Queen's UNIVERSITY

Future Visioning - School of Computing

November 3, 2020

AECOM | Strategy+

CORE TEAM

Director
Hossam Hassanein

Professor
Juergen Dingel

Professor
Nicholas Graham

Professor
Parvin Mousavi

Executive Director - Finance and Operations
Cormac Evans

University Planner
Tony Gkotsis

School Manager - Administration & Technology
Tom Bradshaw

Information and Technical Analyst
Sara Perosa

OBSERVER TEAM

Dean - Faculty of Arts and Science (FAS)
Barbara Crow

Functional Space Planning Analyst
Darcy McNinch

STRATEGY+ FACILITATOR TEAM

Vice President - Americas Practice Leader
Mark Whiteley

Practice Leader - Western Region
Jill Kurth

Strategist - Design and Analytics
David Tao

Strategist - Engagement
Stephanie Lachaud

STAKEHOLDER TEAM

School of Computing Faculty
Steven Ding
Gabor Fichtinger
Christian Muise
Ahmed Hassan
Ting Hu
David Lamb
Wendy Powley
Amber Simpson
Sameh Sorour
Mohammed Zulkernine

School of Computing Staff
Nancy Churchman
Ben Hall
Doug Martin
Aysha Tayab-Ratsep

School of Computing Graduate Students
Ahmad Nagib
Mary Riad
Alice Santilli
Taylor Smith

School of Computing Undergraduate Students
Shreyansh Anand
Nana Boateng
Danielle Edward
Haadia Mufti
Katie Warburton


Queen's
175
YEARS

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Queen's Research
Queen's University

01 EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

KEY HIGHLIGHTS

- A compelling vision for an operational framework at the Queen's School of Computing.
- A step-by-step, goal-oriented, qualitative, philosophical, identity and mission-based roadmap for the future.
- A space programming methodology and needs assessment triggered by undertaking and achieving the operational goals of the plan.
- Aligned with the School of Computing Strategic Plan's Vision, Mission and Strategic Objectives

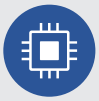
LEARNING

- *Integrate Research in Learning*
- *Grow Enrollment to Meet Economic and Societal Needs*
- *New and Innovative Learning Methods*
- *Expand Interdisciplinary Learning*

STUDENT SUCCESS

- *Industry Engagement & Mentoring*
- *Support for Faculty and Staff*
- *Internships and Career*
- *Equity, Diversity, Inclusion & Indigeneity*

RESEARCH



- *Further Increase Research Quality and Awareness*
- *Invest in Equipment, People, and Partnerships to Expand Research*
- *Integrate Learning in Research*

OUTREACH & ENGAGEMENT

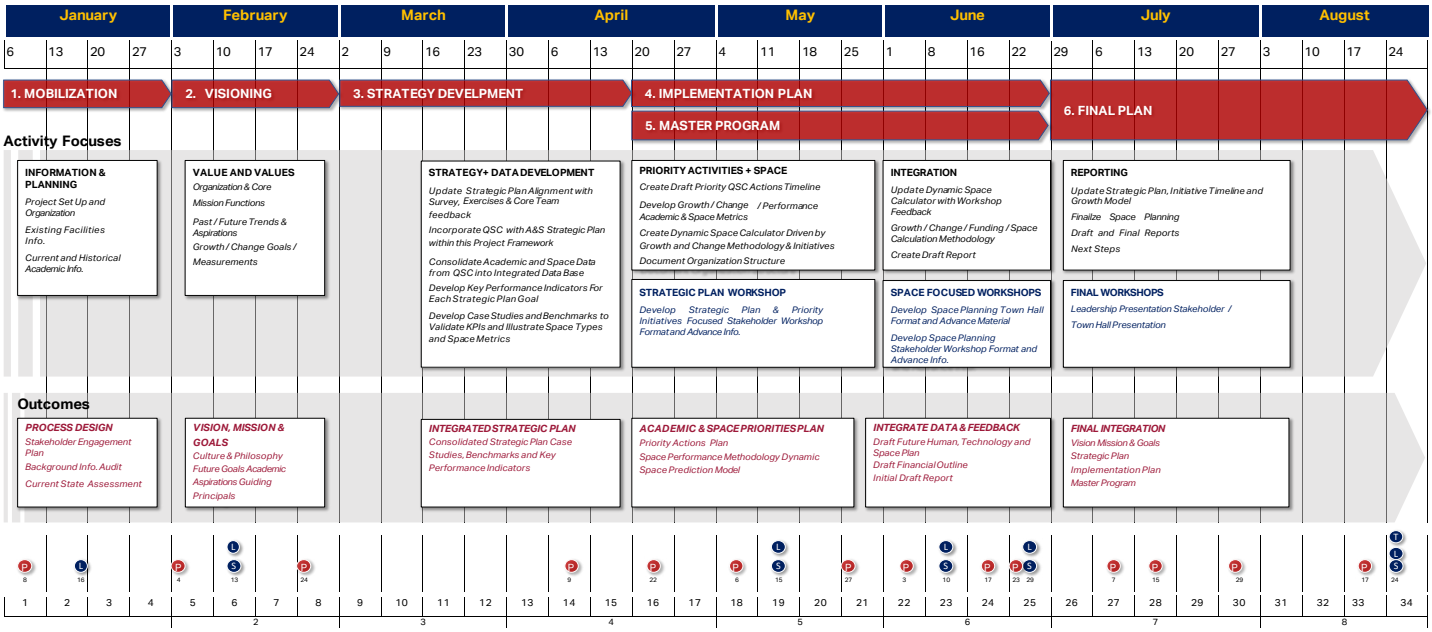
- *Promote Research*
- *Promote Partnerships*
- *Promote Learning*
- *Promote EDII*

INTRODUCTION

On January 16th 2020, the work betweeen Queen's University School of Computing and its Consultant, AECOM Strategy+ began with a Visioning Exercise for an Operational Framework project. The goal of the project was for the leadership and stakeholders of the School of Computing to undertake an inspiring visioning process to imagine an infrastructure and operational framework that enhances research, teaching and internal and external collaborative engagement. The project scope includes a master space programming exercise that would link future operational initiatives with the space needed to achieve their visionary goals.

Extensive engagement with the School of Computing was centered around the development of the vision, mission and strategic objectives of the School of Computing's 2019 Strategic Plan. It resulted in a compelling and inspirational vision, along with qualitative, philosophical, identity and mission-based goals as a depiction of the future.

This report is intended to provide the vision for the future and serve as a tool when undertaking functional programming and assessing space requirements for a new facility.



SCOPE AND PROCESS

The Visioning Exercise for Operational Framework project was undertaken in 6 phases from January 2020 to August 2020.

Phase 1 - Kick Off / Mobilization: Background information, engagement strategy, and kick off meeting.

Phase 2 - Visioning: Definition of vision, mission and goals.

Phase 3 - Strategy Development: priority initiatives developed in detail with goals and outcomes as well as resources required and timeframes for completion.

Phase 4 - Implementation Plan: Growth and priority plan developed into the types of spaces and adjacencies that would be triggered by undertaking each initiative.

Phase 5 - Master Program: Space-needs calculation based on aligning the visionary goals directly with the space allocations.

Phase 6 - Final Plan: Final report outlines the future vision. It contains the initiatives to be undertaken, the resources and time needed and a detailed program.

