DIGITAL science

REVOLUTIONIZING OHIO'S RESEARCH REPUTATION THROUGH INDUSTRY COLLABORATION

Developed and written by
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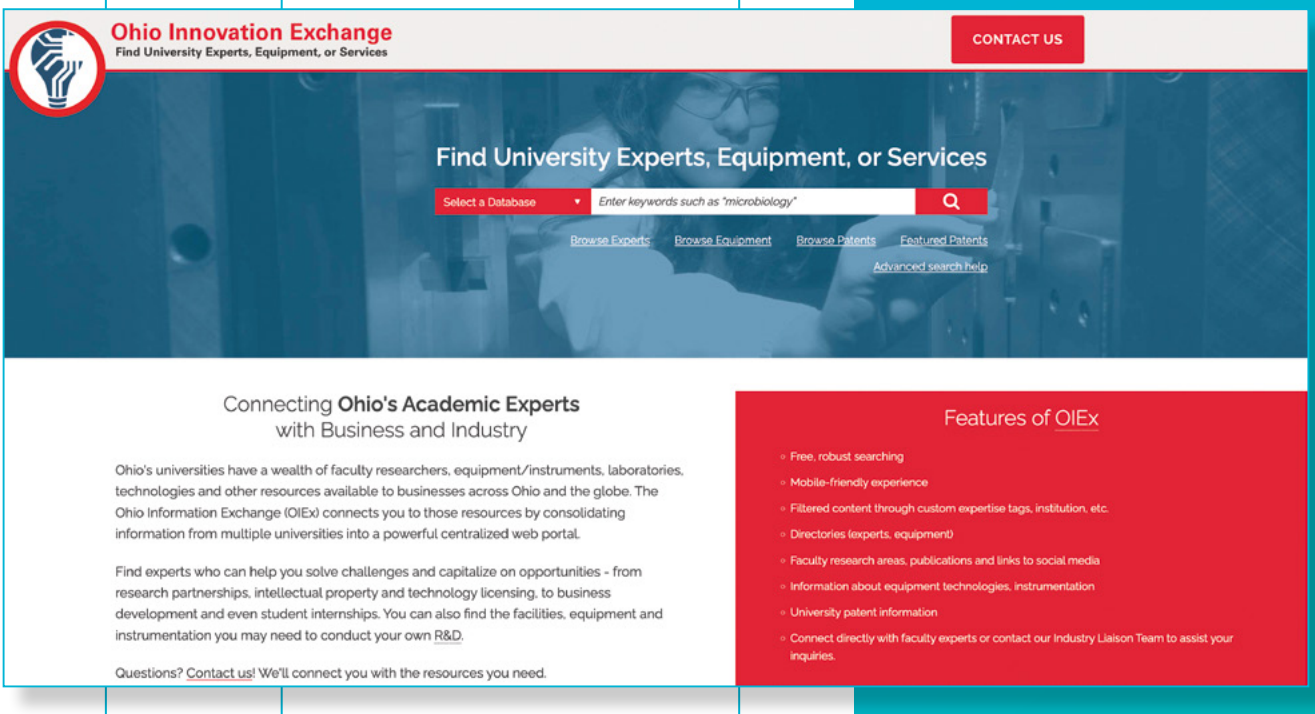


> The home page of the OIEx platform provides visitors with a simple search across the assets of 14k experts, equipment, services and IP from the 7 participating Ohio universities

The Ohio Department of Higher Education together with eight participating universities launched the Ohio Innovation Exchange in 2018 to help increase collaboration between higher education and industry. Built upon technology from Digital Science portfolio companies *Symplectic* and *Dimensions*, the platform sought to offer a new information-driven solution to facilitate connections and collaborations. As a new phase of the collaboration has dawned, Digital Science has interviewed OIEx leaders to understand how the project came about and what benefits it continues to harvest for participating institutions.

In October 2018, the Ohio Department of Higher Education and six universities from across the State of Ohio launched the Ohio Innovation Exchange (OIEx). This web-based platform provides a next-generation mechanism to stimulate increased collaboration between Ohio's universities and industries. Underpinned by high-quality curated data, OIEx is supported by an inter-university network of industry and research professionals.

When the programme launched, Digital Science interviewed two of the project leaders Tim Cain and Jeff Smith on the strategic rationale behind the Ohio Innovation Exchange, their goals for the project and why Digital Science was selected to deliver the solution. More recently, we spoke again with Tim as well as Jeff Agnoli about how the implementation has gone and what benefits have accrued for Ohio's universities and industry alike.

