

Team Nugget



Presenters:

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Problem Statement

One should be able to open a door without the hands.



Customers

Primary Customers

- People in the medical fields
 - Doctors
 - Nurses
 - EMT
- People who have a disability that will not allow them to open doors easily
- Warehouse workers
- University staff
 - Maintenance workers
 - Professors
 - Students



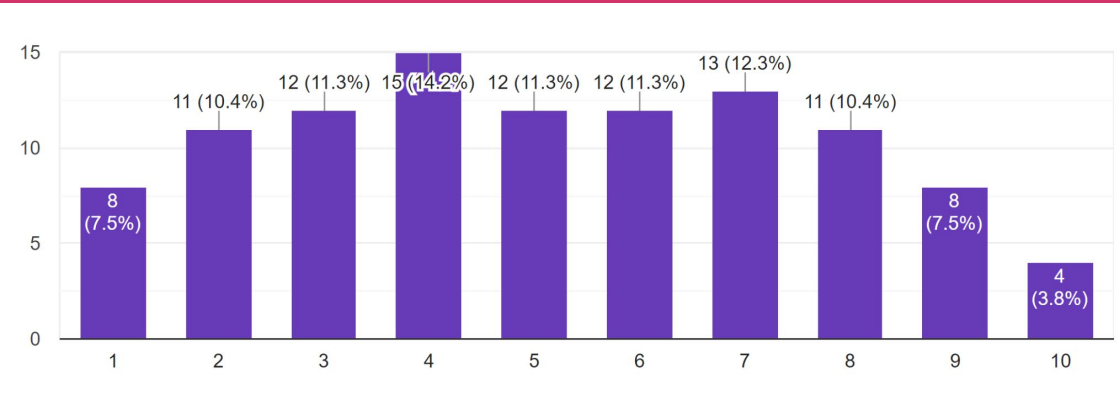
Secondary and Tertiary Customers

- The team/company that manufactures the product
- Government regulating bodies
- Whomever will market and sell the product to the general public
- Anyone that plays a role in the decision making process of the product

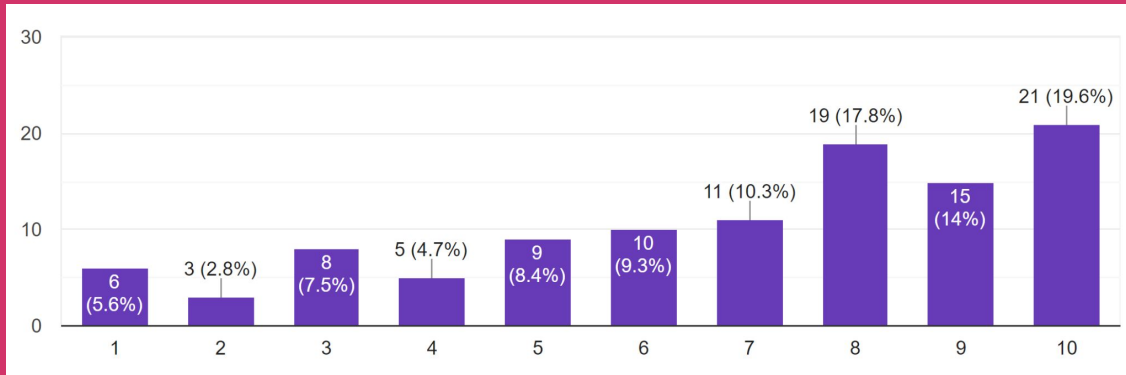


Customer Research

What do our customers want?

