MiHIVE Final Report

September 2024

Problem Statement

Academia's persistent challenge is providing curricula and training that meet the needs of the job markets so students are best equipped to succeed in the health IT workforce upon graduation. This is a very significant challenge for the ever-evolving world of health informatics.

For training in health informatics, it is difficult for academic faculty to find affordable and consistent tools that give students realistic and immersive learning opportunities. Because of this, health informatics programs across the state of Michigan are struggling to provide the depth and breadth of hands-on learning needed to adequately prepare students for their careers.

For the first time, Michigan colleges, universities, and industry stakeholders are pooling their energy and resources to collectively create shared instructional materials in conjunction with a shared virtual platform so all students in Michigan pursuing degrees related to health data and health technology can benefit. This vision is called the Michigan Health Interoperability Virtual e-laboratory, or **MiHIVE**.

Mission

MiHIVE's mission is to provide faculty and the students they teach with needed technology platforms and corresponding curricula so that Michigan colleges and universities can collaboratively create the nation's most proficient health IT, health informatics, and healthcare innovation workforce. MiHIVE is positioned to ensure Michigan's health informatics graduates can "hit the ground running" as they begin vital careers in the areas of health information exchange, big data analytics, machine learning, and artificial intelligence.

MiHIVE's focus supports the Michigan Health Information Technology (HIT) Commission efforts to ensure our healthcare systems can leverage health IT to improve the health and wellness of all Michiganders. Through MiHIVE, Michigan universities will be engaged in many of the priorities outlined in the HIT Commission's strategic roadmap, including the following:

- Advancing health data utility
- Promoting data integration and sharing involving social determinants of health to reduce health disparities and social inequities
- Improving data sharing and analytics for population and public health, health information exchange, and interoperability.

Primary Goals

MiHIVE's primary goals are as follows:

- Leverage the collective expertise of the academic, industry, and public sectors across Michigan to produce cutting-edge, shared health information technology (HIT) educational resources
- Foster development of a diverse, dynamic Health IT and health informatics workforce to advance Health IT innovation in Michigan

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Michigan Health Endowment Fund Support

In August 2023, the Michigan Health Endowment Fund (MHEF) confirmed its support of the MiHIVE mission by awarding a grant to the Interoperability Institute (IOI) for an initial series of three planning workshops and MiHIVE efforts between September 2023 – August 2024.

The grant planning committee includes the following four individuals:

- Mary Kratz, Interoperability Institute (IOI)
- Amber Weeks, Interoperability Institute (IOI)
- Helen Hill, Michigan Healthcare Information and Management Systems Society (HIMSS)
- Allen Flynn, Department of Learning Health Sciences, University of Michigan Medical School

The e-Laboratory

MiHIVE is working to build an e-laboratory environment outfitted with all of the health IT components students read about in textbooks, but typically do not get to interact with or use during their training. The e-laboratory will be housed online within MELD, the Interoperability Institute's open-source healthcare sandbox populated with fully synthetic FHIR data. MELD provides an online experience for creation, development, testing, and validation of health IT data sharing technology and various healthcare applications and APIs. The fully synthetic and highly realistic patient data in MELD allows for users—in this case, students—to learn by "failing forward" when working with the health data, as there is no risk of exposing Protected Health Information (PHI).

As MiHIVE matures, members will create the pieces of core curriculum elements required to complement the tools available within the e-lab hosted within MELD. These core curriculum elements (CCEs) include health data sets, interactive software and tools, tailored exercises, real-world case studies, student progress evaluation mechanisms, and more.

The Interoperability Institute's Role

IOI is a non-profit software technology research and development institute. Uniquely positioned as a health IT innovation incubator, IOI's core competencies include Agile software development, applied research, immersive environments, synthetic data and personas, and workforce development. IOI's mission is to enable organizations and communities to harness the benefits of interoperability at scale. This is achieved through next-generation workforce training, interoperability testbed standardization, and solution development focused on enabling interoperability and standards.

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For MiHIVE specifically, IOI was the recipient of the MHEF grant. IOI used these funds—in addition to IOI's own in-kind contributions— to convene the academic institutions and industry advisors, as well as provide HIT tools and resources to further MiHIVE's mission. IOI has the capability to bridge the workforce skill building gap between academic informatics curricula and industry needs by providing the MELD platform to enable the MiHIVE immersive e-laboratory platform, pre-loaded with synthetic data, de-identified data, and packaged course materials.

