach, and alternatives should be explored for this sector.

## Advised Changes

I'd advise looking into alternatives for order fulfillment. As mentioned previously, fulfillment composes up to 77% of costs related to sales, and the cost-optimization of this service could increase profits significantly. This additional profit can be reinvested into marketing and infrastructure to increase growth. Additionally, more robust investment in manufacturing can lead to decreased production costs and better production time. For example, a fleet of Bambu printers or Prusa mk4 printers rather than Prusa mk3's will decrease print time and lower manufacturing costs. Investment in overseas manufacturing for injection moulding could also be key to reducing material and manufacturing costs. Also, the product at this point is slightly over-engineered, as a lower infill (~10%) could be marginally as sturdy as the current revision. Above all, the reduction of fulfillment costs by seeking alternative services is key to increasing the growth of this business.

# The Business Model Canvas

Designed for: Chalk roller
Designed by: Alex Bartella - 4B03
Date:
Version:

|  |   |   |
|--|---|---|
| <p><b>Key Partners</b></p> <ul style="list-style-type: none"> <li>- Prusa, Bambu, and other 3D printer manufacturers</li> <li>- Mass 3D print manufacturing providers</li> <li>- Rock Climbing gyms</li> <li>- Goodlife fitness and other gyms</li> <li>- Outdoor gear retailers i.e. Mountain Equipment Company</li> <li>- Filament suppliers</li> <li>- Chalk company</li> <li>- partnerships</li> <li>- Sell combination packs</li> </ul> | <p><b>Key Activities</b></p> <ul style="list-style-type: none"> <li>- marketing</li> <li>- product development/design</li> <li>- testing</li> <li>- establishing partnerships</li> <li>- fulfilment/distribution</li> </ul> | <p><b>Value Propositions</b></p> <ul style="list-style-type: none"> <li>- Convenient solid chalk applicator</li> <li>- very effective for belay/lead climbing</li> <li>- cheap and durable</li> <li>- more ergonomic and easy to use</li> </ul> |
| <p><b>Key Resources</b></p> <ul style="list-style-type: none"> <li>- CAD</li> <li>- patents</li> <li>- support staff</li> </ul>  | <p><b>Customer Relationships</b></p> <ul style="list-style-type: none"> <li>- promotions/community events</li> <li>- customer support</li> </ul>  | <p><b>Customer Segments</b></p> <ul style="list-style-type: none"> <li>- Rock climbers</li> <li>- gym-goers</li> <li>- climbing instructors</li> <li>- summer camps</li> </ul>  |
| <p><b>Cost Structure</b></p> <ul style="list-style-type: none"> <li>- manufacturing (3d print/inj mould)</li> <li>- marketing/advertising</li> <li>- influencer marketing</li> <li>- community outreach events/samples</li> <li>- fulfillment/shipping/ amazon costs</li> <li>- website</li> <li>- testing, prototyping, development</li> </ul>  | <p><b>Channels</b></p> <ul style="list-style-type: none"> <li>- e-commerce (amazon)</li> <li>- MEC/outdoor gear shops</li> <li>- promotional events/pop-ups</li> <li>- climbing gyms</li> </ul>                             | <p><b>Revenue Streams</b></p> <ul style="list-style-type: none"> <li>- product sales</li> <li>- bulk orders</li> <li>- branded/novelty orders</li> </ul>  |

