EPIC World Photonics Technology Summit 2022

Voice of the Customer – Working Together

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Agenda

Background

Who is my customer?

What do they really need?

Scenarios

Summary

Background

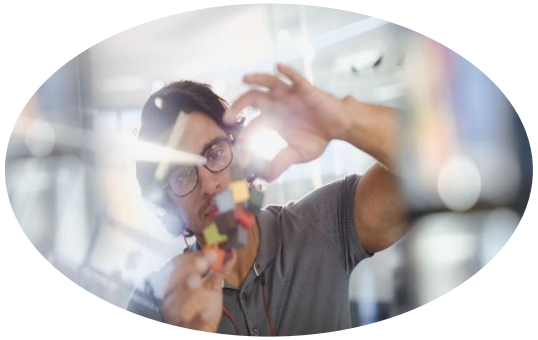
30 years in the laser/photonics industry

- 4 years with Hobart Laser Products -- Laser manufacture producing multi-kW, CW lasers to the automotive, nuclear, naval and industrial sectors
  - Roles -- Test, R&D, applications and service.
    - Final role – Worldwide service and applications manager
  - Technology – Cutting, welding & cladding of metals

- 26 years at HP Inc. – Laser process and application development within the Inkjet division
  - Roles – Sustaining, Process Development, R&D along with technology & IP review
  - Technology – Ablation, micromachining, cutting, drilling, welding, deposition, roughening and 3D-printing
    - Lead engineer for high-volume manufacturing in Corvallis
    - Roadmap, mentor and guide global manufacturing sites
    - Manage 9 R&D laser labs

Who is my customer & what phase are they in?

- What is the knowledge base of the customer?
- Is this a proper fit for my product?



Research

Customer

Project -- Niche Work

Volume -- Single product

Work -- Customized solution

Needs -- Highly variable

Outcome -- Open ended

Development

Customer

Project -- Loosely defined

Volume -- Single product

Work -- Refined solution

Needs – Conversation around goal

Outcome – Open ended

Prototyping Low Volume

Customer

Project – Defined (preliminary data)

Volume -- Single product

Work – Known solution

Needs -- Understanding of goal

Outcome – Work towards stability

High Volume Production

Customer

Project -- Highly defined

Volume – 1+ products

Work -- Locked solution

Needs – Stability & Reliability

Outcome – Partnered with vendor

As a vendor – What actions should I take?

- What information would help the customer be successful with my product?
- How are they using the product?
- Be proactive with communications

Research

Vendor Involvement

Meet specified criteria

Light check-in with customer

Development

Vendor Involvement

Understand customer's goal

Meet specified criteria

Proactive communication with customer

Request feedback on what is being observed

Prototyping Low Volume

Vendor Involvement

Working with customers on goal

Meet specified criteria

Proactive communication with customer

Request feedback on what is being observed

High Volume Production

Vendor Involvement

Know customer's goal

Meet specified criteria

Light check-in with customer

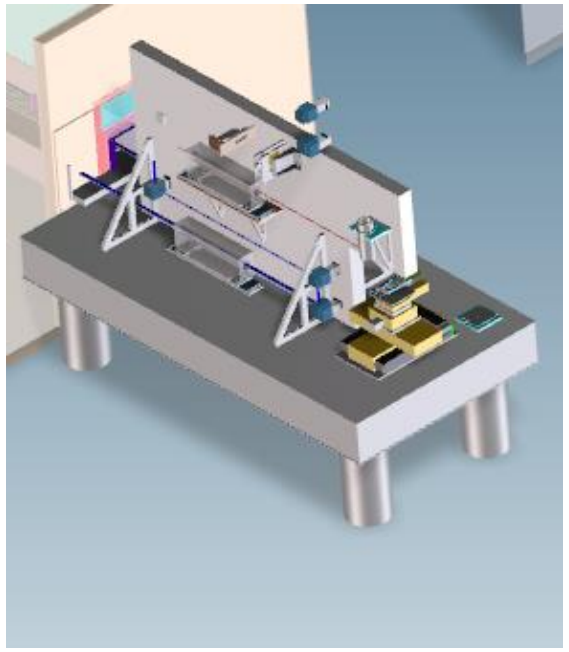
Core partnership is started and solidified in these phases