SCHOOL OF COMPUTING

World-Class Leadership in Research, Training, and Diversity

- Four Canada Research Chairs in Intelligent Systems (three tier 2 and one tier 1)
- Four IEEE Fellows, and two members in the New College of the Royal Society of Canada
- Home to Queen's only NSERC Steacie Fellow
- Pioneered the concepts of intelligent operation rooms, data centres, communication & software systems
- Home of two of Queen's nine NSERC CREATEs in the past decade
- Winners of three Queen's Research Excellence Awards and three Excellence in Graduate Supervision Awards
- Winners of two CS-CAN Life-Time Achievement Awards
- Extensive service to and recognition from IEEE and ACM societies
- Extensive funding from NSERC, CIHR, OCE, ORF, MITACS and industry
- A leader in specialized and general Artificial Intelligence and Data Analytics training
- Excellence in Teaching and Training, including Frank Knox Award for Teaching Excellence and Chancellor A. Charles Baillie Teaching Award
- Queen's University Distinguished Service Award
- Highly popular undergraduate programs (25+% annual increase in demand – making the QSC one of the most selective programs on campus)
- High ratio of female/male faculty (20%) with 75% of our assistant professors being female (the median is 13%) across Canada. Above or at median for non-Caucasian professors
- Highest ratio of female/male undergraduate students (30%) across all Computing departments in Canada
- Leaders in Women in Computing, including championing the "Celebration of Women in Computing" conference

Goodwin Hall

Graduate Lab

CURRENT STATE

The School of Computing has a long tradition of teaching and research excellence in a supportive community fostering fairness, diversity, and respect for individual creativity. The School's mission is to educate computer scientists of the highest caliber and to discover and disseminate new findings from rigorous research that enable, delight, and improve overall quality of life. Operating from a home base at Goodwin Hall, the School of Computing's research and learning operations are spread across 6 different campus and downtown Kingston locations. The department is home to 950 undergraduate students, 137 graduate students, 33 faculty and 21 Staff.

The School of Computing has a long history of interdisciplinary collaborations, especially with colleagues in the Health Sciences, Creative Arts and Faculty of Engineering and Applied Science.

The School of Computing also aims to increase its leadership in intelligent systems. The School continues to grow its network of industry and government collaborations in the Kingston and Ottawa regions while aiming to become a primary resource and leader in applied machine learning in the region. The QSC Office of Research currently has an active role in exploring opportunities in between industry and academia.

There is currently no undergraduate learning home base. We need a future undergraduate and graduate hub for learning in the school

-Faculty, Kick Off

THREATS AND RESPONSES

LEARNING
Raise Quality, Increase Attraction

Threats
- *Scattered student body*
- *No undergraduate or graduate home base*
- *Lack of business courses*
- *Insufficient preparation in professional presentation skills and tools*
- *Outdated lecture and lab spaces don't facilitate new modes of teaching*
- *Declining Queen's overall ranking*

Responses
- *Expand research and project-based undergraduate curriculum*
- *Expand high quality on-line offerings*
- *Maximize graduate student-to-faculty ratio and introduce new graduate programs*
- *Provide space for project, design, research and fabrication activities*
- *Provide support to Faculty and TAs to develop new forms of learning delivery*

STUDENT SUCCESS
Improve Proactive Support Activity

Threats
- *Lack of improved academic resources*
- *Lack of improved career preparation and advice*
- *Lack of access to resources which encourage equity, diversity, inclusion, and indigeneity*
- *Absence of a cultural, social and academic "hub"*

Responses
- *Improve mental health support*
- *Strengthen equity, diversity & inclusion through faculty / staff / student training*
- *Improve academic and career mentoring*
- *Improve faculty and staff career development plans and resources*
- *Increase and improve student support, and academic spaces*

THREATS AND RESPONSES

Threats faced by Queen's School of Computing were identified through engagements with faculty, staff and students. Through this plan, the School of Computing will respond to these challenges and thereby greatly increase their excellence in learning and research.

Learning: Although the School has been a pioneer in blended learning, most in-class learning takes the form of the traditional lecture. Many courses meet the student demand for applications-based, research- focused and hands-on learning, but current facilities do not support these styles of in-class learning for large classes. These demands can be addressed by providing faculty and TA training, wider celebrations of teaching excellence, developing new undergraduate work related / research curriculum, expanding online capabilities, aligning consistent material and delivery across all courses, optimizing student-to-faculty ratio and aligning these with new space types. It is also important to engage more intensively with alumni and industry for mentoring, projects and internships.

In addition, the School has reacted to enforced distance learning in response to COVID-19 time by developing new collaborative learning styles based on industry-standard tools that can be used by large numbers remotely. The ideas which were most successful will be adopted for use after the University has fully re-opened.

Student Success: Feedback from students highlighted the need for increased access to targeted support

THREATS AND RESPONSES

RESEARCH
Improve Process, Raise Quality and Volume

Threats

- *Declining enrollment in graduate studies*
- *Lack of coordinated infrastructure investment and management*
- *Future decline of research productivity, quality, and research funding*
- *Lack of research and career development*

Responses

- *Increase interdisciplinary and collaborative research, internally and with industry partners*
- *Invest in modern and flexible facilities to remain competitive and enable growth*
- *Maximize graduate to faculty ratio, through aggressive recruitment*
- *Focus on hiring and training diverse and high quality faculty*
- *Invest in high achievers within the department*
- *Introduction of new graduate programs (AI, Biomed, Cybersecurity)*

OUTREACH & ENGAGEMENT
Improve Awareness and Perception

Threats

- *Insufficient industry and alumni and community engagement capabilities and activity*
- *Insufficient marketing and advertising*
- *Decreasing national and international reputation and ranking*
- *Insufficient research funding*

Responses

- *Increase departmental events and hosting of major conferences*
- *Enhanced communication structure and increased marketing activity*
- *Increased nominations to national leadership awards*
- *Increase fundraising activities, emphasizing industry and alumni engagement*

for students, faculty, and staff. This vision highlights an opportunity to create dedicated support for their students in equity, diversity, inclusion, & indigeneity, careers and academics. In addition, investing in the career development of faculty and staff will directly strengthen student success. The insufficiency of non-scheduled student study spaces will also need to be addressed to support future academic and student initiatives.

Research: A competitive research enterprise relies on excellent faculty and staff, state-of-the-art infrastructure, maximizing graduate student enrollment and optimizing research productivity and quality.

Moving forward, QSC is committed to the recruiting and developing high quality new faculty and optimizating the activities of its research office and technical staffing. Aggressive graduate recruitment, coupled with growth in professional certificates will occur. A commitment to improving knowledge dissemination will enable the growth of internal interdisciplinary research funding. Building on this goal externally through increased alumni and industry engagement will raise research income by the 20% growth identified in the QSC 2019 Strategic Plan.

Outreach & Engagement: Strengthening promotional activity through the development of an enhanced marketing and communication structure will increase engagement with potential hires and student enrollment, as well as increasing activity with industry, alumni, and the general public.

Future activity will address QSC's lowered ranking through increasing publications, leadership of large grants, and conference visibility. The School also aspires to host major national and international conferences as a means to build on its success of the CSearch and Canadian Celebration of Women in Computing conferences. The School plans to also increase fundraising activity with alumni and industry partners.