Dr. Tim Cain is Assistant Professor in the School of Medicine, Ohio University and Executive-in-Residence with Ohio Department of Higher Education (ODHE), lending experience and insights to the statewide initiative.

Jeff Smith is Technology Director and leads the Shared Infrastructure division of the Ohio Technology Consortium (OH-TECH), an operational extension of ODHE that also includes that includes the Ohio Academic Resources Network (OARnet), the Ohio Supercomputer Center, and the Ohio Library and Information Network (OhioLINK).

Jeff Agnoli is Senior Liaison for Strategic Partnerships in the Office of Corporate Partnerships at The Ohio State University.

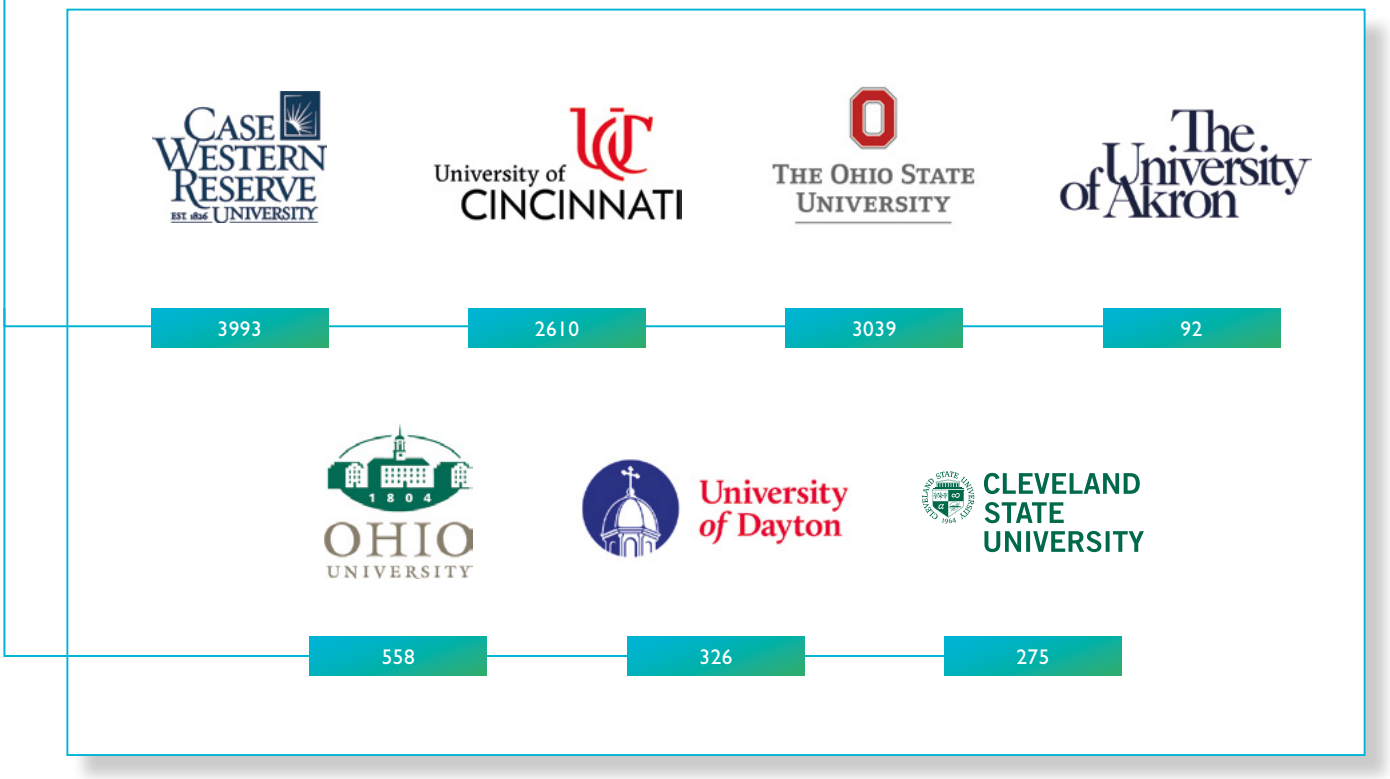
WHAT IS OIEx?

The Ohio Innovation Exchange (OIEx) provides an openly accessible platform featuring profiles of over 14,000 STEMM-focused faculty experts as well as information about equipment, research support services and intellectual property (IP) from across the higher education system in Ohio. OIEx provides extensive search functionality and an intuitive interface, which allows visitors to find relevant experts and explore each institution's publications, patents and equipment. It also facilitates connections with the OIEx human network, a team of university-embedded, industry liaisons who help visitors find more information and create relationships with researchers and institutions.

