Academia and Industry Collaboration During Early Onset Of COVID-19 Pandemic

Success Stories and Barriers Encountered

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Dissemination and Implementation Launchpad

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Purpose

UW-ICTR and UW Health received grant from:

Tommy G. Thompson Center
on Public Leadership
UNIVERSITY OF WISCONSIN–MADISON

Grant scope: UW-Madison-Based Biomedical Technology 'Think Tank' in Advancing Biotechnology Innovation

Project pivoted at the onset of COVID-19 pandemic to study collaborations between academic institutions and biomedical companies to address this health crisis.

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Methodology

- Conducted ten qualitative interviews (May, 2020 – June, 2020) to analyze **barriers and facilitators** among the following sectors:
    - Academia
    - Private industry
    - Health systems (Hospitals)
    - Advocacy

- **Products / Projects included:**
    - Procedure mask, N95 masks, N95 style masks, face shields, powered air purifying respirator, ventilator fixtures and COVID-19 testing

Analysis

- Criteria:

Timely and through multi-sector collaboration

- Categories / Domains for analysis:
  - ❑ Process - Supply chain, frameworks
  - ❑ Product – Type, specifications
  - ❑ Collaboration – Networks, communications
  - ❑ Regulation – Internal, external, open-sourcing
  - ❑ Demand – Defined goals, needs
  - ❑ People – Talent, leadership
  - ❑ Financial – Funding, costs
  - ❑ Tools – Specialized 'labs', databases
  - ❑ Organization – Academia, private, government, health system, size

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Results - Products / Projects

Made It To Market*	Did Not Make It To Market*
Procedure Face Mask	N95 Mask
N95 Style Mask – Mask Force	COVID-19 Testing
Face Shield – Badger Shield	
Powered Air Purifying Respirator	
Ventilator Fixtures	

Based on when the interviews were conducted

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Product / Project Description

	PROCEDURE FACE MASK (PROC MASK)	**MASK FORCE FACE MASK (N95S)**	**COVID-19 TESTING (COVTEST)**	**N95 MASK (N95A)**	**N95 MASK (N95B)**	**BADGER SHIELD (FSBDG)**	**POWERED AIR PURIFYING RESPIRATOR (PAPRA)**	**VENTILATOR FIXTURES (VENT)**
Product Description	Procedure mask project (not medical grade N95 or surgical mask)	Re-usable "N95" style face mask	Covid-19 Testing	N95 Mask - Face mask	N95 Mask - Face Mask	Face Shield	Powered Air Purifying Respirator	Ventilator Fixtures
Product Intended Use	High-quality mask for UW-Madison staff (e.g. employees in Housing), faculty, and potentially students.	Frontline workers, such as EMT (Emergency Medical Technician), and fire departments	Community	Healthcare workers	Healthcare Workers	Healthcare Workers	Healthcare Workers	GE - Manufacturer of ventilators for patients
Manufacturer	Lackee and Joys	Each academic institution	None	None	None	Midwest Prototyping, UW-Madison DoIT	OEM in South Korea	GE

Sectors Involved

	PROCEDURE FACE MASK (PROC MASK)	MASK FORCE FACE MASK (N95S)	COVID-19 TESTING (COVTEST)	N95 MASK (N95A)	N95 MASK (N95B)	BADGER SHIELD (FSBDG)	POWERED AIR PURIFYING RESPIRATOR (PAPRA)	VENTILATOR FIXTURES (VENT)
Academia	UW-Madison	UW-Milwaukee, Marquette; Medical College of Wisconsin; Concordia University	UW-Milwaukee		Morgridge Institute for Research, UW-Madison	UW-Madison, Morgridge Institute for Research	UW-Madison	
Private Industry	Laacke and Joys	Waukesha based companies		Engineering design consultants		Delve (Design); Midwest Prototyping (Manufacturing)	Delve (Design); Miller Welding – OEM in South Korea	Engineering design consultants; GE (Manufacturing)
Health System	UW Health			Several	UW Health	UW Health	UW Health	
Policy and Advocacy		BioForward	BioForward					
Government			State and Federal					

Findings: Prior to COVID-19

- **Process**
    - <u>No emergency process existed for making urgent products</u>

    "There was not a process. We created the process. It wasn't like there wasn't a playbook at UW Madison we could turn to…" - PROCMASK

- **Organization**
    - <u>Goals of academia did not necessarily focus on commercialization</u>

    "It's very difficult to do because it is outside the normal incentive of the academic system for sure. It is really risky in terms of your time, we could have wasted a lot of time and you don't necessarily get to publish..." - FSBDG

Findings: Prior to COVID-19 contd.

