

**Foresight**  
science & technology



**APTA** | ANDES  
PACIFIC  
TECHNOLOGY  
ACCESS

**Presented by:**

Phyllis Leah Speser, J.D., Ph.D., R.T.T.P., N.P.D.P, EMT  
Chair, Board of Directors

Foresight Science & Technology, Inc.  
leah.speser@foresightst.com

**Assessing enterprises' absorptive capacity for new  
technologies**



# What is it

- Absorptive, an adjective, absorb: the quality of absorbing
- Capacity, the amount that something or someone can contain

# Context Counts!

Leah Speser, Foresight Science & Technology, [leah.speser@foresightst.com](mailto:leah.speser@foresightst.com)

# Absorptive (like sponge) Capacity (ability to do something)

## Common Sense

- The ability to see practical solutions that work
- The ability to avoid problems that you should not have to deal with

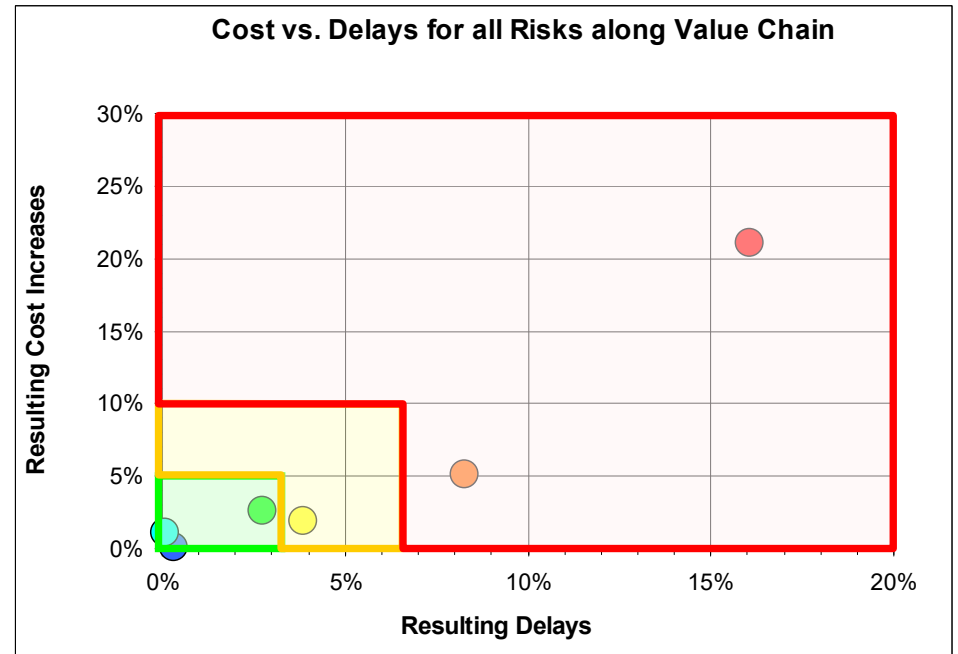
## Instinct

- An understanding of what is important to be aware of in your environment
- An ability to jump to conclusions based on signs in the environment

# Why do we care about Absorptive Capacity



Risk



What are we *really* assessing?

# Assessing involves Measuring

- Traditional metrics were developed by academics
  - Number or percent of workforce that are engineers and/or scientists
  - Distribution of bachelorette, masters, and Ph.D. degrees for technical and R&D personnel
  - Percent of revenues from innovative new products introduced in some time frame
  - Only work in a specific set of settings (i.e. Context Counts!)
- Metrics not always appropriate for SMEs
  - It's not about research but getting a product out the door
  - No-one really relies only on universities and research organizations for new product and service concepts and technologies

