



15.390 New Enterprises

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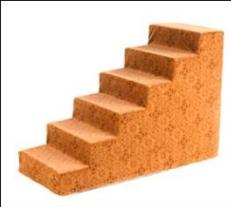
Product Definition & Development
to Delivery

Howard Anderson

Bill Aulet



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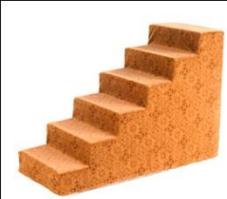


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Product Development

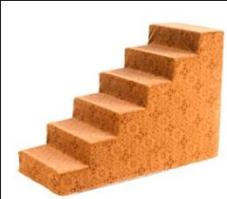
or

Once I know who my customer is and have confirmed my value prop with them, how do I build the first product? And then follow on products?



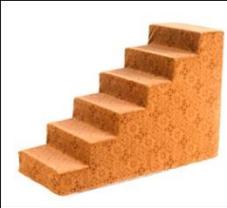
Current Status

1. We have an idea
2. We have a core team
3. We have defined a target customer/persona and developed a target customer segment and TAM
4. We have done primary market research to better understand our target customer, our value prop as well as their decision making process to refine our target customer segment analysis
5. We have essential done as much as we can do to optimize our odds that our targeted dogs will eat and pay for our dog food
6. Now what?



Next Steps ...

- Let's put some dog food in front of them and see if they eat it
- Test hypotheses as quickly and as efficiently as possible
- Build a product plan to optimize success over the long term ... incorporating flexibility knowing that it will change
- Rapid, measured iterations



Here's your problem:

1. You have spent two years developing your product. It works. Now you would like to devote \$ to:
 - ▶ Marketing
 - ▶ Sales
 - ▶ Customer Service...
- And you'd like to cut back on product development

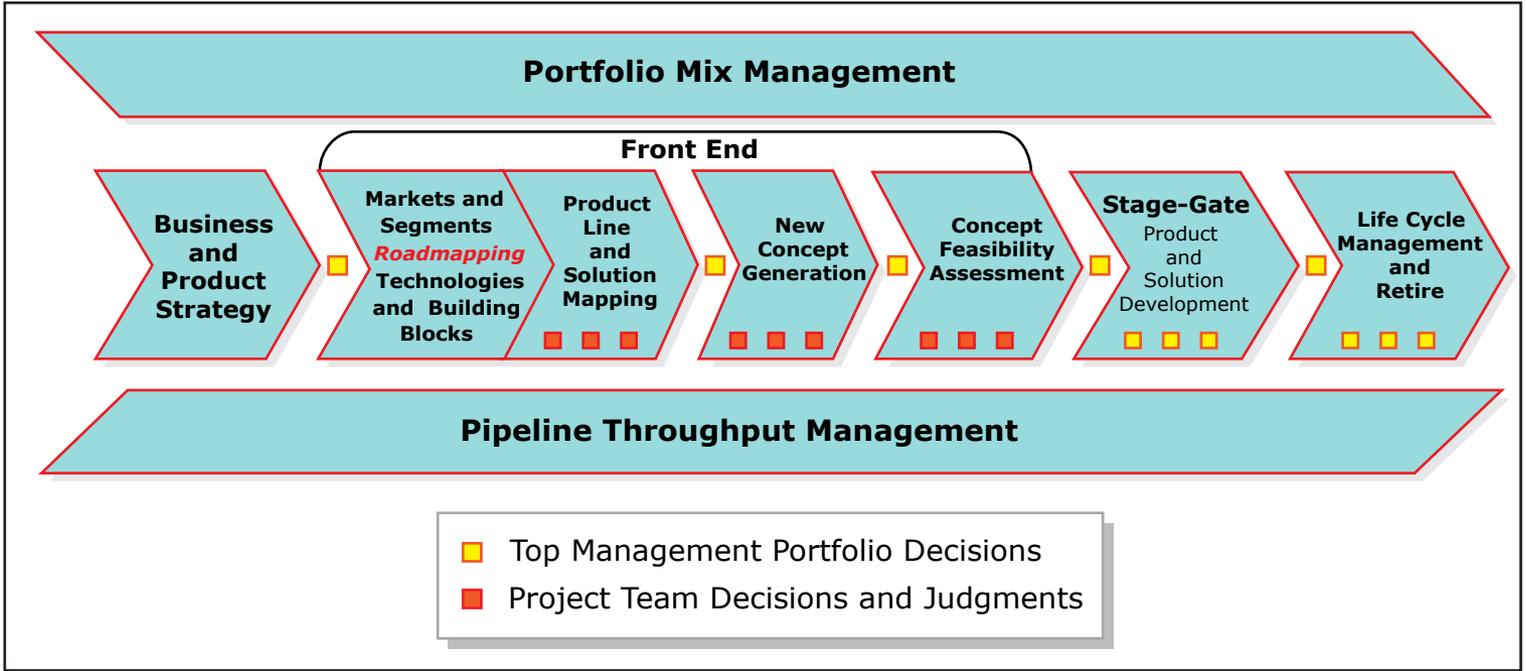
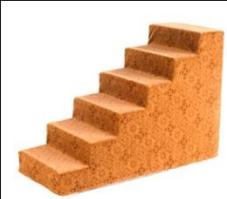


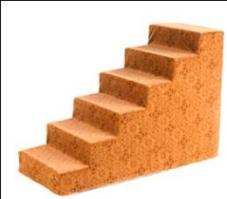
Image by MIT OpenCourseWare.



2. You don't really have competition – yet; but you know you will.

- ▶ Should you “gather” your improvements?
- ▶ Come out with a new release next quarter? Next year?

3. When do you come out with a completely “better” product?



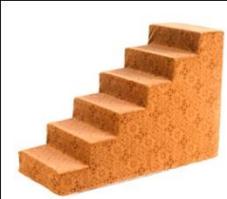
4. You can either make more products for the same market... or take your technology and go to new markets.

You cannot do both!

- What do you do?
 - ▶ Leverage your technology?
 - ▶ Leverage your sales channel/brand?

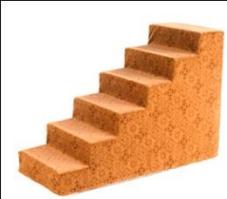
5. You can make a lower priced version of your product... or a higher priced version.

- What's it going to be?



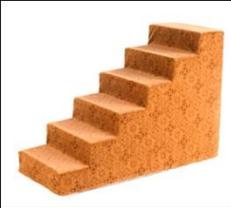
Ask... who?

- Ask sales?
 - ▶ They want more features.
- Engineering?
 - ▶ More Technical elegance. And maybe internal competition.
- Manufacturing?
 - ▶ Long production runs with a product that does not change.
- Finance?
 - ▶ When do we get to break even!



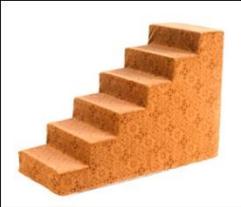
Ask your customer?

- Which customers?
 - ▶ The ones you have?
 - ▶ The ones you want?
 - ▶ The most demanding?
- Suppose they want the same product they are now buying, but cheaper?
- Or some arcane features which only they want... and may not even want to pay for?
 - ▶ Are you a manufacturing company or a job shop?



Let's start with your customer...

- You want to drive a fine line between being:
 - ▶ “delightfully” early with improvements
 - ▶ keeping your competition out of your hair, and...
 - ▶ keeping your development team pointed in the right direction...



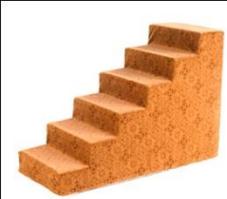
1. Start with the mainstream of your existing or expected customer base.

- Example: Diplomats at the Radiological Society of North America who run community hospitals in the United States with over 500 beds.
- At a certain point, you have to **FREEZE** the design... or you will never ship.



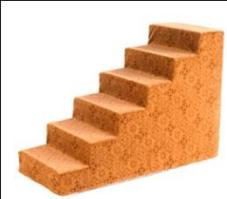
2. You have to eventually split your development team into enhancements/new products.