| Appendix B1 - 3D printed with ads |                |                 |  |                 |                 |                 |                 |                 |
|-----------------------------------|----------------|-----------------|--|-----------------|-----------------|-----------------|-----------------|-----------------|
| Annual Discount Rate              |                | 0.07            | * this represents opportunity cost, interest |                 |                 |                 |                 |                 |
| Quarterly Discount Rate           |                | 0.0175          | interest/4                                   |                 |                 |                 |                 |                 |
|                                   |                |                 |  |                 |                 |                 |                 |                 |
|                                   | Year 1         |                 |  |                 | Year 2          |                 |                 |                 |
|                                   | Q1             | Q2              | Q3   | Q4              | Q1              | Q2              | Q3              | Q4              |
| n=                                | 1              | 2               | 3  | 4               | 5               | 6               | 7               | 8               |
| <b>Inflows</b>                    |                |                 |  |                 |                 |                 |                 |                 |
| Roller Sales                      |                | \$12,000        | \$14,400                                     | \$17,280        | \$20,736        | \$24,883        | \$29,860        | \$35,832        |
|                                   |                |                 |  |                 |                 |                 |                 |                 |
| <b>Total Revenue</b>              |                | <b>\$12,000</b> | <b>\$14,400</b>                              | <b>\$17,280</b> | <b>\$20,736</b> | <b>\$24,883</b> | <b>\$29,860</b> | <b>\$35,832</b> |
|                                   |                |                 |  |                 |                 |                 |                 |                 |
| <b>Outflows</b>                   |                |                 |  |                 |                 |                 |                 |                 |
| Labour                            | \$2,880        | \$2,880         | \$4,320                                      | \$5,760         | \$5,760         | \$7,200         | \$8,640         | \$8,640         |
| Advertising                       | \$3,000        | \$3,000         | \$3,000                                      | \$3,000         | \$3,000         | \$3,000         | \$3,000         | \$3,000         |
| Storage + Fulfillment             | \$0            | \$2,856         | \$3,428                                      | \$4,113         | \$4,936         | \$5,923         | \$7,108         | \$8,529         |
| Printers                          | \$2,660        | \$0             | \$1,330                                      | \$1,330         | \$0             | \$1,330         | \$1,330         | \$0             |
| Filament                          | \$594          | \$713           | \$855  | \$1,026         | \$1,232         | \$1,478         | \$1,774         | \$1,862         |
| Energy                            | \$41           | \$41            | \$62   | \$82            | \$82            | \$103           | \$123           | \$123           |
| <b>Total Costs</b>                | <b>\$9,175</b> | <b>\$9,490</b>  | <b>\$12,995</b>                              | <b>\$15,312</b> | <b>\$15,010</b> | <b>\$19,034</b> | <b>\$21,975</b> | <b>\$22,155</b> |
| labour & storage/total cost       | 31%            | 60%             | 60%  | 64%             | 71%             | 69%             | 72%             | 77%             |
|                                   |                |                 |  |                 |                 |                 |                 |                 |
| <b>Quarterly Cash Flow</b>        | -\$9,175       | \$2,510         | \$1,405                                      | \$1,968         | \$5,726         | \$5,849         | \$7,885         | \$13,677        |
| <b>Quarterly NPV</b>              | -\$9,175       | \$2,424         | \$1,334                                      | \$1,836         | \$5,250         | \$5,271         | \$6,983         | \$11,904        |
| <b>Total NPV</b>                  | \$25,828       |                 |  |                 |                 |                 |                 |                 |
|                                   |                |                 |  |                 |                 |                 |                 |                 |
|                                   |                |                 |  |                 |                 |                 |                 |                 |
| <b>Supporting Calculations</b>    |                |                 |  |                 |                 |                 |                 |                 |
| Rollers per unit                  | 1              |                 |  | Exchange rate   | 1.33            |                 |                 |                 |
| Price per unit                    | 20 CAD         |                 |  |                 |                 |                 |                 |                 |
| Material cost per roller          | 0.99 CAD       |                 | Per Prusa Software                           |                 |                 |                 |                 |                 |
|                                   |                |                 |  |                 |                 |                 |                 |                 |

