



# “Understanding Product Specifications”

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# Learning Outcomes

**At the end of the session today you will be able to,**

- Understand the concept of product specification
- Learn to develop your own product specification
- Understand limitations and challenges associated



# Introduction

## Product Specification

- Also, commonly known as Requirements and in some circles Engineering Characteristics
- Product Specifications and Requirements are synonyms, and they **spell out in measurable detail about what the product has to do**

For example: *The maximum width of the wheelchair is 80 cm, Cooling capacity: The amount of cooling generated (in kW), The manufacturing cost is under 100 €*

## Connection With Need Identification

- You have a clear idea about Must be Satisfied Need, Optional Needs in layman terms
- You have a prioritized set of customer needs
- Benchmarking

## Importance

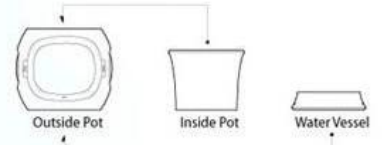
- Process of converting VAGUE/Nonspecific Statements into Engineering Aspects
- Imagine if a user wants the product small. Does it mean small in volume or weight or length or thickness ??







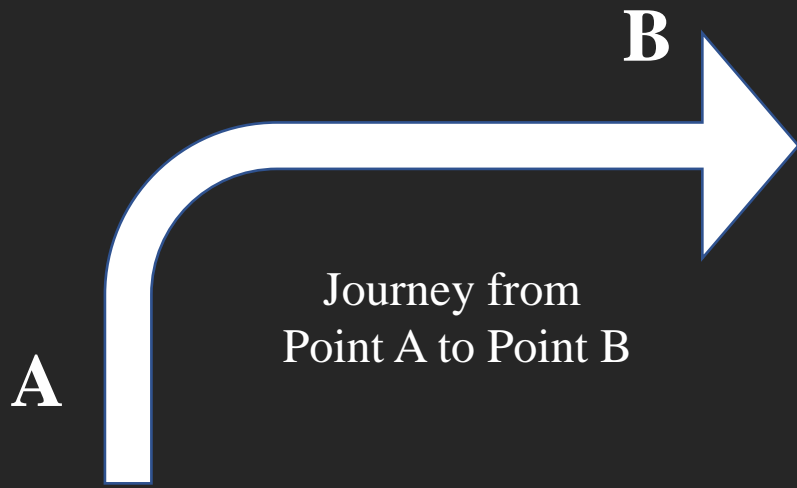
**CONSTRUCTION**



**EXPRESSION**

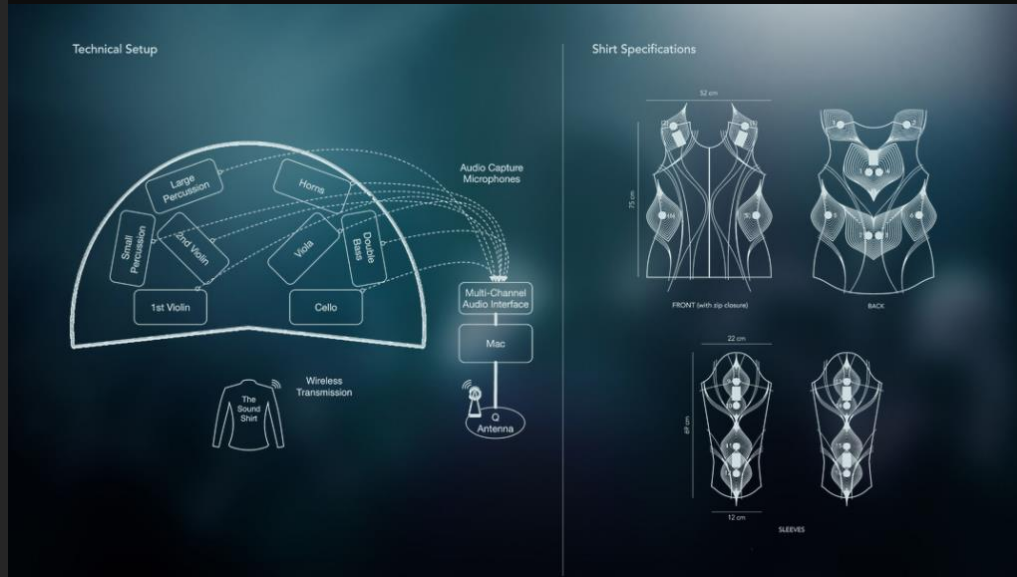
- |  |                 |  |                |
|--|-----------------|--|----------------|
|  | Normal (female) |  | Bad (female)   |
|  | Normal (male)   |  | Bad (male)     |
|  | Dissatisfying   |  | USB Connecting |
|  | More water      |  | Danger         |

