1. INTRODUCTIONS
PROJECT TEAM: PAULIEN & ASSOCIATES

ABOUT PAULIEN

• Understanding of the academy from the inside
• Breadth & depth of higher education experience
• Expertise in data management and visualization
• Space Needs Assessments and Analytics
• Benchmarking
• Capital Planning
• Process and Policy Recommendations

700 Campuses
49 States
10+ State Systems
38 Years in Higher Education Planning

MEET OUR TEAM

Paul A. Leef  
Project Manager

Steve Schonberger  
Space Needs Specialist

Frank A. Markley  
Strategic Planning & Visioning Specialist

Chris Vanneste  
Laboratory Planner
PROJECT TEAM: SMITHGROUP
INTEGRATED, MULTIDISCIPLINARY, RECOGNIZED.

SmithGroup has been honored with 7 Lab of the Year recognitions from R&D Magazine

LEED Platinum / R&D Magazine's 2014 Lab of the Year
National Renewable Energy Laboratory Energy Systems Integration Facility

PROJECT TEAM: SMITHGROUP
YOU'RE IN GOOD COMPANY

SmithGroup has worked with 9 of the 30 Best Engineering Schools in the Country

Colorado School of Mines, Brown Hall Renovation/Addition | Duke University, Pratt School of Engineering, Home Depot Smart Home | Michigan State University, Biophysical Sciences Building | Michigan Technological University, Dow Environmental Sciences and Engineering Building | National Renewable Energy Laboratory, Energy Systems Integration Facility, Science and Technology Facility | Northern Arizona University, College of Engineering and Natural Sciences | North Carolina State University, Engineering IV | Oakland University, Engineering Center | The Ohio State University, Koffolt-Fontana Feasibility Study, Advanced Materials Corridor | Oregon State University, Kelley School of Engineering Sciences | South Dakota School of Mines and Technology, Chemistry and Chemical Engineering | Temple University, College of Engineering Expansion | University of Arizona, Engineering Innovation Building | University of California, Berkeley, Energy Biosciences Building, Sutardja Dai Hall | University of California, Merced, Science and Engineering II | University of Georgia, Driftmier Engineering Center | University of Illinois at Urbana Champaign, Electrical and Computer Engineering Building | University of Maryland, Joong H. Kim Engineering Building | University of Michigan, Bagnoud Aerospace Engineering, Lurie Nanofabrication Facility | University of Texas at Dallas, Engineering and Computer Science Complex, Mechanical Engineering Building | Virginia Tech, Institute for Critical Technology and Applied Science II
1. TRENDS IN EDUCATION & RESEARCH

EDUCATION NOW

boundary-busting
• interdisciplinary
• nano-bio-geo-chem-eomics

highly collaborative
• instructional – research
• technology transfer – business partners

flexible / adaptable
• modular
• accessible pathways

sustainable / energy efficient
• pleasant work environment
• net zero energy

showcase
• transparent / celebratory
• learning tool
TRENDS IN EDUCATION

Provide hands-on experimental learning
Provide a broad education:
  • Develop communication and problem-solving skills
  • Stimulate creativity and develop critical thinking skills
Integrate technology into the curricula
Provide appropriate experiential (evidence-based) environments
Promote team work, interaction and collaboration
Celebratory / Showcase
Attract and retain students, faculty and staff

THEMATICALLY ORGANIZED – FLEXIBLE SPACES

University of Illinois, ECE Building
Pod A – Electronic Circuits
Pod B – Optical Imaging
Pod C – Signal Processing and Power
Pod D – Communications
Pod E – Robotics and Controls
Pod F – Senior Design
Pod G – Intro Lab (ECE 110)
Pod H – Digital Projects
Pod I – Integrated Circuits (Clean Room)
Pod J – Computer Systems

Space Assignment on Modular Basis
Convert-ability from dry to wet space
RESEARCH- MTU R&D EXPENDITURES