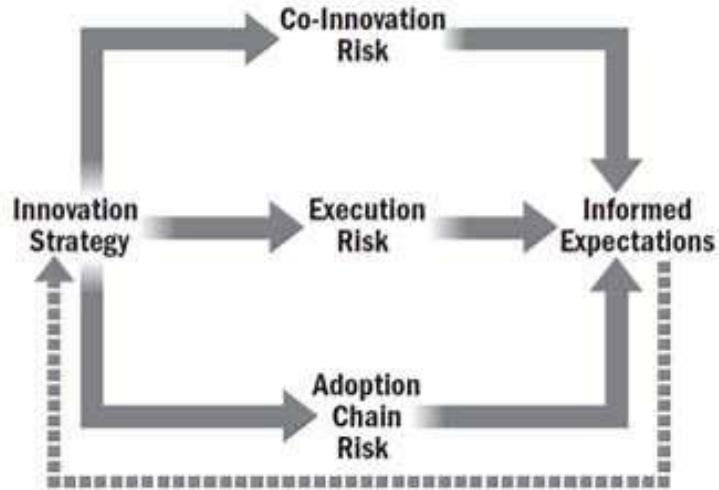
# Measuring the Absorptive Capacity of a Company to Conduct NPD

**What's in This Toolkit  
and  
Why use it?**



## Innovation risk framework

---

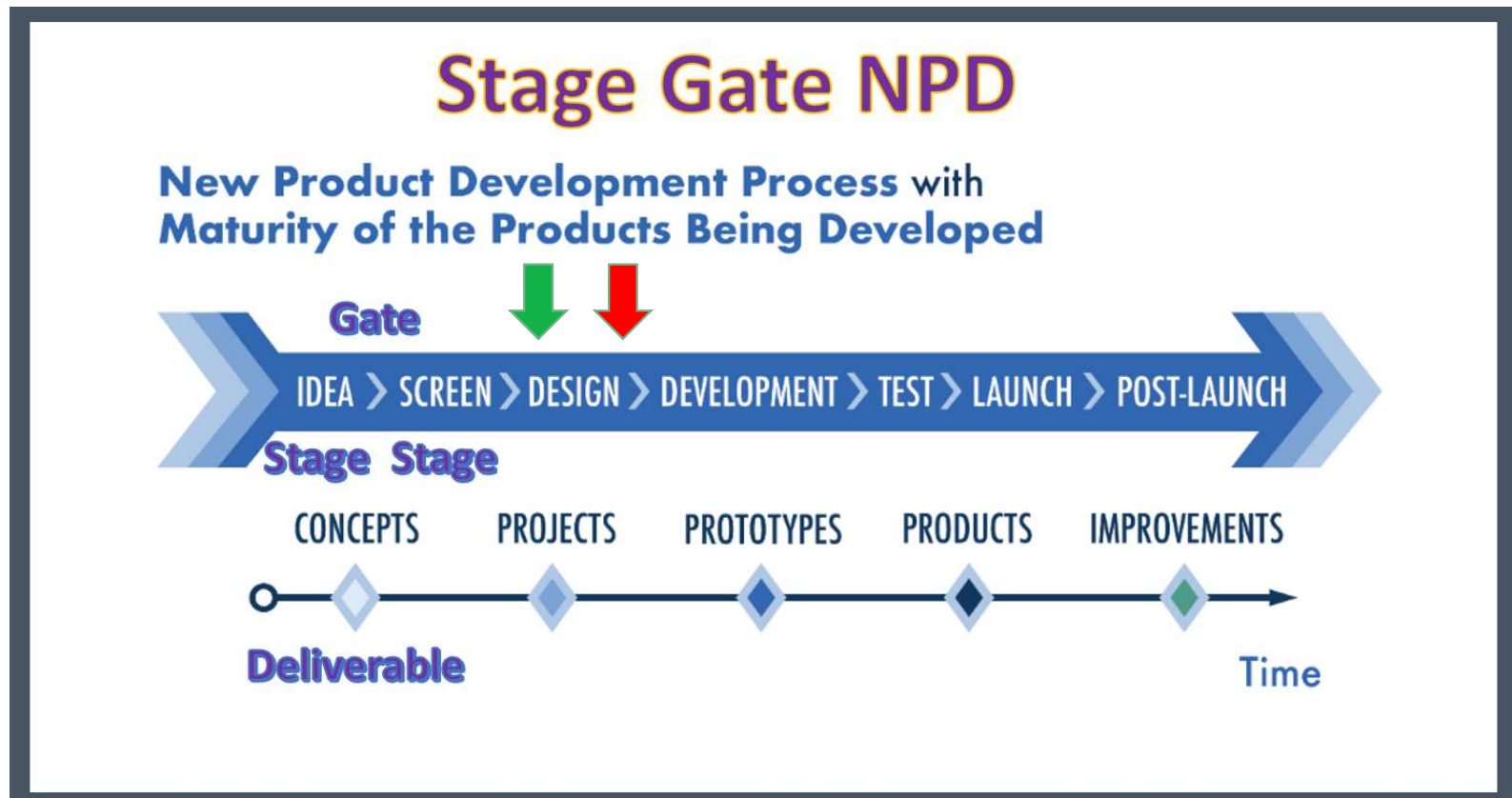


Ron Adner, The Wide lens, 2012

Addresses  
these Risks

Leah Speser, Foresight Science & Technology, [leah.speser@foresightst.com](mailto:leah.speser@foresightst.com)

# NPD Context



Leah Speser, Foresight Science & Technology, [leah.speser@foresightst.com](mailto:leah.speser@foresightst.com)

# The Tools in the Toolkit

Tool	Capabilities it measures (Can the SME do this?)	Gate Where it is Used
NPD Charter	<ol style="list-style-type: none"> <li>1. Identifies the customer, what the product is, and why it should have value for the customer</li> <li>2. Initial estimate of market size and profit margin target (hurdle rate for NPV)</li> <li>3. Estimates the timing and overall cost and why it should have value for the developer</li> </ol>	<ol style="list-style-type: none"> <li>A. Before beginning</li> <li>B. At each gate to determine if on track</li> <li>C. Revised before entering design</li> <li>D. Revised before entering development</li> </ol>
Action Plan	<ol style="list-style-type: none"> <li>1. Defines who will do what</li> <li>2. Identifies core tasking and milestones</li> <li>3. Specifies resources to be used and when money will be spent (timing of cost)</li> <li>4. Specifies who is responsible for what</li> <li>5. Enables initial estimate of technical risk and firm specific risk</li> </ol>	<ol style="list-style-type: none"> <li>A. Before beginning</li> <li>B. At each gate to determine if on track</li> <li>C. Reviewed before entering design, before entering development, and before entering launch and revised whenever appropriate</li> </ol>
Voice of the Customer	<ol style="list-style-type: none"> <li>1. Specifies the core benefits and the tangible and augmented features needed to provide them</li> <li>2. Suggests if the benefits are sufficient to drive buying</li> <li>3. Identifies beta testers, confirming there is potential value for the customer</li> <li>4. Provides initial estimate of revenues and length of time for product life cycle</li> <li>5. Enables initial estimate of market risk</li> </ol>	<ol style="list-style-type: none"> <li>A. Before entering screening</li> <li>B. Reviewed at each gate to ensure it remains valid</li> <li>C. Revised whenever customer needs, desires, and requirements may have changed</li> </ol>