|  |                    |                       |        |         |         |         |         |         |
|--|--------------------|-----------------------|--------|---------|---------|---------|---------|---------|
| Estimated units/month via amazon                                 | 200                |                       |        |         |         |         |         |         |
| Quarterly growth   | 20%                |                       |        |         |         |         |         |         |
| Sales Volume (units)   | 0                  | 600                   | 720    | 864     | 1037    | 1244    | 1493    | 1792    |
| Rollers to be fabricated   | 600                | 720                   | 864    | 1037    | 1244    | 1493    | 1792    | 1881    |
|  |                    |                       |        |         |         |         |         |         |
|  |                    |                       |        |         |         |         |         |         |
| Fabrication Time per roller                                      | 5 h                | 4 rollers/day/printer |        |         |         |         |         |         |
| Cost per printer   | 1000 USD per Prusa |                       |        |         |         |         |         |         |
|  | 1330 CAD           |                       |        |         |         |         |         |         |
|  |                    |                       |        |         |         |         |         |         |
| 90 days/quarter, 4 rollers/printer/day = 360 rollers/printer/qtr |                    |                       |        |         |         |         |         |         |
|  |                    |                       |        |         |         |         |         |         |
| n Printers   | 2                  | 0                     | 1      | 1       | 0       | 1       | 1       | 0       |
| \$ Printers  | 2660               | 0                     | 1330   | 1330    | 0       | 1330    | 1330    | 0       |
| total number of printers   | 2                  | 2                     | 3      | 4       | 4       | 5       | 6       | 6       |
|  |                    |                       |        |         |         |         |         |         |
| Labour   | 2880               | 2880                  | 4320   | 5760    | 5760    | 7200    | 8640    | 8640    |
| * assume 1h/day to print deburr, maintain per printer, \$16/hour |                    |                       |        |         |         |         |         |         |
|  |                    |                       |        |         |         |         |         |         |
| Materials  | 594.00             | 712.80                | 855.36 | 1026.43 | 1231.72 | 1478.06 | 1773.67 | 1862.36 |
| Printing Energy cost   | 41.13              | 41.13                 | 61.69  | 82.25   | 82.25   | 102.82  | 123.38  | 123.38  |
| kwh consumed per day   | 3.84               | 3.84                  | 5.76   | 7.68    | 7.68    | 9.60    | 11.52   | 11.52   |
| *average cost in ontario is                                      |                    |                       |        |         |         |         |         |         |
| *11.9 cents/kwh  |                    |                       |        |         |         |         |         |         |
| *prusa consumes 80 W during printing                             |                    |                       |        |         |         |         |         |         |
|  |                    |                       |        |         |         |         |         |         |
| Storage  | 400                | 400                   | 400    | 400     | 400     | 400     | 400     | 400     |
| * assume one storage unit  |                    |                       |        |         |         |         |         |         |
|  |                    |                       |        |         |         |         |         |         |
| Advertising  |                    |                       |        |         |         |         |         |         |
| Instagram Ads  | 3000               | 3000                  | 3000   | 3000    | 3000    | 3000    | 3000    | 3000    |
|  |                    |                       |        |         |         |         |         |         |
| Amazon Fulfilment per unit                                       | 4.58               |                       |        |         |         |         |         |         |
| Amazon Storage per 1000 units                                    | 30                 | 30                    | 30     | 30      | 30      | 30      | 30      | 30      |
|  |                    |                       |        |         |         |         |         |         |
| Storage and Fulfilment per unit                                  | 4.76               | 4.76                  | 4.76   | 4.76    | 4.76    | 4.76    | 4.76    | 4.76    |
| * assume stored in storage unit when not being sold by amazon    |                    |                       |        |         |         |         |         |         |