Scenario #1 – Development Phase for Project & Relationship

Building a testbed for applied applications

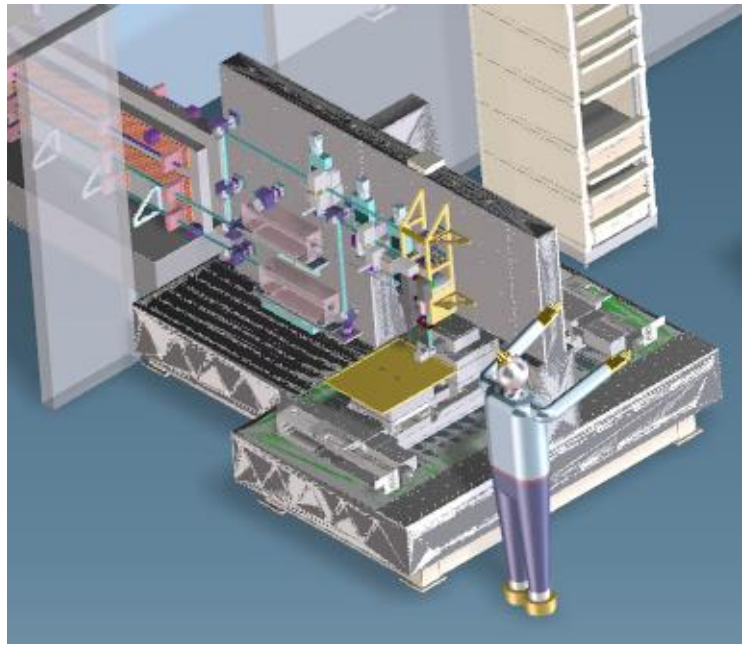
Begin building the relationship as soon as possible

- Understand the customers initial needs and long terms goals
- **Note: The criteria can change in a moments notice early in this phase**
- Customer is not typically locked into a specific design or integration
  - If there is a better way to integrate or utilize your product into a tool. Mention it up front. Explain the advantages



SCOPE CREEP HAPPENS

Beginning	End
Base - Optical table (305cm x 122cm)	Base - 12-ton Granite (366cm x 305cm)
Mech-bearing travel (250mm x 250mm)	Air-bearing travel (1000mm x 500mm)
Precision & accuracy (<+/-5um)	Precision & accuracy (<+/-2um)