# Digital Plant Pot



Vague ambiguous nature of the customer needs

- The shirt should feel good
- It should be comfortable to wear
- It should look good
- It should function
- Should not cause electrocution



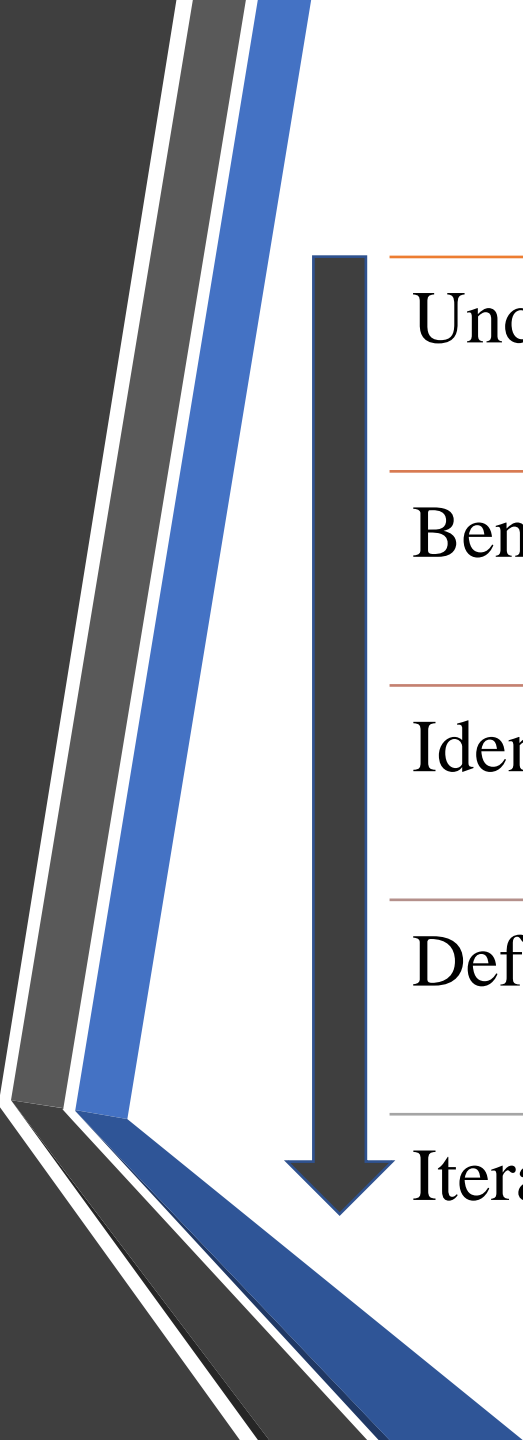
Sound  
Shirt

# Product Specification

- Product Information
- Business Benefits
- User Stories
- User Personas
- Product Designs
- Functional Specification



# Procedure to Define Product Specification



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Understand Customer Feedback

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Benchmarking

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Identify Must Have Specification

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Define Metrics

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Iterate and Improve





# Case Study

## “Fruit Juicer”

# A Product Designer

## Product Concept:

We are developing an automated fruit juicer– the kind where you can use squeeze the fruits to get the juice out.

