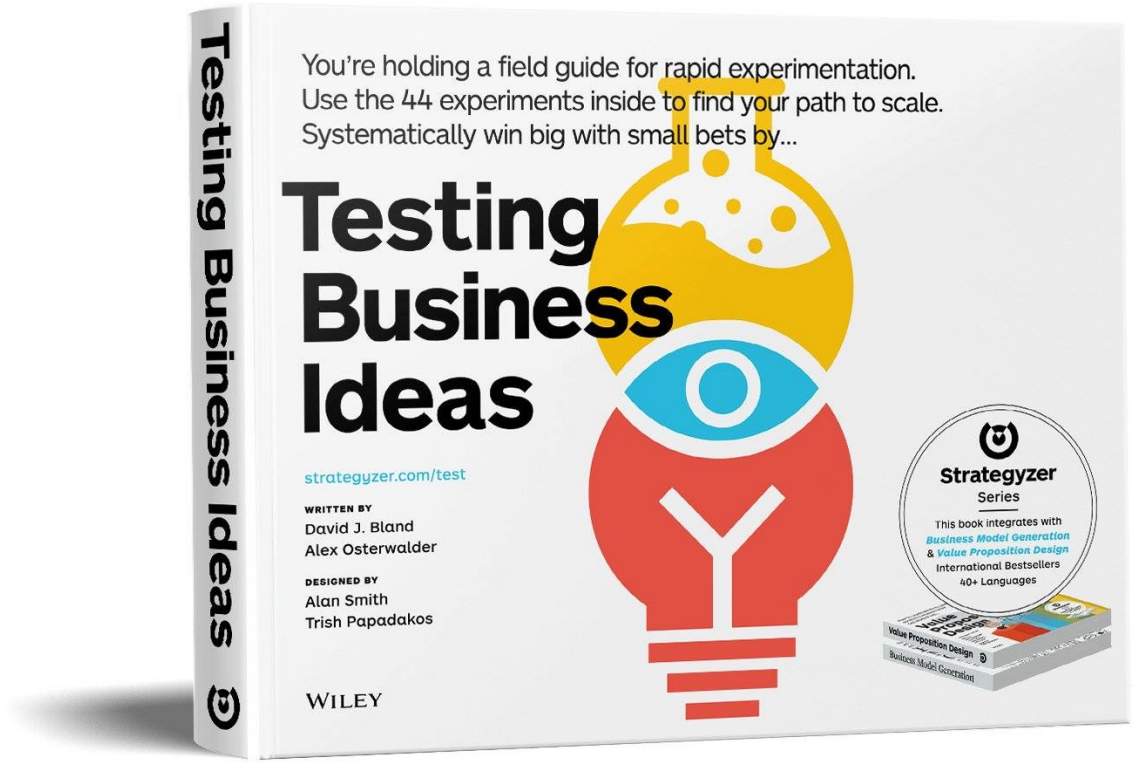
De-risking New Growth Through Lean Innovation

Presented by David J Bland
May 2025 - ISBM Conference
In partnership with DuPont

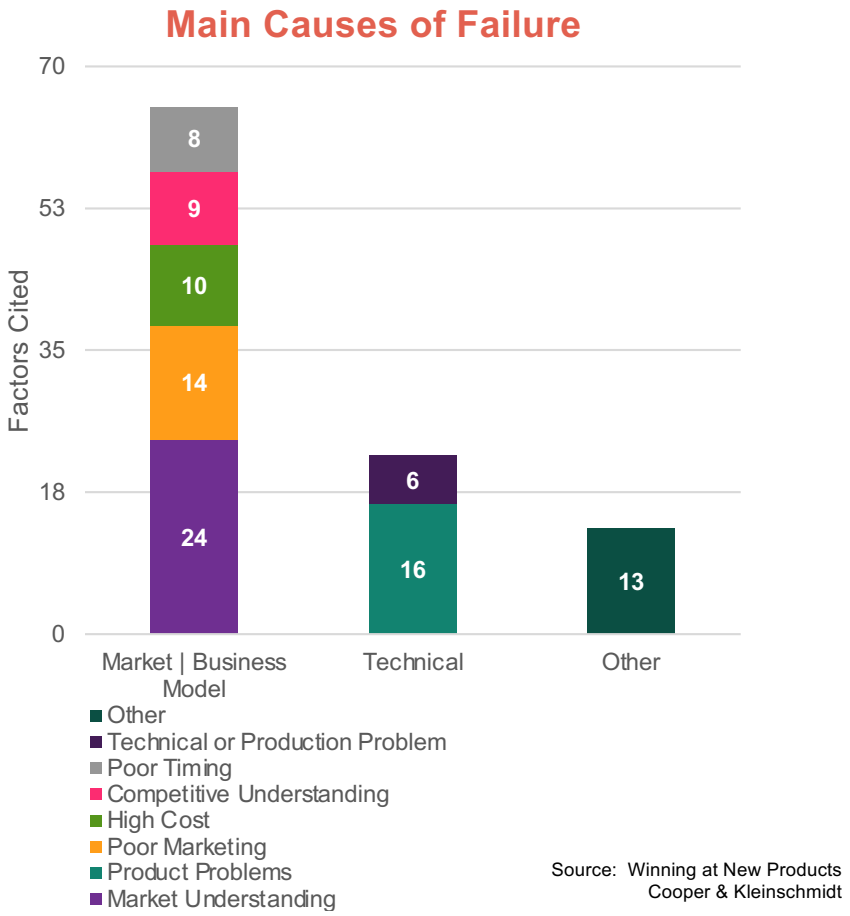

I help large organizations **reduce risk** in new growth through **lean innovation**.
This presentation consists of the same tools and techniques that I use with DuPont to **test new areas of growth.**
I believe it is the **future** of innovation.
- David J Bland, Founder - Precoil

Why **test** your ideas?


Testing Business Ideas
TESTING BUSINESS IDEAS
You're holding a field guide for rapid experimentation. Use the 44 experiments inside to find your path to scale. Systematically win big with small bets by...
Strategyzer
WILEY



https://www.amazon.com/Rapid-Testing-Business-Ideas-Customer/dp/1119551447



Source: Winning at New Products
Cooper & Kleinschmidt

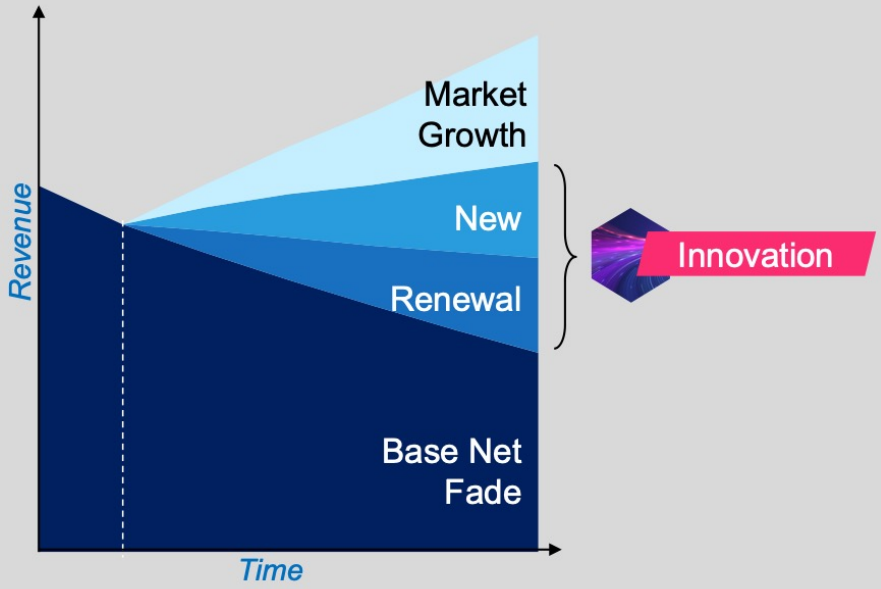
Correlation Matrix

	Analysis Paralysis	Confirmation Bias	Failure to learn And Adapt	Incomparable Data/ Evidence	Outsource Testing	Time Trap	Too Few Experiments	Weak Data/ Evidence
Analysis Paralysis	1							
Confirmation Bias	0.340	1						
Failure to learn And Adapt	0.262	0.536	1					
Incomparable Data/Evidence	0.446	0.520	0.437	1				
Outsource Testing	0.338	0.421	0.527	0.311	1			
Time Trap	0.355	0.344	0.474	0.458	0.220	1		
Too Few Experiments	0.328	0.391	0.576	0.400	0.398	0.282	1	
Weak Data/Evidence	0.394	0.479	0.389	0.720	0.190	0.338	0.400	1