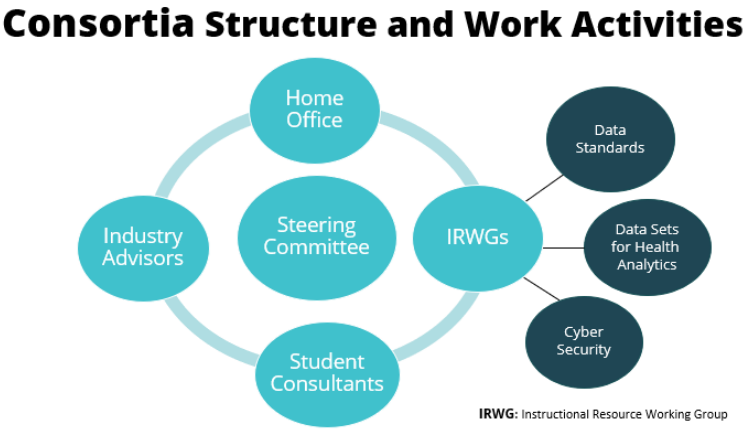
MiHIVE's Progress to Date

Governance and Workgroups

Armed with feedback from the first workshop, MiHIVE created a steering committee and workgroups to advance its mission. Steering committee functions include (but are not limited to) collective decision making regarding finance, funding sustainability, performance objectives, communications, engagement, and data governance and risk management. See Appendix A for a list of steering committee members.

The steering committee—with feedback from workshop participants— identified four instructional resource working groups (IRWGs) to address four focus areas of instruction and engagement:

- Data Standards
- Data Sets for Health Analytics
- Student Consultants
- Cybersecurity



Work to develop classroom-ready materials and establish MELD as an online training platform for students to use is actively being progressed by the four IRWGs. See the Curriculum Materials and Cybersecurity sections of this document below for details on progress made to date.

Stakeholder Feedback

MiHIVE has gathered feedback from industry and academic leaders through its three-part workshop series. At these workshops, participants provided feedback on the MiHIVE governance structure, shared curriculum priorities, created materials, and more. There is general agreement throughout MiHIVE's stakeholder community that gaining access to more up-to-date and realistic hand-on training exercises for health informatics students is a high priority. In total, 68 professionals participated in the three-part

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MiHIVE workshop series between September 2023 – June 2024. Participants provided insight from the following academic institutions and industry organizations:

Academic Institutions

- Central Michigan University
- Davenport University
- Eastern Michigan University
- Ferris State University
- Grand Valley State University
- Lawrence Technological University
- Michigan Technological University
- Saginaw Valley State University
- University of Charleston, West Virginia
- University of Michigan
- University of South Carolina
- Wayne State University
- Western Michigan University

Industry Advisors

- Center for Health and Research Transformation (CHRT)
- Michigan Department of Health and Human Services (MDHHS)
- Altarum Institute
- Michigan Health Endowment Fund
- Michigan State Medical Society (MSMS)
- Zscaler
- NTT Data
- Connected Nation, Inc.
- GMP Network
- Greater Flint Health Coalition
- Health Focus Software Solutions
- iMPROve Health
- Informa Markets
- Michigan Data Collaborative
- Michigan Healthcare Information and Management Systems Society (HIMSS)
- Clinical Architecture
- Concentric AI
- Michigan Public Health Institute (MPHI)
- Molina Healthcare
- HCTec
- Phoenix Project
- Covenant HealthCare
- Point-of-Care Partners
- Health Focus Software Solutions
- Point-of-Care Partners
- Radius Advisory Group
- Schoolcraft Memorial Hospital
- TRIARQ Health

Curriculum Materials

The Data Standards IRWG has so far created four hands-on lessons and worksheets around Health Level Seven International® (HL7) Fast Health Interoperability Resources® (FHIR) resources. This interoperability curriculum begins with the basics in Lesson 1 and builds on those basics in the subsequent lessons. Specific learning objectives can be found in each lesson. Instructors may use any of these lessons and worksheets to teach about interoperability and HL7 FHIR using highly realistic examples and approaches. These materials are designed to be used both by individual students and by small groups of students. To offer flexibility to instructors and students, these materials have been developed in ways that allow them to be incorporated into course sessions and/or assigned as homework.

Additionally, the Data Sets IRWG is creating classroom-ready materials such as open-source data sets with specified statistical analytic approaches and supporting analytics applications that provide learners

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with realistic health data analysis challenges to learn from. These skill-building resources will be relevant to health IT data and analytics. The Data Sets IRWG has two phases to its work:

- Determine open-source data sets and annotate them with appropriate metadata (i.e. unit of analysis, sample size, geographic granularity, setting, and more) to help the end user (educator) filter out data sets which may not be appropriate for a particular classroom exercise
- Determine potential data analytics or data mining tasks that can be completed for each dataset

By Fall 2024, the Data Sets IRWG will have multiple data sets annotated and have at least one classroom-ready lesson on health data analytics to share throughout the MiHIVE stakeholder community.

The number of curriculum materials available to instructors will grow as MiHIVE continues to progress.

Cybersecurity

The Cybersecurity IRWG has outlined areas of focus to begin movement toward an effective methodology for learning health informatics with a risk management (cybersecurity) perspective. One recommendation is to require students to participate in a series of cyber range risk-based immersive exercises designed to provide practical cyber experiences with team building, leadership, problem solving, data management as well as key technical capabilities. The Cybersecurity IRWG created a cost estimate for a student cyber range, which can be provided upon request.