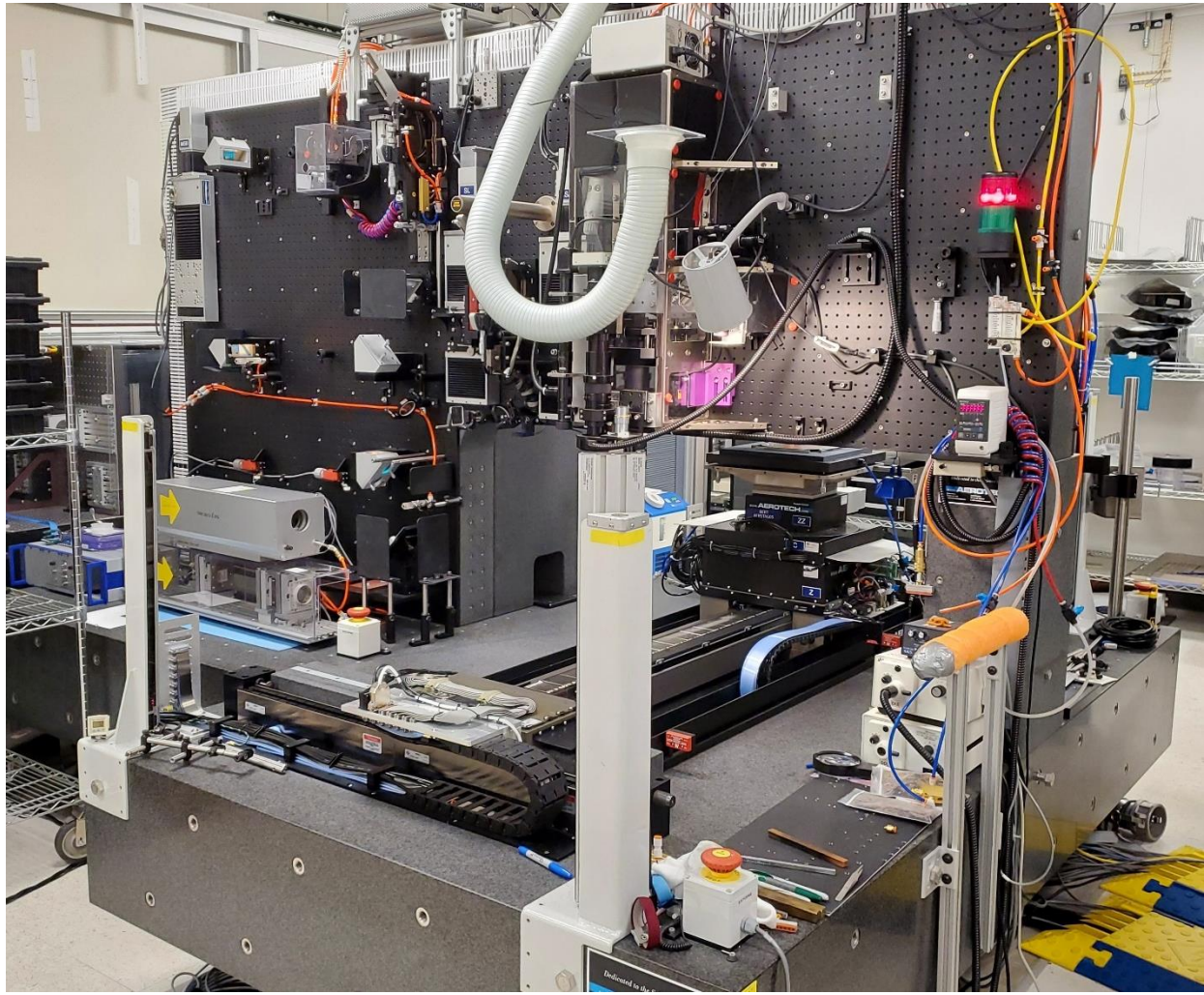


Scenario #1 – Development Phase for Project & Relationship

Building a testbed for applied applications

Teams working together

- Vendor suggested granite base design
- Both companies partnered on the optical backplane
  - Ran FEA individually and designed the gusset to stabilize the structure
  - Reviewed both designs and found that the optimal stability was a combination of the two ideas.
    - 200nm deflection with 1G acceleration and 25kg payload
- Buyoff testing
  - Project manager from vendor side was sent the buyoff criteria early so team could prepare and set up testing. During the review, the vendor suggested additional testing to be done that was not covered in the original draft.
  - All specifications were exceeded



Laser Development Platform – 9 separate optical paths

Scenario #2 – Understanding High Volume Concerns

Turning Mirrors for an installed fleet – No relationship developed in the first 3 phases

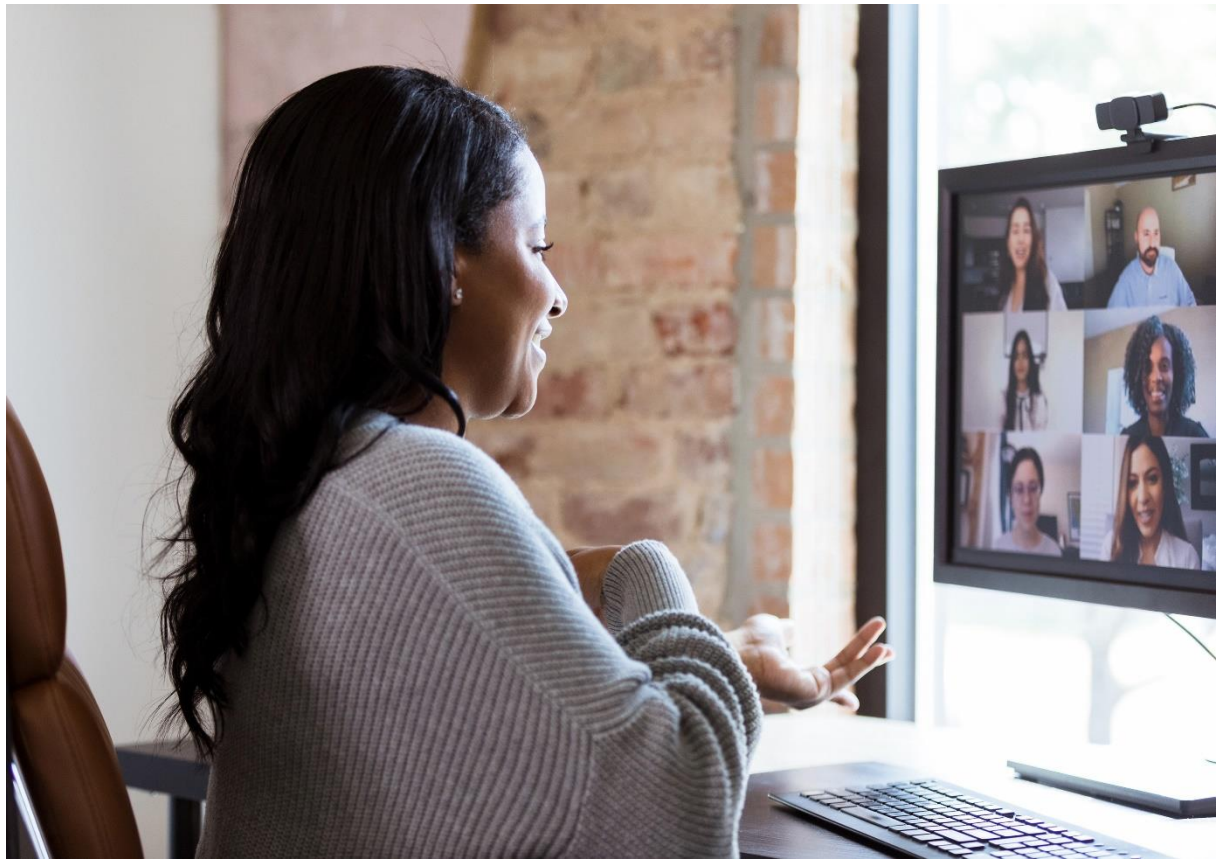
- Current manufacturer was unknown due to vendor relabeling of spare parts.
- Said vendor is no longer in business and now responsibility of customer to manage and source spare parts.
- Will be replacing turning mirrors during another planned upgrade to minimize tool downtime in future.
- Assume ~$200 per turning mirror
- 750 turning mirrors are in operation across the world for this set of processes alone.
  - $150, 000 worth of turning mirrors actively being used.