Source: https://www.precoil.com/articles/2023-state-of-experimentation

We must be AMBIDEXTROUS leaders

Achieve business growth by delivering healthy core businesses (Renew) and extending into high growth adjacencies (New)

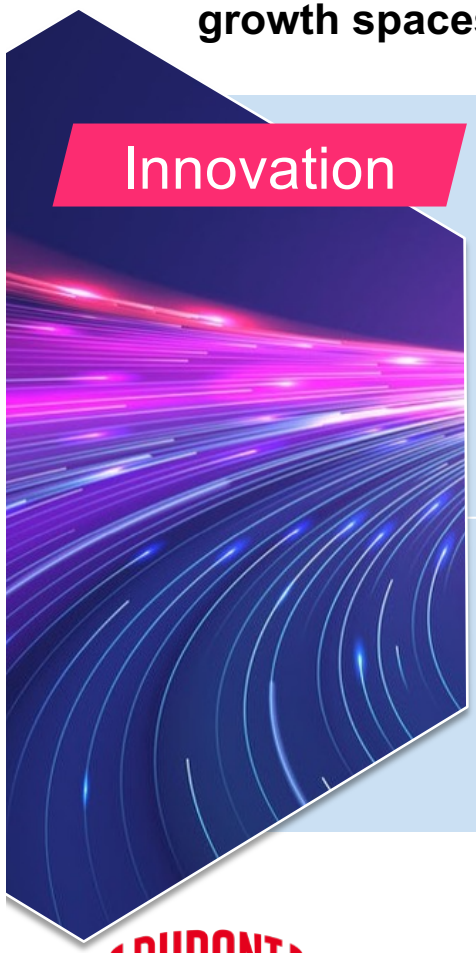


Powerful intersections deliver future-focused business growth mindset for value creation

We need to be GREAT at NEW
(not just renew)

Sustainability + Digital are strong drivers for both Renew & New

Above market growth requires that we both renew strong cores and extend into new high growth spaces



New

- How to **create new growth** based on tackling important and valuable challenges aligned with secular growth trends?
- How to **expand the addressable market** based on new business models and offerings?

Renewal

- How to **increase relevance in existing value chains** based on incremental enhancements in products and applications?
- How to **expand margins** based on productivity?

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De-risking NEW GROWTH is the innovator's #1 job

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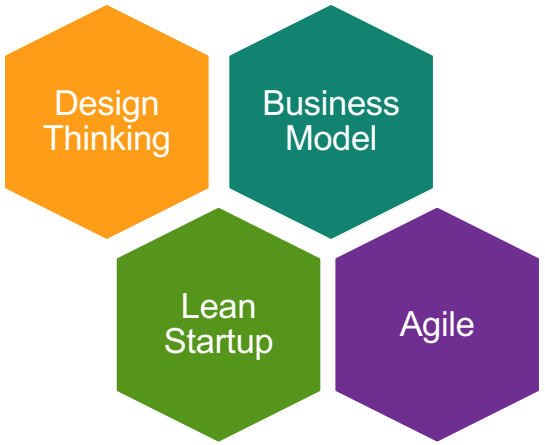
Delivering NEW growth the hardest work we do.

Source: Harvard Business Review

What is Lean Innovation?

Mash up of proven approaches for successfully innovating when uncertainty – market &/or technology – is high.

- Grounded in the scientific method
- Systematic and iterative
- Adapted for B2B applications



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Lean Innovation Approach

Prioritize | Experiment | Sprint | Decide

Scan

Issue Scanning & Critical Thinking

- Business Model Canvas
- **Make-Or-Break Assumptions**
- **Value Proposition**

Hypothesize

Build Your Learning Plan – Testable Hypotheses

- Critical Hypotheses
- **Proof Points / Evidence of Value**
- **Experimental Plan**

Analyze

Drive Rapid Learning Cycle to De-Risk the Opportunity

- **Testing Critical Hypotheses**
- Value of Evidence
- **Sprint** vs Marathon

Track

Path Forward & Iterate Based on Learnings

- Experiment Update
- **Persist, Pivot, Kill**
- Repeat Learning Cycle

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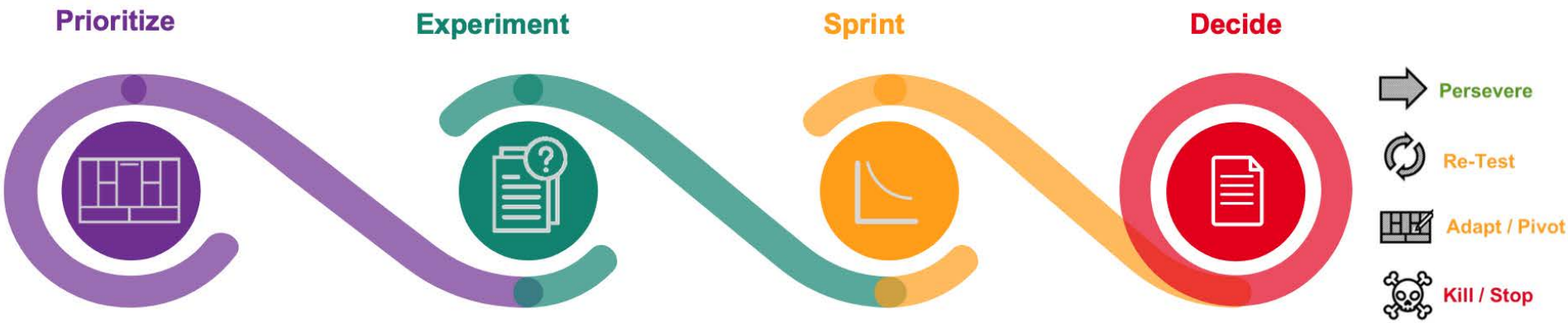
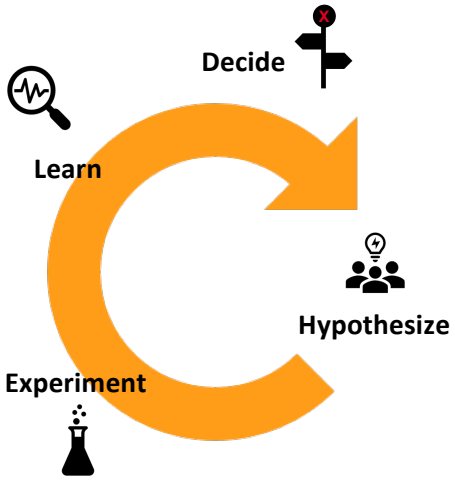