PLANNING FRAMEWORK

EQUITY, INCLUSION + DIVERSITY

COLLABORATIVE PARTNERSHIPS

ACCESS TO KNOWLEDGE

PROMOTION OF EXCELLENCE

SHARING OF PEOPLE, TECHNOLOGY + SPACE

OPERATIONAL EFFECTIVENESS

VISION: GUIDING PRINCIPLES

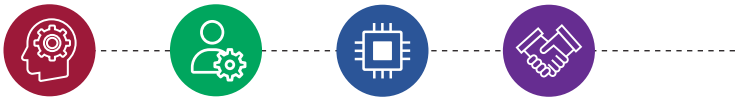
LEARNING
Enrich the Student Experience

STUDENT SUCCESS
Preparing & Engaging Students for the Future

RESEARCH
Strengthen our Prominence

OUTREACH & ENGAGEMENT
Engaging and Diversifying our Community

VISION: INITIATIVES FRAMEWORK



Enriching the classroom experience through hands-on applications-based learning, involving research, industry and other disciplines. Increase graduate enrollment.

Engage and enhance student, faculty, and staff support by leveraging existing University capabilities and bolstering QSC support in Careers, Academics, Wellness, Equity & Diversity.

Optimize and expand research activities, leveraging internal and external partnerships and optimizing investments in technology and human resources.

The strengthening and development of capabilities and activities focused on promoting our reputation and improving our excellence.

MISSION: INITIATIVE FOCUSES

VISION AND MISSION

Guiding Principles

The vision for the future of Queen's School of Computing is in the FAS Strategic Plan and the QSC 2019 Strategic Plan. The documents serve as a foundation for the six guiding principles shown above.

Through engaging discussions with the project core team and stakeholders, the six guiding principles were used to inform and develop the four-part Vision and Mission statements of the initiatives framework.

Vision and Mission

Learning: Focusing on enriching the student learning experience through work related pedagogy. Increasing enrollment in graduate studies and internships.
Student Success: Focusing on enhancing student experience beyond the classroom, and developing faculty and staff, especially in the areas of careers, mental healthc and EDII.
Research: Focusing on increasing the quality, productivityc and volume of discovery activities with internal and external partners and targeted hires.
Outreach and Engagement: Expanding engagement activities and awareness of the excellence of the school through strengthened communications and marketing operating structures.

FUTURE INITIATIVES

PLAN IMPLEMENTATION

Strategic Goals and Initiative Tactics
Further discussions with the core leadership team, faculty, staff, and students yielded four initiatives for each of the strategic goals and focus. Each of these strategic goals was further developed to identify the tactical activities that would be required to achieve each strategic goal.

Initiative Requirements
The assets and organizational requirements for each strategic initiative to be successfully implemented have also been identified. These include internal and external human resources, university and departmental processes and promotional needs. The space needs for each initiative were also calculated based on the visionary needs, but also with the understanding that they would only be triggered by undertaking the initiative implementation process

Future Development Team
Four development teams have been identified, corresponding to each initiative focus, plus a leadership team. Working with internal and external partners, these teams will collaboratively take the strategic vision into implementation.

	VISIONING EXERCISE FOR AN OPERATIONAL FRAMEWORK - Strategic Focuses and Initiatives			
QSC 2019 STRATEGIC PLAN GOALS	**LEARNING**	**STUDENT SUCCESS**	**RESEARCH**	**OUTREACH & ENGAGEMENT**
1 Become a Global Leader in Research and Training for Intelligent Systems	Research in Learning	Industry Engagement	Support	Promote Research
Ranked in top two computing departments + the leader in applied intelligent systems regionally with an extensive network of industry and government collaborations	New Curriculum UG Opportunities	Mentoring Speaker Series	Knowledge Management Pre and Post Award	Achievements QSC Led Institutes
2 Establish World-Class Research, Scholarship, Innovation and Creative Work	Enrollment and Programs	Faculty / Staff Development	Resources	Promote Partnerships
Ranked in top five departments, through increasing: - h-indexes for all full and Associate Professors by 20% - Number and scope of research partnerships with private sector companies - dollar value of funding from NSERC, CIHR, OCE and other sources by 20%	Increase MSc and PhD New Graduate Programs	Hiring & Training Advancement	Equipment Investment Partnerships Commercialization	Government + Industry Hosting Events
3 Offer an Excellent Graduate and Undergraduate Diversified Education Experience	New Learning Methods	Student Careers	Learning in Research	Promote Learning
Ranked in top 5 computing departments in 5 years. Ranked in top 3 computing departments worldwide in 2 specialty / focus programs. Top medium-size computing department in Canada. Producing trainees that are well sought after. Increasing the faculty complement and number of students at QSC	Innovation Activity Shifts	Internships Careers	Faculty Accessibility Access to Equipment	Rankings Alumni
4 Create an Inclusive, Diverse and Welcoming Environment for our Trainees and Employees	Interdisciplinary Learning	Equity, Diversity, Inclusion, & Indigeneity	Diversify People & Work	Promote EDII
Maintain our leadership as the most diverse computing department in Canada at the undergraduate level. Be in the top 3 computing departments in terms of diversity and EDII at the graduate level	Joint Courses Project-Based Courses	Leadership Integration	Interdisciplinary Hiring	Internal Events Communications
SPACE NEEDS	**Smart Classrooms** **Project / Maker Space**	**Social Space** **Study / Meeting Space**	**Specialist Labs** **Flexible Labs**	**Event Space** **Demonstration / Exhibition**

PLANNING INTEGRATION

The Visioning Exercise for an Operational Framework project develops the goals of the School of Computing's 2019 Strategic Plan into a roadmap of Initiatives which consequently define the future space needs of the school. The table above illustrates how the four goals of the QSC Strategic Plan intersect with each of the strategic initiatives and Initiative tactics.

The left-most column summarizes the QSC 2019 Strategic plan goals. The four columns to the right identifies the corresponding Initiative strategies and tactics for each goal in the four Strategic focus areas:

- **Learning:** Preparing Students for Future Space
- **Student Success:** Enriching the Student Experience
- **Research:** Strengthening our Research Prominence
- **Outreach & Engagement:** Engaging our Community