- If all your effort is in enhancements, then you will be too late with a new product.
- If all your effort is in the new product, you leave room for your competition.

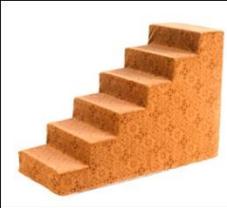


3. You only have a certain number of Very Good Technical People

- Demands:
 - ▶ A. Make a version for the European market; get certification.
 - ▶ B. Work with a big OEM so that your product works with his.
 - ▶ C. Put in the five features that you promised to your biggest customers by next quarter and test.

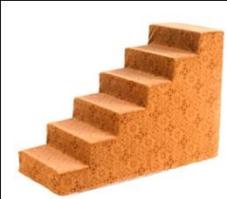


- ▶ D. Redesign the product so that it can be made 40% cheaper in an overseas factory.
- ▶ E. Take the product and simplify it for the Indian/Chinese market.
- ▶ F. Take the technology and repackage it for the security market...



In the end, you need a product roadmap.

1. What enhancements will you do... and when? What is the cost?
2. What MAJOR upgrades will you be doing?
3. When will you come with a Major redesign? What will be the specifications?



The real decision: Deciding what you are NOT going to do.

- Example: We will concentrate on two industries – radiologists in community hospitals and rapid response medical service.
- We will not go into Security, We will not go to India, We will not do OEM... yet.



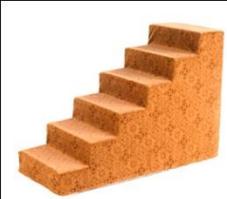
Product Development Must be a Rapid & Continuous Process

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Speed-learning-focus figure removed due to copyright restrictions. See: Maurya, Ash. "Lessons learned in 2010." *practice trumps theory* (blog). n.d. <http://practicetrumpstheory.com/2010/12/lessons-learned-in-2010/>.

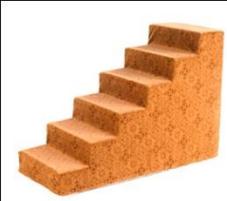


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But How? I Have Very Limited Resources & Time

- Before you build anything – test with visuals (e.g., storyboards, drawings, prototypes) with Target Customers
- Understand your “Core” (i.e., your sustainable competitive advantage)
- Identify most important assumption(s)
- What is the quickest & most efficient way to test this? (different for sw, web, hardware, bio, energy)
- This will be your MVP – Minimum Viable Product



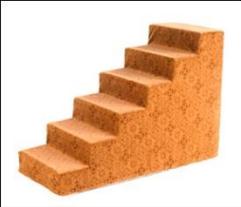
Examples

- SenAble
- Your projects

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Successfully Crossing the Chasm

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Figure removed due to copyright restrictions. Bowling alley market development.
Moore, Geoffrey A. *Inside the Tornado*. HarperCollins, 2004, p. 38.



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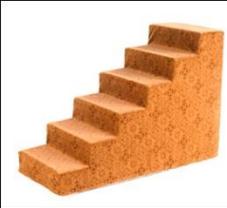


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Industry	Entertainment	Industrial Design	Medical Visualization	Surgical Simulation	Micro Surgery	Geophysical Visualization	Non Visual C.H.I.	Prototyping	V.R.
End User	• Animator	• Stylist • Designer	• Radiologist • Surgeon	• Med student • Surgeon	• Surgeon	• Geophysicist	• Blind person	• Engineer	• Researcher • Designer
Application	• Sculpt • Animation • Paint	• Sculpt • Paint • Modeling	• Segmentation • Navigation • Surgical planning • Diagnosis	• Training • Surgical planning	• Ophthalm. surgery • Neurosurgery	• View enhancement • Drill plan	• H.U.I	• Design review • Model evaluation	• Architect render • Simulation
Benefits	• Ease of use • Reduce cycle	• Reduce cycle • Increase accuracy	• Ease of use • Increase accuracy	• Increase use of new tech. • Increase accuracy	• Reduce cycle • Increase accuracy	• Reduce errors • Increase yields	• Increase access, "mainstream"	• Reduce cycle • Improve designs	• Realism • Increase accuracy
Lead Customers	• Disney • ILM • Dreamworks	• Toyota • Ford • Rollerblade	• Brigham & Women's • German Cancer Research	• U of Colorado • Penn • BDI	• Dr. Ohgami • Ottawa Eye	• BHP • WMC / CSIRO	• Certec • U Delaware	• Volkswagen • Stratasys • Toyota	• Boeing • Corrie Latham • NASA
Market Characteristics	• Early adoption • High-priced talent • High growth	• Dislike CAD & computers • High-priced talent	• Mainstream • High-priced talent • HMO	• Mainstream • High-priced talent • HMO	• Early adoption • High-priced talent • HMO • Not computer automated	• Late mainstream • Oligopoly	• Late mainstream • No money • Gov't sponsor	• Mainstream • Pressure to reduce product cycle	• Early adopt • Fuzzy ROI • Slow accept
Partners/ Players	• Alias • Soft Image • Discrete Logic	• PTC • Alias • Imageware	• GE • Siemens • Picker	• Smith & Neph • Heartport • Ethicon • US Surgical	• Toshiba • Hitachi	• Landmark • Fractal Graphics	• IBM • Apple • SUN • HP • Microsoft	• PTC • Solid Works	• Sense 8 • Division • Coryphaeus
Size of Market	40,000	X00,000	X0,000	X0,000	X,000	X,000	X,000,000	X,00,000	X,000
Competition	Watcom	None yet	None yet	Immersion	None yet	None yet		None yet	None yet
Platform	• SGI • Windows	• SGI • SUN	• SGI • SUN	• ?	• None	• SGI • SUN	• Windows	• SUN, HF	• SGI • SUN, HF
Needs	• NURBS • Stylus • Dynamics	• NURBS • Stylus	• Voxels • Stylus • VRML	• 6 DOF • Custom devices	• 3-finger scaling	• Voxels • Stylus	• Windows I/F • P300	• NURBS • VRML • Dynamics	• Polygons • Dynamics • 2-finger?

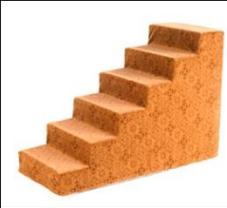
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Objective: First Vertical Product

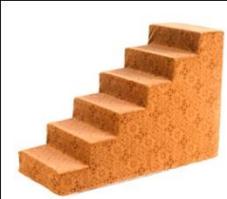
- ▶ Needed to validate
- ▶ Drill down much deeper
- ▶ Storyboards
- ▶ Value proposition
- ▶ Competition
- ▶ Use Case – Take it All the Way Thru



Sighting of Potential Killer App

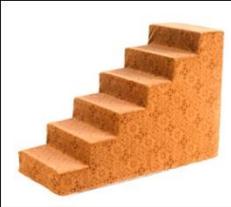
- Digital Clay --- Industrial Design/Modeling
- Why?
 - ▶ No Other Way
 - ▶ “All about Tactile”
 - ▶ Payback is Very High
 - ▶ Easy to Understand Why It Would Be Good Application
 - ▶ Strong High End Demand
 - ▶ Cross Industry Ramifications
 - ▶ High Visibility
 - ▶ Current Technology is Very Good Fit

SensAble Technologies Complanly 12/16/69



Conceptual Design Techniques Today

- Clay
- Issues
 - ▶ Hard to Leverage Existing Work/Files
 - ▶ Limits Communications
 - ▶ Limits Possibilities
 - ▶ Limits Productivity
 - ▶ Exchange of Works with Rest of Development Process is “Clumsy”
- Cost Per Station:
 - ▶ ?
- CAD (A|W, PTC, CATIA)
- Issues
 - ▶ Difficult to Learn
 - ▶ Difficult to Use
 - ▶ Lack of Key Function – Sculpting
 - ▶ Stifles Creative Process
 - ▶ Expensive
- Cost Per Station:
 - ▶ \$50-100K