Currently the platform showcases research and resources from 7 participating universities: Case Western Reserve University, University of Cincinnati, Dayton University, the Ohio State University, Ohio University, University of Akron and Cleveland State University.

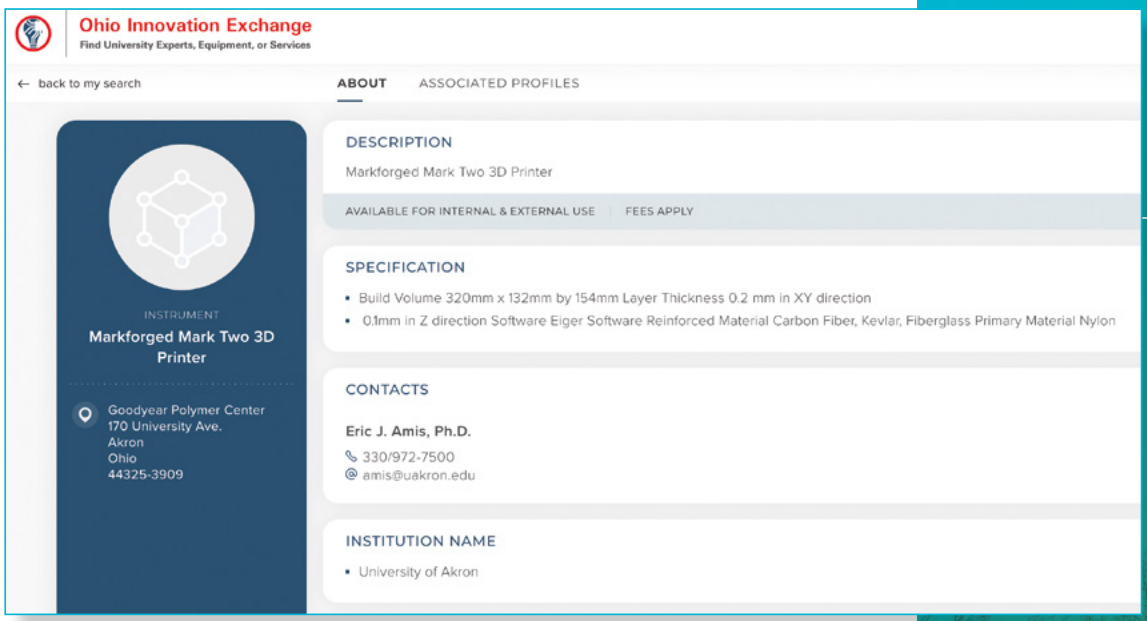
> Participating institutions were invited to submit profiles for people, equipment, research support services and featured patents, or a mix of all three in the areas of science, technology, engineering, mathematics, and medical disciplines (STEMM). This affords us the flexibility to promote the institutional expertise and assets of Ohio universities and community colleges across the spectrum – from research-intensive to more applied technical skills and know-how.
>
> — JEFF SMITH

> The number of faculty experts from each participating university profiled on OIEx at launch in October 2018



Back in 2018, Jeff Smith commented that a key feature of the OIEx that it was not just about showcasing researchers. Equipment and services available in the institutions, and university innovation centers were also very important to the industrial sector. "Participating institutions were invited to submit profiles for people, equipment, research support services and featured patents, or a mix of all three in the areas of science, technology, engineering, mathematics, and medical disciplines (STEMM). This affords us the flexibility to promote the institutional expertise and assets of Ohio universities and community colleges across the spectrum – from research-intensive to more applied technical skills and know-how".

> An example of an equipment profile in OIEx, in this case 3D printers with details of their product details, geographical location and academic ownership



University campuses often have expensive, specialized equipment on campus such as electron microscopes or 3D printers, which can cost several million US dollars. Under the right circumstances, companies can request access to these resources if needed. For example, small-to medium-sized companies needing to analyze prototypes or production line materials might be interested in renting access to microscopes to examine product output, and avail themselves of the technical expertise on hand to assist with the use of the equipment, analysis, and data interpretation. Industry professionals across a variety of sectors have often spoken of the need for an easy-to-use platform that they could use to find equipment, technologies and services, which *Symplectic* now provides with its *Discovery Module*. The *Equipment Profiles* in the Module have been enhanced, adding new tabs to show related experts, publications and grants, helping you signpost researchers to people who have experience or expertise with these specialist tools, facilities or services as well as showcase the research findings and outputs that your equipment has made possible.