2017 R&D EXPENDITURES

National science Foundation center for Science and Engineering States Higher Ed R & D Funding

NIH FUNDING TRENDS

NIH FY 2017 BUDGET SUMMARY
CLASSROOM TRENDS

ACTIVE LEARNING

DISTANCE LEARNING / TELECONFERENCING

COLLABORATIVE STUDY OUTSIDE THE CLASSROOM

MULTIPLE CLASSROOM PEDAGOGIES

TRENDS

EXPERIENTIAL LEARNING

TEAMING
- Problem-Based
- Write-Up
- Experiment Design

WET SCIENCE / ENG LABS

RESEARCH
- Student
- Faculty
- Demonstration Lab “Stations”

SUPPORT LAB
- Prep
- Equipment
- Storage

ACTIVE LAB
- Team-based
- Mobile Technology
TRENDS
EXPERIENTIAL LEARNING

SUPPORT LAB 1
Prep Equipment Storage

ACTIVE LAB
Team-based Mobile Technology

SUPPORT LAB 2
Dedicated Equipment

TINY TEAMING
Write-Up Experiment Design

BIG WINDOW ON SCIENCE

DRY-ISH
GENERAL SCIENCES /ENG

INTERPROFESSIONAL EXPERIENCES
LEARNING TOGETHER IN TEAMS
PROFESSIONAL IDENTITY AND LEADERSHIP
STUDENT ORGANIZATIONS, ADVISING, OUTREACH

TECHNOLOGY
CHANGING THE WAY STUDENTS LEARN...AND THE WAY THEY WILL ENGAGE WITH PATIENTS
EXTERNAL PARTNERSHIPS
CAMPUS, COMMUNITY AND REGIONAL ENGAGEMENT AND RESEARCH OPPORTUNITIES

COLLABORATIVE WORKPLACE
CHANGING FACULTY DEMOGRAPHICS DRIVING FLEXIBLE WORKPLACE ENVIRONMENTS
ENGINEERING IS NOT JUST FOR ENGINEERING STUDENTS

ENGINEERING EDUCATION IS ABOUT EXPERIENTIAL, HANDS-ON LEARNING
AND COLLABORATIVE TEAMWORK

CREATING A SENSE OF WONDER, ATTRACTING STUDENTS TO ENGINEERING
FLEXIBLE, CROSS-FUNCTIONAL, UNBREAKABLE LABS

STUDENT–FACULTY INTERACTION AND...SHOWING OFF!
IT IS ABOUT PERSONAL INQUIRY

PERSONAL SPACE
SPACE FOR COOL STUFF

2. BENCHMARKING + METRICS
### Program Mix

<table>
<thead>
<tr>
<th></th>
<th>Traditional</th>
<th>Classrooms</th>
<th>Active Learning</th>
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<td>Shared, Flexible</td>
<td>Dedicated</td>
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<td>Teaching Labs &amp; Simulation</td>
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#### Research Lab
- Student Engagement
- “Workplace of Future”
- Office
- Private

#### Collaborative Space
- Social Hub

#### Clinic
- Interprofessional

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<th>10%</th>
<th>20%</th>
<th>30%</th>
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</table>
**FLEXIBLE FLAT FLOOR**

- **Flexible space for teaching, community outreach**
- **25-30 Assignable Square Feet**
- **100-120 Seats**
- **24-32 Weekly Room Hours**

**Small Group Active Learning**

- **25-30 Assignable Square Feet**
- **40-60 Seats**
- **24-32 Weekly Room Hours**
GROUP STUDY / PBL