Leah Speser, Foresight Science & Technology, [leah.speser@foresightst.com](mailto:leah.speser@foresightst.com)

# The Tools in the Toolkit

Competitive Advantage	<ol style="list-style-type: none"> <li>1. Identifies current and potential substitutes and competitiveness vis-à-vis them</li> <li>2. Enables refining estimate of market risk</li> </ol>	<ol style="list-style-type: none"> <li>A. Before entering design</li> <li>B. Before entering development</li> <li>C. Revised whenever a new substitute is discovered</li> </ol>
Freedom to Operate	<ol style="list-style-type: none"> <li>1. Determines if the product can legally be made, used, sold, and transported to the customer</li> <li>2. Determines if there is potential for IP based monopoly in specific markets</li> <li>3. Enables initial estimate of IP risk</li> </ol>	<ol style="list-style-type: none"> <li>A. Before entering design</li> <li>B. Revised whenever new IP is published by a patent-granting agency or developed in-house</li> </ol>
Value Chain Analysis	<ol style="list-style-type: none"> <li>1. Determines if NPD is likely to be completed within time and budget</li> <li>2. Determines if the capability and capacity exist to make the product and market, sell, and support it effectively and cost-efficiently</li> <li>3. Enables refining estimate of firm specific risk</li> </ol>	<ol style="list-style-type: none"> <li>A. Before entering design</li> <li>B. Revised whenever the product or service changes or the value chain changes</li> </ol>
SWOT (Strengths, Weaknesses, Opportunity, Threats) Analysis	<ol style="list-style-type: none"> <li>1. Helps identify strategy and tactics for development and manufacturing</li> <li>2. Helps identify strategy and tactics for launch and market expansion</li> <li>3. Enables refining estimates of all risks</li> </ol>	<ol style="list-style-type: none"> <li>a. Before entering development</li> <li>b. Before entering launch</li> <li>c. Revised whenever a modification of the product or service concept is needed, or the value chain changes</li> </ol>
Business Model Canvas	<ol style="list-style-type: none"> <li>1. Used confirm there is a viable business opportunity for the product or service being considered or developed</li> <li>2. Focuses on what is necessary to create value for the customer segment and the entity conducting NPD</li> </ol>	<ol style="list-style-type: none"> <li>A. Can be used at any gate but particularly helpful before starting the Design Stage</li> <li>B. Summarizes findings from prior stages and gate reviews when used before the Design Stage</li> </ol>