As a statewide initiative, the Ohio Innovation Exchange currently features 2,364 equipment items sourced from across seven organisations, and we plan to work with them further in order to allow them to showcase patent data.

DIGITAL SCIENCE SOLUTION

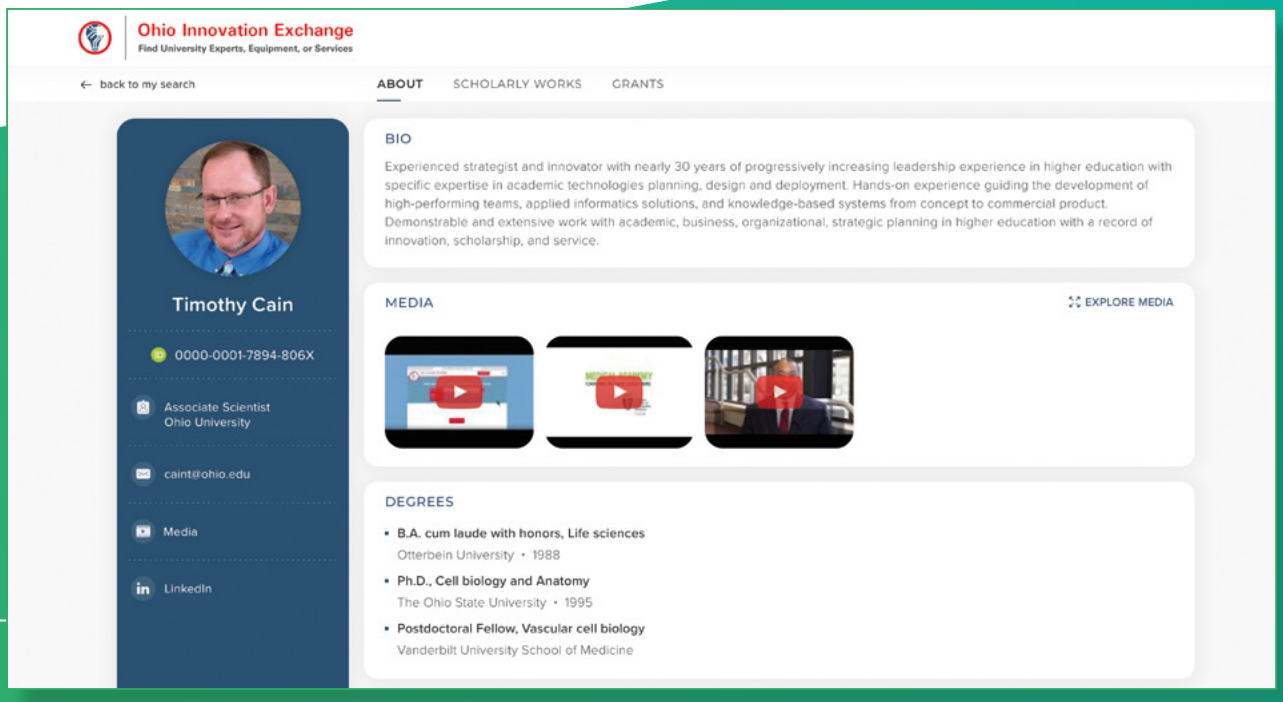
OIEx combines the research information management capabilities of *Symplectic Elements* and the search and discovery power of *Dimensions*.

Behind the scenes, *Elements* allows the Ohio Technology Consortium (OH-TECH) to consolidate and curate the data, which powers OIEx. To ensure OIEx features authoritative information on Ohio's researchers and to minimize the need for manual entry, faculty data is fed into *Elements* by Ohio's *Higher Education Information System* (*HEI*), a modern university reporting system managed by Jeff Smith's OH-TECH team. The integration with *HEI* provides *Elements* with institutional data about researchers and equipment. *Elements* then automatically searches for publications associated with their researchers and brings records into *Elements* to be claimed and curated. *Elements* harvests and disambiguates publication information for OH-TECH from a range of data sources that include: *Dimensions*, *Web of Science*, *PubMed* and *arXiv*.

Symplectic's Discovery Module serves as the public front end of the OIEx portal, providing visitors with a wide range of search and discovery tools to help them explore a rich collection of experts, publications, patents and equipment collected within the portal. Profiles are dynamically populated with curated data by *Elements* on an ongoing basis, including linked publications grants, and professional & teaching activities, ensuring the platform is always up-to-date.
The OIEx platform offers visitors extensive search functionality including filters and analytical features to allow them to find the most relevant information.