GRADUATE PROGRAMS

SMALL GROUP COLLABORATION AND PROJECT WORK

30–50 Assignable Square Feet

6–10 Seats

24–32 Weekly Room Hours

UNDERGRADUATE CLASS LABS & RESEARCH LABS

EARLY EXPOSURE TO BASIC TECHNICAL AND COMMUNICATION SKILL DEVELOPMENT

CLASS AND RESEARCH LABS

35–75 Assignable Square Feet Per person

16–24 4–10 Seats

24–32
CASE STUDIES

1. OAKLAND U HUMAN HEALTH BUILDING
2. UNIVERSITY OF MICHIGAN BIOLOGICAL SCIENCE BUILDING
3. UNIVERSITY OF PENNSYLVANIA NEURAL & BEHAVIORAL SCIENCE BUILDING
4. VIRGINIA TECH INS FOR CRITICAL TECH & APPLIED SCIENCE II
5. OAKLAND UNIVERSITY ENGINEERING CENTER
6. UNIVERSITY OF MICHIGAN DEARBORN ENGINEERING LAB BLDG.
7. CU BOULDER, SYSTEMS BIOTECHNOLOGY BUILDING
8. UNIVERSITY OF MISSOURI, COLUMBIA BOND LIFE SCIENCES BLDG.
Oakland University Human Health Building

160,000 GSF
1. OAKLAND U HUMAN HEALTH BUILDING

2. UNIVERSITY OF MICHIGAN BIOLOGICAL SCIENCE BUILDING

3. UNIVERSITY OF PENNSYLVANIA NEURAL & BEHAVIORAL SCIENCE

4. VIRGINIA TECH INS FOR CRITICAL TECH & APPLIED SCIENCE II

5. OAKLAND UNIVERSITY ENGINEERING CENTER

6. UNIVERSITY OF MICHIGAN DEARBORN ENGINEERING LAB BLDG.

7. CU BOULDER, SYSTEMS BIOTECHNOLOGY BUILDING

8. UNIVERSITY OF MISSOURI, COLUMBIA BOND LIFE SCIENCES BLDG.

THE UNIVERSITY OF MICHIGAN

BIOLOGICAL SCIENCE BUILDING

The new Biological Science Building (BSB) represents the culmination of the College of Literature, Science and Arts’ (LSA) long-term vision and initiative to consolidate the Biological Sciences in one area of campus. The 300,000 gsf building, houses classrooms, a 200-seat Active Learning Hall, and research space for the departments of Molecular, Cellular, and Developmental Biology (MCDB) and Ecology and Evolutionary Biology (EEB). Included in the program is a new home for the re-envisioned University of Michigan Museum of Natural History, which will serve as a resource to the University community and region.

SPACE ALLOCATION:

LAB + LAB SUPPORT
1,100 NASF / PI (MCDB)
900 NASF / PI (EEB)

LINEAR EQUIPMENT ROOM (LER)
40 – 50 NASF / PI

CORES
Imaging, Molecular, Vivarium
THE UNIVERSITY OF MICHIGAN
BIOLOGICAL SCIENCE BUILDING

1. OAKLAND U HUMAN HEALTH BUILDING
2. UNIVERSITY OF MICHIGAN BIOLOGICAL SCIENCE BUILDING
3. UNIVERSITY OF PENNSYLVANIA NEURAL & BEHAVIORAL SCIENCE
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8. UNIVERSITY OF MISSOURI, COLUMBIA BOND LIFE SCIENCES BLDG.
To investigate the biological basis of behavior, the University of Pennsylvania assembled psychology, biology and behavioral sciences programs in an interdisciplinary facility. Connected to adjacent building below grade, the Levin Neural and Behavioral Sciences Lab is both an icon and crossroads in this area of campus.

The research labs are a mix of dry computational, behavioral, and wet bench.

SPACE ALLOCATION:

LAB + LAB SUPPORT
1,200 NASF / PI (Behavioral)
900 NASF / PI (Wet Bench)
600 NASF / PI (Computational)

CORES
In adjacent buildings—vivarium
1. OAKLAND U HUMAN HEALTH BUILDING
2. UNIVERSITY OF MICHIGAN BIOLOGICAL SCIENCE BUILDING
3. UNIVERSITY OF PENNSYLVANIA NEURAL & BEHAVIORAL SCIENCE
4. VIRGINIA TECH INS FOR CRITICAL TECH & APPLIED SCIENCE II
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**VIRGINIA TECH INS FOR CRITICAL TECH & APPLIED SCIENCE II**

**CHEMISTRY**

SmithGroup provided precinct planning for more than 600,000 gsf of interdisciplinary research at VT. The plan established preliminary building footprints and massing, relocated parking and proposed onsite, storm water management and a new all-campus path dubbed “Research Walk.”