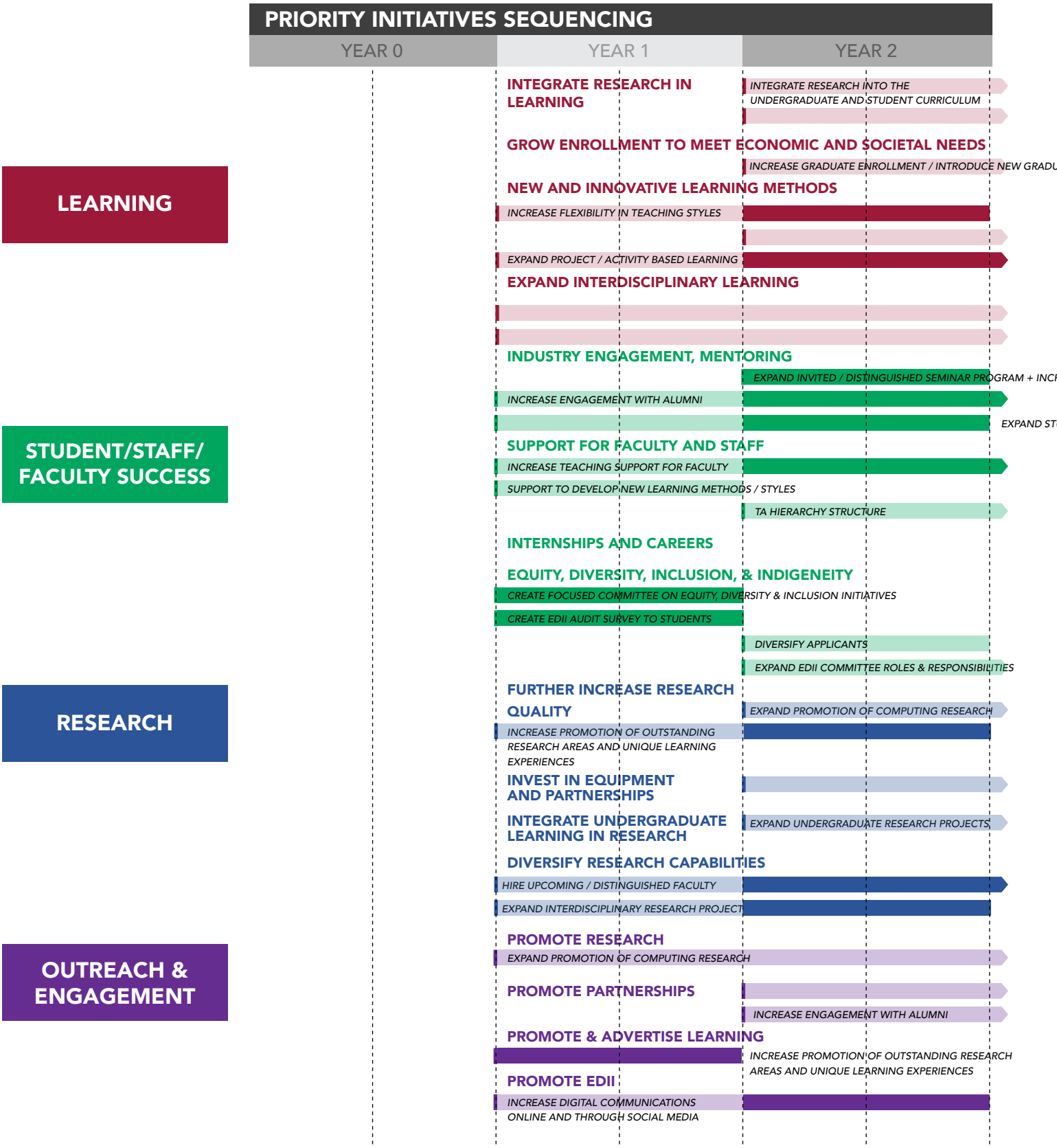
The bottom row summarizes how each space category can directly support the implementation of the Future Vision and Operational Framework and achieving the goals of the 2019 Strategic Plan.

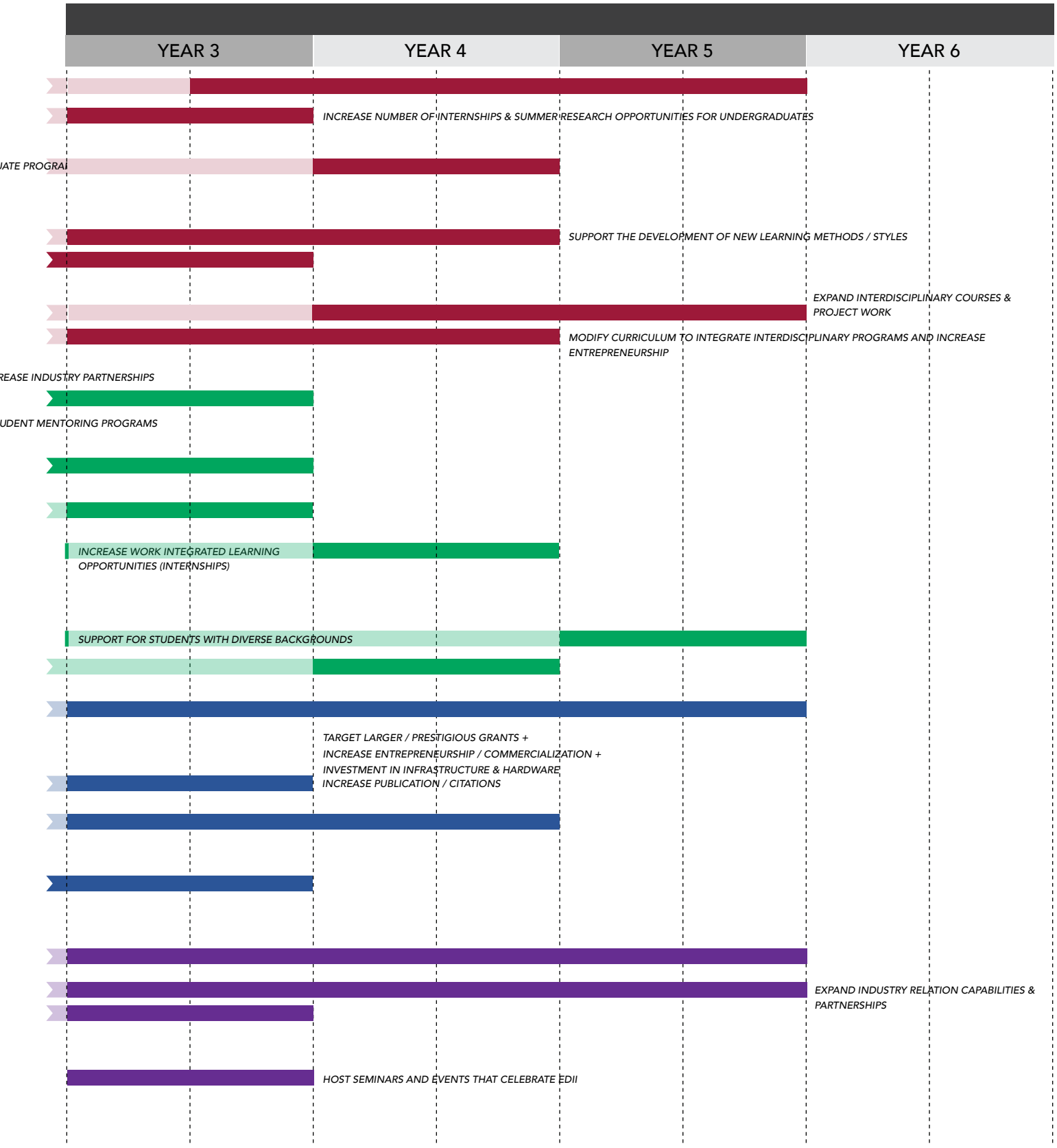
Our current building locations hinder communications and collaborations. We should co-locate people and facilities for the future to allow more opportunities for interactions