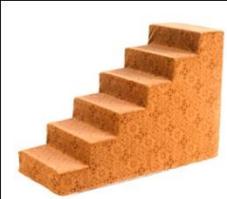
Replaces & Expands Current Tool Set

Current

New

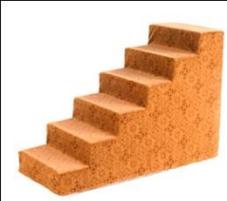
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Product Definition

- General Agreed on Product Overview
 - ▶ Features (e.g., Technology)
 - ▶ Functions (e.g., Facilitates part of job responsibilities)
 - ▶ Benefits (i.e., Dollars because it is faster, better and/or cheaper)
- Understand What is Your “Core” (i.e., your Sustainable Competitive Advantage) and Do That Yourself
- You Can Outsource The Other Elements if That Helps to Speed You Up & Reduce Costs/Risks



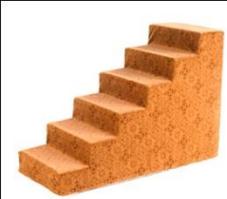
Next Steps

- Build a Brochure
- See if you can sell Vaporware



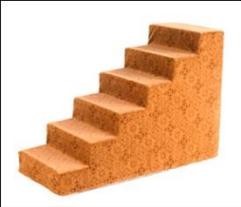
Tips

- A Picture is Worth a Thousand Words
- A Prototype may be Worth a Thousand Pictures
- A Rapid Prototype is Worth its Weight in Gold



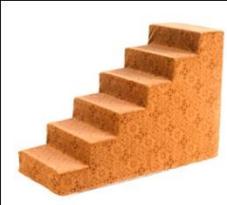
Tips #2

- Experiment – Explicitly State Your Hypothesis & Then Test with Data
- Digital Tools Make it Very Easy for You to Experiment
- Do not Bias Your Feedback



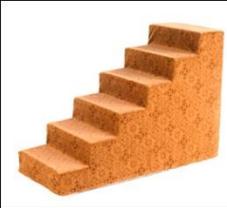
Avoid Point Solutions

- Understand Customers Workflow and Fit Into It
- Partial Solutions are Worth a Lot Less than Full Solutions
- Company/People Do Not Like Too Much Change



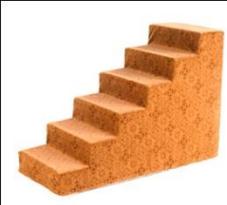
Simple Overview of Process

- Brochure
- Customer Commitments
- Marketing Requirements Document
- Functional Specifications Document
- Alpha
- Beta
- General Release



Key Elements of the Process

- Interlock and Sign Offs
- “The Line”
- Tensions Between the Different Parties
- No Broken Glass -- Next Release

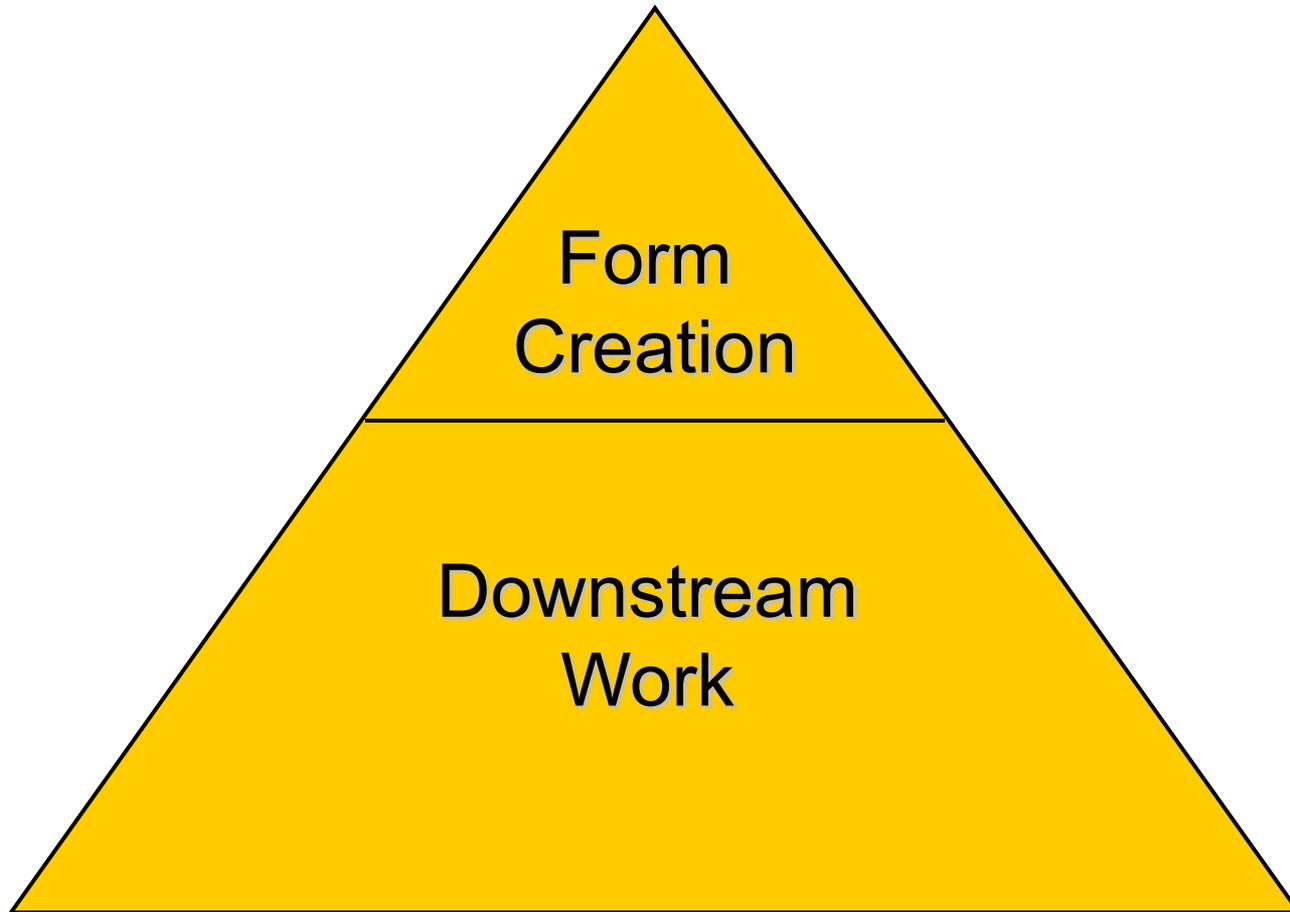


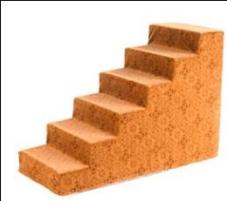
Other Questions

- How often should we do releases
- Alternating focus of releases (feature expansion/stabilization)
- How much QA is enough?
- Outsourcing?



Two Types of Modeling Work





Toy Industry Summary 1

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Europe

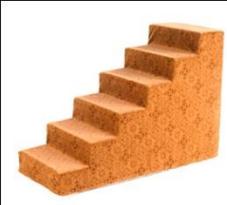
- Synapse*
- Hasbro E
- Schleich
- Playmobile
- Mattel
- Disneyland

US

- Hasbro*
- Mattel
- Fisher-Price*
- FP Brands*
- Creata*
- Equity Mktg*
- Mktg Store
- Gemmy
- Gentle Giant
- Whitestone
- List is Long...

Asia

- Bandai***
- Tomy
- Unitec
- Creata*
- Hermon Ind
- Luen Shing
- Mattel
- Hasbro
- Equity Mktg
- List is Long...