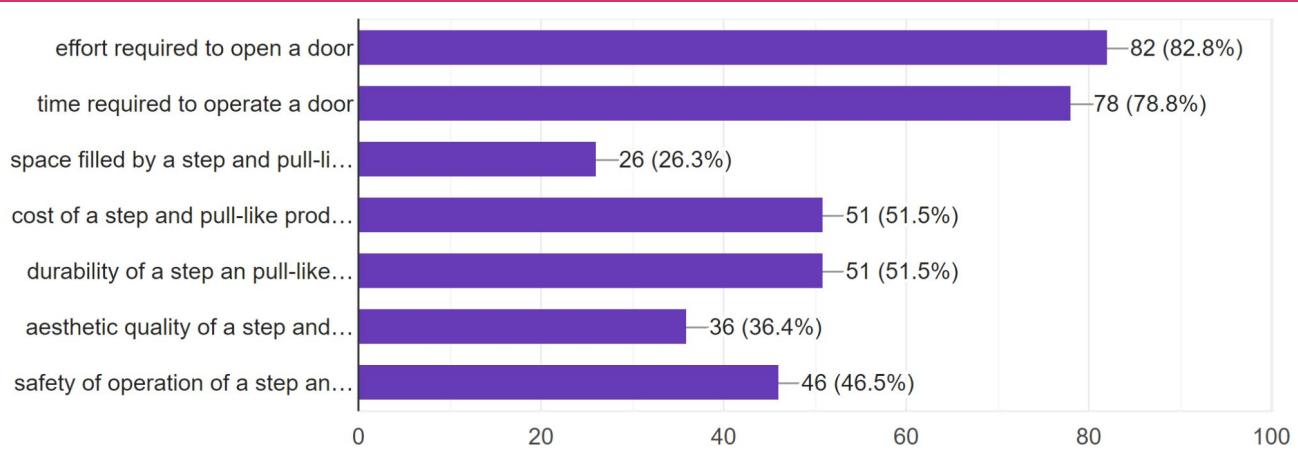


In the top graph, we asked respondents to rate their **level of care for/awareness of the spread of germs** from door handles. Our results roughly display a bell curve pattern.

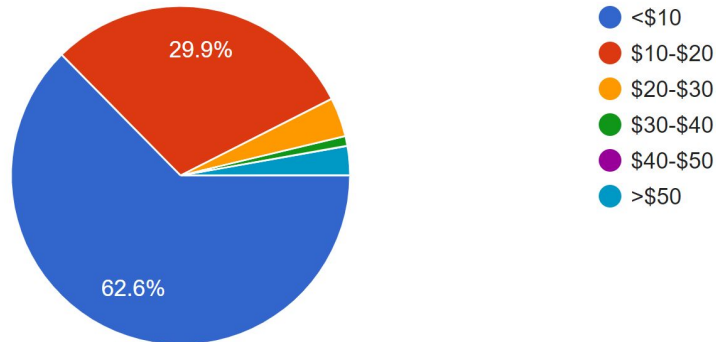


In the bottom graph, we asked respondents to rate their **affinity for ease of use of a door**. Here, we see a clearly defined bias toward a higher ease of use.

What do our customers want?




In this graph, we asked respondents to check **every factor (if any) that they care about in a step N pull-like product.** The time and effort customer requirements proved to be the most important of the categories tested.



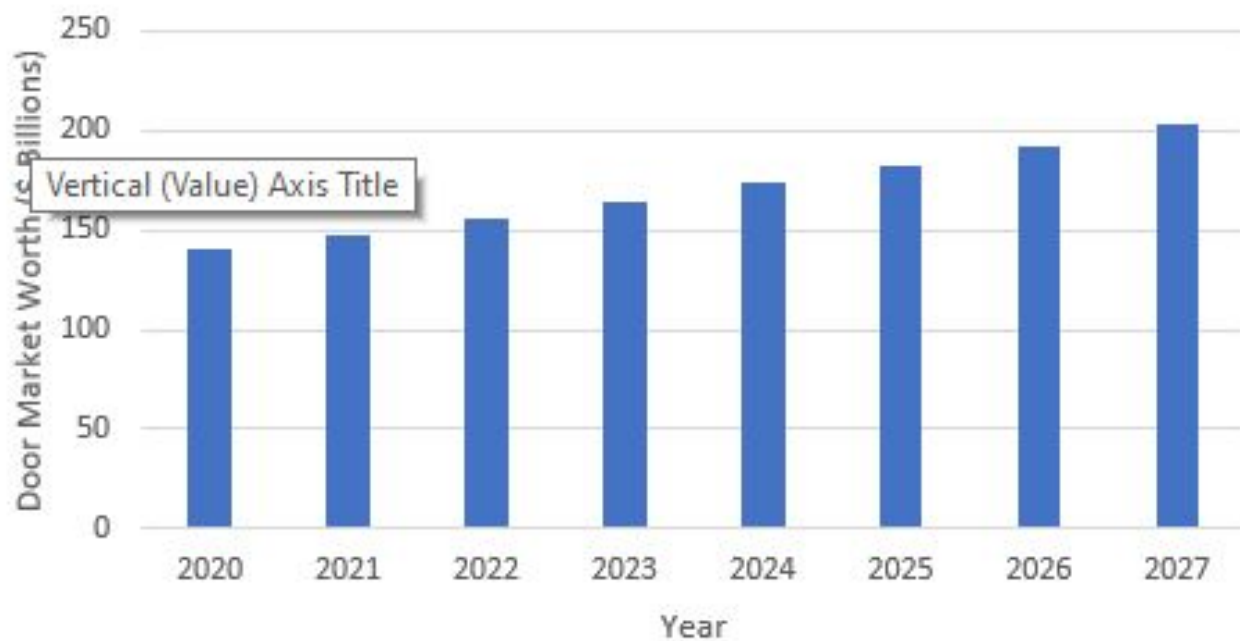
Here, we asked respondents to place a **price range** on what they would be willing to spend on a step N pull-like product. Low price/cost of manufacturing will definitely need to be an important factor for our product.