-Faculty, Workshop 4

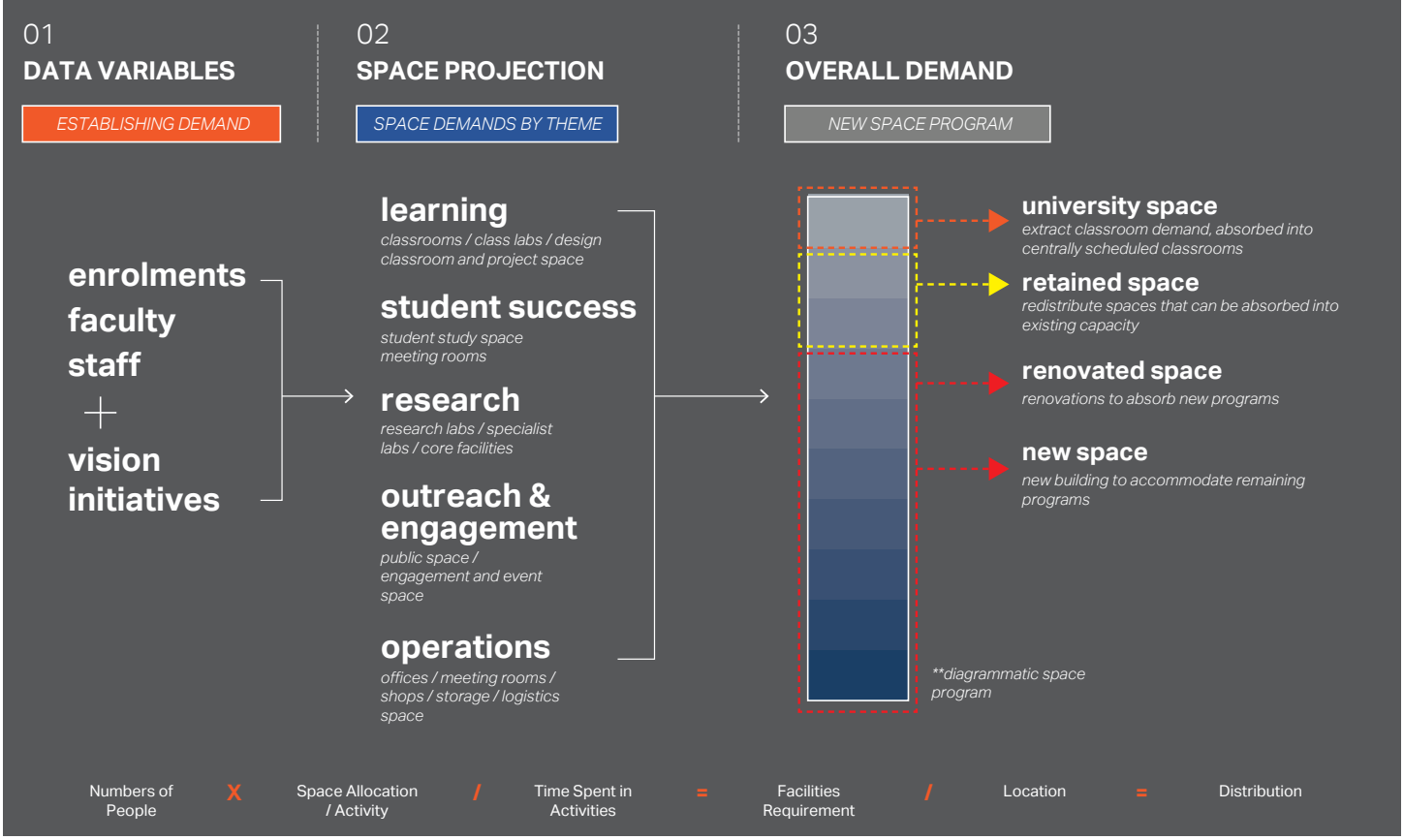
INITIATIVES TIMELINE

The Initiatives timeline that follows each strategic initiative is determined by Queen's School of Computing to what holds priority.




YEAR 3
YEAR 4
YEAR 5
YEAR 6
INCREASE NUMBER OF INTERNSHIPS & SUMMER RESEARCH OPPORTUNITIES FOR UNDERGRADUATES
UATE PROGRAI
SUPPORT THE DEVELOPMENT OF NEW LEARNING METHODS / STYLES
EXPAND INTERDISCIPLINARY COURSES & PROJECT WORK
MODIFY CURRICULUM TO INTEGRATE INTERDISCIPLINARY PROGRAMS AND INCREASE ENTREPRENEURSHIP
REASE INDUSTRY PARTNERSHIPS
UDENT MENTORING PROGRAMS
INCREASE WORK INTEGRATED LEARNING OPPORTUNITIES (INTERNSHIPS)
SUPPORT FOR STUDENTS WITH DIVERSE BACKGROUNDS
TARGET LARGER / PRESTIGIOUS GRANTS +
INCREASE ENTREPRENEURSHIP / COMMERCIALIZATION +
INVESTMENT IN INFRASTRUCTURE & HARDWARE
INCREASE PUBLICATION / CITATIONS
EXPAND INDUSTRY RELATION CAPABILITIES & PARTNERSHIPS
HOST SEMINARS AND EVENTS THAT CELEBRATE EDII

SPACE CALCULATION METHODOLOGY



SPACE PREDICTION MODEL

The space prediction model uses a four-step process to determine the space needs of Queen's School of Computing.

1. **Population:** Student growth projections to 2030, coupled with the associated faculty and staff projections form the basis of the space calculations.
2. **Vision Initiatives:** Space allocations for future activities undertaken by the population are defined by the requirements of each of the Vision initiatives.
3. **Space Demand**: The output of the population, space and time allocations is a comprehensive room-by-room space program for Queen's School of Computing.
4. **Space Allocation:** The space demand is then divided into two areas:
   - A new building will house the future space demands of the School of Computing
   - Centrally scheduled classrooms allocated to the overall university pool

NSM - *Net Square Meter - This is the usable space that is available for furnishing, equipment and personnel*
GSM - *Gross Square Meter - This is the total enclosed area that includes walls, circulation, and back-of-house*

FUTURE SPACE PROGRAM

LEARNING		ALL QTY	AREA/ROOM	AREA (SM)
Classroom - *Seminar*	12	12	36.0	432
Classroom - *Active*	24	10	72.0	720
Classroom - *Active*	48	7	96.0	672
Classroom - *Standard*	96	9	192.0	1728
Classroom - *Lecture*	120	1	192.0	192
Classroom - *Lecture*	200	3	320.0	960
Classroom - *Lecture*	500	1	800.0	800
Teaching Lab	48	1	158.4	158
Teaching Lab	96	1	316.8	317
Comp Lab	48	1	158.4	158
Comp Lab	96	1	316.8	317
Design / Project Space	50	2	225.0	450
Design / Project Space	100	1	450.0	450
Class Support		1	235.2	235
Lab Support		1	185.0	185
Online Teaching				-1021
Subtotal				6753.5

NON-SCHEDULED				
Enclosed Study		10	57.7	577.2
Open Study		3	39.7	119.2
Design / Maker Space		2	200.4	400.8
Media Development		2	11.9	23.8
Subtotal				1121.0

RESEARCH				
Research Intensity 1		3	133.8	385.3
Research Intensity 2		9	92.0	860.9
Research Intensity 3		10	54.3	547.8
Research Intensity 4		14	13.9	190.6
Core Facilities / Shared		2	99.7	199.3
Secondary Equipment Space		0	0.0	0.0
Partner Space		3	43.7	131.0
Testing / Experimentation 1		0	0.0	0.0
Testing / Experimentation 2		0	0.0	0.0
High Bay		0	0.0	0.0
Subtotal				2315.0