Concerns of the customer:

- Cost
- Quality
- Longevity
- Global Support

Scenario #2 – Understanding High Volume Concerns

Turning Mirrors for an installed fleet – No relationship developed in the first 3 phases



Initial questions to vendors **“What is the typical lifetime of the coatings? Do you have data?”**

Common answer – “At this wavelength, they last forever as long as you keep the surface clean.”

Customer reply – “Fantastic! We must have a good purge design to keep the optics clean, we currently have 10 trillion shots on the current mirrors.”

Vendor – Be careful on your response

Scenario #2 – Understanding High Volume Concerns

Turning Mirrors for an installed fleet – No relationship developed in the first 3 phases

Not the best response

- "Wow! I have never heard of a mirror coating that lasted that long"
- "Our specifications are good. Buy a set and try them out."

Customer Takeaway

- Not concerned or vested with process or long-term goals.

Better response

- "Wow! That is impressive. We don't get feedback like this very often"
- "Would you mind sending one of these used optics to our facility so that we can analyze it?"
- "Could we have a discussion so that I can learn more about your process and I can feed that back to my technical team?"

Customer Takeaway

- Interested in the success of the process, not just the sale
- Wants to make better products

Scenario #3 – Obsolescence -- Assurance of Supply

Next generation component was not a direct replacement as thought by vendor

- Vendor notified customer that current vintage of component would be obsoleted when next generation is released
- The agreed plan between the two companies was to obtain a beta unit for initial testing
  - Results from testing showed a significant (unacceptable increase to part cycle time)
  - Customer begins to characterize component and discuss findings with vendor
  - A second component was tested along with factory testing to confirm findings.

As a vendor, how would you react to this situation?

Scenario #3 – Obsolescence -- Assurance of Supply

Next generation component was not a direct replacement as thought by vendor

- Vendor steps up due to long partnering relationship
- “We will not let you hang out to dry”

Response:

- Both parties meet to discuss details and path forward
- Agreed that to accept component “as is” is not an acceptable solution
- Customer agreed to characterize component to determine root cause
- Vendor agreed to have engineering investigate solution to mimic previous generation performance parameters
- Customer also performs characterization on Alpha units and provides feedback to vendor.
- Teams agree to perform extended stability testing at factory to ensure quality on first production units

Summary

Typically have one shot. Make it count.

- Is this a good match for my product?
  - Will it work?
  - Will the customer be happy with the product?
- Avoid the “sales only” approach
  - Many times, with more complex components or high-volume installations, issues will arise.
  - If there are issues, sales will sell the first unit, it will be up to service to sell anything else.
- Be proactive, not reactive with communications
  - Understand the needs
  - What are the goals?
  - Encourage feedback early


Thank you