Market Research

Current Market

- “People with disabilities are the **largest and fastest-growing minority in the U.S.** They **control \$1 trillion in total annual income.**” - Americans with Disabilities Act National Network
 - “**Doors Market** size is valued at **USD 140.5 billion in 2020** and will **grow at a CAGR (Compound Annual Growth Rate) of around 5.4%** from 2021 to 2027.” -Global Market Insights
 - “StepNpull could now sell 150,000-200,000 units in 2020 – and that’d be **an increase of at least 1,000% over 2019.**” - SBJ
 - “Spending on nonresidential building construction [is expected] **to increase by 5.4 percent in 2022, and accelerate to an additional 6.1 percent increase in 2023.**” - American Institute of Architects
 - “Each accessible entrance (**at least 60% of public entrances** in newly built facilities must be accessible to individuals who use wheelchairs or have mobility impairments).” Along with many other requirements- Americans with Disabilities Act National Network
- 

Projected Door Market Worth by Year



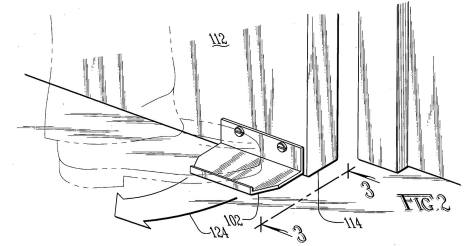
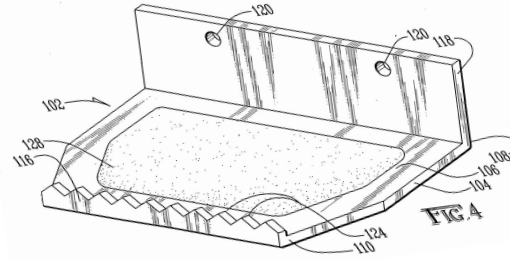
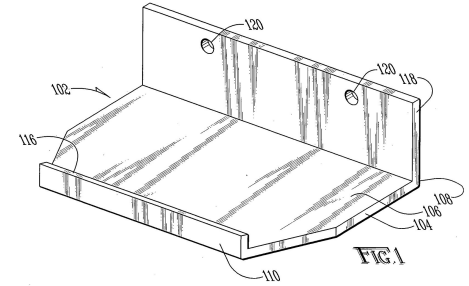
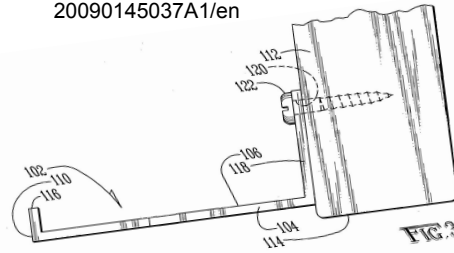


Benchmarks and Patents

<https://patents.google.com/patent/US20090145037A1/en>

Step N Pull

- Attaches on one side of the door
- Costs ~ \$30
- Takes max effort to open
- Awkward to use (especially when right next to the wall)



<https://patents.google.com/patent/US20090145037A1/en>

- Patent granted in 2015 and is still active
- US9115530B2



<https://allsharktankproducts.com/shark-tank-products-home/stepnpull-door-opener/>

Automatic Door and Hardware

- Button push activates the door to automatically open
- Costs range \$300 - \$600
- Slow to open
- Cannot control speed of door