## Identified Customer Needs:

- The fruit juicer is **small** that it does not take space on the counter or when stored
- The fruit juicer **squeezes quietly** so that I do not wake up others in the morning
- The fruit juicer is **affordable**
- The fruit juicer can be **stored easily** so that it fits in the kitchen cupboard
- The fruit juicer is **easy to keep clean**



<b>Customer need</b>	<b>Specification</b>	<b>Target value</b>
The fruit juicer is small	The footprint of the fruit juicer shall be less than 30 cm <sup>2</sup>	< 30 cm <sup>2</sup>
The fruit juicer squeezes quietly	The fruit juicer shall operate with noise level less than 70dB	<70dB
The fruit juicer is affordable	The fruit juicer unit material costs shall be < 20 €.	< 20€
The fruit juicer can be stored easily in the kitchen cupboard	The fruit juicer shall have a shape that is storable	Yes (binary)
The fruit juicer is easy to keep clean	The parts of the fruit juicer that come in contact with fruits can be washed in a dishwasher.	Yes (binary)

## Initial Target Specification for the Coffee Grinder

# A Few Samples of Product Specification Document

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# Product Specification Sheet

This one page covers details regarding sample food product specification sheet in terms of product description, ingredients statement, nutritional information, regulatory claims, etc.



## Product Description

- Food product is made by flour, water, salt and yeast
- All powders are mixed, and all liquids are added
- Add text here

## Ingredient Statement

Ingredient include, flour, wheat starch, salt, vegetable fat, chicory fibers, yeast

Add text here

## Nutritional Information

Servings	500g	Size	XXX
Calories	204 kCal	Protein	XXX
Total Fat	12.18g	Vitamin A	XXX
Saturated Fat	3g	Vitamin C	XXX
Trans fat	9.18g	Vitamin D	XXX
Cholesterol	0mg	Calcium	XXX
Sodium	272mg	Iron	XXX
Carbohydrates	40g	Potassium	XXX
Dietary Sugar	2g		
Sugars	30g		

## Regulatory Claims

Claim	Status	Size	<input checked="" type="checkbox"/>
Soy Free	<input checked="" type="checkbox"/>	Gluten Free	<input checked="" type="checkbox"/>
Peanut Free	<input checked="" type="checkbox"/>	Natural Flavors	<input checked="" type="checkbox"/>
Dairy Free	<input checked="" type="checkbox"/>	Natural Colors	<input checked="" type="checkbox"/>
GMO Free	<input checked="" type="checkbox"/>	Certified Organic	<input checked="" type="checkbox"/>