Leah Speser, Foresight Science & Technology, [leah.speser@foresightst.com](mailto:leah.speser@foresightst.com)

# The Tools in the Toolkit

Competitive Advantage	<ol style="list-style-type: none"> <li>1. Identifies current and potential substitutes and competitiveness vis-à-vis them</li> <li>2. Enables refining estimate of market risk</li> </ol>	<ol style="list-style-type: none"> <li>A. Before entering design</li> <li>B. Before entering development</li> <li>C. Revised whenever a new substitute is discovered</li> </ol>
Freedom to Operate	<ol style="list-style-type: none"> <li>1. Determines if the product can legally be made, used, sold, and transported to the customer</li> <li>2. Determines if there is potential for IP based monopoly in specific markets</li> <li>3. Enables initial estimate of IP risk</li> </ol>	<ol style="list-style-type: none"> <li>A. Before entering design</li> <li>B. Revised whenever new IP is published by a patent-granting agency or developed in-house</li> </ol>
Value Chain Analysis	<ol style="list-style-type: none"> <li>1. Determines if NPD is likely to be completed within time and budget</li> <li>2. Determines if the capability and capacity exist to make the product and market, sell, and support it effectively and cost-efficiently</li> <li>3. Enables refining estimate of firm specific risk</li> </ol>	<ol style="list-style-type: none"> <li>A. Before entering design</li> <li>B. Revised whenever the product or service changes or the value chain changes</li> </ol>
SWOT (Strengths, Weaknesses, Opportunity, Threats) Analysis	<ol style="list-style-type: none"> <li>1. Helps identify strategy and tactics for development and manufacturing</li> <li>2. Helps identify strategy and tactics for launch and market expansion</li> <li>3. Enables refining estimates of all risks</li> </ol>	<ol style="list-style-type: none"> <li>a. Before entering development</li> <li>b. Before entering launch</li> <li>c. Revised whenever a modification of the product or service concept is needed, or the value chain changes</li> </ol>

Leah Speser, Foresight Science & Technology, [leah.speser@foresightst.com](mailto:leah.speser@foresightst.com)

# The Tools in the Toolkit

Business Model Canvas	<ol style="list-style-type: none"> <li>1. Used confirm there is a viable business opportunity for the product or service being considered or developed</li> <li>2. Focuses on what is necessary to create value for the customer segment and the entity conducting NPD</li> <li>3. Acts as a business plan framework or a “path marker” for NPD</li> <li>4. Facilitates finding gaps or weaknesses in the NPD initiative which create risks</li> </ol>	<ol style="list-style-type: none"> <li>A. Can be used at any gate but particularly helpful before starting the Design Stage</li> <li>B. Summarizes findings from prior stages and gate reviews when used before the Design Stage</li> </ol>
Intellectual Property Audit	<ol style="list-style-type: none"> <li>1. Catalogs the intellectual assets of the company or organization</li> <li>2. Determines which ones should be protected and how best to accomplish that protection</li> <li>3. Used to restrict competition and create a competitive advantage in the marketplace</li> <li>4. Used to open up new revenue streams due to licensing</li> <li>5. May facilitate eliminating or mitigating execution risks due to infringement and adoption risks due to competition</li> </ol>	<ol style="list-style-type: none"> <li>A. Before entering Design</li> <li>B. Updated whenever a new intellectual asset is created</li> <li>C. Revised Launch to ensure nothing which may restrict competition or have marketing value has been missed and determine which IP, if any, could be licensed without harming the competitive advantage of this or subsequent products and services</li> </ol>