<https://www.amazon.com/Handicap-Door-Access-Switch-Button/dp/B07Q6BVRNS>

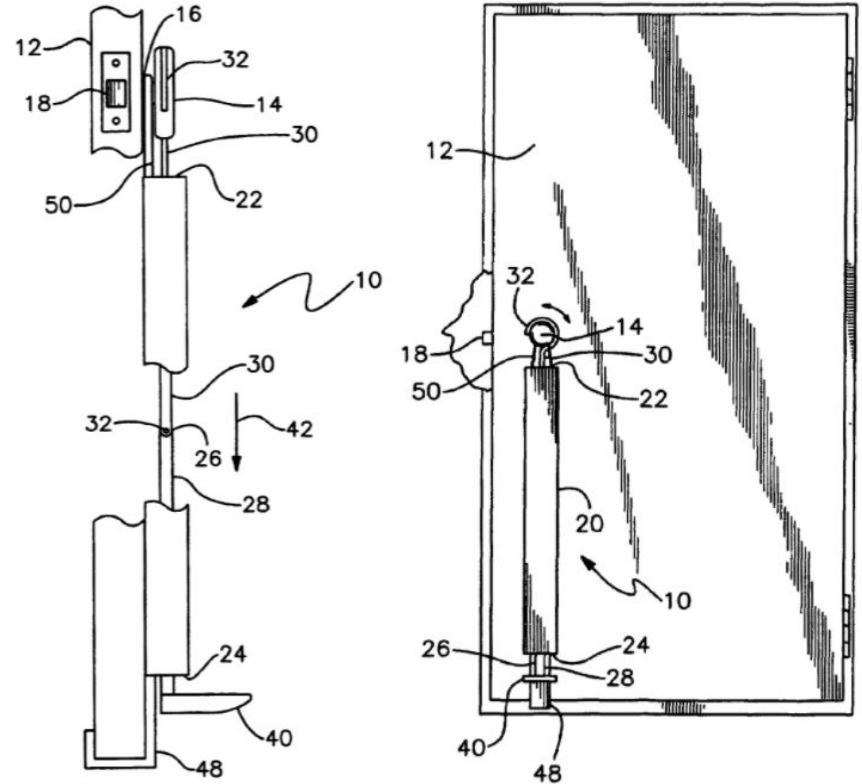


<https://utsgroup.ca/improve-accessibility-with-an-automatic-door-opener/>

Foot-operated door opener

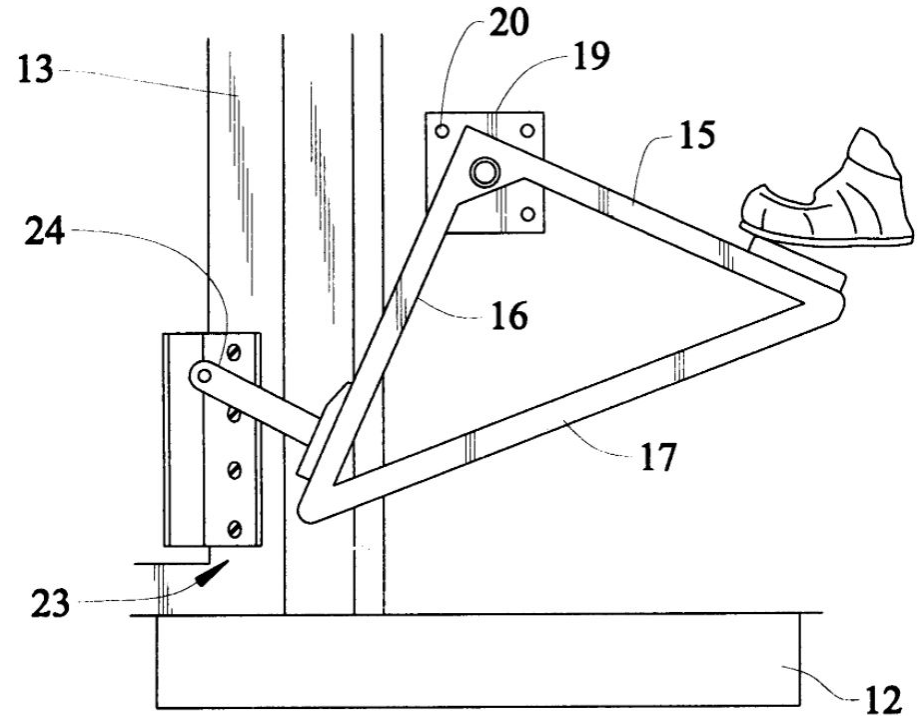
- Step on it (part 40) to pull the handle
- Relatively small
- Complicated to build

- Inventer: Robert Stuart
- Patent granted on 09/18/2007
- Currently Expired
- US7270352B1