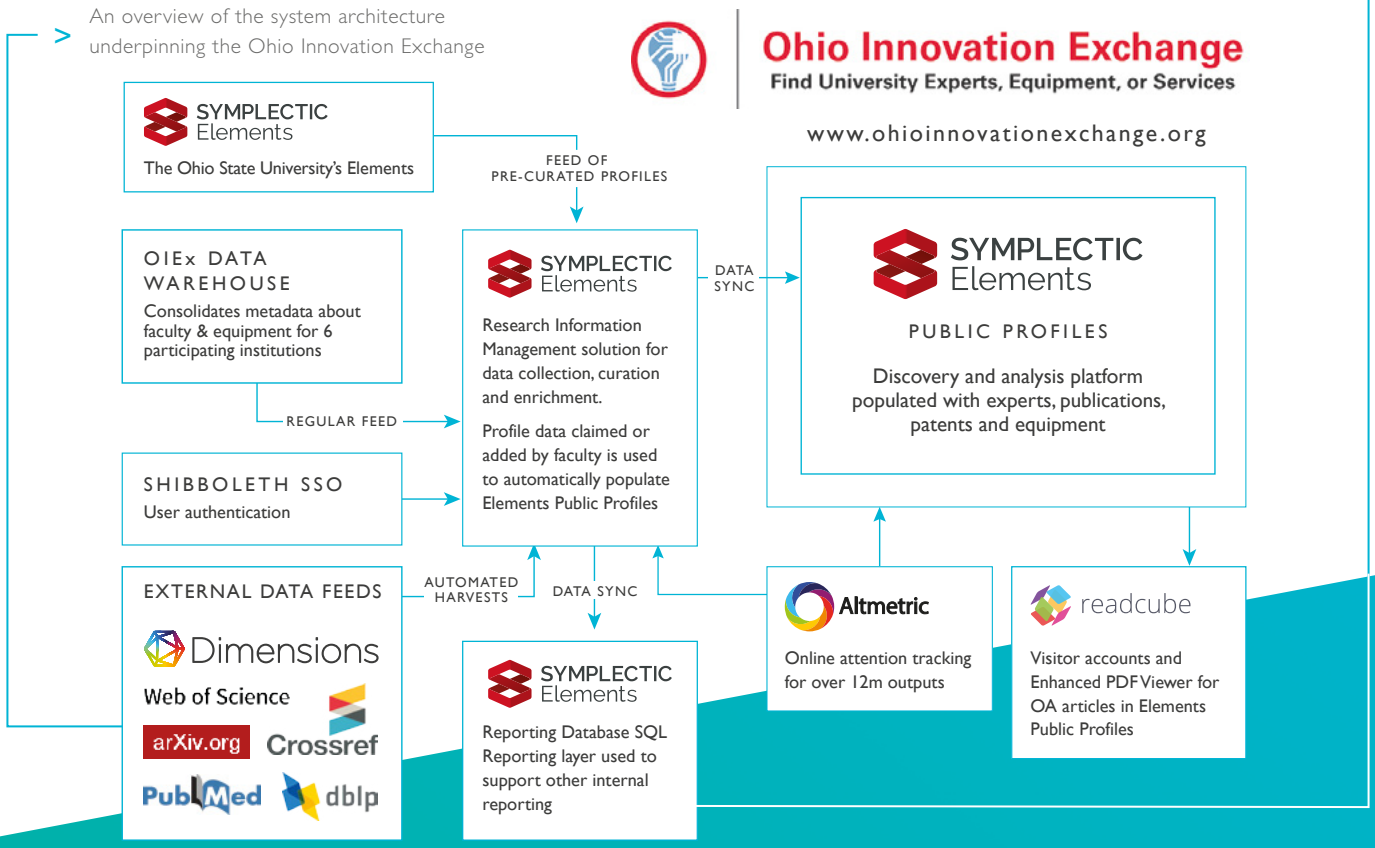
The platform also integrates features from a number of other Digital Science portfolio companies. Online attention to research outputs are highlighted in Altmetric scores available across OIEx making it easier for visitors to identify and explore high-attention research, while Readcube integration gives direct access to PDFs of publications where appropriate.

> An expert profile from OIEx profiling project leader and biomedical scientist Tim Cain. Note the online engagement with Cain's research captured in the latest Altmetric mentions.