OPERATIONS		ALL QTY	PER USER	AREA/RM	AREA (SM)
Office	Faculty	41	11.0	11.0	451.0
Office	Staff Admin	27	8.5	8.5	232.8
Office	Staff Technical	6	8.5	8.5	50.3
Office	Postdoc	25	8.5	8.5	212.5
Office	Student Support	2	8.4	8.4	16.9
Office	Career Service	2	8.4	8.4	16.9
Office **	Shared - Masters	60	2.0	4.0	240.0
Office **	Shared - PhD	50	2.5	5.0	250.0
Open Office **	Grad Students	110	1.6	16	171.5
Work Room	Staff / Faculty	2	1.2	38.0	76.1
Co-Working		2		35.7	71.3
Project Space		0		0.0	0.0
Conference	Small	8		7.9	63.4
Conference	Medium	4		12.7	50.7
Conference	Large	1		25.4	25.4
Media Support / Creation		2		9.9	19.7
Break / Hub		2		37.0	74.0
Mother's Room		2		9.3	18.5
Reception		1		24.7	24.7
Storage / Office Services		1		61.7	61.7
Subtotal					2127.2

PUBLIC / OUTREACH				
Lobby	1		171.2	171.2
Exhibition	1		102.7	102.7
Food Service	1		85.6	85.6
Performance / Showcase	1		128.4	128.3
Subtotal				487.6

** Grad student population work areas are distributed between shared offices and open offices to accommodate workstyle variances

Central Classrooms

SUBTOTAL (NET)	**12,804 NSM**
SUBTOTAL (WITHOUT CENTRAL CLASSROOM)	*7,611 NSM*
PROJECTED TOTAL (GROSS)	**19,206 GSM**
PROJECT TOTAL (WITHOUT CENTRAL CLASSROOM)	*11,416 GSM*

MASTER SPACE PROGRAM

Along with updated current facilities needs, the Master Space Program identifies the priority facilities the School of Computing will need to achieve the requirements of the vision initiatives:

Learning Space: 6,753 NSM
- Design Space and Class Labs: hands-on learning
- Active Classrooms: for research and applications based learning

Non Scheduled Study Space: 1,121 NSM
- Meeting Space for research projects, student study and support

Public Space: 488 NSM
- Lobby and exhibition space for public and industry outreach

Research Space: 2,315 NSM
- Research labs to house growth in faculty and graduate students
- High-bay, drone and testing/experimentation space needed to remain at the forefront of research
- Partner lab space for external collaborators

Operations Space: 2,127 NSM
- Offices, meeting rooms to house faculty, staff and graduate student growth

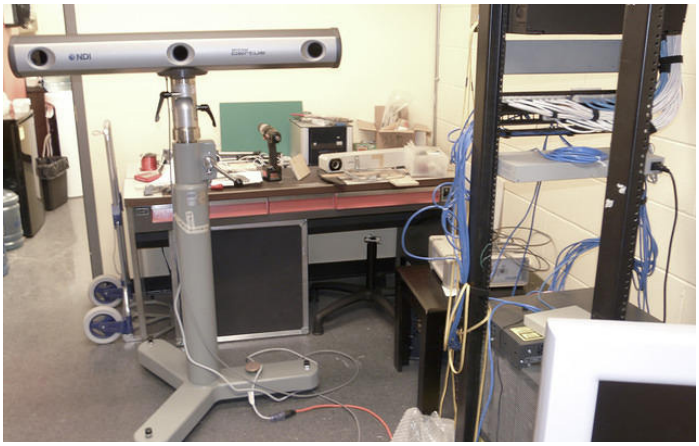
02 INTRODUCTION

INTRODUCTION

Goodwin Hall

Goodwin Hall Graduate Space

Goodwin Hall Lab



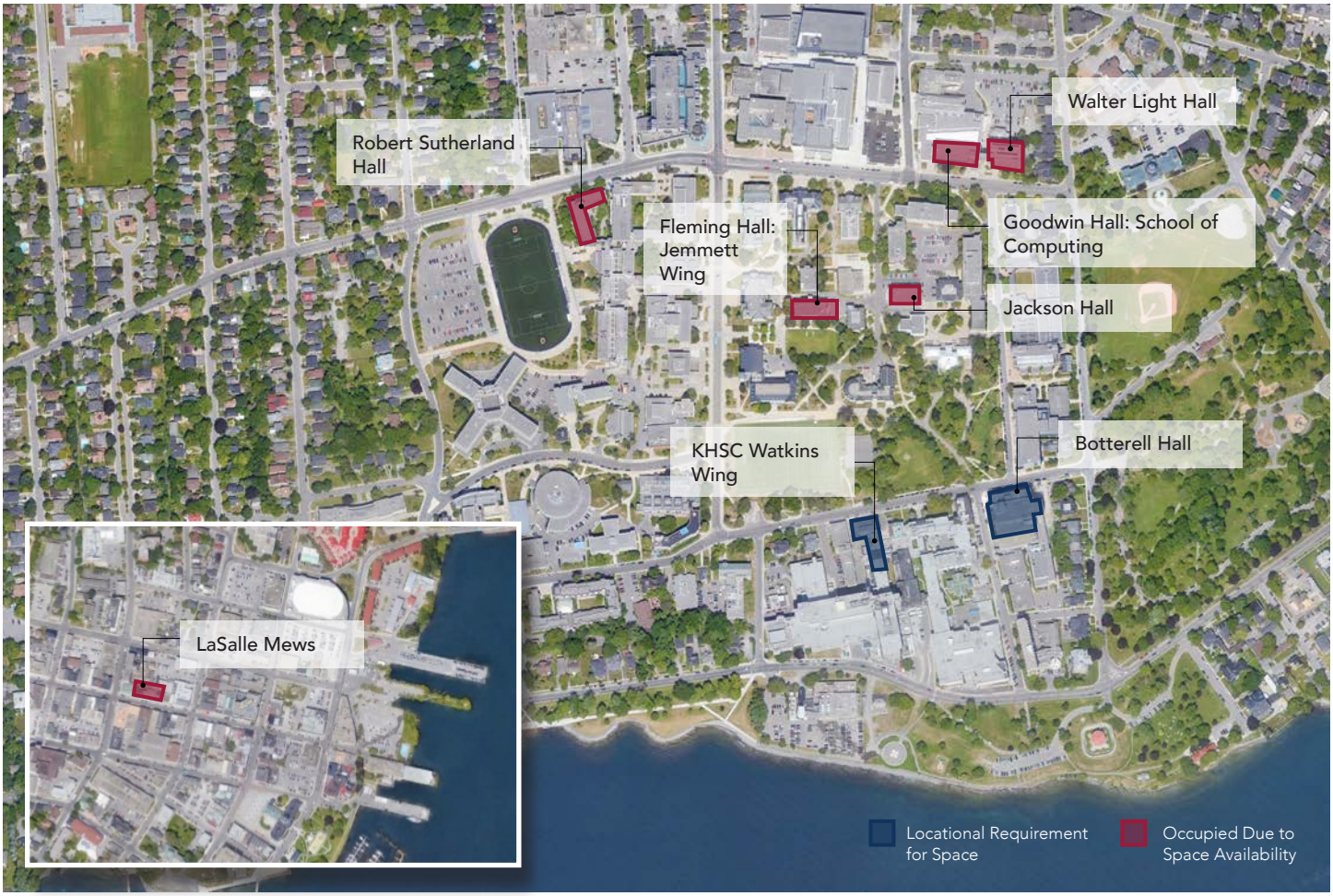
Goodwin Hall Lab

INTRODUCTION

On January 16th 2020, the Queen's University School of Computing together with its Consultant, AECOM Strategy+ started a Visioning Exercise for an Operational Framework project. The goal of the project was for the leadership and stakeholders of the School of Computing to undertake an inspiring visioning process to imagine an infrastructure and operational framework that enhances research, teaching and collaboration. The project scope includes a master space programming exercise that would link future operational initiatives with the space needed to achieve their visionary goals.