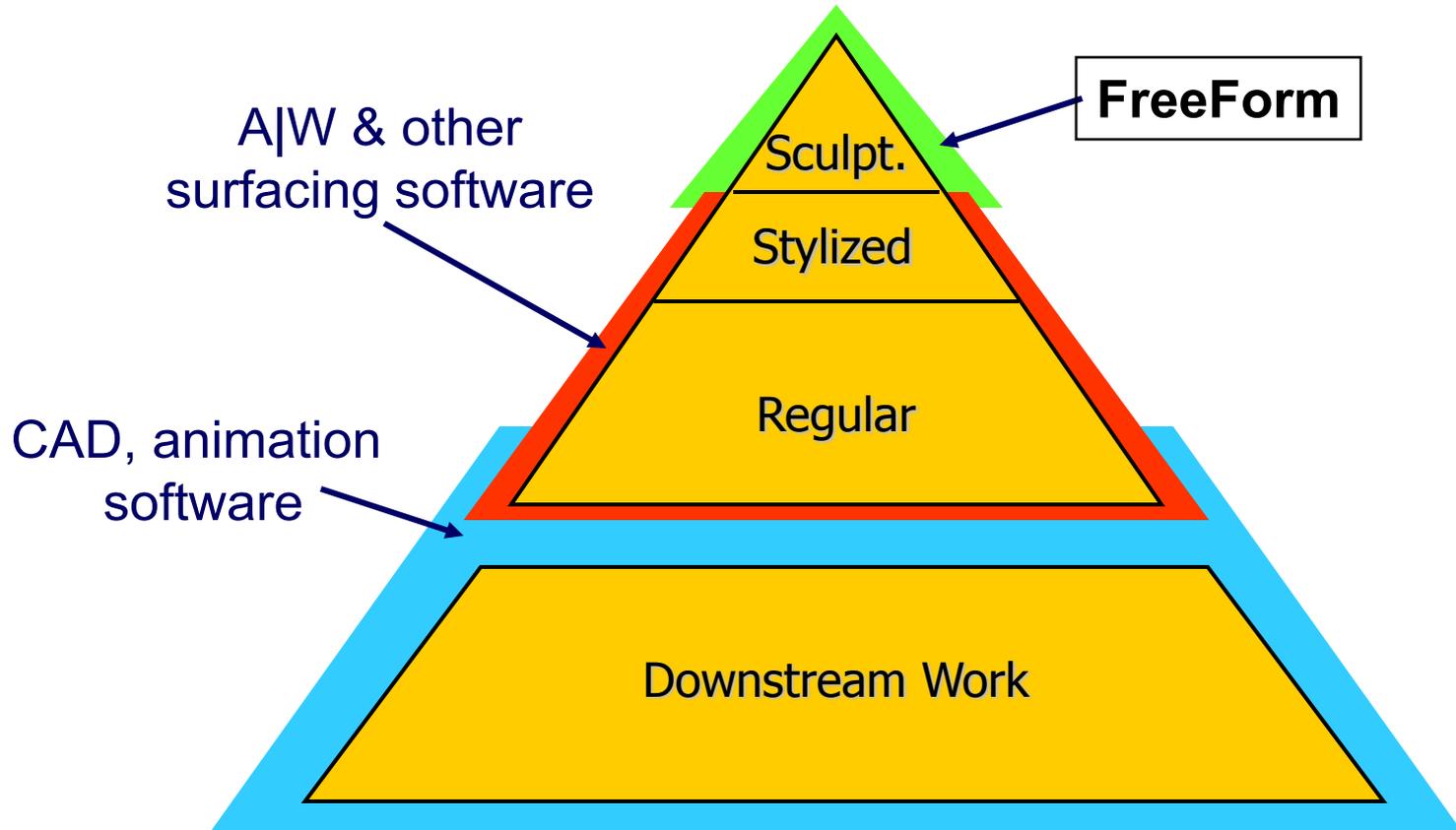


Creates Great Focus

- Persona is critical
- Also understand the DMU and DMP
- Each you will have to address
- This will not happen on Day 1 but will evolve over time and you know what the goal is
- But finding your target customer is essential ... and a testable hypothesis



Today's Competitive Landscape



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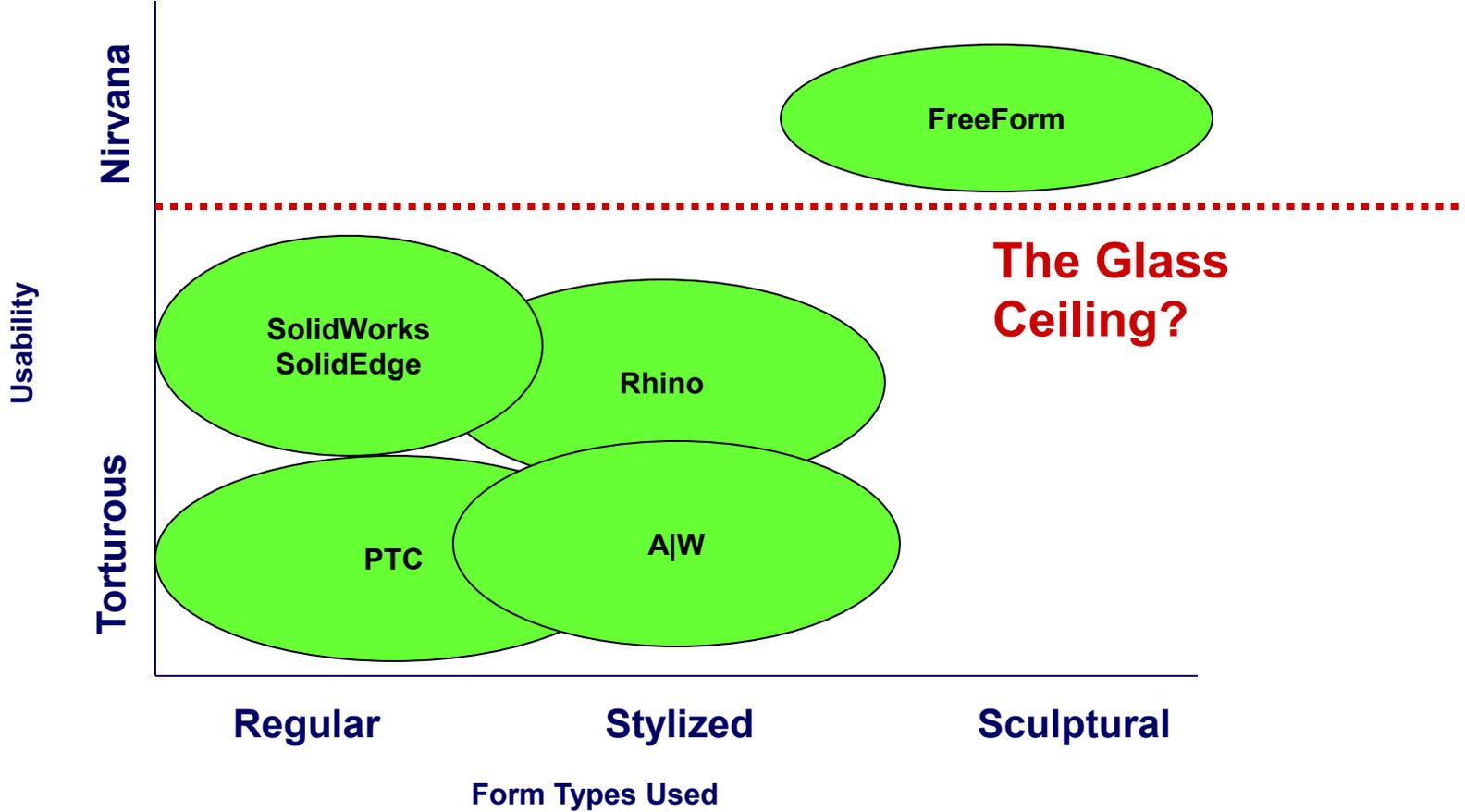


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Today's Competitive Landscape