The Ohio innovation exchange system architecture

> An overview of the system architecture underpinning the Ohio Innovation Exchange



PROJECT GENESIS

BACKGROUND TO OIEx

Tim Cain described the circumstances that led to the design and deployment of OIEx. The project first arose from a key recommendation from a 2013 report on the Condition of Higher Education in (the state of) Ohio which had been commissioned by the Ohio Department of Higher Education (ODHE) and authored by academic officials, policy makers and vested industry leaders. The report detailed strategies aimed at advancing Ohio's innovation economy by fueling collaborations across the sectors of academia, business and state government. The report spoke to the importance of stimulating cross-sector work to help ignite breakthrough science and technology innovations, accelerate laboratory bench to production floor translation, and fuel economic growth and jobs creation.

One recommendation detailed in the report was a call to explore the feasibility of creating a statewide platform to showcase, share and promote university/college faculty, research strengths, assets and equipment. ODHE committed to this recommendation in 2015 and commissioned a feasibility study to explore how best to stand up a multi-institution, research expertise and asset platform. It was at this point that Tim Cain joined the project and helped complete the feasibility study. Tim recalls, "We looked at the modern ways in which universities were managing their research information. We looked at the products out there on the market. While doing something as a multi-university initiative would prove challenging, we were convinced modern digital strategies would enable us to accomplish the task. ODHE secured funding through its capital appropriations budget to seed the initiative and assembled a coalition of willing, research-intensive universities that included: Case Western Reserve University, University of Cincinnati, the Ohio State University, and Ohio University, with the University of Dayton being added later. Over the years, each of these universities have contributed in-kind, staffing expertise and support from a variety of domains – academic research, library/data, technology, and industry engagement."

In addition, the Ohio Manufacturing Institute was an early participant to help bridge and explore collaborations between the manufacturing industry and academia.
Tim stresses the importance of adding Ohio Manufacturing Institute as a partner: "They brought a customer perspective to the table to insure we didn't end up with a project team and solution geared exclusively for academics. We quickly realized that the categories of information that may be valuable in the academic arena might not have the same value to an industry-focused audience. By having an industry voice at the table, we were trying to ensure that we did not miss the mark. It was an all-volunteer army, who aligned to the idea that these institutions are part of the state and that it was part of their mission as well to help achieve effective higher education-industry collaboration."

An OIEx feasibility study looked carefully at the historical barriers to higher ed-industry collaboration. Tim commented, "Industry officials would often report on the challenge of finding experts in academia. While industry was more than willing to call upon the expertise of university faculty or try to seek research services, equipment or IP, they suffered from diminished visibility into the key academic assets." Tim explains that the barrier is the way in which universities are organized in the digital world. Universities are highly decentralized and have information managed by many different departments and in many different locations. "There's plenty of information on the Web on academic expertise, but it's all over the place. With OIEx, we wanted to create a single, multi-university resource that provides enhanced visibility into expertise, equipment and research support services and available IP."

Indeed, the state of Ohio and OIEx are very much the trailblazers in understanding that the future of research lies in collaborating more closely with industry. As Tim explains, "Supporting an ecosystem of innovation in Ohio, OIEx was conceived in 2015 as an inter-university initiative to make it easier to find faculty experts, intellectual property/licensable patents, state-of-the-art university equipment, and research support services across multiple universities. Using information collected from Ohio universities — that now include Case Western Reserve University, Cleveland State University, Ohio University, The Ohio State University, University of Akron, University of Dayton, and University of Cincinnati — the program goals were initially realized in the 2018 launch of the OIEx web portal.

The evolution of OIEx, which has seen growth in enhanced functionality, searchable assets, and partner schools, is helping to spark university connections with Ohio-based companies and other organizations seeking access to next-generation ideas, translation-ready innovations, and meaningful collaborations that help fuel economic development.".
Jeff Agnoli adds, "OIEx has seen an ongoing commitment from the Chancellor of Ohio higher education and senior government officials, all of whom have been unwavering in their support of Ohio's ecosystem of innovation and the key role that higher education plays. As one of the programme sponsors says, "OIEx is one more tool that facilitates collaboration within the state and beyond'."

DATA FIRST APPROACH

From the outset of the OIEx project, it quickly became clear that each of the participating schools managed their research information sets in a myriad of different ways. There was no consistent research information platform used by each Ohio institution. Tim explains that the project team recognized that if they were to be successful they would have to honor the investments the universities had already made in systems and that it would be a mistake to suggest supplanting these existing systems and institutional workflows from the level of the state.

In a strategic masterstroke, the team designed the project to focus on "data first", working with the participating institutions to identify, assemble and source simply the data. Tim says, "We didn't care what systems were used locally to manage the data. In one case, a category of data was tracked and managed locally in analog form. Often universities would not have enterprise-level visibility into this data because it is managed at a department or unit level. We had to honor this culture, especially as the institutions were volunteering the time and effort of their staff to go out and find this information."

