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Technology Transfer Case Study: *Development of a Safety & Health Intervention: When the Researcher is the Inventor -- Finding a Manufacturer*

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Technology Transfer Case Study

Development of a Safety & Health Intervention:

When the Researcher is the Inventor – Finding a Manufacturer

Introduction

A research project that results in a new invention designed to reduce workers' risk for injuries and illnesses can have a significant impact if it is successfully transitioned from a prototype in a laboratory to one that is available to end-users. The timing of when information on such a research project is released and when other departments within a researcher's university or organization are brought into the process, the documentation that may be needed to attract a manufacturer, and the decision whether to patent an invention or open source the design will influence whether or not a research-based invention ultimately reaches end users and achieves its intended outcome.

This case study focuses on the lessons a researcher should consider if their goal is to turn over ownership of their research-based invention to a manufacturer for commercialization, rather than becoming the manufacturer. It is based on a safety and health research project that resulted in the successful transition of a research-based invention from the *laboratory* to the *market place.*

Background

In this case study, a research team received funds to study and develop a solution for a task that created a high risk for musculoskeletal injuries. The researchers identified the need for a solution at a meeting of researchers, contractors and workers representing multiple building trades and construction sectors. During this meeting, participants discussed the tasks that create the greatest risks for musculoskeletal disorders, and the availability and use of ergonomic solutions. Participants identified one task as being the most fatiguing and injury prone of all the tasks performed by workers in the industry sectors represented at the meeting, and concluded that research should be conducted to develop a solution.

Following this meeting, the researchers submitted a proposal and received funds to conduct a five year study to evaluate potential solutions for the musculoskeletal hazards associated with the task. The researchers' goal was to design a tool that would minimize the adverse ergonomic

impacts from the task. To ensure that the results of their research would be commercially available for use on construction projects, the researchers said in their proposal that they would try to find a manufacturer to produce and market their invention.

The researchers involved contractors and workers from the affected industry sectors and trades in all phases of the study, including: designing and field testing the invention, providing feedback on its usability, and gathering physical response measurements -- shoulder pain, shoulder posture, electromyography of shoulder and forearm muscles, and vibration -- as well as limited information on the invention's impact on productivity. Stakeholder involvement in the research study and the development of the tool was completely voluntary. There were no formal agreements between any of the parties.

During the course of the study, four different prototypes of the new tool were created, with each successive one improving on the previous version based on the stakeholders' input. In addition to the musculoskeletal hazards, which were the focus of the study, the researchers identified another hazard related to exposure to silica that they were able to address in the tool design.

In the second year of the project, the researchers approached their university's department responsible for intellectual property (IP) and technology transfer to discuss the possibility of patenting their invention. Based on the advice of the university, the researchers did not pursue a patent (i.e., ownership of their invention, the IP). Since their invention was not patented, it became part of the public domain (open sourced), with the design and technology available to anyone who wanted to manufacture the tool. (For information related to the patent process, see the CPWR *Intellectual Property Patent & Licensing Guide for Construction Safety & Health Researchers and Inventors* http://www.cpwr.com/publications/intellectual-property-patent-licensing-guide-construction-safety-health-researchers.)

The lack of a patent did not stop the researchers from reaching out and trying to convince several large manufacturers to develop and market the tool. When the researchers approached the manufacturers they were able to use the worker and contractor testimonials and the data collected on the tool's effectiveness in reducing the risk for musculoskeletal injuries, as well as the

potential for reducing the risk for exposure to silica dust, to make a strong safety and health argument for the new tool. However, the researchers lacked the other types of information that would have been needed to convince a manufacturer that it was in their business interest to commercialize a new tool, such as the size of the customer base (who the customers are), how to reach the customers, the size of the market for the invention (potential demand), and evidence, through a patent or pending patent application, that the invention is protected from copyists. (See CPWR's *Intellectual Property Patent & Licensing Guide for Construction Safety & Health Researchers and Inventors*, *Section V: How Do I Determine Whether to Pursue Intellectual Property Protection?*) In addition, the researchers were approaching manufacturers at a point when demand for construction tools and equipment was down due to a deep and prolonged downturn in construction activity. Although several large manufacturers expressed interest in the researchers' invention, none were willing to produce and market the invention.

Despite this setback, the researchers continued to pursue smaller manufacturers, as well as to market their invention directly to end-users. These efforts included conducting demonstrations of their invention with manufacturers and potential end-users at safety conferences and trade shows, sharing information online through a website containing videos, pictures, and PowerPoint presentations, and encouraging peer-to-peer dissemination through articles in trade publications distributed to contractors and workers and word-of-mouth.

The researchers' translation and dissemination activities also included the development of an innovative "loaner program" for the invention. This program was created to build bottom up demand for the invention by providing contractors with the opportunity to try it out with their employees.