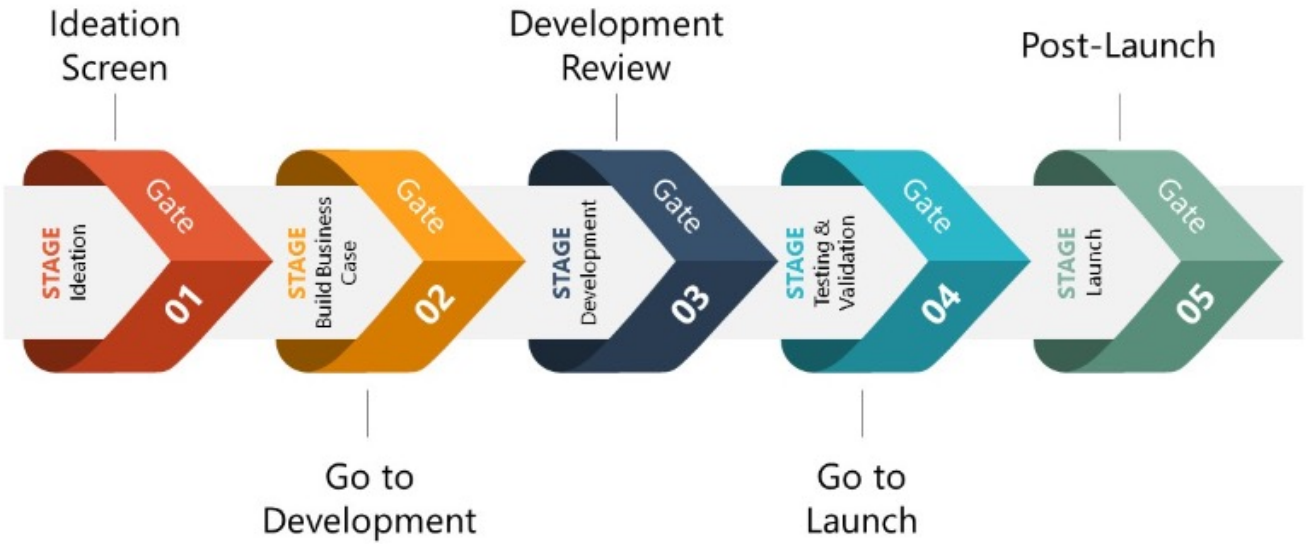
Scan → Hypothesize → Analyze → Track

	Critical Hypotheses	Proof Sought	Experiment	Learnings
DESIRABILITY *Do customers want this?*	We believe that… ACTION, IDEA or ASSUMPTION will result in…(DESIRABLE) OUTCOME for (customers, partners, end users)	We'll know that the hypothesis is true if… EVIDENCE / PROOF is delivered	The research, test or experiment to be run that will deliver the proof	Incremental learnings and implications on the path forward
VIABILITY *Should we do this?*				
FEASIBILITY *Can we do this?*				

FOR HIGH IMPACT, HIGH RISK PROJECTS

Lean Innovation fits within the stage gate[1] framework





Lean Learning Loop Intensity

Lean Learning Loop: Hypothesize – Experiment – Learn → Decide

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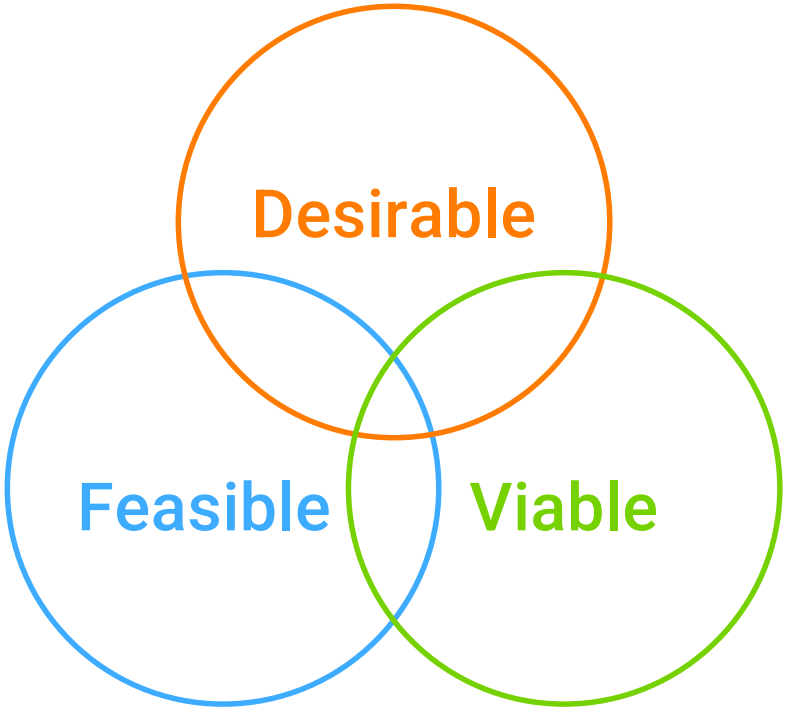
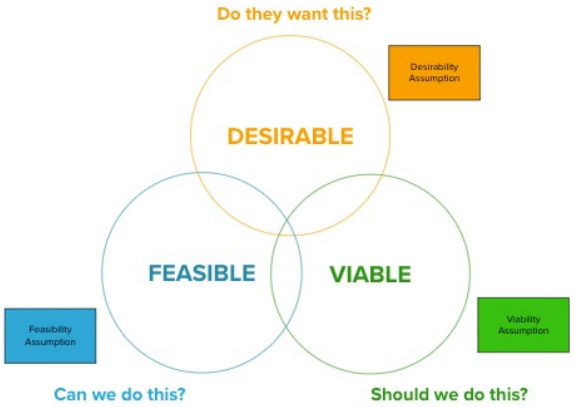
1 Copyright, Robert Cooper.



Adapted from Larry Keeley, Doblin Group

Extract



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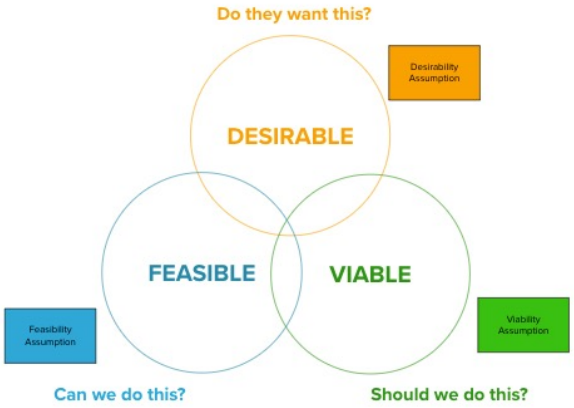
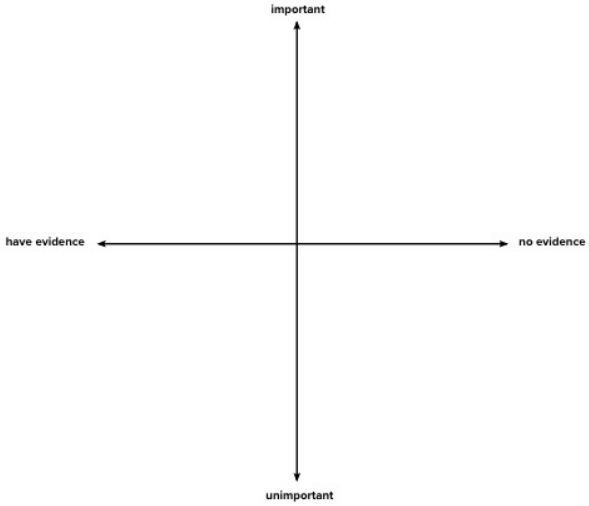


Map



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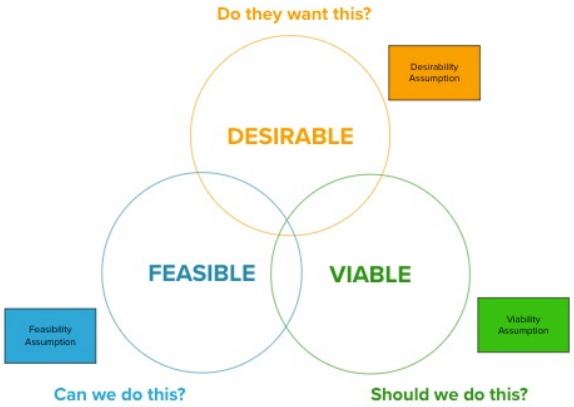