| Appendix B2 - 3D printed without ads |                 |                 |  |                 |                 |                 |                 |                 |
|--------------------------------------|-----------------|-----------------|--|-----------------|-----------------|-----------------|-----------------|-----------------|
| Annual Discount Rate                 |                 | 0.07            | * this represents opportunity cost, interest |                 |                 |                 |                 |                 |
| Quarterly Discount Rate              |                 | 0.0175          | interest/4                                   |                 |                 |                 |                 |                 |
|                                      | Year 1          |                 |  |                 | Year 2          |                 |                 |                 |
|                                      | Q1              | Q2              | Q3   | Q4              | Q1              | Q2              | Q3              | Q4              |
| n=                                   | 1               | 2               | 3  | 4               | 5               | 6               | 7               | 8               |
| <b>Inflows</b>                       |                 |                 |  |                 |                 |                 |                 |                 |
| Roller Sales                         |                 | \$12,000        | \$12,600                                     | \$13,230        | \$13,892        | \$14,586        | \$15,315        | \$16,081        |
| <b>Total Revenue</b>                 |                 | <b>\$12,000</b> | <b>\$12,600</b>                              | <b>\$13,230</b> | <b>\$13,892</b> | <b>\$14,586</b> | <b>\$15,315</b> | <b>\$16,081</b> |
| <b>Outflows</b>                      |                 |                 |  |                 |                 |                 |                 |                 |
| Labour                               | \$2,880         | \$2,880         | \$2,880                                      | \$2,880         | \$2,880         | \$2,880         | \$2,880         | \$2,880         |
| Advertising                          |                 |                 | \$1,000                                      |                 |                 |                 | \$1,000         |                 |
| Storage + Fulfillment                | \$0             | \$2,856         | \$2,999                                      | \$3,149         | \$3,307         | \$3,472         | \$3,646         | \$3,828         |
| Printers                             | \$2,660         | \$0             | \$0  | \$0             | \$0             | \$0             | \$0             | \$0             |
| Filament                             | \$594           | \$624           | \$655  | \$688           | \$722           | \$758           | \$796           | \$836           |
| <b>Total Costs</b>                   | <b>\$6,134</b>  | <b>\$6,360</b>  | <b>\$7,534</b>                               | <b>\$6,717</b>  | <b>\$6,909</b>  | <b>\$7,110</b>  | <b>\$8,322</b>  | <b>\$7,544</b>  |
| <b>Quarterly Cash Flow</b>           | -\$6,134        | \$5,640         | \$5,066                                      | \$6,513         | \$6,983         | \$7,476         | \$6,994         | \$8,537         |
| <b>Quarterly NPV</b>                 | -\$6,134        | \$5,448         | \$4,809                                      | \$6,077         | \$6,403         | \$6,737         | \$6,194         | \$7,431         |
| <b>Total NPV</b>                     | <b>\$36,964</b> |                 |  |                 |                 |                 |                 |                 |
| <b>Supporting Calculations</b>       |                 |                 |  |                 |                 |                 |                 |                 |
| Rollers per unit                     | 1               |                 |  | Exchange rate   | 1.33            |                 |                 |                 |
| Price per unit                       | 20              | CAD             |  |                 |                 |                 |                 |                 |
| Material cost per roller             | 0.99            | CAD             | Per Prusa Software                           |                 |                 |                 |                 |                 |
| Estimated units/month via amazon     | 200             |                 |  |                 |                 |                 |                 |                 |
| Quarterly growth                     | 5%              |                 |  |                 |                 |                 |                 |                 |
| Sales Volume (units)                 | 0               | 600             | 630  | 662             | 695             | 729             | 766             | 804             |



|  |        |                       |        |        |        |        |        |        |
|--|--------|-----------------------|--------|--------|--------|--------|--------|--------|
| Rollers to be fabricated   | 600    | 630                   | 662    | 695    | 729    | 766    | 804    | 844    |
|  |        |                       |        |        |        |        |        |        |
| Fabrication Time per roller                                      | 5 h    | 4 rollers/day/printer |        |        |        |        |        |        |
| Cost per printer   | 1000   | USD per Prusa         |        |        |        |        |        |        |
|  | 1330   | CAD                   |        |        |        |        |        |        |
| 90 days/quarter, 4 rollers/printer/day = 360 rollers/printer/qtr |        |                       |        |        |        |        |        |        |
| Need 1 printers to make 210/quarter, 2 for 500                   |        |                       |        |        |        |        |        |        |
| max rollers printed/qtr  | 844    |                       |        |        |        |        |        |        |
| n Printers   | 2      |                       |        | 0      |        |        |        |        |
| \$ Printers  | 2660   |                       |        | 0      |        |        |        |        |
|  |        |                       |        |        |        |        |        |        |
| Labour   | 2880   | 2880                  | 2880   | 2880   | 2880   | 2880   | 2880   | 2880   |
| * assume 1h/day to print deburr, maintain per printer, \$16/hour |        |                       |        |        |        |        |        |        |
|  |        |                       |        |        |        |        |        |        |
| Materials  | 594.00 | 623.70                | 654.89 | 687.63 | 722.01 | 758.11 | 796.02 | 835.82 |
|  |        |                       |        |        |        |        |        |        |
| Storage  | 400    | 400                   | 400    | 400    | 400    | 400    | 400    | 400    |
| * assume one storage unit  |        |                       |        |        |        |        |        |        |
|  |        |                       |        |        |        |        |        |        |
| Advertising  |        |                       |        |        |        |        |        |        |
| Instagram Ads  |        |                       |        |        |        |        |        |        |
|  |        |                       |        |        |        |        |        |        |
| Amazon Fulfilment per unit                                       | 4.58   |                       |        |        |        |        |        |        |
| Amazon Storage per 1000 unit                                     | 30     | 30                    | 30     | 30     | 30     | 30     | 30     | 30     |
|  |        |                       |        |        |        |        |        |        |
| Storage and Fulflment per unit                                   | 4.76   | 4.76                  | 4.76   | 4.76   | 4.76   | 4.76   | 4.76   | 4.76   |
| * assume stored in storage unit when not being sold by amazon    |        |                       |        |        |        |        |        |        |