Extensive engagement with the School of Computing was centered around the development of the vision, mission, and strategic objectives of the School of Computing Strategic Plan. It resulted in a compelling and inspirational vision to enhance QSC's prominence in learning, research, student support and outreach and engagement. This vision is coupled with qualitative, philosophical, identity and mission-based goals as a depiction of the future.

This report is intended to provide the vision for the future and serve as a tool when undertaking functional programming and assessing space requirements for a new facility.



Kingston Downtown Location

School of Computing Main Campus Locations

The first two chapters set out a detailed implementation plan for the steps the School of Computing has identified to best ensure that their learning and research enterprise thrives and meets the complex challenges of this century. Chapters three and four outline how student services will be strengthened and how outreach and engagement will be enhanced. Chapter five describes the operations support needed to ensure that the goals of the first four chapters are achieved. The sixth chapter presents a sophisticated model which ensures that future space needs are aligned with the visionary goals described in the preceding chapters.

This introduction outlines the scope of the project, the current state of the School of Computing, the development of a compelling vision, mission and guiding principles, and the relationship of this plan to the School of Computing's Strategic Plan, the Strategic Plans of the Faculty of Arts and Science, and the Strategic Mandate Agreement between Queen's University, Ontario's Ministry of Advanced Education and Skills Development.

SCHOOL OF COMPUTING

World-Class Leadership in Research, Training, and Diversity

- Four Canada Research Chairs in Intelligent Systems (three tier 2 and one tier 1)
- Four IEEE Fellows, and two members in the New College of the Royal Society of Canada
- Home to Queen's only NSERC Steacie Fellow
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- Winners of three Queen's Research Excellence Awards and three Excellence in Graduate Supervision Awards
- Winners of two CS-CAN Life-Time Achievement Awards
- Extensive service to and recognition from IEEE and ACM societies
- Extensive funding from NSERC, CIHR, OCE, ORF, MITACS and industry
- A leader in specialized and general Artificial Intelligence and Data Analytics training
- Excellence in Teaching and Training, including Frank Knox Award for Teaching Excellence and Chancellor A. Charles Baillie Teaching Award
- Queen's University Distinguished Service Award
- Highly popular undergraduate programs (25+% annual increase in demand – making the QSC one of the most selective programs on campus)
- High ratio of female/male faculty (20%) with 75% of our assistant professors being female (the median is 13%) across Canada. Above or at median for non-Caucasian professors
- Highest ratio of female/male undergraduate students (30%) across all Computing departments in Canada
- Leaders in Women in Computing, including championing the "Celebration of Women in Computing" conference

SCHOOL OF COMPUTING

POPULATION

Undergraduate Majors	**950**
Masters	**79**
PhD	**58**
Faculty FT	**29**
Academic and Research Staff	**17**
Technical Staff	**4**
Postdoctoral Students	**15**
Service Learners	**1863**

DEGREES

Undergraduate: Fundamental Computation, Data Analytics, Artificial Intelligence, Game Development, Biomedical Computing, Security, Cognitive Science.
Graduate programs include thesis-based Master's (MSc and MBI) and Ph.D. degrees in Computer Science.
PhD in one of the research areas of specialization
Undergraduate Service Teaching: Introductory Computer Science courses that are available to all students at Queen's.

RESEARCH GROUPS

Artificial Intelligence, Biomedical Computing, Cybersecurity, Data Analytics, Human-Computer Interaction and Gaming, Software Engineering, Systems and Networks, and Theory of Computation

CURRENT STATE

The School of Computing has a long tradition of teaching and research excellence in a supportive community fostering fairness, diversity, and respect for individual creativity. The School's mission is to educate computer scientists of the highest caliber and to discover and disseminate new findings from rigorous research that enable, inspire, and improve overall quality of life. The department is home to 950 undergraduate students, 137 graduate students, 33 faculty and 21 Staff.

The School of Computing has a long history of interdisciplinary collaborations, especially with colleagues in the health sciences, creative arts and department of Engineering and Applied Science.

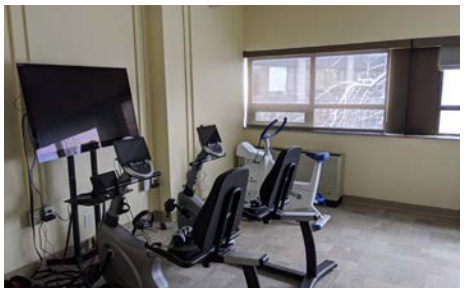
The School of Computing also aims to be a leader in intelligent systems. The School of Computing plans to grow their current network of industry and government collaborations in Kingston and Ottawa region, and become the de facto resource and leader in applied ML in the region. The QSC Office of Research currently has an active role in exploring opportunities in industrial-academic partnerships.

Goodwin Hall - *Departmental Administrative Home - Main Center for Learning & Research*

Botterell Hall - *Computational Biology and Bio Physics Lab*

Fleming Hall- Jemmett Wing - *Drone Lab*

Walter Light Hall - *Teaching Classroom*



Robert Sutherland Hall - *EQUIS Lab*

KHSC Watkins Wing - *Human Mobility Center*

Jackson Hall - *Human Media Lab*

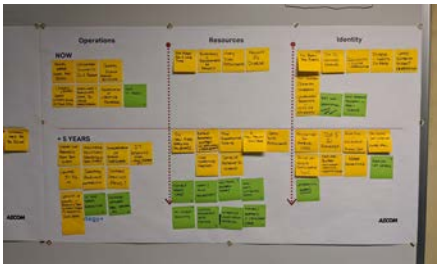
LaSalle Mews - *Software Analysis and Intelligence Lab*

The Queen's School of Computing's main administrative functions, faculty offices, research facilities and classrooms are located in Goodwin Hall, which was built in 1972. The majority of classrooms are held in Jeffrey Hall and Walter Light Hall, but its research facilities are scattered across many other buildings such as Jackson Hall, Botterell Hall, Sutherland Hall, Fleming Hall and KHSC Watkins Wing. Goodwin Hall was built in 1972.