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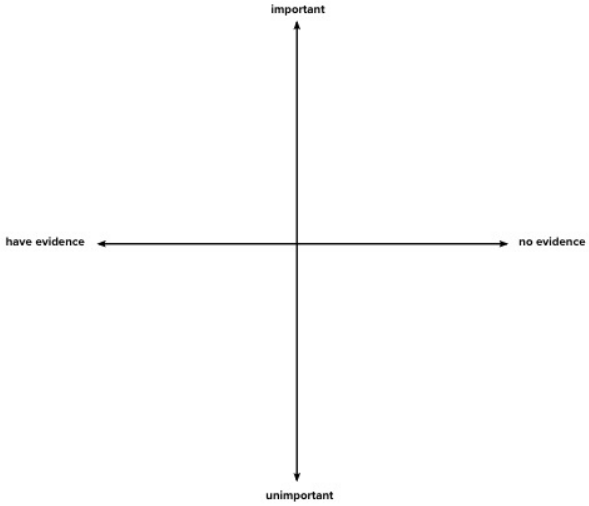

Test

Case Study

Vespel® Film Technology

Development of Vespel® Films and Laminates for High-Speed High-Frequency (HSHF) Printed Circuit Boards (PCBs)

Project Leader: Lucas Amspacher
Core Team: Harry Jie (ML), Rakesh Nambiar (TL), Peter Fox, Hau-Nan Lee
Lean Innovation Coaches: Owen Compton, Greg Blackman, Steve Pisklak
Sponsors: Doug Hopek, Marty Degroot

Lean Innovation Cohort #4

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Vespel® Polyimide Shapes, Parts (*and Films*)

Current Vespel® S-Resin Offerings

Custom Parts

Stock Shapes

Value Propositions:

- Low Wear & Friction
- Chemical and Thermal Stability
- Mechanical and Electrical Properties

Vespel® Film Technology

- Transformational technology enabling the creation of 4-20 mil ***rigid*** polyimide dielectric films and laminates
- New applications and markets created in rigid laminates for HSHF PCBs and thermal management

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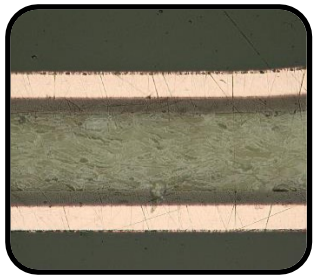
Vespel® Polyimide Rigid Laminate – Value Proposition Statement

Prototypes

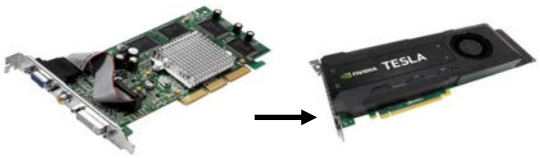
Patterned Laminate w/ Thick Copper

Patterned Laminate for PCB Prototype



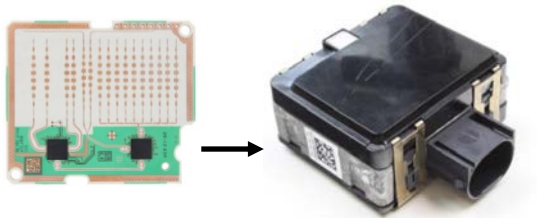
X-section 6 mil Dielectric Laminate

Applications



Nvidia™ Graphics Card (PPE)

Tesla™ AI Self-Driving Module



Bosch™ RF Board (PTFE Outer Layer)

Bosch™ ADAS Radar Device

Our **Vespel® Polyimide Rigid Laminate** help(s) **Military and Automotive OEMs**

who want to **design and build Next-Gen Rigid PCBs for high-speed and high-frequency applications**

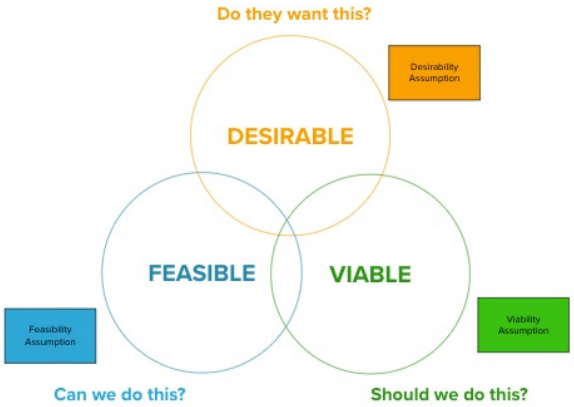
by **reducing signal loss and removing PFAS**

and **improving product reliability and processability**

unlike **PPE, LCP & PTFE (which have reliability/processing issues, and contain PFAS)**

Strategyzer Ad Lib Template: https://www.strategyzer.com/library/ad-lib-value-proposition-template