The MIHIVE Cybersecurity IRWG is coordinating closely with the State of Michigan Cybersecurity Task Force and the regional Cybersecurity and Infrastructure Security Agency (CISA).

Industry and Community Resources

In addition to its academic partners, MiHIVE prioritizes including and directly involving industry and community stakeholders. Over the last year since MiHIVE's inception, the steering committee outlined what it means to be MiHIVE industry partner.

Presently, MiHIVE is working with the company Clinical Architecture to incorporate one of its tools into the MELD e-laboratory online training environment. Tools from Clinical Architecture will help students learn about data normalization and best practices for improving health data quality.

Additionally, MiHIVE is partnering with the Phoenix Project, which provides a public health "prevalence profiler" including an interactive dashboard that merges de-identified clinical and Social Determinants of Health (SDOH) data from data sources throughout Michigan and beyond. The MiHIVE steering committee and relevant IRWGs are determining how to best integrate this tool from the Phoenix Project into the MiHIVE e-Lab platform.

Furthermore, MiHIVE supports leveraging industry relationships to develop an accessible electronic health record (EHR) environment for on-demand use for Michigan academic institutions. MiHIVE is partnering with the Michigan company Carefluence to integrate an open-source EHR system. MiHIVE's administrative office provides support to enable legal license agreements, service level agreements, and community-based End User License Agreements for use of a private sector company's software in the MiHIVE virtual e-laboratory.

The MHIVE Steering Committee is beginning assessment of the Electronic Medical Research Search Engine (EMERSE), a software tool built to aid research, spanning cohort discovery, population health, and

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data abstraction for clinical trials. EMERSE is now live at three academic medical centers, including the University of Michigan, with additional sites scheduled to onboard to support the National Cancer Institute at the National Institutes of Health cancer moonshot program aa a Clinical Translational Science Award (CTSA) to further precision medicine.

As MiHIVE progresses, it will continue to use these partnership models to identify and connect with the specific technology resources needed to support immersive e-lab exercises simulating the real-world healthcare information ecosystem.

Evaluation

MiHIVE is partnering with the Center for Health and Research Transformation (CHRT) to develop a formal evaluation process to continuously track the ongoing quality, relevance, and impact of MiHIVE technology resource investments. This will ensure MiHIVE remains current by integrating new and emerging technologies while dropping underused resources. The evaluation process will include quality assurance and quality improvement metrics to identify inherent biases and ensure integration of universal topics (e.g., health equity, cybersecurity) across all instructional resources.

Next Steps

MiHIVE's high-level priorities for the coming year include expanding IRWGs; involving more Michigan employers (healthcare, government, and health IT); engaging community colleges; piloting curriculum materials in classrooms; and building out the technology tools and educational materials within the e-laboratory.

The Steering Committee has formed a subcommittee to update the MiHIVE governance model to include sustainability through a membership structure that includes higher education member fees, industry affiliate member sponsorships, and in-kind contributions of data, tools, and subject matter expertise. Finally, MiHIVE is building relationships with Michigan-based foundations and pursuing grant funding, in addition to public sector funding at the state and federal levels.

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Appendix A: Steering Committee Members

The Steering Committee was formed on a volunteer basis. The MiHIVE organizers at the Interoperability Institute (IOI) sent an open invitation to those who attended the initial kick-off meeting in September regarding interest and availability. This list reflects the members of the steering committee, as of September 2024.

Individual	Organization Name	Job Title
Allen Flynn	University of Michigan	Assistant Professor and Director of the Master of Health Informatics Program
Sharon Kim	University of Michigan	Research and Evaluation Director, Center for Health and Research Transformation (CHRT)
Rutendo Goto	Western Michigan University	Ph.D. Student
Pat Rinvelt	Eastern Michigan University	Adjunct Faculty, School of Health Sciences; Former Board Member of Velatura Services and MiHIN
Shamsi Berry	Western Michigan University	Associate Professor, Department of Biomedical Informatics
Mary Kratz	Executive Vice President	Interoperability Institute
Steven Korzeniewski	Wayne State University	Associate Professor, Clinical Unit: Emergency Medicine
Kimberly McVicar	Ferris State University	Professor, Master's in Health Administration and Health Care Systems Administration Programs and HCSA Clinical Coordinator
Theresa Anderson	Senior Project Specialist	Michigan Department of Health and Human Services
Betsy Freeman	Radius Advisory Group	Chief Executive Officer
Helen Hill	Michigan HIMSS	MI HIMSS Board Public Policy Chair
Dimitrios Zikos	Central Michigan University	Associate Professor and Director of the Health Administration Division
Dara Barrera	Michigan State Medical Society	Director, Health Quality, Equity, and Technology
Melissa Riba	University of Michigan	Research and Evaluation Director, Center for Health and Research Transformation (CHRT)

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