## Physical Specifications

Viscosity	XXX
Color	White

## Chemical Specifications

pH	5
Fat Content	XXXX

## Shelf Life

12 weeks

## Suggestive Storage

Refrigerated

## Allergens

Eggs, milk or mil derivatives, nuts

## Package Content

Packed under nitrogen atmospheres

## Microbiological Specification

Yeast <10 cfu/g

Mold <10 cfu/g

Add text here Add text here

## Version No.

12345

## Issue Date

2 Sep' 2020

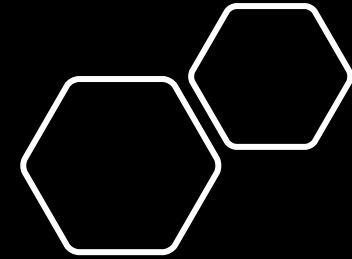
## PRODUCT DESIGN SPECIFICATIONS

Parameters	Unit	Datum	Target Range
Drying Time	Days	6 - 9	2 - 4
Throughput	Bricks/Minute	4	2
Manufacturing Cost	USD	5	500
Maximum Compressive Force of Device on Clay	lbs-f	N/A	9,600
Number of Operators	People	1-2	1-2
Weight of Device	lbs	2	200
Percent Volume Compression	%	0	20-30
Life of Assembly	Months	3	48
Brick Composition	Type	Natural Clay, Dirt, Sand Sawdust	Model: Earthenware Clay, Sand Sawdust
Target Market	Type	N/A	Brick Makers in Third World Countries
Minimum Human Force Input for Compression	lbs-f	N/A	75
Power Source	Type	Manual (By Hand/Feet)	Manual (Compound Lever Force Multiplication)
Dimension of Brick	in (l,w,h)	12x5x2.5	12x5x2.5
Reloading/Forming Time	Minutes	0.5	1
Brick Density	lb/ft <sup>3</sup>	50-60	70-75
Compression/Forming Time	Minutes	N/A	5

# WORKING SPEC

- Installed System Life: 7 years (industry standard) (60k hours)
- Operating Temp Range: -40 to 65C (industry standard)
- Dimensions:
  - Overall height 27"
    - pole + ball: 18"
  - Main housing: cylinder
    - height: 9"
    - diameter: outside 5.5"
  - PCB Dimensions: TBD!
- Weight: TBD g
- Force/Strain gauge measurements, 12-bit, 3 axis.
  - Implied wind range: 2 to 200 mph (1.5 to 90 m/s)
  - Implied wind accuracy: 1 mph (0.5 m/s)
  - Implied rain range: 0.1 in/hour to 4 in/hour
  - Implied rain accuracy: 2% < 0.5 in/hour
  - Implied hail range: 1/2 inch diameter and higher
  - Implied hail accuracy: 1/4 inch diameter
- Temperature measurement:
  - Range: operating temp range (-40 to 65C)
  - Accuracy: 0.3 C
  - Aspirated temp. measurement required for industry standard accuracy
    - Direct sunlight causes significant temp offset.
    - Industry has tried to develop passive methods but aren't good enough
    - highly insulated thermocouple based solutions are used in very high end systems
  - Research option: measure sunlight w/ calibrated lux sensor and apply correct via thermal model
- Humidity
  - Range: 1 to 100% Relative Humidity
  - Accuracy: 1.8% Relative Humidity
- Sunlight sensor:
  - detects ambient light through the case (not through a clear window)
  - Light range: TBD lux
  - Light accuracy: probably doesn't need to be that good. Needs to be better if we

- Indicators: TBD (brightness is probably important since these are up on poles and such)
- Power:
  - Receives IEC power cable, so 120VAC.
  - Power Rating: TBD W
  - Output voltages: TBD V
    - So far, need 3v3 and 5v0
- On-board GPS: (battle between Alex and Bryan)
  - Tradeoffs: cost vs getting:
    - good timebase (which you need, can also pull from cell network, annoying to propagate through star or mesh network)
    - location (very useful for operations)
- Battery Backup
  - Runtime: 1 day without power
  - Cell chemistry: rechargeable (TBD) (probably lead-acid or LiFe to hit operating life)
  - Cell configuration: TBD
  - Battery Dimensions: TBD L x W x H
  - Battery Capacity: TBD mAh
  - Gas Gauge indication
- Locally logged data: (somewhat implied by battery backup --- failover for comm. outages)
  - Runtime: 4 years
  - Number of samples: 4 years @ every 5 seconds
  - Storage Capacity: 2 gb
  - Round-Robin ok (new data clobbers oldest data when buffer is full)
- Field Strategy:
  - Not field serviceable
  - System \_should\_ be robust to be installed and last for operating life
  - RMA strategy is provide new unit and swap out bad units.
  - (this implies no power switch or reset button)
- Wireless Firmware Update?
  - linux makes this easy, hard otherwise



# Summary

- Convert vague, ambiguous customer needs and requirements into engineering-specific measurable variables.
- Writing a product specification is an iterative process that varies with different industries, products, requirements and company's operating procedure

Thank You