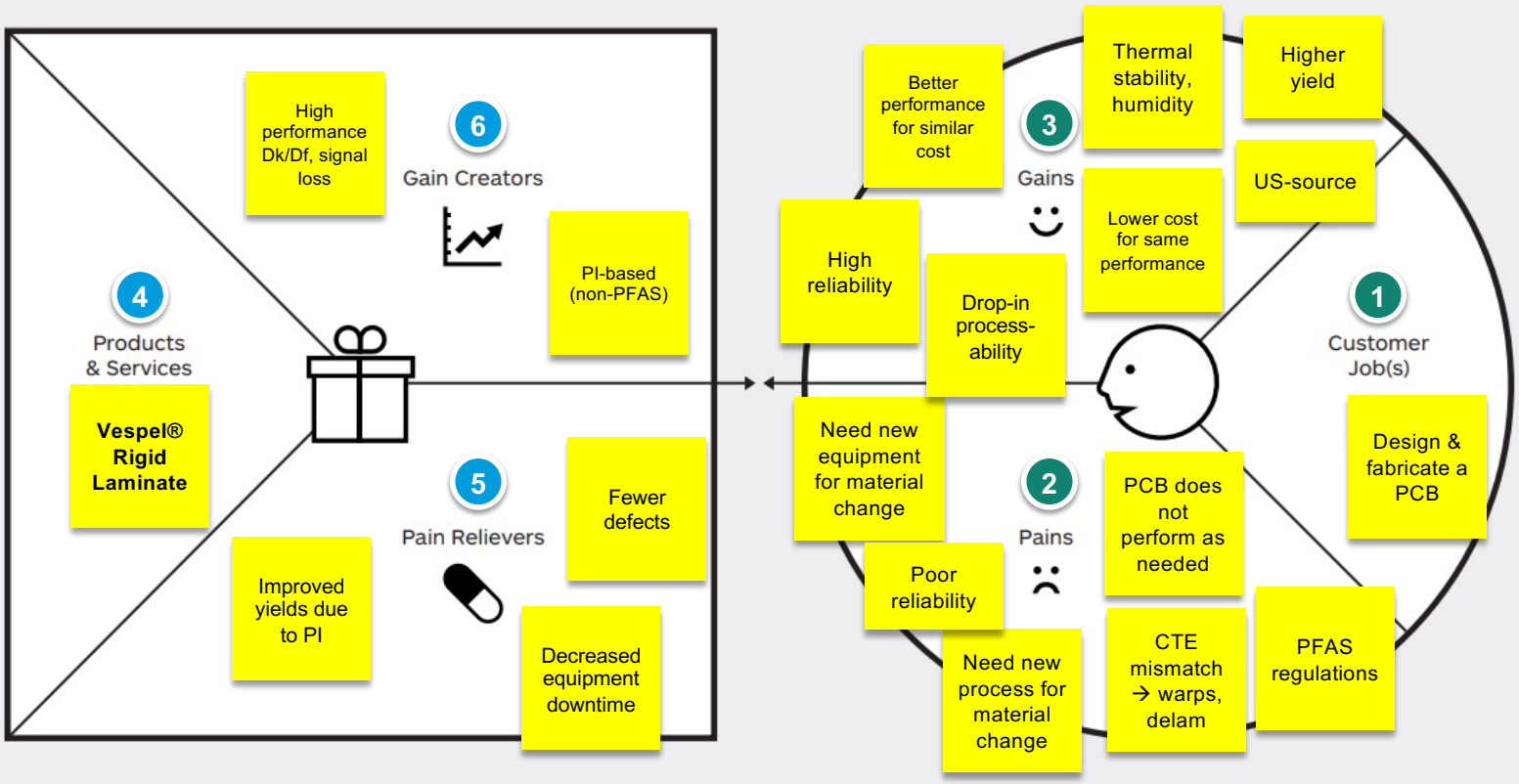
Extract



The Value Proposition Canvas

Value Proposition: …

Customer Segment: **PCB Fabs/OEMs for Military & Auto**

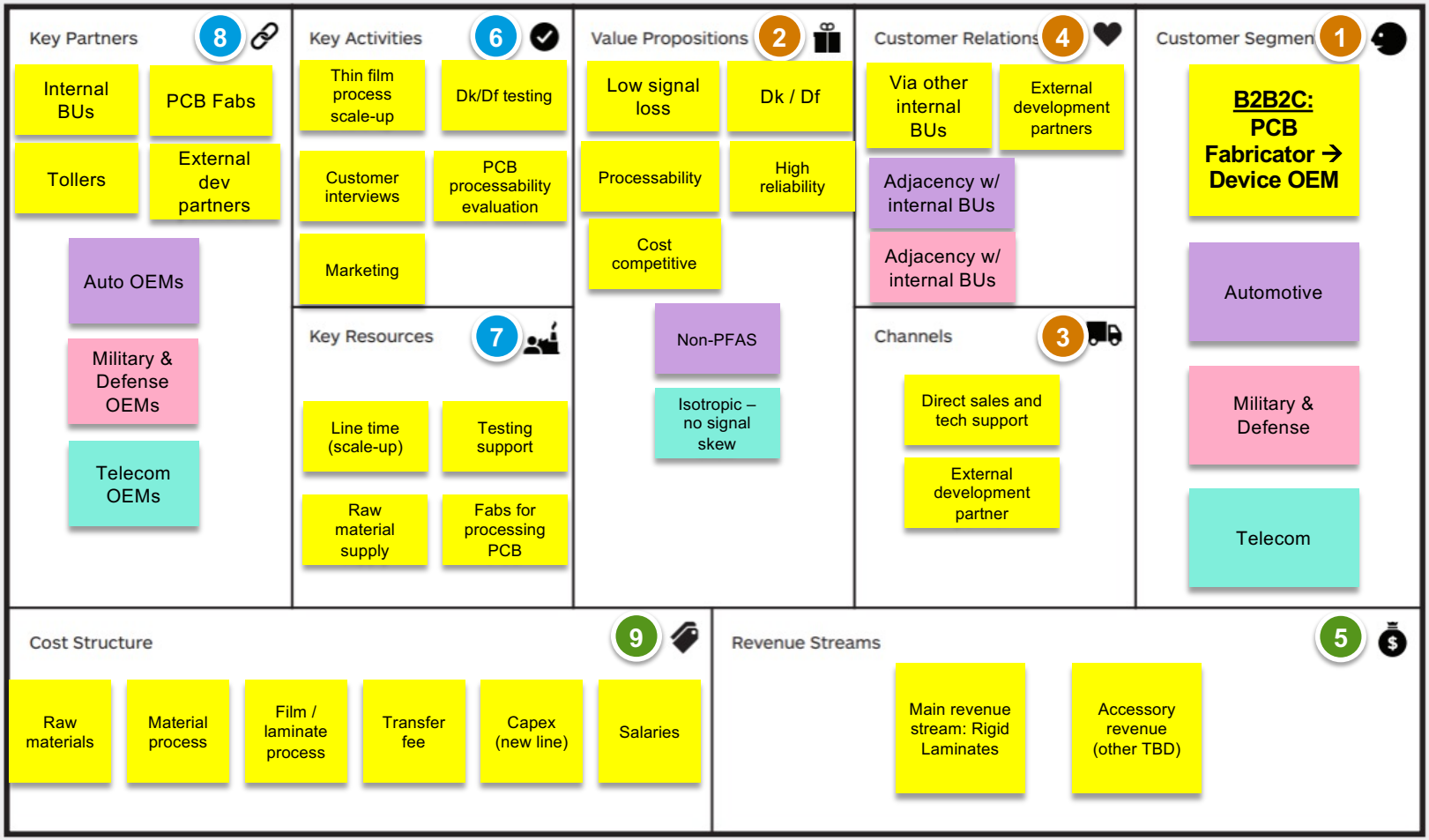


Strategyzer
strategyzer.com

1. **Customer Jobs** - What are the most important functional / social / emotional jobs your customer are trying to accomplish?
2. **Pains** - What are the biggest pains / challenges preventing them from accomplishing these jobs?
3. **Gains** - If they were able to do these jobs and overcome these pains, what positive outcomes would they experience?
4. **Products & Services** - What are the core products / services you offer to solve for the customer jobs?
5. **Pain Relievers** - Which features / benefits do you offer to solve for customer pains?
6. **Gain Creators** - Which features / benefits do you offer to create customer gains?

The Business Model Canvas

Designed for:	Designed by:	Date:	Version:



1. **Customer Segments:** For whom are we creating value?
2. **Value Propositions:** What value do we deliver to the customer?
3. **Channels:** How are we reaching our customers?
4. **Customer Relationships:** What is the relationship we have with our customers?
5. **Revenue Streams:** What do customers pay for our value?
6. **Key Activities:** What key *verbs* do we have to perform?
7. **Key Resources:** What key *nouns* do we have?
8. **Key Partners:** Who are our key partners and suppliers?
9. **Cost Structure:** What are our most important costs?

DESIGNED BY: Strategyzer AG
The makers of Business Model Generation and Strategyzer