# The Tools in the Toolkit

Technology Forecasting	<ol style="list-style-type: none"> <li>1. Examines the technology available today and in a relevant time frame going forward that can be used in NPD</li> <li>2. Considers technology relevant for the current product or service, for future improvements to this product or service, and for other goods in relevant product lines or families</li> <li>3. Used to update the Competitive Advantage Analysis for this good</li> <li>4. Facilitates eliminating risks associated with suboptimal selection of technology to implement the design, production, marketing and sales, and support of the good</li> </ol>	<ol style="list-style-type: none"> <li>A. Before entering Design</li> <li>B. Before Development</li> <li>C. At Post-Launch for purposes of product or service improvements or development of a superior substitute</li> </ol>
Life Cycle Risk Reduction	<ol style="list-style-type: none"> <li>1. Examines the risks that occur during a product's or service's life cycle from the initial idea conception, through new product development, into sales and use, and until its final disposal</li> <li>2. Considers execution, co-innovation, and adoption risks</li> <li>3. Used to identify risks that can be mitigated or avoided through the product or service design and/or through subsequent stages of NPD and beyond</li> </ol>	<ol style="list-style-type: none"> <li>A. Before entering Design</li> <li>B. Revised thereafter whenever there is a change in internal operations, the external environment, customer and end-user requirements, or the materials, components, subsystems, and systems purchased to make the product or service</li> </ol>

Leah Speser, Foresight Science & Technology, [leah.speser@foresightst.com](mailto:leah.speser@foresightst.com)

# The Tools in the Toolkit

NPD Portfolio Construction	<ol style="list-style-type: none"> <li>1. Determines how the product or service currently being developed fits within the larger NPD portfolio of the entity developing it and the entity's overall business and NPD strategies</li> <li>2. Informs the design of this good to leverage any relevant economies of scale and scope or network economies, thereby reducing expenses associated with the good or the sales price</li> <li>3. Used to ensure NPD is an on-going activity and not a single shot, thereby contributing to the long-term vitality of the entity</li> </ol>	<ol style="list-style-type: none"> <li>A. In larger or multi-product companies before entering Screening</li> <li>B. Before entering Design for an independent NPD initiative or in a single product start-up, but can be conducted earlier if relevant</li> </ol>
TRIZ	<ol style="list-style-type: none"> <li>1. A brainstorming technique for resolving conflicts during design based on specifications which improve performance on one parameter but make it worse on another parameter or specification</li> <li>2. Useful for examining if there are ways to improve the design even when a conflict does not exist between the parameters or specifications, such as finding ways to reduce the cost of the product or service</li> <li>3. Facilitates thinking "outside the box" when the team or person doing design is stumped</li> <li>4. Used to avoid or mitigate execution and adoption risks that might otherwise be unavoidable</li> </ol>	<ol style="list-style-type: none"> <li>A. During Design</li> <li>B. Before entering Development</li> </ol>