- **Collaboration**

  - <u>Complexities existed when working with academia and tech-transfer</u>

  "What worked well and we got to an agreement to use that technology that was initially developed at UW that is fine. What didn't work well is that it took almost 2 years to get there. We are lucky today that we don't have to go back through WARF for this too much. - COVTEST

  - <u>No formal global network to access experts from companies who have presence in Wisconsin</u>

  "I think we should have, and it is happening around the world, and is having regional areas that think about this stuff all the time. Companies that have a global reach. There are several companies in the Milwaukee area that have 10 of thousands employees all over the world. Where do they go for advice? Where do they get their content expertise about this problem or that potential problem on the horizon?" – COVTEST

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Findings: Commonalities
Products That Made it to Market – Positive Enablers

(Procedure facemask, N95 style mask, Badger Shield, Ventilator fixtures, PAPR)

Domains	Factors	Quotes
Process	Focused objectives and communication	*"A guy from computer science, the dean, and myself got together every Tuesday morning. The meeting was limited. **We took about 20 minutes, got everything done**. This is what we're going to accomplish this week. And by Thursday we were done" - N95S*
	Improvised supply chain	*"We were working with Ford because they saw our open sourced design and they were retooling to manufacture. They were having a hard time finding the quantities of elastic needed because of the demand from COVID and plus they don't normally work in this area. They don't usually work with elastics. It was not a familiar supply chain. So, (the faculty member), called it **a pop up supply chain** that we tried to facilitate" - FSBDG*
Product	Sourceability	*"There are four materials, plastic shield, elastic, foam, and some staples….**Pretty basic**"- FSBDG*
	Type of Product	*"They were produced to the same specifications as the ones we were purchasing. They are **very simple.** It is a class one medical device, and there's not much regulation to it" - FSBDG*
Collaboration Engagement – Community and Industry	Connections	*".. we **partnered with a local manufacturer** who does HVAC (heating, ventilation, and air condition), heating and air conditioning, ventilation. We were able to create filters that were equivalent to N95 …. It worked out great"- N95S*
	Rapid product testing and user feedback	*"..a prototype would be delivered at 3:30 in the afternoon and we would have someone on standby in materials to get it over immediately to infection control. Then they would put it through their rigors and have a few folks that were available staff members that would use the product, try it on, and give feedback. We were getting that feedback and that **review of the product in less than 24 hours**" - FSBDG*

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Findings: Commonalities contd.
Products That Made it to Market – Positive Enablers

(Procedure facemask, N95 style mask, Badger Shield, Ventilator fixtures, PAPR)

Domains	Factors	Quotes
Regulation	Internal use	*"The intended users are the UW Madison community...we decided **not to commercialize** it, not to IP (Intellectual Property), that was just a decision that we made initially, what the scope would be - PROCMASK*
	Open sourcing – Product design	*"At least 400 hospitals and 400 manufacturers use the Badger Shield Tool, the web too l. Some of them were **using the design or modified** it on the face shield "- FSBDG*
People	Boundary spanners	*"I come out of the medtech industry and pharma.....Part of the reason why I was brought on the team was that I worked in **industry and in business**. I was connected to different people in both public and private industries. At the hospital, others, kind of had a similar background. They brought in the business people as well as the experts, (Engineer Professor). It certainly has public/private components to" - PROCMASK*
	Leadership - Motivation	*"People got creative. We were working nights and weekends. People were driving around dropping off prototypes and meeting each other wherever they could or needed to, to keep the initiative moving. ...the **determination of literally everyone involved to pitch in** and help in any way "-FSBDG*
Demand	Shortage of PPE	*"What we were looking at the time was that we had only **one week of inventory** of face shields . And the large companies we purchase these shields from, could not tell us when they would have them back in supply" - FSBDG*

COVID-19 RESPONSE

The UW Makerspace team along with many partners have developed open-source designs for personal protective equipment (PPE) to help assist with the Covid-19 pandemic.

Our first focus was to help connect material suppliers, manufacturers, and those in need of face shields. As we have expanded to other open-source designs like intubation boxes and PAPR hoods (more coming soon!), our goal is to connect PPE with those in need. Check out the information below if you are in need of PPE, want to make PPE, or are interested in helping out!