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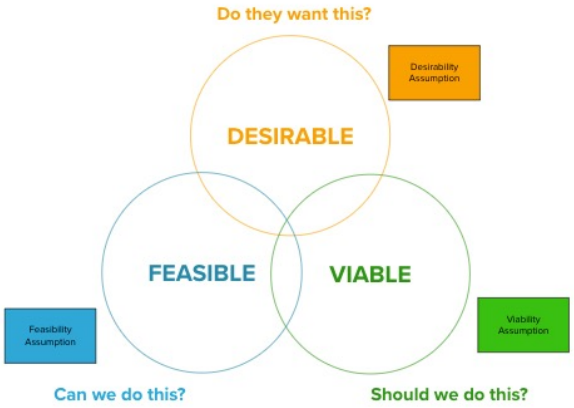
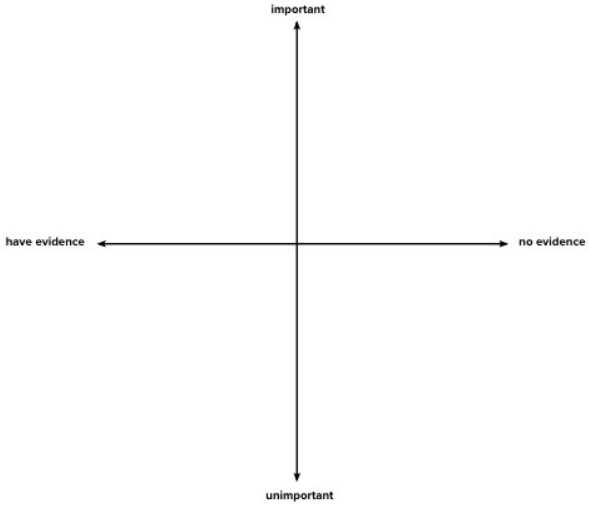
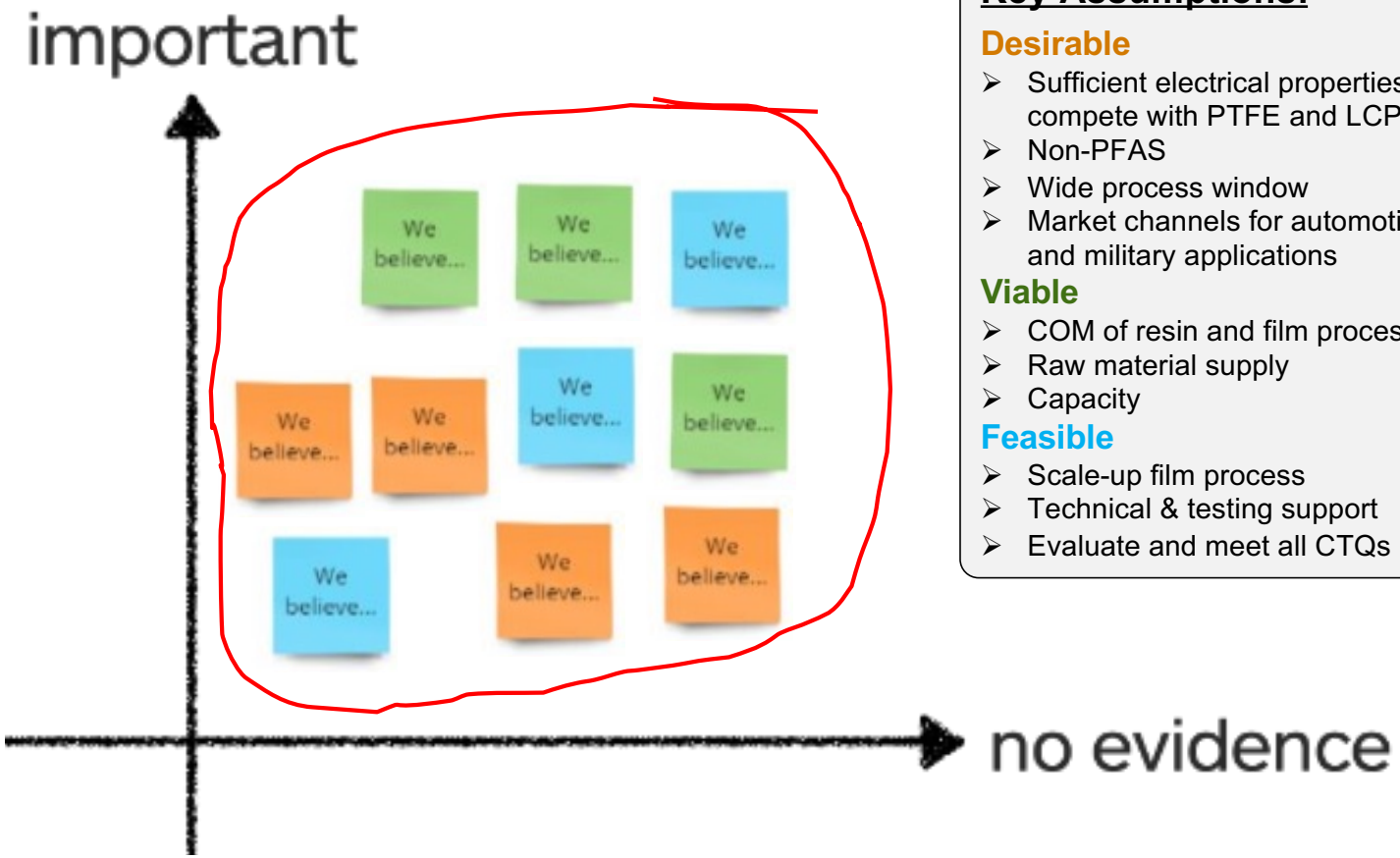
strategyzer.com

Extract



Map





Key Assumptions:

Desirable

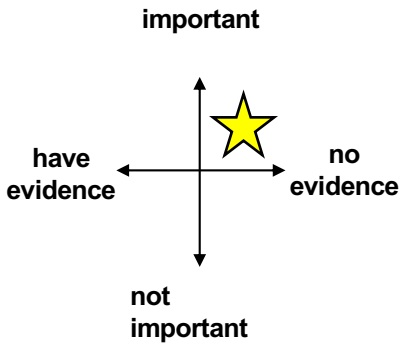
- Sufficient electrical properties to compete with PTFE and LCP
- Non-PFAS
- Wide process window
- Market channels for automotive and military applications

Viable

- COM of resin and film process
- Raw material supply
- Capacity

Feasible

- Scale-up film process
- Technical & testing support
- Evaluate and meet all CTQs



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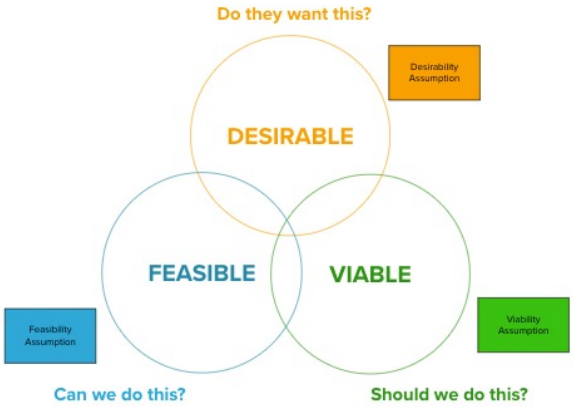
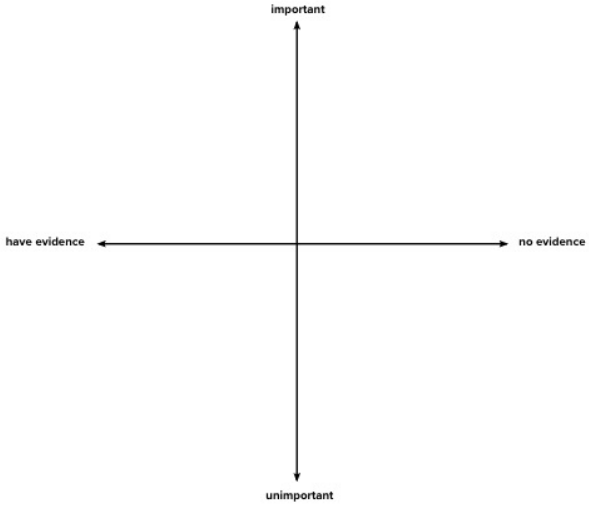


Map



Test

Critical D-V-F Hypotheses

DESIRABILITY

We believe...

- ★ PCB OEMs will desire a non-PFAS option
- ★ PCB OEMs will desire a thermally conductive, low-loss dielectric
- ★ PCB fabs will desire improved processability and reliability from PI
- Value proposition is strong enough for customers to switch
- Fluorinated laminates will be phased out due to regulations
- ★ Customers will not have significant switching costs (ex. new equipment or process needed)

FEASIBILITY

We believe...

- Adhesion, Dk/Df, and insertion loss meet CTQ's for PCBs
- We can scale-up the film in a continuous process that meets laminate dimensional specs
- Approval for tech and testing support from internal resources
- Thermal stability and processability requirements are met

VIABILITY

We believe…

- HSHF PCB market is large enough to be worth it
- ★ Cost of manufacturing is low enough to enable target margin for customer segments and application spaces
- Cost of capex is not prohibitive

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Testing Critical Desirability Hypotheses

- Customer Interviews to gain insights and validate value propositions

DISCOVERY / EXPLORATION

Customer Interview

An interview that is focused on exploring customer jobs, pains, gains, and willingness to pay.