# The Tools in the Toolkit

<p>Gate Progress Review and Next Stage Planning Risk Reduction</p>	<ol style="list-style-type: none"> <li>1. Examines execution, co-innovation, and adoption risk associated with the tangible and augmented features of the product or service being developed</li> <li>2. Examines how successfully risks have been reduced during the stage just completed and forecasts risks going forward, with an emphasis on the next stage</li> <li>3. Used to ensure the NPD initiative is on track with respect to the core benefits and services desired by customers and end-users, along with the tangible and augmented features they prefer and/or which are being used to provide those core benefits and services – thereby directing attention on the need to reduce specific risks</li> </ol>	<ol style="list-style-type: none"> <li>A. Critically important for the gate between Design and Development due to the rapid rise of expenses that begins there</li> <li>B. Reviewed before entering Test and Launch</li> <li>C. Useful for any gate review</li> </ol>
<p>NPV Calculator</p>	<ol style="list-style-type: none"> <li>1. Estimates the net present value, total gross profit, and internal rate of return for the product or service being developed</li> <li>2. Allows for developing different scenarios such as most likely, best possible, and worst possible NPVs</li> <li>3. Useful when developing financial pro-forma projections for management and investors</li> <li>4. Useful when deciding whether to terminate continued sales of a product or service or when to phase out this generation and go to a next generation of it</li> <li>5. Important adjunct for the NPD Portfolio Tool as it provides a means for comparing the financial impact of the products and services in the NPD Portfolio</li> </ol>	<ol style="list-style-type: none"> <li>1. Useful for any gate review</li> <li>2. Critically important for the gate between Design and Development due to the rapid rise of expenses that begins there</li> </ol>

Leah Speser, Foresight Science & Technology, [leah.speser@foresightst.com](mailto:leah.speser@foresightst.com)

# The Tools are Exell® Workbooks

NPD Charter					
<b>Good Being Developed</b>					
We are developing a mobile mini-factory that converts organic matter in municipal or farm solid waste streams into biodiesel, ethanol, or hydrogen. It uses a fungus (or possibly other organisms) to extract valuable oils from municipal solid waste and agricultural waste. The components and subsystems of the mini-refinery can be purchased commercially. We anticipate licensing the fungi or another suitable organism from Sustainable Biofuels LLC or another company. Another option would be to work with a university or research institute to develop a proprietary organism. Multiple units will be able to be linked together to create a larger scale system. We will sell both the production unit and the organism used (the consumable). It can be remotely monitored and controlled and will have on-board diagnostics to identify emerging or existing problems. We will develop our own sensor suite and software for operations, preventive maintenance, and trouble shooting.					
<b>Business Case for Developing It</b>					
There remains strong demand in the near- and mid-term for biofuels for transportation due to environmental concerns and associated government incentives. Energy independence is also a factor. In addition to government support for clean energy, we may also be able to obtain government funds to support start-up and early stage operations. Standards for product quality are set and known. Downstream, hydrogen remains a option, especially for rural areas, as a clean transportation fuel. Even if electric power for transportation becomes the norm, hydrogen can be used to power generators making clean electricity. The technical approach we are following has been pioneered by Sustainable Biofuels LLC in the USA. (See https://www.sbr.gov/sbc/sustainable-bioproducs-llc) so technical risk is manageable. There are ample sources of waste streams and some crops we could use can be grown on land less desirable for food or other economically more valuable uses. We see two primary exit strategies for the company. These are taking the biofuels business public, perhaps via a spin-out, or selling the business to a larger company. The company could elect to retain and grow this product family.					
<b>Targeted Customer Segments &amp; Why They Use It</b>			<b>Success Metrics</b>		
We are targeting municipalities, farms and farm cooperatives, and companies collecting municipal and other compatible waste. They will use the fuel themselves or sell it. We have the option of making and selling fuel to them for ourselves.			95% customer endorsement of the product after one year, two year payback period for customers with on-going cost of fuel, after that below market price for same fuel. Above industry average ROI for small companies and for refineries making it possible to attract investment.		
<b>Scope, Budget, and Spending Authority</b>			<b>Team Members</b>		
A budget of US \$2.3 million has been established for NPD. \$300 thousand of that will come from the founders, with the remainder needing to be raised from government sources and private investors on an as needed basis. The NPD Project Team will have authority to spend up to \$20,000 without additional authorization during the each of the Idea, Screen, and Design steps. New limits will be set for future stages at the end of Design.			Ayubu (Dui) Zubira, Project Team Leader, Sarah Lao, Engineering and Technical Research Expert, Roberto de la Manago, Market Reseach and Business Development Expert, Dieter Mench, Logistics Expert, Gwendoline (Gwen) Jones, Finance, Budgeting, and Administrative Assistant. The team will have access to Harriet Goldman, Design Consultant, Quincy Algiers, Production Engineering Consultant, Lupelele Hana, IP and Legal Consultant, and David Muro, Training Consultant as needed and within budget. The Senior Manager for reporting purposes and funding is Komen Saetang.		
<b>Preliminary Project Plan:</b>		<b>Target Date: 28/02/21</b>	<b>Actual Date:</b>		
Product Concept		31/5/2021	31/5/2021		
Design Project		31/10/2021			
Operational Prototype for Test		31/10/2022			
Tested & Evaluated Product		31/03/2023			
Launch		30/05/2023			
Submitted by: Bu Zubiran, Project Team Leader			Approved by: Komen Saetang, Manager		
Date: 21/1/2021		Date: 30/01/2021			