Tim adds that the ways in which each of these universities interact with industry was also very different. "For some, it was a one-person show, for others, it was a robust office of individuals working across the scope of the institution. Also, from a cultural perspective, separate schools didn't really work together in technology transfer and industry engagement." Tim explains that it wasn't a case of these schools being highly competitive with each other, but rather that as they had each grown with their own industry engagement offices, collaborating with the school on the other side of the state was not the first thing they thought about. Tim continues, "We had to rethink the rules of engagement with these schools. We had to try to build a culture that meant that if an enquiry from industry was received by one school, and if the required expertise was recognized to be in another school, then this enquiry could easily be passed from one school to the other."

The project team worked with the participating schools to target the data of interest and progressed through to develop a central strategy for data submission. Each of the participating institutions then went to find that information.

TECHNICAL PERSPECTIVE ON OIEX

Jeff Smith and his team oversees the support and security of the centralized data warehouse in which the seed data about faculty and equipment resides. They also look after the mechanisms, processes, and specifications through which the participating universities would submit data to the central data warehouse ready to be fed into *Elements* for curation and enrichment.

Following their data-first approach, they looked to established mechanisms used for reporting requirements of the universities to the State Government. HEI housed at OH-TECH already provided the inputs for data areas of academic programs, enrollments, facilities, faculty and staff, financials, and financial aid for students for reporting to the State and Federal governments. It was determined that HEI could provide OIEx with much of the faculty and staff data they needed. Jeff Smith comments, "We added an additional data area to the system and now we have a central data feed point for OIEx where faculty and institutions can come and submit those files specifically to a faculty directory of activity, qualifications, honors and awards. This is what goes through to the OH-TECH instance of *Elements* in OIEx. It all has the same front end on the campus side and we take this and route it to *Elements*."

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>
> — TIM CAIN

NEVER REKEY THE DATA

Jeff Smith adds that ensuring faculty members would never have to enter data into the system more than once came up early in the discussion. The team at Ohio State University (OSU) raised this key consideration; OSU had already implemented *Elements* on campus to support their promotion and tenure process. Jeff Smith says that OH-TECH wanted to leverage the high level of data curation already completed in the OSU *Elements* instance and so they turned to the Digital Science team for a solution. Jeff commented that this is where the *Symplectic* product management team led by Kate Byrne and Dave Budenberg really stepped up and presented us with an option, which was fairly new to us. Jeff Smith says, "In OIEx, we connected two *Elements* systems together so that the data from the OSU instance remained the authoritative source for that institution and fed the curated data to the OH-TECH *Elements* instance in OIEx." He adds this allowed them to realize great efficiency by leveraging the OSU source of authority for their faculty data along with the publication curation. "We imported this data directly in real time via API calls from the OSU *Elements* instance to the OH-TECH *Elements* instance. Elegantly, the data is locked and cannot be enhanced in OH-TECH, so OSU retains the single source of truth for the data it submits to OIEx."

DIGITAL SCIENCE DELIVERED

Jeff Smith says that decision to award the state-initiated, request for proposals (RFP) to Digital Science was largely based on a need for an off-the-shelf, vendor-supported solution. "We did not want to invest in a custom-developed application because although OH-TECH does have an IT staff we didn't have resources that could be dedicated to this project for some number of years. There would be too many unknowns: How long would it take to build OIEx? What would be the best way to take it to market? Would the project be too costly to deliver? We also wanted to install and on-board institutions quickly."

The project team looked at several different options from vendors and Jeff says they were impressed by the polished look and feel of the *Symplectic Elements* user interface. "Ultimately, the faculty were going to be asked at some point to go in and curate their profiles and we had to think what would be the easiest tool for them to use. We also looked at the data attributes that were required for the project and these mapped quite well to what was available from *Elements* out of the box. The publications and citations data sources in *Elements* were also impressive."

Tim adds that the RFP was designed to be ambitious in its scope. The project team mapped out over one hundred functionality requirements desired in the technology layer. These included handling the data complexities, tapping into licensed data sources provided by OhioLINK and other third parties; reporting and modern analytics, and social media. While Elements has been able to deliver on these requirements in the time since it was first implemented, there have also been some additional benefits that have accrued. Jeff Agnoli says, "It is hard to measure, but the Intel Corporation has just invested $100m to build a new microprocessor plant in the state, and competitors along with others in their supply chain are also considering a move into Ohio. Intel is also offering Ohio universities and colleges $50m over 10 years to fund research and curricular projects (www.theregister.com/2022/03/17/intel_100m_chip_skills), so you can see how the research funding landscape is changing. It is not only about bidding for federal research grants any more, but also recognizing the value of seeking industry partnerships to help fund discovery, innovation, and economic development."