As the first building in the precinct, ICTAS II provides an interdisciplinary setting for Virginia Tech’s Institute for Critical Technology and Applied Science. Supporting science at intersection of engineering and biology this new 42,000 gsf facility provides advanced laboratories for cross-disciplinary investigation, dedicated collaboration areas, and touchdown faculty offices.

**SPACE ALLOCATION:**

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<td>CORES</td>
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<tr>
<td>CORES</td>
<td>960 NASF / PI (Chem / Physical)</td>
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50 smithgroup.com
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OAKLAND UNIVERSITY ENGINEERING CENTER

Instructional and Research Facility for Four Departments and Two Focus Areas.
- Mechanical Engineering
- Computer Science and Engineering
- Industrial and Systems Engineering
- Biomedical Engineering (new focus area)
- Power and Energy Systems (new focus area)

Support Research Centers
- Fastening and Joining Research Institute (FAJRI)
- Clean Energy Research Center
- Automotive Tribology Center
- Stephen and Rita SHARF Robotics Lab
- Center for Robotics and Advanced Automation
1. OAKLAND U HUMAN HEALTH BUILDING
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Systems Biotechnology Building, CU Boulder

- 330,00 GSF (grew to 400,000 GSF)
- General Fund Building—No ICR Support
  - Supplementary revenue
- Occupants:
  - Dept of Biochemistry
  - Dept of Chemical Engineering
  - BioFrontiers Institute
  - Private Industry Partners
- Administrative Responsibilities
  - Security, Keys, Parking, Loading Dock
  - Facilities Liaison, DI Water Contract
  - Scheduling Events, CR, TL, Conf Rms
  - IT and Classroom AV
  - Landlord to Private Industry Leasees

Systems Biotechnology Building, CU Boulder

- Designed for “Productive Collisions”
  - Thematic Neighborhoods
- Space decisions made by Exec Comm:
  - Chair, Dept of Biochemistry
  - Chair, Dept of Chemical Engineering
  - Director, BioFrontiers Institute
- Core Facilities are fee for service
  - Tissue Culture (Biochem)
  - MRI, NMR (Biochem)
  - Mass Spectrometry (Biochem)
  - X-Ray Deffraction (Biochem)

For more information:
Lee Silbert,
Lee.Silbert@Colorado.EDU
1. OAKLAND U HUMAN HEALTH BUILDING
2. UNIVERSITY OF MICHIGAN BIOLOGICAL SCIENCE BUILDING
3. UNIVERSITY OF PENNSYLVANIA NEURAL & BEHAVIORAL SCIENCE
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8. UNIVERSITY OF MISSOURI, COLUMBIA BOND LIFE SCIENCES BLDG.
**Administrative Structure**

- 230,000 GSF Building
- Funding: ICR/F&A Capture
- Director, appointed by VCR
  - Facilities
  - Event Scheduling
  - IT
  - Fiscal
  - Grant Admin
  - General Admin

Source: Bond Life Science Center - bondlsc.missouri.edu/about/facilities
Bond Life Sciences Building, University of Missouri Columbia

MOU -- PI EXPECTATIONS

- To develop and maintain a vigorous and externally research program
- To cultivate collaborative interactions with other investigators both within and beyond the LSC
- Provide and annual report
- Participate in governance and meetings
- Participate in evaluating the director
**Bond Life Sciences Building, University of Missouri Columbia**

**Administrative Structure**

- Faculty Committees:
  - Policy
  - Personnel
  - Facilities/Lab Operations Group
  - Space and Equipment