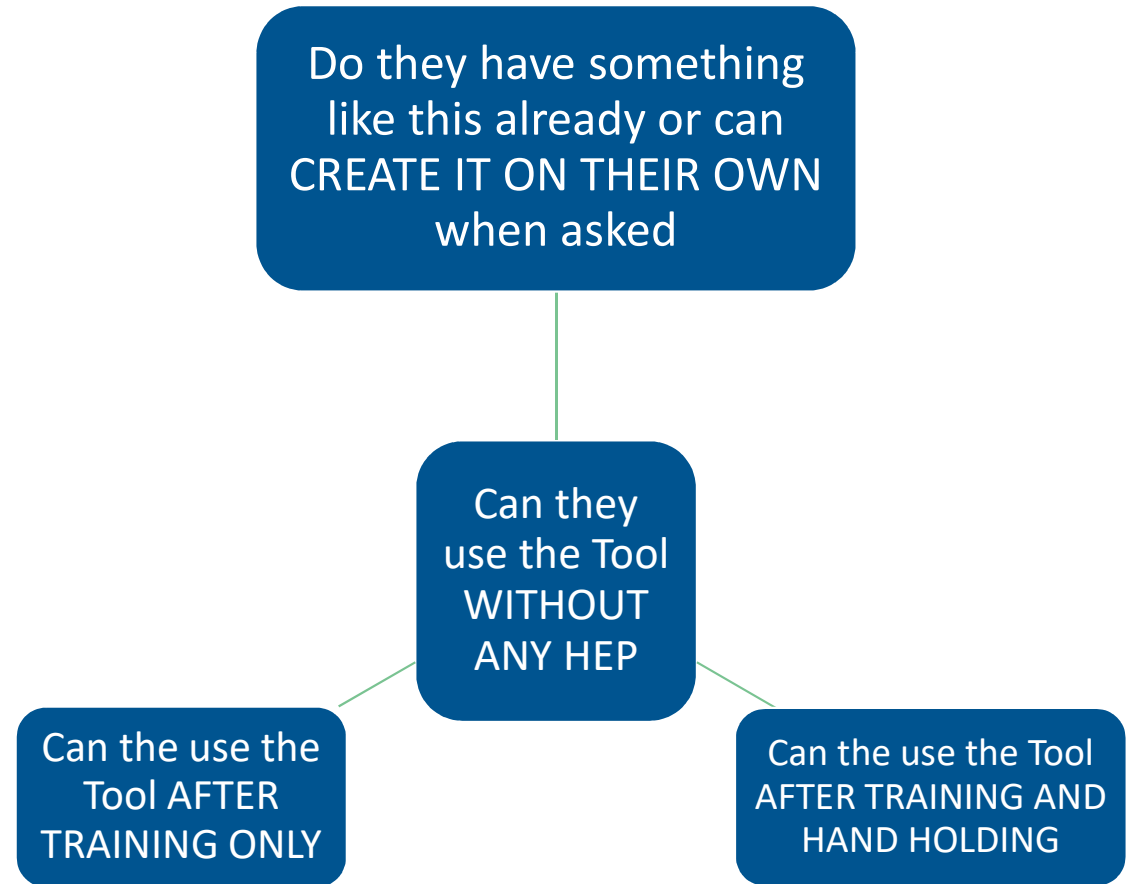
STAGE	Steps Involved and Percent of Anticipated Progress towards Completion						STAGE	How It Will be Accomplished and How You Will Know it is Done					
	Idea	Screen	Design	Development	Test	Launch		Key Tasking	Who is Responsible for Completion	Completion Milestone	Budget	Begin and End Date	
<b>Tangible Features OR Design Requirements</b>	Min	Screen	Design	Development	Test	Launch	Post-Launch						
1								<b>Idea</b>	Determine Feasibility of Finding Necessary Organisms, Parts, Components, Systems	Engineering and Technical Expert(s)	Validation they exist	\$5,000	02/02/2021 - 20/02/2021
2	Cutting and Mulching Waste Equipment	5%	20%	20%	50%	5%	0%	100%					
3	Brewing Vats and Capture Tanks	5%	20%	35%	25%	15%	0%	100%	Establish Market, Technical and Financial Viability	Market work - Market Research Expert; Technical viability - Engineering Expert and Legal Consultant; Financial - Finance and Budgeting Expert	Establish Competitive Advantage and Freedom to Operate plus Market Entry is Feasible for Product Concept; Attain TRL Level 2	\$25,000	01/03/2021-25/05/2021
4	Cleanable Filters	5%	20%	20%	40%	15%	0%	100%	Establish Business Model Canvas; Fix Technical Approach, License Organisms, and Establish Proof of Concept; Complete Design Project Consistent with Model	BUSINESS MODEL CANVAS - team LEADER; Technical Approach and Design - Engineering and Technical Expert and Design Consultant; IP and Supplier Vendor Qualification and Contracting - Logistics Expert with Legal Consultant	Business Canvas Model Approved; Licenses for Organisms Obtained; Attain TRL 3; Design Approved and Vendors/Suppliers Qualified and Contracts in Place	\$100,000	01/07/2021 - 30/11/2021
5	Piping and Valves	5%	20%	35%	25%	15%	0%	100%	Develop Benchtop Prototype and Operational Prototype; Raise Rest of Necessary Funding	Engineering and Technical Expert with Production Engineering Consultant	Attain TRL Levels 4, 5, 6, and 7	\$170,000 through TRL 4, Additional \$1.9M as raised	01/12/2022 - 28/10/2022