By the time the study ended, these activities had resulted in two large contractors developing their own versions of the tool for use on their projects. Following the completion of the study, due to the researchers' ongoing dissemination activities, a small manufacturer adapted, marketed, and made their own version of the tool commercially available. Since the researchers' invention was open source (i.e., not protected by a patent), the manufacturer initially trademarked the name of its version of the tool to establish a level of IP protection, and then added a new patentable

design feature to protect their investment. *(Note: this action did not prevent others from producing the researchers' original design.)*

Interest created by involving end-users of the invention in the development and testing of the tool, making it available to contractors to try out, and the outreach to manufacturers ultimately led to a technology transfer success. The researchers' ongoing dissemination efforts generated demand for the invention and led to many rentals and purchasing requests from contractors. In addition, data developed by another research team on the invention's impact on productivity and potential return on investment helped strengthen the business case for the invention. Based on the success of the first invention, the original research team also received funds for a follow-up study that expanded on what they learned and resulted in a new invention.

Lessons Learned

There are important lessons learned from this project that can be applied to future research initiatives where the goal of the research is to develop a new tool, service or product – an invention – and then turn it over to a manufacturer for development and marketing.

Lesson 1: Contact the University's Office that Handles Intellectual Property and Technology Transfer Early in the Process

When a researcher approaches a manufacturer to take on the development and marketing of a research-based invention, one of the first questions the manufacturer will ask is "Who owns the research-based invention?" The answer to this question will have a significant influence over the manufacturer's decision. Having a patent on the invention (or one pending) can provide a potential manufacturer with confidence that the technology (and thus their investment) is protected from copyists.

Researchers should address ownership and patenting issues very early in their research study, well before any information about their idea or concept is disclosed to the public, including potential end-users. Disclosing information too early could limit the researcher's ability to protect their invention – their intellectual property or IP – and find a manufacturer willing to take over its production and marketing.

Most, if not all, universities and research institutions have policies and staff focused on intellectual property and technology transfer issues. These policies typically stipulate when the university should, or must, be notified if a research project is likely to result in the development of a new tool, modification to an existing tool, or a new method of performing a particular construction task. In addition, the staff responsible for enforcing the policy often has resources available to help the researcher-inventor understand the pros and cons of, and alternatives to, patenting their research-based invention. Some also have programs in place to help researchers assess the market for their invention, develop the business case, and connect with potential manufacturers. For example:

> At Duke University *"[w]hen new inventions and patentable technology arise during the course of ongoing University research activity, researchers have a responsibility to disclose these new technologies and inventions to the Office of Licensing and Ventures for evaluation and potential licensing. Duke's policy on inventions, patents, and technology transfer… has been written to assure that inventions resulting from Duke research are utilized in a manner consistent with University policies and values. The policy is written to facilitate and encourage patent protection, licensing, and the development and marketing of inventions where appropriate."* (https://ors.duke.edu/orsmanual/inventions-patents-and-technology-transfer)
>
> Duke's Office of Licensing and Ventures (OLV), in turn, requests that ideas be submitted using an invention disclosure form *"preferably, at least three months before disclosing your idea to the public."* (https://olv.duke.edu/) The OLV is described as the *"licensing and new venture creation arm of Duke University and the Duke University Medical Center. It's where Duke innovations meet industrial, entrepreneurial, legal and investment markets to create the partnerships necessary to create value and benefit society."* Its purpose is to provide researchers with guidance on the patentability of their ideas (the research-based invention), guidance on what should and should not be publicly disclosed and the timing, and recommendations for a course of action. The OLV also provides support with marketing or becoming a start-up company: *"OLV has industry contacts and expertise to market your invention to both large and small companies…. We*

may also recommend that your invention become a start-up company. If a start-up is appealing to you, we will work with you to provide support."

(See Appendix A in CPWR's *Intellectual Property Patent & Licensing Guide for Construction Safety & Health Researchers and Inventors* for *"Links to Examples of University Intellectual Property and Technology Transfer Policies"* and see the CPWR *Resources for Technology Transfer in Construction* for examples of other university resources and support for getting research-based inventions to market.)

In this case study, the researchers did not approach the university with their research-based invention until the second year of the project. By that time, the idea for their invention had already been publicly disclosed through presentations at meetings and discussions with potential end-users. Earlier contact with the university's staff responsible for IP and tech transfer might have prompted the researchers to take steps to protect their IP, rather than to use an open-source approach, and allowed them to:

- Address any manufacturer concerns about ownership;
- Control who could produce their invention;
- License the technology to other companies in exchange for license fees; and
- Ensure that the versions of the invention ultimately produced met all of their quality and safety standards.