COST ●●○○○ | EVIDENCE STRENGTH ●○○○○

SETUP TIME ●●○○○ | RUN TIME ●●○○○

CAPABILITIES *Research*

DESIRABILITY · FEASIBILITY · VIABILITY

Customer Interviews are ideal for gaining qualitative insights into the fit between your value proposition and the customer segment. It's also a good starting point for price testing.

Customer Interviews are not ideal as a substitute for what people will do.

Military and Automotive OEMs

DUPONT

+

DISCOVERY / DISCUSSION PROTOTYPES

Data Sheet

One page physical or digital sheet with specifications of your value proposition.

COST ●○○○○ | EVIDENCE STRENGTH ●●●○○

SETUP TIME ●●○○○ | RUN TIME ●●○○○

CAPABILITIES *Design / Technology / Marketing*

DESIRABILITY · FEASIBILITY · VIABILITY

Data sheets are ideal for distilling down your specifications into a single page for testing with customers and key partners.

Share Performance of current Candidate

+

DISCOVERY / PREFERENCE & PRIORITIZATION

Buy a Feature

A technique where people use pretend currency to buy the features that they would like to be available for a given product.

COST ●●○○○ | EVIDENCE STRENGTH ●●○○○

SETUP TIME ●●○○○ | RUN TIME ●○○○○

CAPABILITIES *Product / Research / Finance*

DESIRABILITY · FEASIBILITY · VIABILITY

Buy a Feature is ideal for prioritizing features and refining customer jobs, pains, and gains.

What is the value of non-PFAS and sustainability?

What about high TC and processability?

+

VALIDATION / INTERACTION PROTOTYPE

Life-Sized Prototype

Life-Sized prototypes and real-world replicas of vice experiences.

COST ●●●●● | EVIDENCE STRENGTH ●●○○○

SETUP TIME ●●●●○ | RUN TIME ●●●○○

CAPABILITIES *Design / Product*

DESIRABILITY · FEASIBILITY · VIABILITY

Life-sized prototypes are ideal for testing higher fidelity solutions with customers at a small sample size, before deciding to scale your solution.

Sample to interested Customers in 2024!

Mock Technical Data Sheet

Approved for external release, highlighting:

- Sustainability
- Performance

Developmental Rigid Laminate

Rigid Circuit Board Materials

Ceramic-Filled Polyimide Double-Sided Copper-Clad Laminate

***All Reported Values and Product Offerings are Tentative**

Product Description

DuPont™ Developmental Rigid Laminate is a double-sided copper-clad laminate featuring an adhesive-less, ceramic-filled polyimide composite dielectric layer. This material has no glass reinforcement and exhibits excellent low loss performance, enabling remarkable signal integrity for high frequency circuit applications in addition to excellent thermal resistance for high reliability applications. Offered in a variety of both dielectric and conductor thicknesses, DuPont™ Developmental Laminate provides designers, fabricators, and assemblers a versatile option for a wide variety of rigid circuit board constructions.

Key Features and Benefits

- Compliance with proposed PFAS (Per- and polyfluoroalkyl substances) Annex XV Restrictions
- Superior signal integrity afforded by low loss dielectric and conductor layers
- Excellent thermal resistance from adhesive-less polyimide composite dielectric
- Good environmental stability due to minimal moisture absorption and low CTE of composite dielectric
- High thermal conductivity (>2.5 W/mK)
- UL 94V-0, Pending
- RoHS Compliant

Packaging

DuPont™ Developmental Rigid Laminate is supplied in sheet form, with standard dimensions of 24 x 36 in (610 x 914 mm), 18 x 24 in (457 x 610 mm), and 12 x 18 in (305 x 457 mm).

Storage

DuPont™ Developmental Rigid Laminate should be stored in original packaging at temperatures of 4-29 °C (40-85 °F) and below 70% relative humidity. The material should be kept clean and well protected from physical damage. The product should not be refrigerated or frozen and should be kept dry and clean.

Processing

DuPont™ Developmental Rigid Laminate is fully compatible with all conventional rigid circuit fabrication processes, including oxide treatment and wet chemical plated-through-hole de-smearing. Pyralux® HT Bonding Film is recommended for use as pre-preg for multi-layer constructions.

Table 1 - Developmental Rigid Laminate Construction Options

Laminate Component	Available Options
Copper Foil Thickness, µm (oz/ft²)	18 (0.5), 35 (1.0), 70 (2.0)
Type	Rolled Annealed and Electrodeposited
Polyimide Composite Thickness, mm (mil)	0.13 (5.0), 0.25 (10.0), 0.51 (20.0), 0.67 (30.0), 1.28 (50.0), 1.52 (60.0)

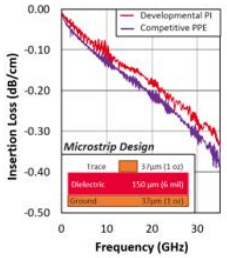
Sustainability and Regulatory Compliance

Addressing societal concerns regarding public safety and product sustainability, while still meeting the performance needs of customers, requires ingenuity and innovation. DuPont™ Developmental Rigid Laminate leverages the reliability and strength of polyimide to enable a completely fluorine-free low loss laminate with no woven glass reinforcement. Designers and customers may rest assured knowing their circuit boards and electronic modules conform to all current and future global regulations and raw material restrictions.

Low Loss Performance

DuPont™ Developmental Rigid Laminate offers improved performance over industry leading PPE and other non-fluorinated dielectric materials for rigid circuitry.

Figure 1 - Insertion Loss Comparison



Product Performance

Table 2 - DuPont™ Developmental Rigid Laminate Properties

Property	Developmental Rigid Laminate (10 mil Dielectric & 1 oz/ft² RA Copper)	Test Method
Dielectric Constant (Dk) @ 10 GHz	3.5	IPC-TM-650 2.5.5.5
Loss Tangent (Df) @ 10 GHz	0.0025	IPC-TM-650 2.5.5.5
Adhesion to Copper (Peel Strength) As Received, N/mm (lb/in)	> 0.9 (> 5.1)	IPC-TM-650 2.4.8
Dimensional Stability (MD/TD) After Etching, % After Thermal (200 °C for 30 min), %	 + 0.12 % + 0.12 %	 IPC-TM-650 2.2.4 IPC-TM-650 2.2.4
Coefficient of Thermal Expansion XY-Axis, ppm/°C Z-Axis, ppm/°C	 6 45	 IPC-TM-650 2.4.41 IPC-TM-650 2.4.24
Solder Float, 288 °C for 10 s	Pass	IPC-TM-650 2.4.13
Moisture Absorption, %	0.09	IPC-TM-650 2.6.2.1
Thermal Conductivity, W/mK	> 2.5	ASTM D5470
Volume Resistivity, MΩ - cm	> 10^{16}	IPC-TM-650 2.5.17.1
Surface Resistance, MΩ	> 10^{15}	IPC-TM-650 2.5.17.1
Tensile Modulus, MPa	1,050	ASTM D638
Glass Transition Temperature (Tg), °C	320	DuPont Method, TMA
Density, g/cm³	1.8	ASTM D792
Flammability	V-0 (pending)	UL-94

Data within this table are tentative values for the developmental product. Performance can vary depending on construction and processing and all offerings listed may not become commercially available.

For more information on DuPont™ Developmental Rigid Laminate or other DuPont products, please visit electronics.dupont.com.