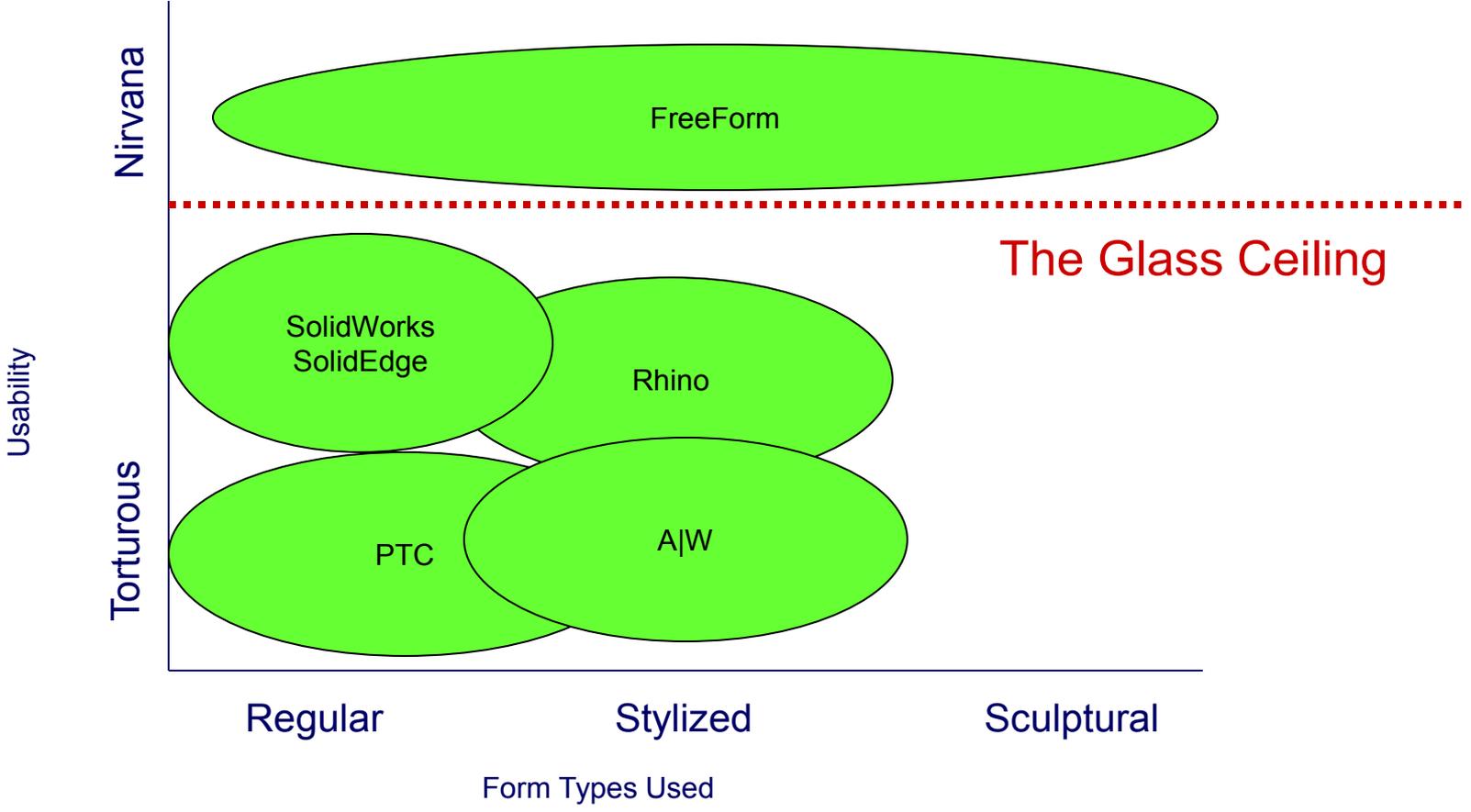
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Our Vision

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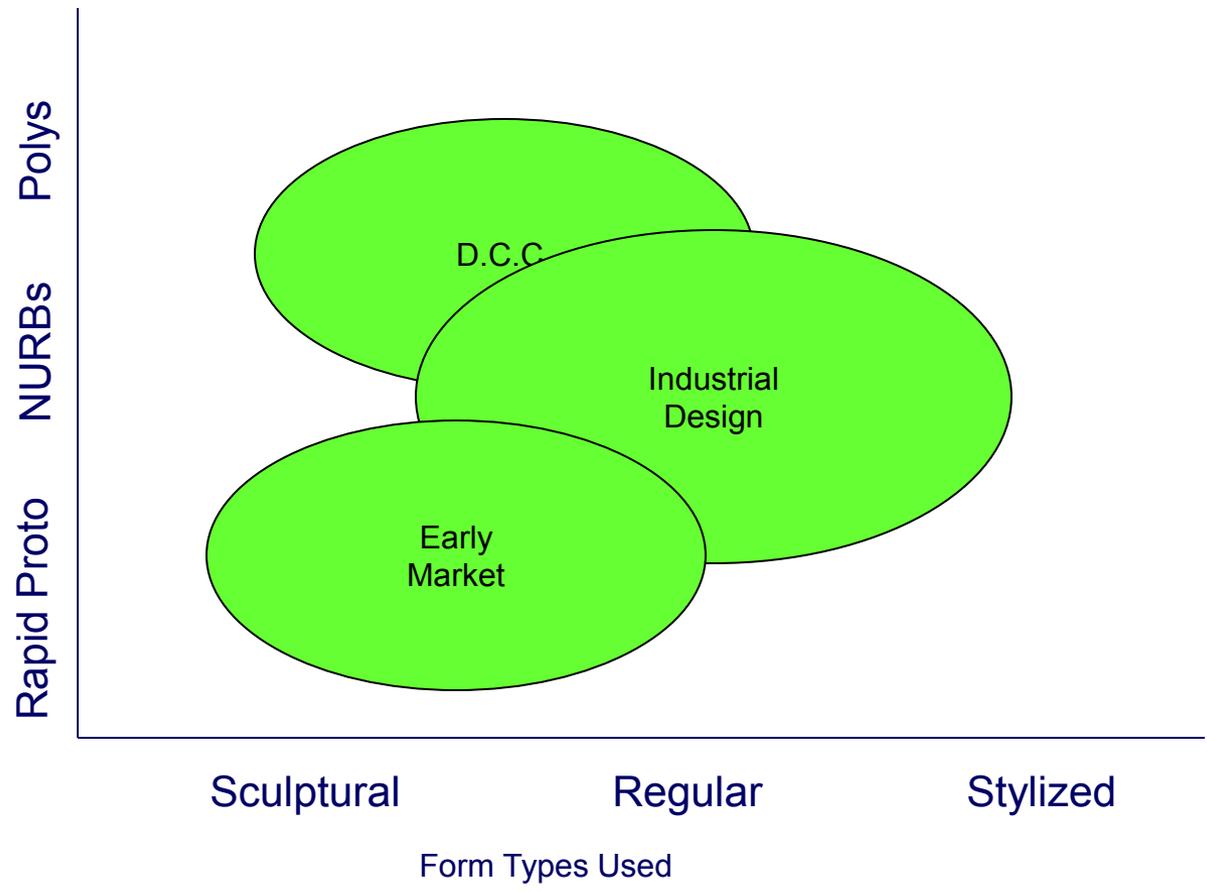
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Mapping the Market Segments