- Space

- Equipment

- For more information:

  Karla Carter, Exec Assistant to the director  
  Email: carterka@missouri.edu

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3. Visioning
H-STEM Strategic Themes, Visioning, Goal Setting

1. Strategic Visioning Themes from Survey
2. Visioning Exercise
3. Draft Vision
4. Tomorrow – Goal Setting

MTU VISION STATEMENT DRIVERS FOR H-STEM

Vision
Michigan Tech is a (globally recognized) technological university that (educates students), (advances knowledge), and (innovates) to (improve the quality of life) and to promote mutual respect and equity for all people within the state, the nation, and the (global community).
**STRATEGIC THEMES FROM SURVEY**

**Experience**
- Teaching Excellence, Academic Quality, Culture, New Pedagogies, New Ways of Thinking, Learning and Doing, Remove Physical and Practical Barriers, Schools/Colleges Visibly Working Together

**Collaboration**
- Fostering Interactions, Break-down Silos, Shared Spaces, Combined Research and Education, Cross-disciplinary Discussions, Faculty and Student Interactions

**Impact**
- Medical Advancements, Improve Human Health and Wellbeing, Results Disseminated all over the World, Reputation, Partnerships

**Innovation**
- Interdisciplinary Research, New Approaches, Recognition, Entrepreneurialism, Advancement of Knowledge

**Operations**
- State-of-the-Art Facility, Centralization, Process Improvement, Central Hub Spaces, New Technologies, Infrastructure Alignment, Space Accessibility

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**VISIONING EXERCISE**

This activity will help us reach consensus about H-Stems ideal future. By envisioning the ideal or best-case scenario, a vision statement can be developed.

**Step One:** Review the strategic visioning themes.

**Step Two:** Image five to seven years from now.
1) What is the best-case scenario regarding interactions and/or relationships between stakeholders? – What are the outcomes?
2) Which strategic themes are most critical to building the desired future?

**Step Three:** Report outcomes. We will begin to develop a collective vision about the ideal future. It is this ideal vision that will guide our thinking when we set goals and priorities.
STRATEGIC THEMES FROM SURVEY

Experience
- Teaching Excellence, Academic Quality, Culture, New Pedagogies, New Ways of Thinking, Learning and Doing, Remove Physical and Practical Barriers, Schools/Colleges Visibly Working Together

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SAMPLE VISION STATEMENT (USING VISIONING THEMES)

To create a state-of-the-art facility with centralized operations that will foster internal and external collaborations as a means to increase intellectual output, enhance the student experience, and provide an innovative research environment that creates a shared sense of identity that impacts human health and wellbeing locally and globally.
GOAL SETTING

The next step is to translate the H-Stem project vision into clear achievable goals.

Not every business or university treats goals the same way. In order for us to work together and create H-STEM goals, everybody needs to know where the goal line is. In other words, when you set goals, are you setting goals that are:

1. **Moonshots** (aka, almost impossible to hit)
2. **Challenging** (You’ll hit them 70% of the time)
3. **Focused Effort** (80-95% chance you’ll hit them)
4. **Walk in the Park** (you’ll hit them with ease)

It might not seem important to know this right now, but goals need to be realistic.

---

GOAL SETTING

Each goal needs to support the H-STEM Vision

Know what type of goal you’re setting (Moonshots to Walks in the Park)

First popularized by Intel CEO Andy Grove, this approach has been used by major tech companies like Google, Amazon, Adobe, Dropbox, Slack, and other to align their vision higher-level company goals.