## Appendix B3 - Injection moulded with ads

|                                |                 |                 |  |                 |                 |                 |                 |                 |       |
|--------------------------------|-----------------|-----------------|--|-----------------|-----------------|-----------------|-----------------|-----------------|-------|
| Annual Discount Rate           |                 | 0.07            | * this represents opportunity cost, interest |                 |                 |                 |                 |                 |       |
| Quarterly Discount Rate        |                 | 0.0175          | interest/4                                   |                 |                 |                 |                 |                 |       |
|                                | Year 1          |                 |  |                 | Year 2          |                 |                 |                 |       |
|                                | Q1              | Q2              | Q3   | Q4              | Q1              | Q2              | Q3              | Q4              |       |
| n=                             | 1               | 2               | 3  | 4               | 5               | 6               | 7               | 8               |       |
| <b>Inflows</b>                 |                 |                 |  |                 |                 |                 |                 |                 |       |
| Chalk Roller Sales             | \$0             | \$12,000        | \$14,400                                     | \$17,280        | \$20,740        | \$24,900        | \$29,880        | \$35,860        |       |
| <b>Total Revenue</b>           | <b>\$0</b>      | <b>\$12,000</b> | <b>\$14,400</b>                              | <b>\$17,280</b> | <b>\$20,740</b> | <b>\$24,900</b> | <b>\$29,880</b> | <b>\$35,860</b> |       |
| <b>Outflows</b>                |                 |                 |  |                 |                 |                 |                 |                 |       |
| Labour                         | \$1,475         | \$320           | \$384  | \$461           | \$553           | \$664           | \$797           | \$956           |       |
| Advertising                    | \$3,000         | \$3,000         | \$3,000                                      | \$3,000         | \$3,000         | \$3,000         | \$3,000         | \$3,000         |       |
| Storage + Fulfillment          | \$0             | \$2,856         | \$3,428                                      | \$4,113         | \$4,937         | \$5,927         | \$7,113         | \$8,536         |       |
| Tooling                        | \$7,697         |                 |  |                 |                 |                 |                 |                 |       |
| Materials                      | \$2,351         |                 |  |                 |                 |                 |                 |                 |       |
| <b>Total Costs</b>             | <b>\$14,522</b> | <b>\$6,176</b>  | <b>\$6,812</b>                               | <b>\$7,574</b>  | <b>\$8,490</b>  | <b>\$9,591</b>  | <b>\$10,909</b> | <b>\$12,492</b> |       |
| <b>Quarterly Cash Flow</b>     | -\$14,522       | \$5,824         | \$7,588                                      | \$9,706         | \$12,250        | \$15,309        | \$18,971        | \$23,368        |       |
| <b>Quarterly NPV</b>           | -\$14,522       | \$5,625         | \$7,203                                      | \$9,055         | \$11,232        | \$13,796        | \$16,801        | \$20,340        |       |
| <b>Total NPV</b>               | <b>\$69,530</b> |                 |  |                 |                 |                 |                 |                 |       |
| <b>Supporting Calculations</b> |                 |                 |  |                 |                 |                 |                 |                 |       |
| Rollers per unit               | 1               |                 |  |                 | Exchange rate   | 1.33            |                 |                 |       |
| Price per unit                 | 20              | CAD             |  |                 |                 |                 |                 |                 |       |
| Material cost per roller       | 0.228           | USD             | Per inj mold                                 |                 |                 |                 |                 |                 |       |
| Labour cost per roller         | 0.143           | USD             |  |                 |                 |                 |                 |                 |       |
| Packing cost per roller        | 0.056           | USD             |  |                 |                 |                 |                 |                 |       |
| Estimated units/month via      | 200             |                 |  |                 |                 |                 |                 |                 |       |
| Quarterly growth               | 20%             |                 |  |                 |                 |                 |                 |                 |       |
| Sales Volume (units)           | 0               | 600             | 720  | 864             | 1037            | 1245            | 1494            | 1793            | TOTAL |
| Pumpkins to be fabricated      | 7753            | 0               | 0  | 0               | 0               | 0               | 0               | 0               | 7753  |