> We received 15 competitive submissions, and Digital Science's submission quickly rose to the top in meeting our requirements. Digital Science also demonstrated that they understood the drivers of higher education; the complexities of institutional data, the decentralized and myriad ways this data is often managed, but most importantly they could point to proven strategies and ways to deal with that. We also wanted a provider who was at the forefront of modern informatics, one who was progressive in its thinking of how to integrate data sources such as *Altmetrics*.
>
> — TIM CAIN

> "One example that comes to mind is, a firm came to us with a business plan it was looking to develop and needed help. We were able to partner the firm with a capstone project with our students and faculty. This led the firm to develop and refine its business plan and also enable students to get a real-world project."
>
> — JEFF AGNOLI

CHALLENGES IN THE PROJECT

Jeff Smith and the technical team at OH-TECH thought strategically about the challenges upfront at the start of the project. Disambiguation and strategic collection of the data were primary concerns. Have those initial challenges been overcome? Tim replies, "n the early days of OIEx, partner universities were asked to provide extensive sets of data to create and publish meaningful information about featured faculty experts and equipment. Unfortunately, these data requests often created challenges given the variety of ways our partners capture, manage, and track the data of interest. Over time, however, a variety of data categories (e.g., publications, grants, patents) were no longer needed from the partners due in part to the data-harvesting capabilities that Symplectic Elements introduced. The ability to later enrich Discovery profiles with media (e.g., YouTube) and incorporate links to additional channels (e.g., departmental and laboratory websites, LinkedIn, Research Gate, Google Scholar, etc.) led to richer profiles and improved search engine optimization." Tim also says the more recent introduction of the Elements Equipment module offers a long-sought utility. Information systems in play for cataloging and showcasing shareable equipment and supporting services remain few in number and limited in functionality. "The customizable and scalable Equipment module that enables dynamic cross-linkages to experts, grants, and publications across an institution is a valuable new Elements feature that we think will bring much-needed utility to our partner schools." Jeff Agnoli adds, "Our corporate partnership team finds the Discovery platform essential to develop formal partnerships with business and industry. The OIEx facilitates the process of discovery of expertise and assets, which leads to an action plan."

WHY OIEX AND ELEMENTS HAVE BEEN SUCCESSFUL

Tim, Jeff Smith and the OH-TECH working group were keenly aware from the outset of the OIEx project, that it would not be enough to build a platform to expect end users and public visitors to engage with it. They had learned this from looking at other state models. Tim adds: "The Web doesn't need another watering hole. We needed to think about the customer service around the platform." Ultimately, the success of OIEx and Elements can be seen in the numerous examples where Ohio universities and its industrial communities have collaborated. For example, Jeff Agnoli points to the increased engagement between academia and industry in the strategic sphere. Jeff Agnoli says, "One example that comes to mind is, a firm came to us with a business plan it was looking to develop and needed help. We were able to partner the firm with a capstone project with our students and faculty. This led the firm to develop and refine its business plan and also enable students to get a real-world project."

Looking to the future, OIEx only see further benefits from using Elements to bring them closer to Ohio industry. Tim says, "As we have focused on building broader awareness of and advocacy for this resource-sharing system, many new features and enhancements have been suggested. Two rather intriguing ones stand out. Our university partners have asked if OIEx could be positioned to source information from Ohio businesses advertising internships, sponsoring research, or seeking next-generation workers. Moving beyond a unidirectional flow of information about our universities to a platform where bi-directional exchange could occur is an intriguing challenge and opportunity. From the other side of the table, business leaders often remind us that one key university asset excluded from OIEx, but frequently at the top of their list, is the ability to find qualified students and graduates as they build and grow the next-generation workforce. Ohio is among those committed to workforce development with universities playing a major role." These ideas are emblematic of the wider strategy of increased engagement, which Jeff Agnoli describes as increased focus on the amount and level of engagement firms have with OIEx. "Our focus is to increase the amount of engagement business and industry have with OIEx and move them toward becoming engaged partners. For example, if a company has the interest, we seek to move it along the continuum from attending career fairs and creating internships to research contracts and philanthropic activities with our universities." It seems that the future is bright for both the universities and industrial communities of the state of Ohio.

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