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Downstream Connection

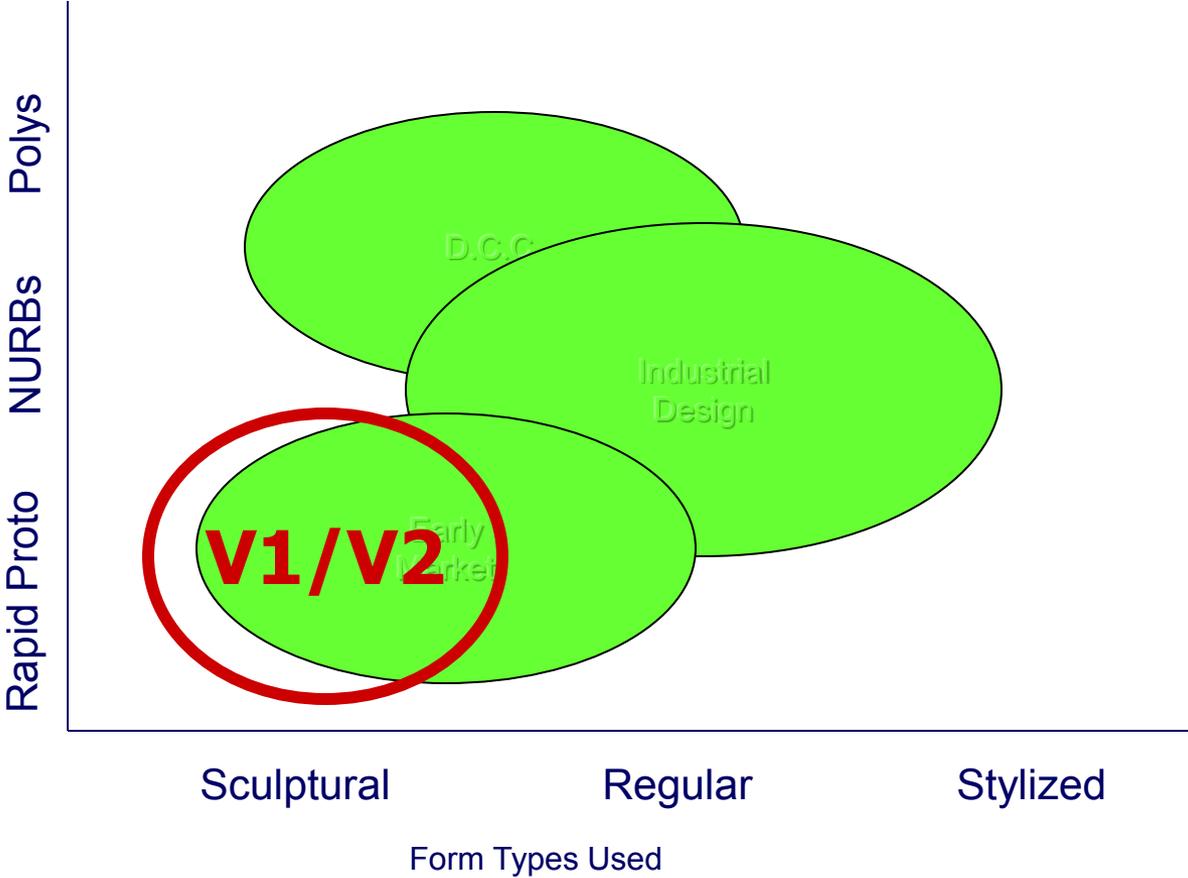




Where We Are Today

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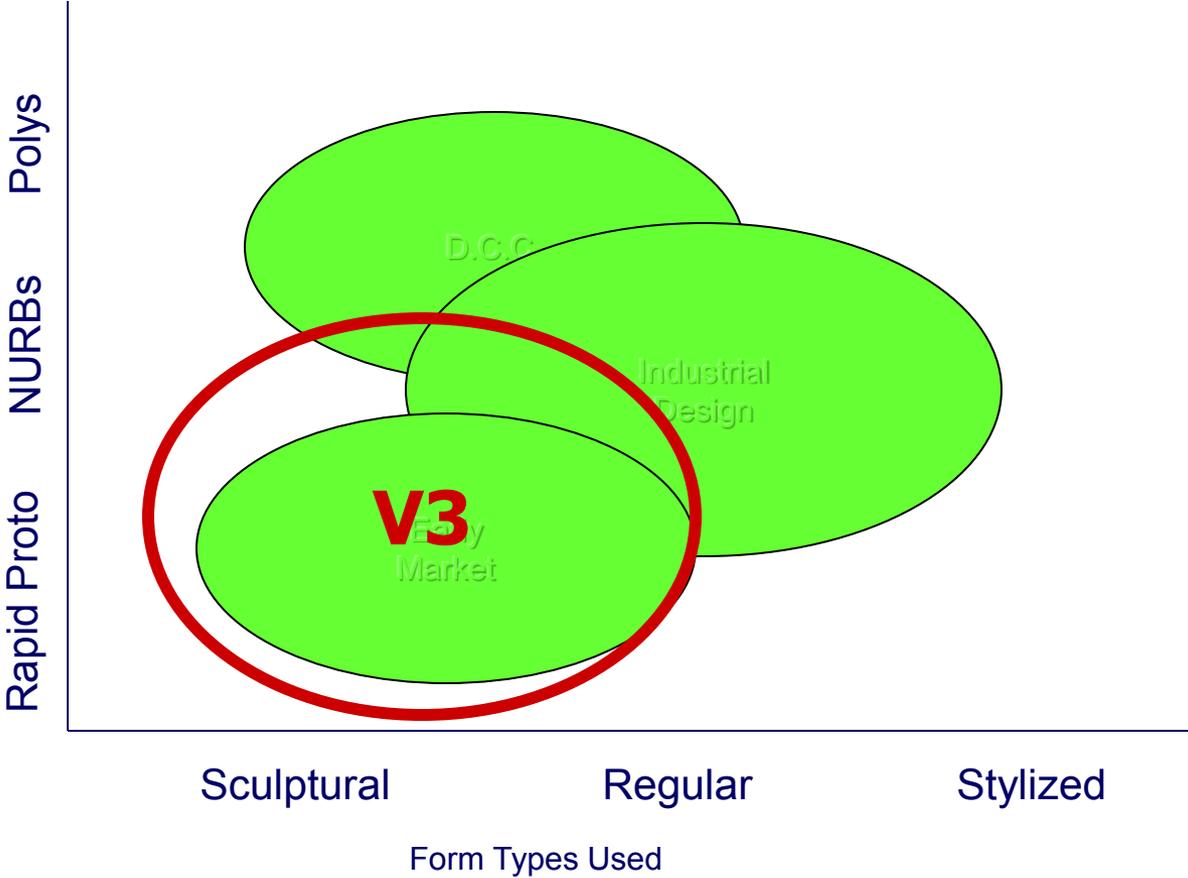
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FreeForm Version 3

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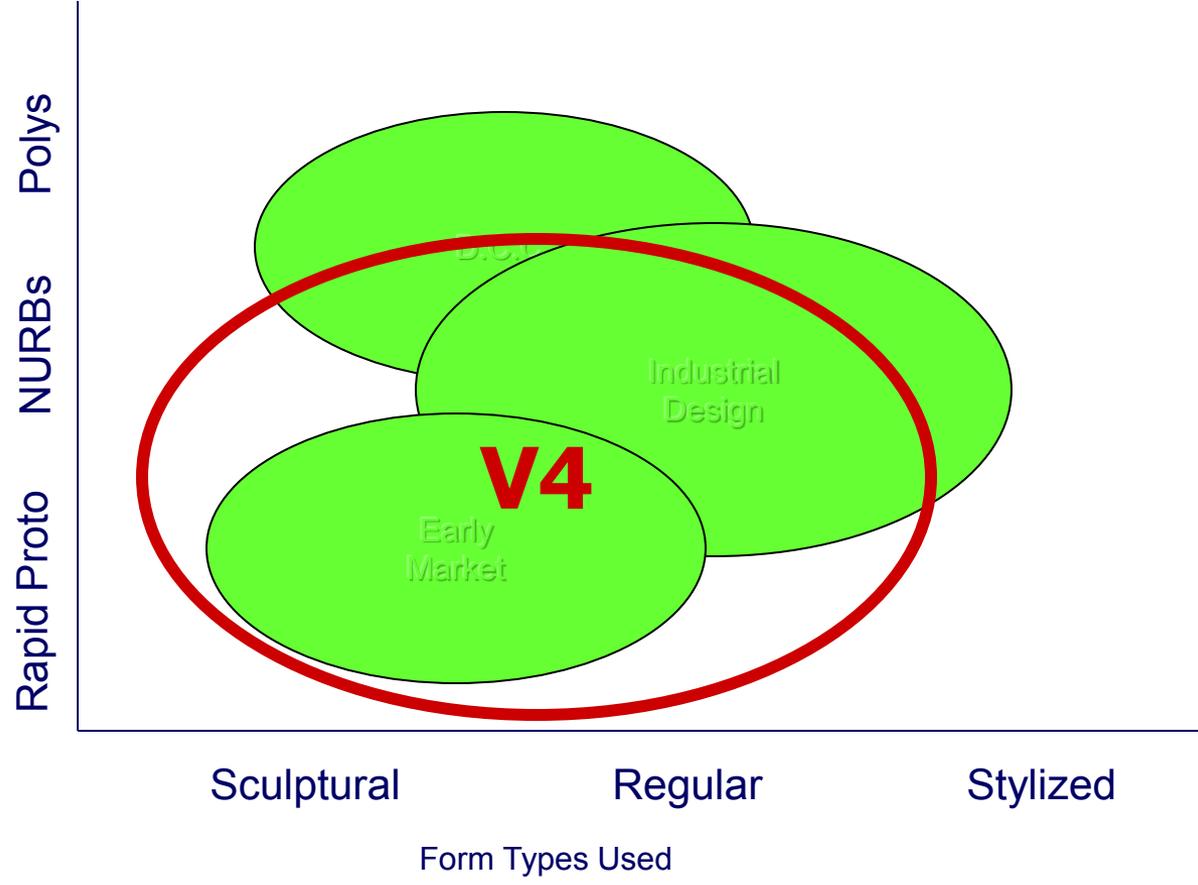