In Grove’s famous manual *High Output Management*, he introduces goal setting by asking 3 questions:

1. **Where do we want to go?** *(What end we want to reach based on identified needs)*
2. **What Challenges do we need to overcome?**
3. **How will I know when we are getting there?** *(what does success looks like)*
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Before engaging in our goal setting exercise, let’s review how survey participants noted the H-STEM project contributing towards each of the following goals.
Student Learning: Integrate instruction, research, and innovation to achieve the student learning goals for undergraduate and graduate programs

- It will provide hands-on learning and interaction space for students and faculty to work together in research and development - learning by doing and solving real problems in a guided, mentored environment.
- The H-STEM complex will provide a centrally located, very research active environment for students to become engaged in basic and applied research related to human health challenges.
- State-of-the-art teaching laboratories for key undergraduate courses (particularly in KIP and BME, which are currently poorly met).
- Collaborative and flexible spaces for researchers to interact with students and other researchers.
- The research performed in H-STEM building will help student learning, knowledge creation and promote innovation.
- Bringing multiple health-related disciplines together under one roof, and breaking down traditional silos, will facilitate the creating of a more multidisciplinary curricula that can be offered more broadly across undergraduate and graduate programs.
- Solving complex societal problems requires an inter-disciplinary effort to develop, translate, and implement solutions. Both undergraduate and graduate education needs to recognize the role of each individual component within a larger context.

Transformative Education: Provide a technologically-rich education grounded in a residential and experiential learning environment

- Provide the framework for shared resources and approaches in a psychical location to bring together cutting-edge research and multiple perspectives to add energy to creative problem solving.
- Both BME and KIP actively encourage undergraduate students to become aggressively engaged in high-tech health care research. This complex will expand those opportunities.
- Discovery-based teaching laboratories.
- Spaces and infrastructure for more undergraduate and graduate research opportunities.
- State-of-the-art labs for research performed by world-class faculty and staff in collaboration with students.
- By ensuring that the H-STEM complex also includes dedicated research and teaching laboratories, we will also ensure that the students are provided with a top-notch, innovative, hands-on, and skills-based learning environment, while minimizing disruption to ongoing research activities.
- MTU is known for hand-on learning approach in its education model, which is further augmented by internships/co-op program as well as building partnerships with the government (both local and national) and industry. This would prepare the students best to treat societal need as the main driver for education and innovation.
Educational Programs: Expand programs in response to social and economic needs and challenges

- Create interdepartmental educational programs to tailor to student needs and interests
- This complex will help to foster inter- and trans-disciplinary research which is critical to solving challenging issues in human health.
- It will provide a rich educational environment allowing students to actively participate in this research and more easily cross traditional departmental boundaries.
- Strengthen existing degrees and programs that are deeply engaged and committed to health, particularly BME, KIP, and Biological Sciences pre-health.
- Create an intersect with these three major programs and some of the others that are more peripherally focused on health.
- Topics like preserving and improving human health, global climate change, and feeding world's hungry population, and bioenergy could be studied.
- By ensuring the accessibility of the H-STEM complex to community partners, we will be positioned to appreciate local social and economic needs/challenges that will complement our understanding of national and international social and economic challenges through our research endeavors.
- The well-being of the society requires a systems-based understanding of the entire complex field. With so many moving parts, changing one parameter impacts other parts in ways that are not well understood. Many more people will become aware of the need to train in systems-wide thinking.

Scholarly Activity: Grow research, scholarship, and creativity

- Provide the pooling of resources to positively build the health research community on campus
- By co-locating the primary departments involved in health research along with other researchers who are engaged in health-related research, the complex will promote interdisciplinary research activity, which is the most fertile ground for solving human health challenges. It will promote the authoring of larger grant proposals consisting on multi-disciplinary teams.
- State-of-the-art facilities to attract more (and larger) NIH grants.
- Upgraded facilities will lead to better scholarship and publications.
- More research by more students and faculty more publications and more research funding more information, knowledge and wisdom
- Primarily by bridging existing gaps between disciplines across multiple colleges. The H-STEM complex has the real potential, if planned appropriately, to launch novel and innovative collaborative research projects by bring together students and faculty from those separate disciplines. With buy in from the upper administration, and incentive structures put in place, the H-STEM complex would facilitate the development of novel, large-scale research programs and funding applications.
- Both graduate and undergraduate research activities will flourish in the H-STEM complex since that is one of the main themes for this initiative.
Economic and Social Development: Promote innovation and development for economic and social progress.