|   |             |      |      |        |             |        |       |             |
|---|-------------|------|------|--------|-------------|--------|-------|-------------|
|   |             |      |      |        |             |        |       |             |
| Material Cost per pumpkin                                     |             |      |      |        |             |        |       |             |
|   |             |      |      |        |             |        |       |             |
| Materials   | 2351.02     | 0    | 0    | 0      | 0           | 0      | 0     | 0           |
| Mfg Labour  | 1474.54     |      |      |        |             |        |       |             |
| Repacking Labour  |             | 320  | 384  | 460.80 | 553.0666667 | 664.00 | 796.8 | 956.2666667 |
| * assume 2 min per unit, \$16/hr                              |             |      |      |        |             |        |       |             |
|   |             |      |      |        |             |        |       |             |
| Packing   | 577.44344   |      |      |        |             |        |       |             |
| Storage   | 400         | 400  | 400  | 400    | 400         | 400    | 400   | 400         |
| * assume two storage unit                                     |             |      |      |        |             |        |       |             |
| Tooling   | 5787 USD    |      |      |        |             |        |       |             |
|   | 7696.71 CAD |      |      |        |             |        |       |             |
|   |             |      |      |        |             |        |       |             |
| Advertising   |             |      |      |        |             |        |       |             |
| Instagram Ads   | 3000        | 3000 | 3000 | 3000   | 3000        | 3000   | 3000  | 3000        |
|   |             |      |      |        |             |        |       |             |
| Amazon Fulfilment per unit                                    | 4.58        |      |      |        |             |        |       |             |
| Amazon Storage per 1000                                       | 30          | 30   | 30   | 30     | 30          | 30     | 30    | 30          |
|   |             |      |      |        |             |        |       |             |
| Storage and Fulfilment per unit                               | 4.76        | 4.76 | 4.76 | 4.76   | 4.76        | 4.76   | 4.76  | 4.76        |
| * assume stored in storage unit when not being sold by amazon |             |      |      |        |             |        |       |             |

## Appendix B4 - Injection Moulded without ads

|                                |                 |                 |  |                 |                 |                 |                 |                 |       |
|--------------------------------|-----------------|-----------------|--|-----------------|-----------------|-----------------|-----------------|-----------------|-------|
| Annual Discount Rate           |                 | 0.07            | * this represents opportunity cost, interest |                 |                 |                 |                 |                 |       |
| Quarterly Discount Rate        |                 | 0.0175          | interest/4                                   |                 |                 |                 |                 |                 |       |
|                                | Year 1          |                 |  |                 | Year 2          |                 |                 |                 |       |
|                                | Q1              | Q2              | Q3   | Q4              | Q1              | Q2              | Q3              | Q4              |       |
| n=                             | 1               | 2               | 3  | 4               | 5               | 6               | 7               | 8               |       |
| <b>Inflows</b>                 |                 |                 |  |                 |                 |                 |                 |                 |       |
| Chalk Roller Sales             | \$0             | \$12,000        | \$12,600                                     | \$13,240        | \$13,920        | \$14,620        | \$15,360        | \$16,140        |       |
| <b>Total Revenue</b>           | <b>\$0</b>      | <b>\$12,000</b> | <b>\$12,600</b>                              | <b>\$13,240</b> | <b>\$13,920</b> | <b>\$14,620</b> | <b>\$15,360</b> | <b>\$16,140</b> |       |
| <b>Outflows</b>                |                 |                 |  |                 |                 |                 |                 |                 |       |
| Labour                         | \$931           | \$320           | \$336  | \$353           | \$371           | \$390           | \$410           | \$430           |       |
| Advertising                    | \$0             | \$0             | \$0  | \$0             | \$0             | \$0             | \$0             | \$0             |       |
| Storage + Fulfillment          | \$0             | \$2,856         | \$2,999                                      | \$3,152         | \$3,313         | \$3,480         | \$3,656         | \$3,842         |       |
| Tooling                        | \$7,697         |                 |  |                 |                 |                 |                 |                 |       |
| Materials                      | \$1,484         |                 |  |                 |                 |                 |                 |                 |       |
| <b>Total Costs</b>             | <b>\$10,112</b> | <b>\$3,176</b>  | <b>\$3,335</b>                               | <b>\$3,505</b>  | <b>\$3,685</b>  | <b>\$3,870</b>  | <b>\$4,066</b>  | <b>\$4,272</b>  |       |
| <b>Quarterly Cash Flow</b>     | -\$10,112       | \$8,824         | \$9,265                                      | \$9,735         | \$10,235        | \$10,750        | \$11,294        | \$11,868        |       |
| <b>Quarterly NPV</b>           | -\$10,112       | \$8,523         | \$8,795                                      | \$9,083         | \$9,385         | \$9,687         | \$10,003        | \$10,330        |       |
| <b>Total NPV</b>               | <b>\$55,693</b> |                 |  |                 |                 |                 |                 |                 |       |
| <b>Supporting Calculations</b> |                 |                 |  |                 |                 |                 |                 |                 |       |
| Rollers per unit               | 1               |                 |  | Exchange rate   | 1.33            |                 |                 |                 |       |
| Price per unit                 | 20              | CAD             |  |                 |                 |                 |                 |                 |       |
| Material cost per roller       | 0.228           | USD             | Per inj mold                                 |                 |                 |                 |                 |                 |       |
| Labour cost per roller         | 0.143           | USD             |  |                 |                 |                 |                 |                 |       |
| Packing cost per roller        | 0.056           | USD             |  |                 |                 |                 |                 |                 |       |
| Estimated units/month via      | 200             |                 |  |                 |                 |                 |                 |                 |       |
| Quarterly growth               | 5%              |                 |  |                 |                 |                 |                 |                 |       |
| Sales Volume (units)           | 0               | 600             | 630  | 662             | 696             | 731             | 768             | 807             | TOTAL |
| Pumpkins to be fabricated      | 4894            | 0               | 0  | 0               | 0               | 0               | 0               | 0               | 4894  |