Foot operated door opener

- Simple structure
- Easy to install
- Require a large force to open
- Inventor: Garritt A. Darling
- Patent granted on 03/26/2002
- Currently Expired
- US 6,360,488 B1



FortStrong

- Slows down door closing
- Costs ~ \$150
- Very slow
- Expensive
- Available almost anywhere (Amazon)



<https://voloshoppe.com/products/volo-automatic-hydraulic-double-speed-aluminium-door-closer-premium-heavy-duty-for-residential-commercial-purpose-with-fitting-set-silver-weight-capacity-30kg-70kg>



https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.amazon.com%2FAutomatic-Adjustable-Door-Closer-Installation-Instructions%2Fdp%2FB0749MCLMQ&psig=AOvVaw2_zuPKuJh0zkKy7iJGsKpC&ust=1643910736025000&source=images&cd=vfe&ved=0CAsQjRxqFwoTCPDvxu3K4fUCFQAAAAAdAAAAABAE

HOQ Results and Analysis

Customer Requirements

| What (Customer Requirements) | Warehouses | Handicapped People | Hostpital | Universities | Weight averages |
|--|------------|--------------------|-----------|--------------|-----------------|
| Effort to open the door | 10% | 15% | 11% | 7% | 10.75% 3 |
| Ease of operating the door | 17% | 12% | 13% | 10% | 13.00% 1 |
| Time required to operate door | 10% | 9% | 5% | 5% | 7.25% 6 |
| Space filled by unit | 3% | 5% | 5% | 5% | 4.50% |
| Ease of installation | 8% | 5% | 8% | 10% | 7.75% 7 |
| Low Cost | 10% | 5% | 8% | 14% | 9.25% 5 |
| Durability | 15% | 11% | 12% | 14% | 13.00% 2 |
| Aesthetically pleasing | 0% | 5% | 5% | 5% | 3.75% |
| Ease of repair | 11% | 7% | 7% | 6% | 7.75% 8 |
| Safe to operate | 10% | 10% | 13% | 10% | 10.75% 4 |
| Retro-Compatibility | 3% | 5% | 8% | 8% | 6.00% 9 |
| Quiet | 0% | 5% | 5% | 5% | 3.75% |
| Purely Mechanical | 0% | 3% | 0% | 1% | 1.00% |
| Customizability of door operation time | 3% | 3% | 0% | 0% | 1.50% |
| Total | 100% | 100% | 100% | 100% | 100.00% |

1. Ease of operating the door
2. Durability
3. Effort to open the door
4. Safe to operate
5. Low Cost

Engineering Specifications

| HOUSE OF QUALITY | How (ES) | | | | | | | | |
|--|--------------------|----------------------|-----------|-----------|-----------------|---------------------------|----------------|-------------------|--------------------------|
| What (Customer Requirements) | Force of operation | Strength of material | Longevity | Unit Cost | Size of Unit | Use of Standardized Parts | Sound Produced | Time to open door | Number of Pinching Parts |
| | Newton | ksi | years | \$ | in ³ | # | Decibels(dB) | Seconds | # |
| | ↓ | ↑ | ↑ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| Effort to open the door | 9 | 1 | 1 | 0 | 0 | 0 | 0 | 3 | 0 |
| Ease of operating the door | 9 | 0 | 3 | 0 | 1 | 0 | 1 | 3 | 0 |
| Time required to operate door | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 9 | 0 |
| Space filled by unit | 0 | 1 | 0 | 1 | 9 | 3 | 0 | 0 | 1 |
| Ease of installation | 0 | 0 | 3 | 3 | 3 | 9 | 0 | 0 | 1 |
| Low Cost | 3 | 3 | 3 | 9 | 1 | 1 | 0 | 0 | 0 |
| Durability | 1 | 9 | 9 | 3 | 0 | 1 | 3 | 0 | 0 |
| Aesthetically pleasing | 0 | 1 | 0 | 3 | 1 | 1 | 9 | 0 | 1 |
| Ease of repair | 1 | 1 | 3 | 1 | 1 | 9 | 0 | 0 | 0 |
| Safe to operate | 3 | 9 | 0 | 0 | 1 | 0 | 0 | 3 | 9 |
| Retro-Compatibility | 0 | 0 | 1 | 1 | 3 | 3 | 0 | 0 | 0 |
| Quiet | 1 | 1 | 0 | 3 | 0 | 0 | 9 | 1 | 1 |
| Purely Mechanical | 0 | 0 | 1 | 3 | 3 | 3 | 1 | 1 | 1 |
| Customizability of door operation time | 0 | 1 | 0 | 1 | 1 | 9 | 0 | 9 | 0 |
| Total | 27 | 27 | 24 | 31 | 24 | 39 | 23 | 29 | 14 |