- The intellectual environment focused on human health helps MTU faculty and students, the local health care community and the people in the Copper Country by educating citizens and students and adding energy to the entire community of health care providers and patients.
- Human health research demands a multi-disciplinary approach. The translation of medical technology (i.e., 'bench-to-bedside' research) must involve basic scientists and engineers with a focus on human health. Co-locating these scientists and engineers can promote invention and innovation in a manner that just does not happen currently.
- Opportunities exist for technological innovations in health, and are happening in BME, Chem, and Chem Eng.
- Opportunity to expand to other departments.
- more patents and publications more faculty and students
- more high paying jobs and economic stability
- Innovative and forward-thinking design of the H-STEM space, with an eye to well-being and quality of life of students, staff, and faculty, and to opportunities for entrepreneurship, we would be positioned to make significant contributions to the local, state, and national economy, and to lead health-related community outreach that would foster social progress.
- The facility would likely act as an incubator for venture capital firms, in addition to generating human resources. Both will contribute towards the economic growth.

Community: Cultivate an exceptional academic and professional community

- Creating a physical location to be the focus of health research in the region brings together students, faculty and staff to facilitate the growth and development of the health research community that supports excellence in education and excellence in research
- Co-locating KIP and BME along with appropriate other faculty will lead to an increase in sharing ideas and research concepts that is not cultivated currently on campus due to the dispersed locations of health-related faculty. This will lead to a richer and more diverse academic and professional community.
- With nearly 1 in 5 faculty somehow connected to health research or education, there is an opportunity for this building to serve as a community hub for health research and education (even for those that are not main occupants).
- Those who come here would contribute to build a better world for us and the future generations!
- Again, by dissolving barriers between existing disciplines to encourage interdisciplinary initiatives. This would surely need to include the design of a reasonably large lecture hall that could be used to bring in world leaders in health-related fields to give plenary talks to all stake-holders in the H-STEM complex.
- H-STEM facility would certainly create a critical mass of academics and professionals, by the very essence of it being an interdisciplinary field.
Quality of Life: Ensure a supportive environment for all members of the University community.

- The complex will bring together and co-locate the KIP department that has no common location for graduate students and faculty to interact with one another. The physical proximity of graduate students and faculty allows a stronger sense of identity and community to develop and increases the likelihood of student-student and student-faculty interactions.
- Current health-related research and teaching facilities on campus are sub-par for an institution such as MTU. The new facility will improve the work environment for faculty, staff and students involved in human health research.
- Research in several areas are addressing quality of life issues.
- Happy and successful community
- By ensuring the allocation of common spaces that can be shared by all students, faculty, and staff to decompress, relieve stress, and engage with each other socially throughout the day.
- It is a collaborative effort, involving people from so many parts of the university. It has to be a supportive environment to be successful.

Infrastructure: Provide exceptional services and infrastructure

- There is a desperate need for research space designed for health research that has appropriate air handling, environmental control, vibration control, etc. for completing human health research.
- Current infrastructure for human health research at MTU is in very poor shape. It consists of space that was designed for distinctly different purposes, which leads to infrastructure challenges that are hard to overcome. The new facility, particularly when the animal care facility is included in its design will help to overcome the distractions and challenges associated with the current extremely poor infrastructure.
- This health-oriented infrastructure is overdue. We have reached our capacity to grow and need state-of-the-art facilities (particularly research facilities).
- H-STEM will play a significant role in this goal
- I have highlighted numerous examples above, including common spaces, inviting lobby space, dedicated teaching and research lab space, accessible parking for community partners, state-of-the-art classrooms and a lecture hall, etc.
- State-of-art research infrastructure would catalyze new research projects, including the ability to attract top talent form all over the country.