Project Actions and Decision to Stop the Project

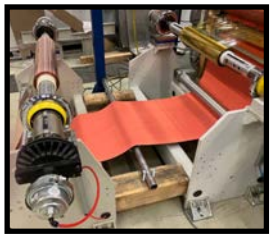
➢ Lean Innovation highlighted key issues with Commercial Viability and Market Desirability

Decisions

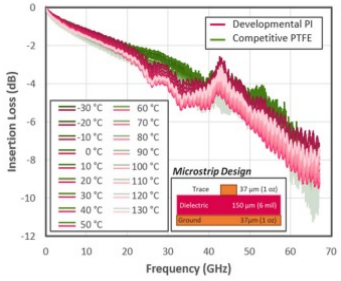
- Persevere
- Re-Test
- Adapt / Pivot
- Kill / Stop

Technical Feasibility
"Can we actually do this?"

Persevere – Commercial process feasible with investment at toller



Re-Test – PCB testing shows promise, but not sufficient for some applications



Commercial Viability
"Should we do this?"

Persevere – Market Assessment ~$1B SAM for Telecom and Automotive. ~0.1B SAM for Military

Adapt – Change in business strategy with spin-off

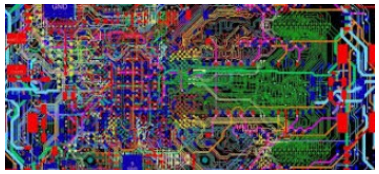
Cost of Manufacturing

- ***Stop – Development for High-Speed Telecom***
- ***Pivot – Focus on niche applications for military and specialized automotive***

Vespel® Resin ($/m²)
Foil/Adh. Variable ($/m²)
Toller ($/m²)
Total ($/m²)

Market Desirability
"Do Customers Want This?"

STOP – High switching costs and risks for customer. Performance and cost are insufficient to justify switching.



STOP – Conservative mission critical applications, with no desire from OEMs to switch from PTFE

PFAS compliant

DUPONT™

Stopping the project is a **win.**

We **didn’t** need more ideas.

We needed a repeatable process to **de-risk** our ideas.

And we use Lean Innovation to de-risk our new growth across the entire organization.

OUTCOMES & IMPACT

Lean Innovation drives rapid de-risking & strategic choices for growth

Building our New Growth Competency

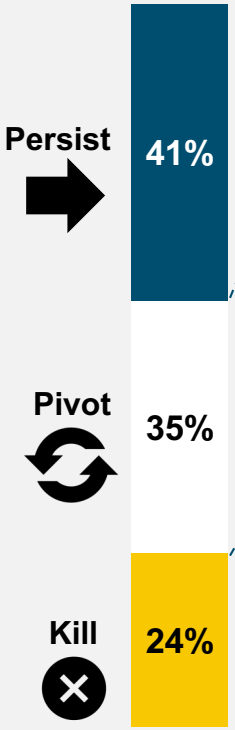
Cohort Model 2022 – 2024

6 Structured Cohorts	**35+** growth projects impacted	**100%** coverage for LOBs & Growth Platforms
300+ trained practitioners[1]	**40+** senior leaders trained	**Built a Foundational Competency**

Coach-Led 2024 & beyond

50+ coaches certified	**100%** Learning Plans for growth projects	**Dedicated Lean Innovation Coaches** for Top 10 Programs
Community of Practice monthly upskilling & best practice	**Customized Training** 1-1 team & project application	LEAN INNOVATION LEARNING LAB

Project Outcomes & Business Impact[1]



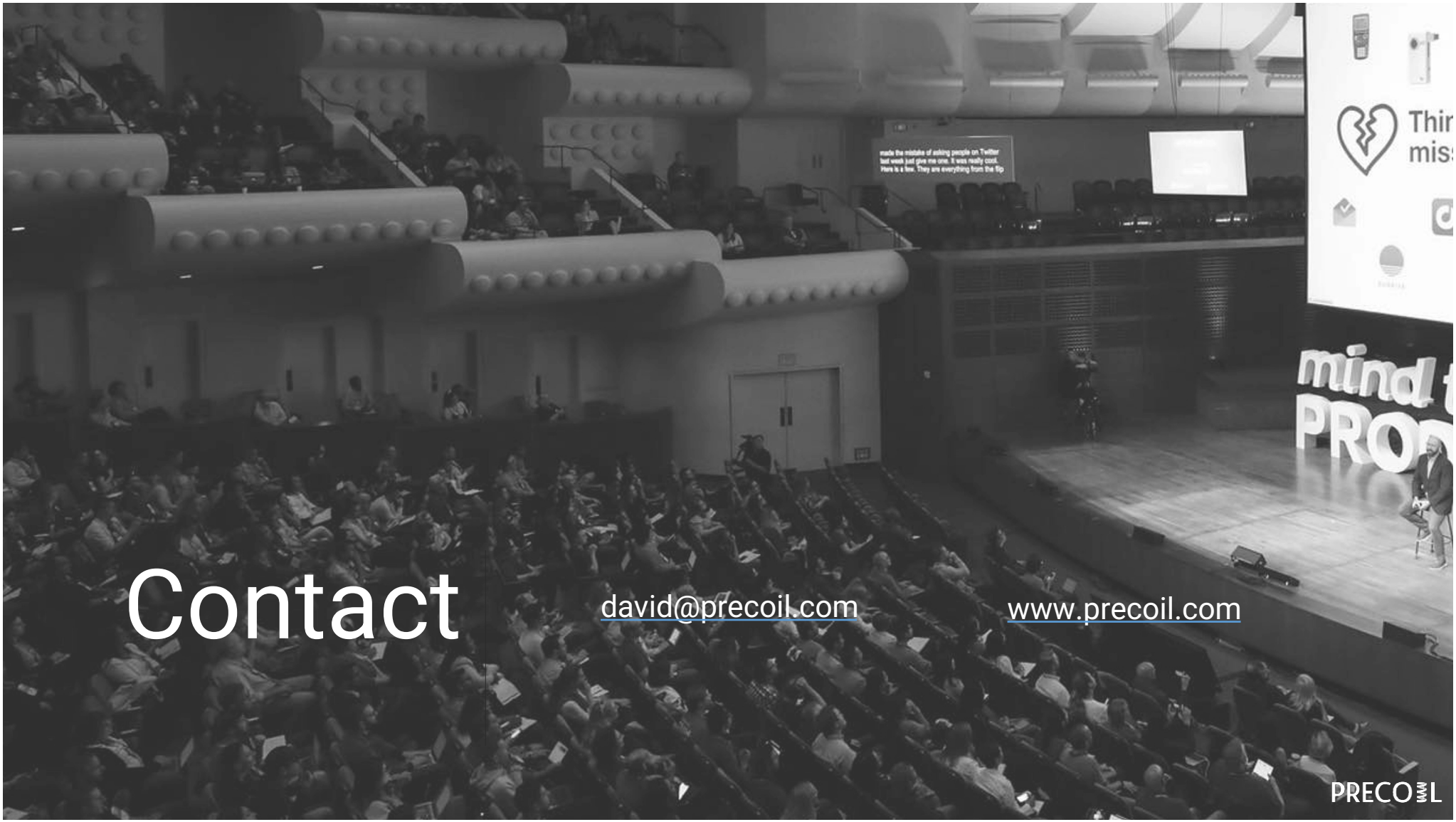
Persist
- Customer validated value proposition
- High customer engagement and "skin in the game"
- Well-defined and 2-in-the-box resourced project with strong sponsorship
- Significant, robust value and competitive advantage

Pivot
- Limited initial product-market fit (value proposition)
- Misalignment with customer priorities (not well-understood)
- Insufficient market readiness and qualification requirements
- Inability to adapt to customer process constraints
- Lacked initial competitive understanding

Kill
- Shifted customer and value chain requirements – timing, process integration, CTQs
- Inability to overcome power of entrenched incumbent
- No viable win-win partnership option
- Not resourced to win (funding, lack of 2-in-a-box)

(1) Data from 6 structured cohort programs, 35 projects

DUPONT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This presentation is a collaboration between

Appendix