6	Conveyors	5%	20%	20%	40%	15%	0%	100%	All Certifications and Regulatory Compliance, Completion of Beta Testing	Engineering and Technical Expert and Logistics Expert with Legal Consultant	Attain TRL 8 and 9; Receive all Necessary Certifications and Registrations	\$500,000	01/11/2022 - 28/03/2023
7	Fungi/Organisms for Biodiesel, Ethanol, and Hydrogen	5%	25%	25%	25%	20%	0%	100%	Prepare Manuals and Train Market and Sales Personnel, Sales Reps, Installers, and Maintenance Repair Personnel; Implement Marketing Campaign; Establish Corporate and Retail Sales Channels	Training - Team Leader with Training Consultant; Marketing and Sales - Business Development Expert and Sales and Marketing Department Manager	Personel Trained, Marketing Campaign Implemented, Sales Channels Established, Initial Revenue Targets Hit	\$200,000	01/04/2023 - 28/08/2023
8	Controls for On-Site and Remote Operations, Monitoring, and Preventative Maintenance	5%	25%	25%	25%	20%	0%	100%					
9	Sensors for On-Site and Remote Operations, Monitoring, and Preventative Maintenance	5%	20%	25%	25%	20%	0%	5%	100%				
10	Software for On-Site and Remote Sensors and Controls for Operations, Monitoring, and Preventative Maintenance	5%	25%	25%	25%	20%	0%	0%	100%				
11	Modularize for Transport	5%	15%	35%	30%	10%	0%	5%	100%				
12	Should-Cost Price	5%	15%	40%	20%	10%	5%	5%	100%				

Leah Speser, Foresight Science & Technology, leah.speser@foresightst.com



# How to Use the Tools to Assess Absorptive Capacity for a Specific NPD Stage

Leah Speser, Foresight Science & Technology, [leah.speser@foresightst.com](mailto:leah.speser@foresightst.com)



# Take Aways

- Nothing happens without a sale.  
David Speser
- If opportunity doesn't knock, build a door.  
Milton Berle
- A well-defined imagination is the source of great deeds.  
Chinese Fortune Cookie