Lesson 2: Collect Data for Making the Business Case

To convince a manufacturer to take on a new product, a researcher will need to provide selling points for their invention beyond the safety and health benefits. The researcher will have to be able to demonstrate that there is a viable market for the invention, and there is the potential for a return on investment. To make this case, the researcher will need information on the size of the market for their invention, including: the number of potential buyers; the types of projects where the device would be used; the outlook for this type of work; and how many devices contractors are likely to purchase. Other information that could help make the case includes the invention's potential impact on productivity, if it reduces the need for other tools or supplies, and if it will last longer than the existing technology.

At the proposal stage, the researcher should be considering what information will be most valuable in making a business case that will support the introduction of their invention into the marketplace, the time required and the approach that will be used to gather the information, and what, if any, support is available from their university, research institution, or funding agency.

Safety and health researchers may not know where to find this information, but their university may have staff, programs, or resources that can help. For example:

- John Hopkins University's Bootcamp for Technology Entrepreneurs is open to *"all John Hopkins (except Carey Business School) Faculty, Staff, Post-doctoral Fellows, Students and Residents,"* and provides participants with ***"****the basic knowledge and skills needed to turn raw ideas into validated business proposals…"* (http://www.jhubootcamp.com/) John Hopkins also has an "Innovation Factory," which is a "*collaborative student-led organization with the mission to foster the entrepreneurial spirit throughout the Johns Hopkins community… [B]y connecting students, alumni, faculty, and friends from Hopkins' nine schools, we can help develop a thriving ecosystem where ideas are shared, problems are solved, and opportunity is cultivated*." (http://ifjh.org/about)
- Boston University's Office of Technology Development's *"mission is to help the Boston University community realize the commercialize potential of their ideas… by working with you to develop a strategy for commercialization and then expanding your network by connection you with people that can help inform and implement that strategy (e.g., licensing to an existing company, forming a new venture, etc.)"* (http://www.bu.edu/otd/for-researchers/) This includes working with researchers on *"a targeted marketing plan…"* (http://www.bu.edu/otd/for-researchers/technology-transfer-process/marketing/)
- The University of Pennsylvania's Center for Innovation (PCI) *"helps to translate Penn discoveries and ideas into new products and businesses… by facilitating technology development connections between Penn and the private sector. Whether the end result is a technology license, an R&D alliance, the formation of a new venture or an integrated combination of any or all of these activities, PCI serves as a dedicated one-stop shop for commercial partnering with Penn."* Their UPstart program *"offers a wide array of*

services to assist entrepreneurial faculty members in the company formation and development process…," including help with assessing the market for an invention. "*UPstart employs student teams from the Wharton SBDC [Small Business Development Center] to research potential applications for the company's technology. These teams perform analysis on the size of the addressable markets and work with the company to begin developing product strategies."* (http://pci.upenn.edu/services/)

(See CPWR's *Resources for Technology Transfer in Construction* for information on construction trends, employment projections, etc., and for other examples of university programs and resources.)

The researchers in this case study understood the market size and demand in the immediate area where their study was conducted, but they had not collected broader market data. The collection of this data could have strengthened the researchers' case for why a large manufacturer should take on production and marketing of their invention, as well as helped them assess whether or not the market for their invention was sizeable enough to attract a large manufacturer.

Lesson 3: Engage Stakeholders in Developing the Business Case

Stakeholders, including contractors and unions, may be able to help researchers develop the types of information needed to convince a manufacturer to take on a new product line. Through their trade associations and other industry contacts, these stakeholders often have access to information on the size of the market, the outlook for the type of construction work where the invention would be used, and employment trends. Stakeholders can also provide important testimonials on the value of an invention, be the testing ground for innovative marketing strategies (such as the 'loaner' program used by researchers in this case example), or, if the invention is open source, they may be willing to develop their own versions for use on construction sites.

In this case example, even though the researchers were unsuccessful in attracting a large national manufacturer, they were able to effectively engage stakeholders and create demand for the invention. These efforts ultimately led to two contractors taking advantage of the open source nature of the invention to create their own tools, and a small manufacturer taking on the production and marketing of a version of the tool.

Conclusion

Construction safety and health researchers know how to conduct research on and develop solutions for hazards facing construction workers. They understand the process, the timing, where to go for help, who to involve, and how to show that their research improves workers' health and safety. With the increased focus on ensuring that research-based solutions end up in use on construction sites (research to practice), researchers are now being asked to also consider their university's policies and timeline on technology transfer, and to collect the information that will be needed to make a business case for their invention.

When a research study is likely to result in an invention, it is important for researchers to notify their university's or research institution's office that deals with intellectual property and technology early in the process, before any information is publicly disclosed. By doing so, the researcher will know from the outset if a patent should be used to insure their proposed research-based invention reaches end-users, if there are resources available to help them develop the business case for their invention, or if they should open source their invention and devote their time to building stakeholder demand rather than pursuing a manufacturer.

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