|   |             |      |      |        |       |        |       |       |
|---|-------------|------|------|--------|-------|--------|-------|-------|
|   |             |      |      |        |       |        |       |       |
| Material Cost per pumpkin                                     |             |      |      |        |       |        |       |       |
|   |             |      |      |        |       |        |       |       |
| Materials   | 1484.06     | 0    | 0    | 0      | 0     | 0      | 0     | 0     |
| Mfg Labour  | 930.79      |      |      |        |       |        |       |       |
| Repacking Labour  |             | 320  | 336  | 353.07 | 371.2 | 389.87 | 409.6 | 430.4 |
| * assume 2 min per unit, \$16/hr                              |             |      |      |        |       |        |       |       |
|   |             |      |      |        |       |        |       |       |
| Packing   | 364.50512   |      |      |        |       |        |       |       |
| Storage   | 400         | 400  | 400  | 400    | 400   | 400    | 400   | 400   |
| * assume two storage unit                                     |             |      |      |        |       |        |       |       |
| Tooling   | 5787 USD    |      |      |        |       |        |       |       |
|   | 7696.71 CAD |      |      |        |       |        |       |       |
|   |             |      |      |        |       |        |       |       |
| Advertising   |             |      |      |        |       |        |       |       |
| Instagram Ads   |             |      |      |        |       |        |       |       |
|   |             |      |      |        |       |        |       |       |
| Amazon Fulfilment per unit                                    | 4.58        |      |      |        |       |        |       |       |
| Amazon Storage per 1000                                       | 30          | 30   | 30   | 30     | 30    | 30     | 30    | 30    |
|   |             |      |      |        |       |        |       |       |
| Storage and Fulfilment per unit                               | 4.76        | 4.76 | 4.76 | 4.76   | 4.76  | 4.76   | 4.76  | 4.76  |
| * assume stored in storage unit when not being sold by amazon |             |      |      |        |       |        |       |       |

## Appendix C – References

[1] “FAQ - frequently asked questions,” Prusa Knowledge Base,  
[https://help.prusa3d.com/article/faq-frequently-asked-questions\\_1932](https://help.prusa3d.com/article/faq-frequently-asked-questions_1932) (accessed Apr. 6, 2025).

[2] “Cost estimator,” Injection Molding Cost Estimator,  
<https://www.custompartnet.com/estimate/injection-molding/> (accessed Apr. 6, 2025).