Beyond Version 3

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Downstream Connection



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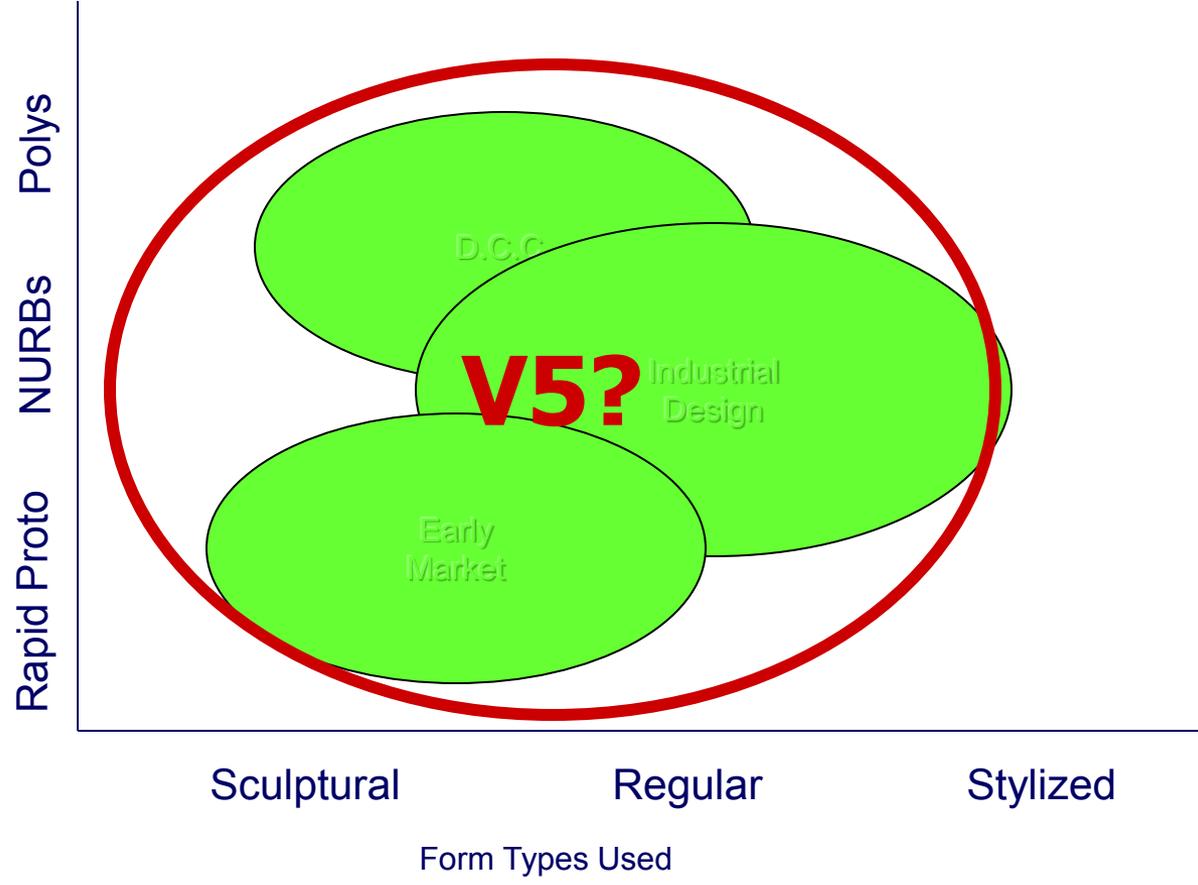
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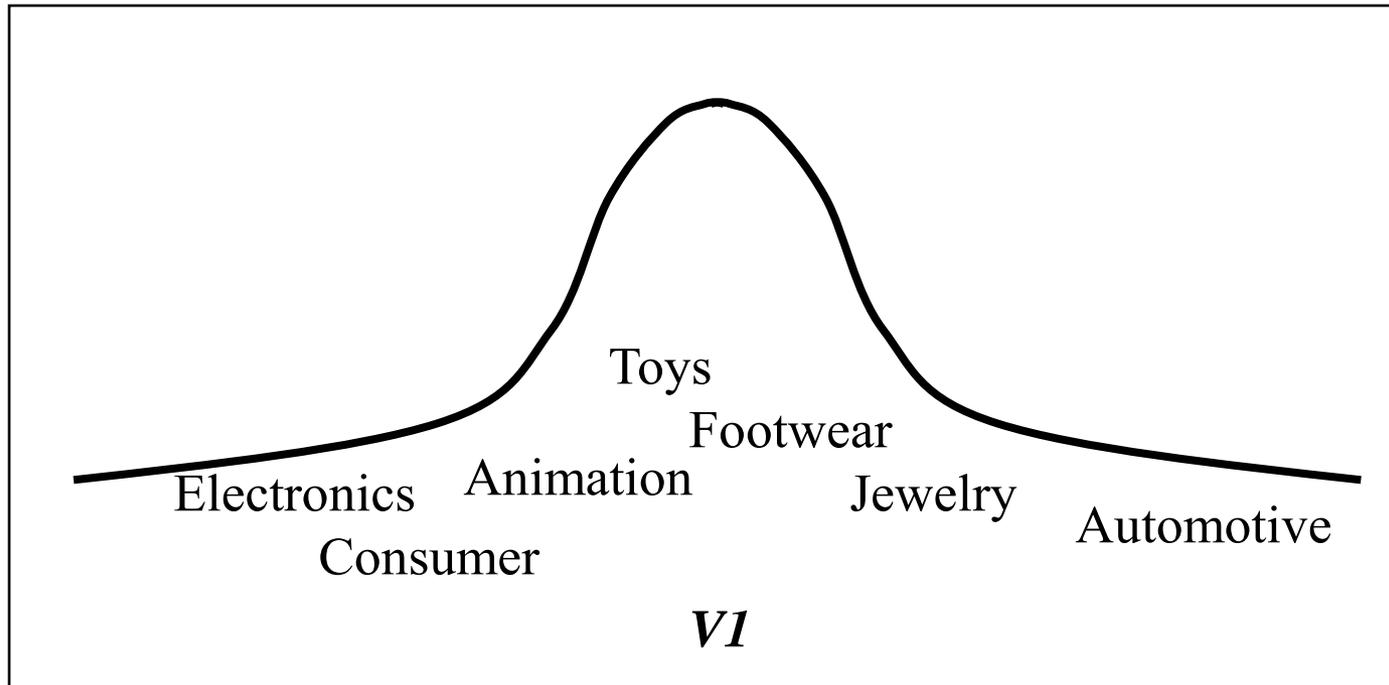
Beyond Version 3

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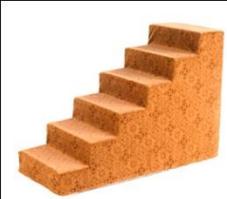
Initial FreeForm Target Market Segments



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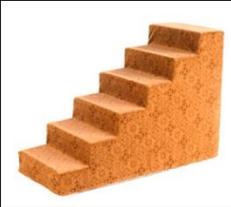
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Alignment

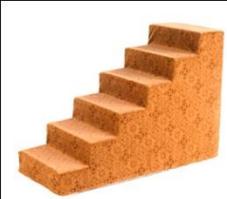
- Always think back to your persona to ensure alignment of your product development efforts to the target customer and your value proposition
- This avoids the feature creep or too heavy engineering mentality that can tend to take over products and make them less successful
- Example of Success: Zip Car
- If it is not aligned, why are you doing it?
- Keep the Main Thing the Main Thing



How Does this Apply to your Projects?