Michigan Technological University
NEEDS IDENTIFICATION

In two groups, using the survey responses, the trends presented at this workshop and your knowledge of the H-STEM project, record on flip chart paper identified needs. Try to reach consensus in your group on these needs.

EXAMPLE

Student Learning: Integrate instruction, research, and innovation to achieve the student learning goals for undergraduate and graduate programs

• It will provide hands-on learning and interaction space for students and faculty to work together in research and development - learning by doing and solving real problems in a guided, mentored environment
• The H-STEM complex will provide a centrally located, very research active environment for students to become engaged in basic and applied research related to human health challenges

KEY CHALLENGES – SURVEY RESPONSES

Survey responses – Are there other challenges that need to be addressed and noted?

What are three key issues or challenges that should be addressed prior to implementation?

• Maintenance of shared equipment
• Accounting for individual research projects (community gloves vs gloves purchased for this project)
• Maintenance of purity of samples/equipment (means to keep chemicals pure, spatulas and pipettes pure, etc.)
• How to move KIP and BME in their entirety to the new complex
• How to incorporate the ACF into the plan
• Where do we draw the (albeit, fuzzy) line as to what goes into this new building and what does not.
• Scope of the new and renovated building, with priority to depts with proven track record
• Who will control the space, and what will be the role of the new Health Research Institute?
• What are funding level expectations for space (and scaling if new resources become available)? This won’t work if we can’t have some flexibility to respond to needs and funding.
• Space utilization
• Infrastructure development
• Collaboration and innovation
• Dedicated separate research and teaching lab space.
• Facilitating the integration of the new H-STEM complex with local community partners.
• Navigating optimal plans for shared laboratory spaces.
• Facilities should not be starved of cash for initial build out.
• Space feuds will naturally arise within the different units. A mechanism to prevent this is needed.
• Keep a 10-year horizon focus in developing a strategic plan for adding faculty and staff.
WE KNOW WE’VE BEEN SUCCESSFUL WHEN...

Goal Factor 3: How will we know when we are getting there? (what does success looks like)

Possible Factors Include:
• Our student quality, retention, & completion improves
• We see growth in graduate programs
• Academic units are able to enhance learning & research outcomes
• Centralized shared core services provide overarching strategy, policy & operational frameworks
• Embedded administrative units engage in integrated strategy & dedicated solutions coordination across units
• Students graduate with a diverse range of knowledge & skills in H-STEM programs
• Students flow freely across themed spaces as needed for their research and studies
• Faculty readily share, learn, & adopt new interdisciplinary practices, with a focus on constant improvement
• Increase efficiency & utilization by aligning size, research activity & pedagogical needs
• Increase in study & collaborative space builds project based and research based learning
• University receives increased income from new revenue sources
• Brainstorm others factors for the H-STEM complex and record on flip chart paper

GOAL EXERCISE

In two small groups:

Using flip chart paper, write five to six H-STEM goals using the following taxonomy:

Review the H-STEM Vision
1. Where do we want to go? (What end do you want to reach based upon identified needs)
2. What Challenges do we need to overcome?
3. How will we know when we are getting there? (what does success looks like)

After 45-60 minutes, share your responses with the larger group. Look for similarities and difference among the two groups and try to reach consensus one combined set of goals.
GOAL EXAMPLE

To accommodate student learning and scholarly activity, the goal is to develop multi-modal space where learning and research takes place simultaneously. Interdisciplinary space provides resources to perform health and engineering research through implementation. Nodes of themed core equipment which can be easily accessed by all research teams and disciplines and are available for contract research. Faculty & students are supported to incubate and develop their ideas into reality and there is an increase in not just the productivity of research, but also the diversity of projects.

VISION STATEMENT

Create a showcase facility that has a positive impact on health-related research activity and the recruitment of faculty and students.

Put research on display. Support research-based discovery learning. Encourage interdisciplinary through thematic rather than departmental grouping.

Reinforce the MTU culture of collaboration.

Focus new construction on state-of-the-art research & research support space.

Renovate existing space for office & instructional space.