FACE SHIELDS   CUSTOM MEDICAL PROFESSION FACE SHIELDS

Findings: Commonalities contd.
Products That Made it to Market – Positive Enablers

(Procedure facemask, N95 style mask, Badger Shield, Ventilator fixtures, PAPR)

Domains	Factors	Quotes
Tools	Project management and communication – Slack Channel	*We got everyone together on a video conference call, and in parallel we started a **slack channel** with 100+ people on that, engineers, doctors, entrepreneurs, business, more generally like companies and private companies it was a communication tool that anyone can join. We were just brainstorming different ideas. That is what we called the sandbox in the process flow. That worked pretty well to get that going and I thought the whole process flow worked" - FSBDG*
	Database of suppliers	*"We put up **resources on our webpage** where people could link with one another . ..we just try to find the resources and individuals between companies and academics to pull together .. we started to analyze the supply chain in the state and how they funnel into the overall industry…We wouldn't have been able to do what we did if we hadn't looked into **our supply chain a couple years** ago" - Advocacy*
Organization	Presence of innovations centers - makerspace	*"..the Design Innovation Lab, it is really well set up. To give the College of Engineering credit, I think that is what our mission is.... That is kind of our strength. ... It has feelings and we have a huge effort for **makerspace, like culture**. COVID was really a makers opportunity. It wasn't new nanotubes. They didn't need nanotubes to solve this. They needed practical, pragmatic let's get this thing to work type solutions" - FSBDG*
	Availability of capacity and support	*"A local company called Delve, was very involved in many of these designs. I think they are a product development company, sort of an idea and prototype generator company. They just had the bandwidth to go out and help. Also, another local company, Midwest Prototyping Company took on a big role with the face shield. And other bigger companies even stepped in. **Sub Zero, Electronic Theater Controls in Middleton stepped in**, there is a long list of smaller companies and individual contributors in the community" - FSBDG*

Findings: Commonalities
Products That Did <u>NOT</u> Make it to Market – Barriers

(COVID-19 testing, N95 masks)

Domains	Factors	Quotes
Process	Lack of alignment of goals and structure	*"Because there are few structures existing that are able to foster the initiative and bring a solution to COVID, it takes every single bit, part of the consumer, not one or two. We have seen **no structure that is able to get everyone to work together towards one goal**. Everybody seems to have different goals or no goal at all"* - COVTEST
Product	Complex	*"N95 masks have a lot of **complex engineering** that goes into the materials. It needs to block 95% of all the particles down to 300 microns. At 3M and the companies that make these masks, there's a lot of engineering that goes into the different material layers that are in those masks"* - N95B
Regulation	Liability concerns	*"The N95 problem is a tricky one. The first layer of difficulty is there are a lot of **regulations** involved. They have to fit certain OSHA (Occupational Safety and Health Administration) standards. There wasn't a good way for us to put out a design that was validated. There was a contingency in the group that was really worried about the liability. That was a hindrance"* - N95B

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Findings: Commonalities contd.
Products That Did <u>NOT</u> Make it to Market – Barriers

(COVID-19 testing, N95 masks)

Domains	Factors	Quotes
People	Lack of leadership	*"Think about an incident command. The person who says this is going to happen - and it happened because they are aligned. Industry usually has that because of the way they operate. They have a boss that says we're going to do this and they do it. In the case of testing, I think the great limiting challenging area was our governmental agency, who did not have the authority or did not exercise the authority to bring the business community leaders, the hospital leaders, and public health leaders to say okay, how are we going to get testing capacity done next, the week after. **There is no clear incidence commander** leading that effort to pull in public health experts and business"* - COVTEST
Funding	Lack of upfront capital or access to capital	*"We needed at least $30,000 of capital to make some orders of bulk materials to produce the mask that we were shown . .. The hospitals wanted something that was certified but they were not willing to **front any kind of capital**"* - N95B

Conclusions and Recommendations

Engagement

- Continue to build relationships between **academia and private industry more proactively.**

- Engage with **local sourcing** of materials / supply chain for healthcare. Create catalog.

- Create an **ongoing council** to align government, academia, advocacy organizations, industry and other areas of civil society to address health and safety of communities. Explore the possibility to coordinate with other states.

- Connect **proactively with global companies** that have local or regional presence to learn more about their expertise and tap into their knowledge base.

- Engage with **academia tech-transfer offices to streamline** working with university IP during an emergency.

Conclusions and Recommendations contd.

Process Enhancements

- Evaluate where **open-sourcin**g is more efficient to bring products / solutions to market (even for non-emergent needs).

- Re-evaluate **inventory levels** for PPE by sectors impacting health in society - state and federal government and healthcare systems.

- Develop approaches to **streamline task meetings** / approval processes (even for non-emergent needs).

- Evaluate any **risks associated** with rapid approval process for products and evaluate their viability long term.

Funding

- **Develop a funding mechanism** (private/public) to help finance local manufacturers / companies who assist with emergency scenarios.

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