Benchmarks

| | Now (Benchmarks) | | |
|--|-----------------------------|-----------|------------|
| | Automatic Door and Hardware | StepNPull | FortStrong |
| Effort to open the door | 5 | 1 | 3 |
| Ease of operating the door | 5 | 1 | 3 |
| Time required to operate door | 2 | 3 | 4 |
| Space filled by unit | 5 | 5 | 5 |
| Ease of installation | 2 | 5 | 4 |
| Low Cost | 1 | 4 | 2 |
| Durability | 4 | 5 | 4 |
| Aesthetically pleasing | 3 | 3 | 3 |
| Ease of repair | 2 | 5 | 3 |
| Safe to operate | 5 | 4 | 4 |
| Retro-Compatibility | 4 | 5 | 4 |
| Quiet | 4 | 5 | 4 |
| Purely Mechanical | 1 | 5 | 5 |
| Customizability of door operation time | 4 | 3 | 3 |
| Total | 47 | 54 | 51 |

Benchmarks vs. Engineering Requirements

| | | How (ES) | | | | | | | | |
|-----------------------------|-----------------|--------------------|----------------------|-----------|-----------|-----------------|---------------------------|----------------|-------------------|--------------------------|
| Universities | Weight averages | Force of operation | Strength of material | Longevity | Unit Cost | Size of Unit | Use of Standardized Parts | Sound Produced | Time to open door | Number of Pinching Parts |
| | | Newton | ksi | years | \$ | in ³ | # | Decibels(dB) | Seconds | # |
| | | ↓ | ↑ | ↑ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| Automatic Door and Hardware | | 67 | ~30 | N/A | \$1,600 | 269 | ~3 | N/A | 6 | 3 |
| StepNPull | | 67 | ~40 | N/A | \$30 | 30 | 0 | N/A | 3 | 0 |
| FortStrong | | 67 | ~30 | N/A | \$130 | 372 | ~3 | N/A | 2 | 3 |
| Target (Delighted) | | 22 | 45 | 15 | \$10 | 100 | 6 | 10 | 1.5 | 0 |
| Threshold (Disgusted) | | 132 | 25 | 3 | \$1,600 | 500 | 0 | 70 | 10 | 6 |

Engineering Requirements

| Engineering Specification | Target (Delighted) | Threshold (Disgusted) |
|---------------------------------|--------------------|-----------------------|
| Force of Operation (N) | 22 | 132 |
| Strength of Material (ksi) | 45 | 25 |
| Longevity (years) | 15 | 3 |
| Unit Cost (\$) | 10 | 1600 |
| Size of Unit (in ³) | 100 | 500 |
| Use of Standardized Parts (#) | 6 | 0 |
| Sound Produced (dB) | 10 | 70 |
| Time to Open Door (seconds) | 1.5 | 10 |
| Number of Pinching Parts (#) | 0 | 6 |

Problem Definition

Team Nugget's current goal is to improve the current method of opening doors without needing to use one's hands.

- Potential Customers: Hospitals, Warehouses, Universities, and Handicapped people.
 - Customer Requirements
 - Engineering Requirements
- Target Purchasing Price: \$85
- Benchmarks: Competitor Products and Relevant Patents were Observed
- Target Selling Quantity: xx first year units sales, assuming
- Remainder of Project
 - Phase 2: Concept Generation
 - Phase 3 Engineering, Modeling, Prototyp



Conclusion and Recommendation



Reference:

Customers:

<https://stock.adobe.com/search?k=doctor>

<https://www.nurseregistry.com/blog/how-to-care-for-loved-ones-in-wheelchairs/>

<https://www.qualitymag.com/articles/93689-lean-manufacturing-respect-your-people>

<https://www.strunkmedia.com/marketing/how-can-small-businesses-benefit-from-a-dedicated-marketing-team/>

Market Research:

<https://adata.org/factsheet/opening-doors-everyone>

16. <https://patents.google.com/patent/US7270352B1/en?q=hands+free+%22door%22+opener&oq=hands+free+%22door%22+opener>

17. <https://patents.google.com/patent/US6360488?q=US6360488B1>

Questions??