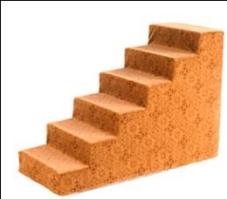
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Product or Service Section

- ▶ Focus on your ***first*** product and version (or service) only
- ▶ Describe in simple terms what it is and how much it costs
- ▶ What is the economic value of your product to the target customer
- ▶ What is the competitive advantage over the alternatives?
- ▶ What new products do you anticipate coming on the market and how will you hold a sustainable competitive advantage against them?
- ▶ What is your primary vector you choosing to compete on – product excellence, product innovation or customer intimacy?
- ▶ Once you have succeeded with this product version, what could it lead you into next? (<10% of effort)

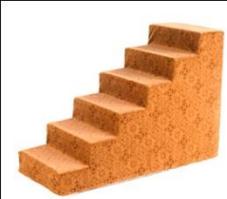


Evaluating Product Section

- ▶ **Bad:**
 - ▶ Lead with Technology – excited about features
 - ▶ Too many products
 - ▶ Incremental or unsustainable advantage
 - ▶ Relies on emotional purchase
 - ▶ Unclear pricing model

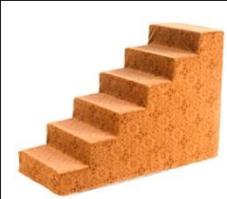
- ▶ **OK to Good:**
 - ▶ Emphasis on benefits
 - ▶ Demonstrated strategy for sustainable competitive advantage
 - ▶ Working prototypes and convincing plan to build
 - ▶ Customers willing to pilot or have successfully piloted product and are happy

- ▶ **Great:**
 - ▶ Product is tested and in production with customers making them lots of money today
 - ▶ Enthusiastic install base buying more and more
 - ▶ Significant and sustainable competitive advantage over existing and on the horizon suppliers
 - ▶ Plan to achieve pricing power
 - ▶ Recurring revenue – consumable(s)
 - ▶ Distributors and customers want to partner



Technology/Competitive Advantage

- ▶ Focus on your ***first*** product (or service) to start
- ▶ Are you choosing to compete on price, technological innovation or customer intimacy?
- ▶ What is your Intellectual Property?
- ▶ What is the state of your technology? Is there technology risk still?
- ▶ What are the technical benefits over the alternatives?
- ▶ What is the source of your competitive advantage and how do you intend to continue to develop and protect it?
- ▶ How do you intend to achieve sustainable competitive advantage over the current and future suppliers?



Evaluating Technology Section

▶ Bad:

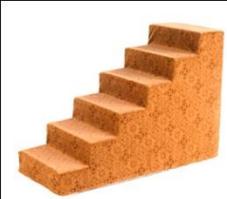
- ▶ Not proven yet
- ▶ Not focused
- ▶ Not aligned
- ▶ Too long – not more than 2 slide and preferably one
- ▶ Come off as a solution looking for a problem
- ▶ No sustainable advantage

▶ OK to Good:

- ▶ Focused, aligned and concise
- ▶ Strategy to leverage initial success for sustainable competitive advantage
- ▶ Fundamental blocking patents
- ▶ Proven technology

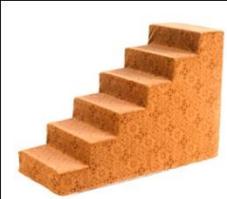
▶ Great:

- ▶ Passionate technical member of the founding team
- ▶ Communicates well internally and externally
- ▶ Enjoys solving problems
- ▶ Strong linkages to innovation centers for ongoing sourcing of ideas



Product Development Section

- ▶ Development Plan
 - ▶ For first product
 - ▶ Timetable
 - ▶ Personnel & materials
 - ▶ Capital equipment
 - ▶ Third party products, service and/or IP
 - ▶ Partners



Evaluating Prod Dev Section

▶ Bad:

- ▶ Not credible
- ▶ No dates
- ▶ Unclear milestones
- ▶ Lack of integration of previous work
- ▶ Lack of flexibility relative to delays in market adoption or product development
- ▶ Too long

▶ Good:

- ▶ Good detail
- ▶ Understand the need to develop and have contingency plans – optimistic yet realistic
- ▶ Creating Core yourself and not through partners
- ▶ Excellent alignment & ongoing rapid testing in marketplace
- ▶ Understand what don't have yet & when to get it

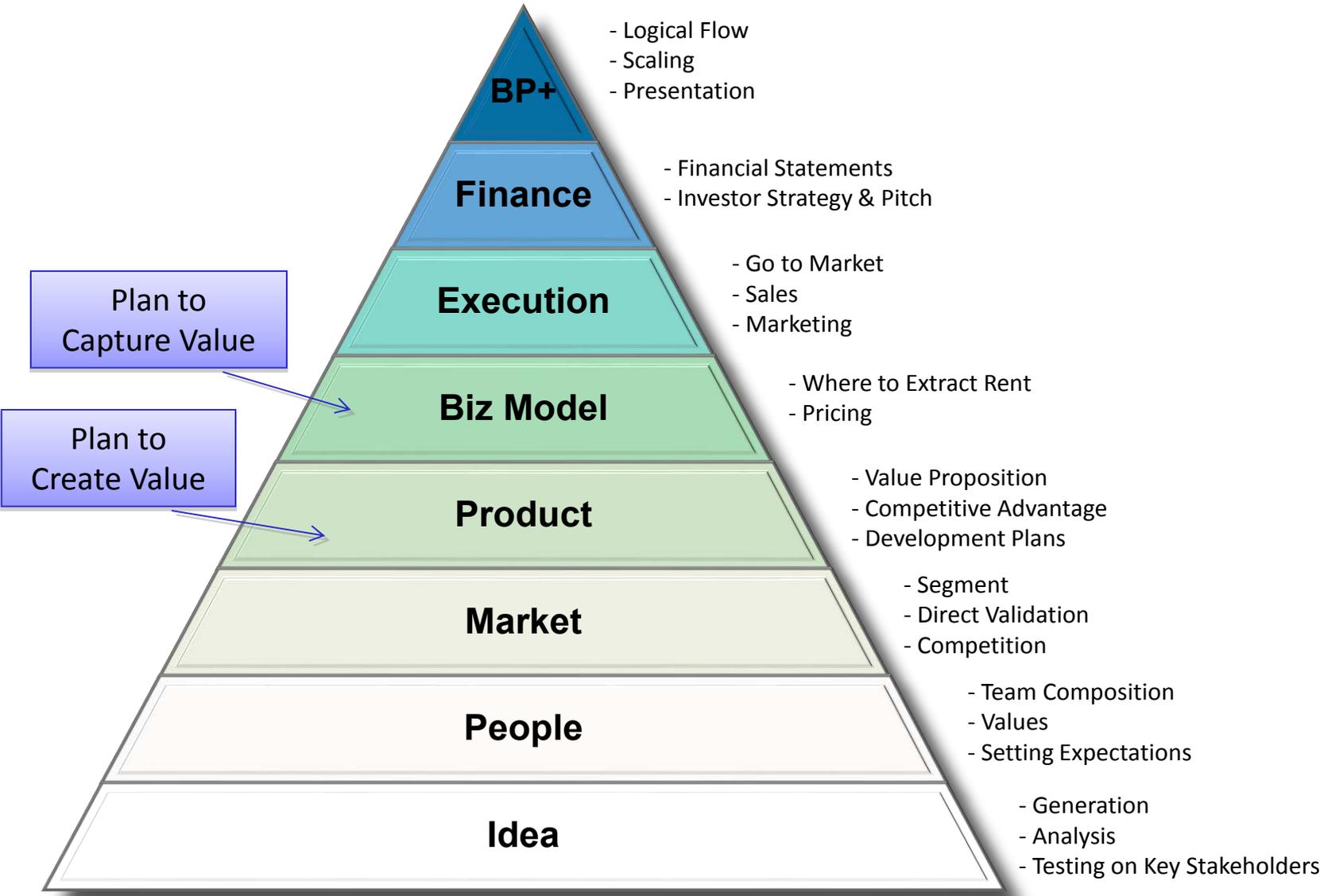


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