The School of Computing's central local in Goodwin Hall has the following deficiencies:

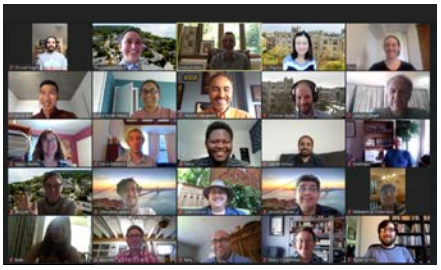
- No room for external and internal events
- Inadequate space for necessary equipment
- Inadequate gathering and collaboration zones
- Inadequate space for graduate students. As the department continues to excel and attract the world's best faculty, students, and staff, these major systems deficiencies, coupled with the limited amount of spaces suitable for the modern research and learning activities envisioned in this plan, point to the need for a major renovation and or new building to create a central hub for the School of Computing

1. https://www.queensu.ca/encyclopedia/g/goodwin-hall

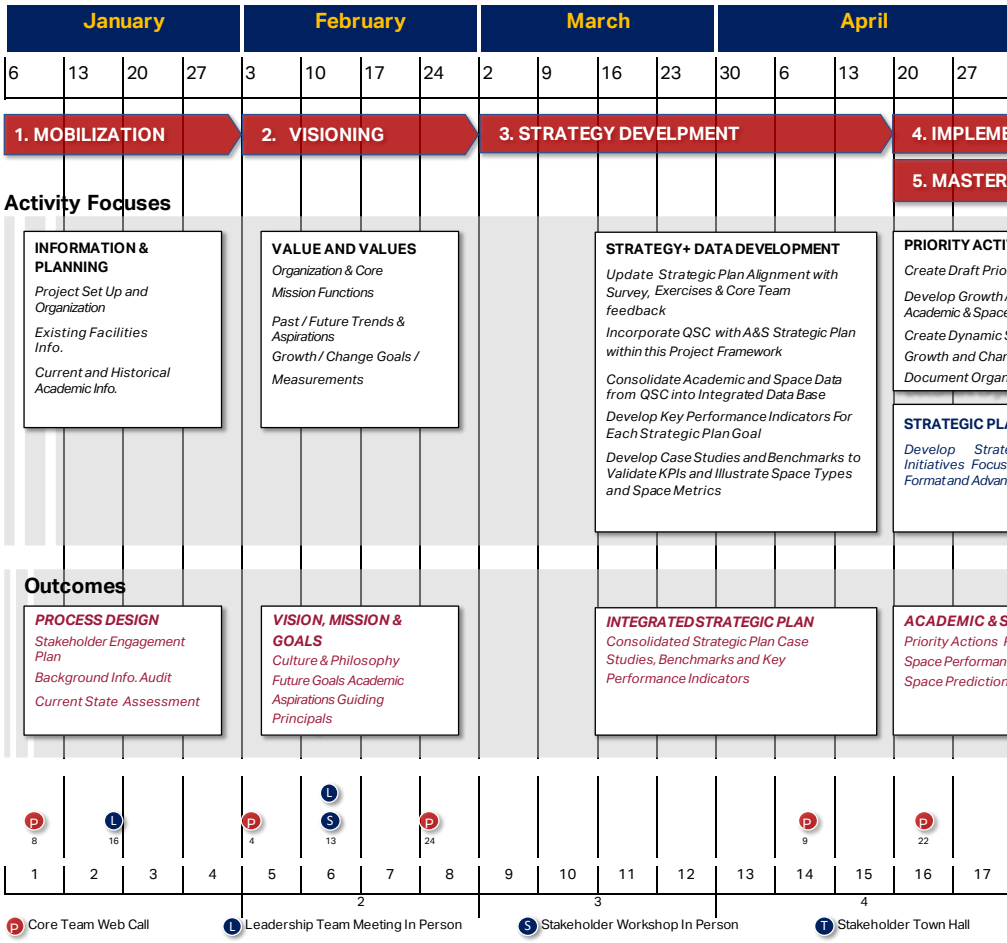


Workshop 1

Workshop 2



Workshop 3



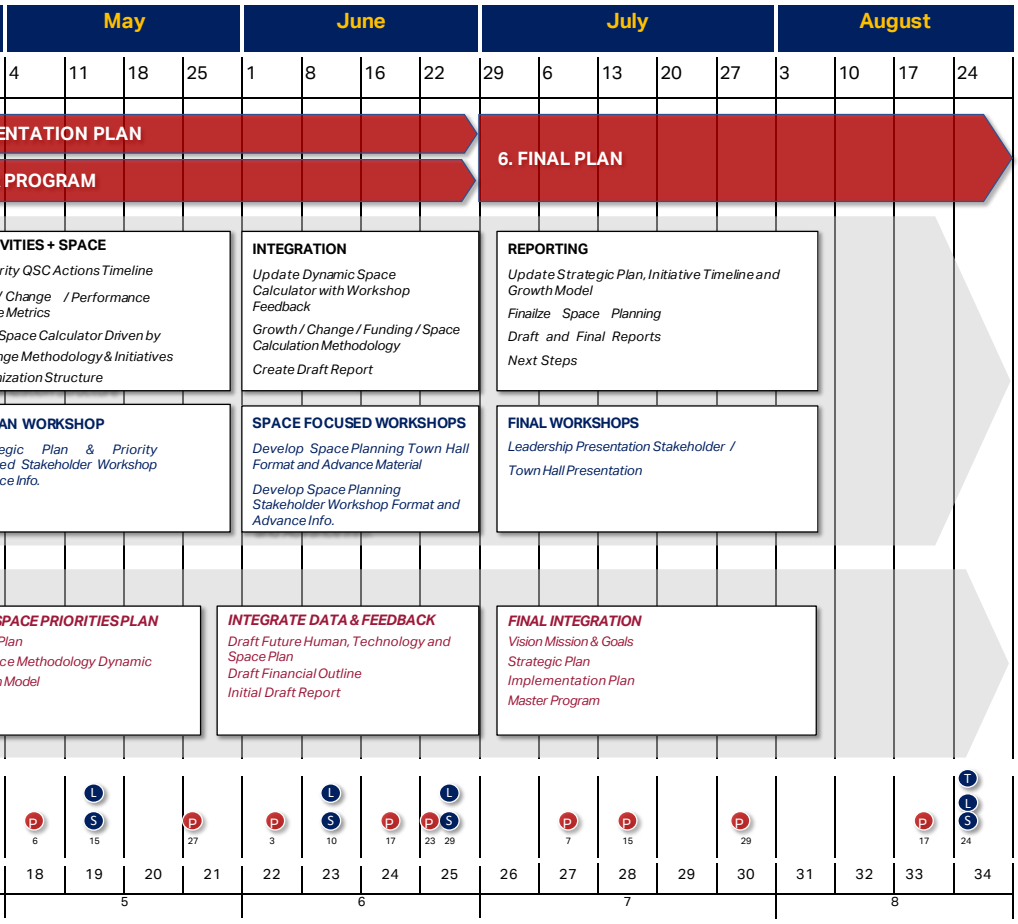
SCOPE AND PROCESS

The Visioning Exercise the Operational Framework project was undertaken in 6 phases from January 2020 until August 2020.

Phase 1: Mobilization
During January 2020 the consultant team gathered background information on the academic structure, programs and assets of the School of Computing. The team also prepared a user-engagement strategy and undertook an initial meeting with the Core team and stakeholders.

Phase 2: Visioning
During January 2020, the consultant team collected the findings of the first workshop and held a second workshop which defined for the School of Computing's major priorities. This workshop also identified School of Computing Strategic Initiatives to align with the visioning process.

Phase 3 Strategy Development:
During February and March 2020, the identified priority initiatives were expanded into further detail. Each initiative was placed in one of four subject areas: Learning, Student Support, Research, and Outreach and each initiative received its goals and outcomes, resources required and timeframes for completion.



Workshop 4

Workshop 5

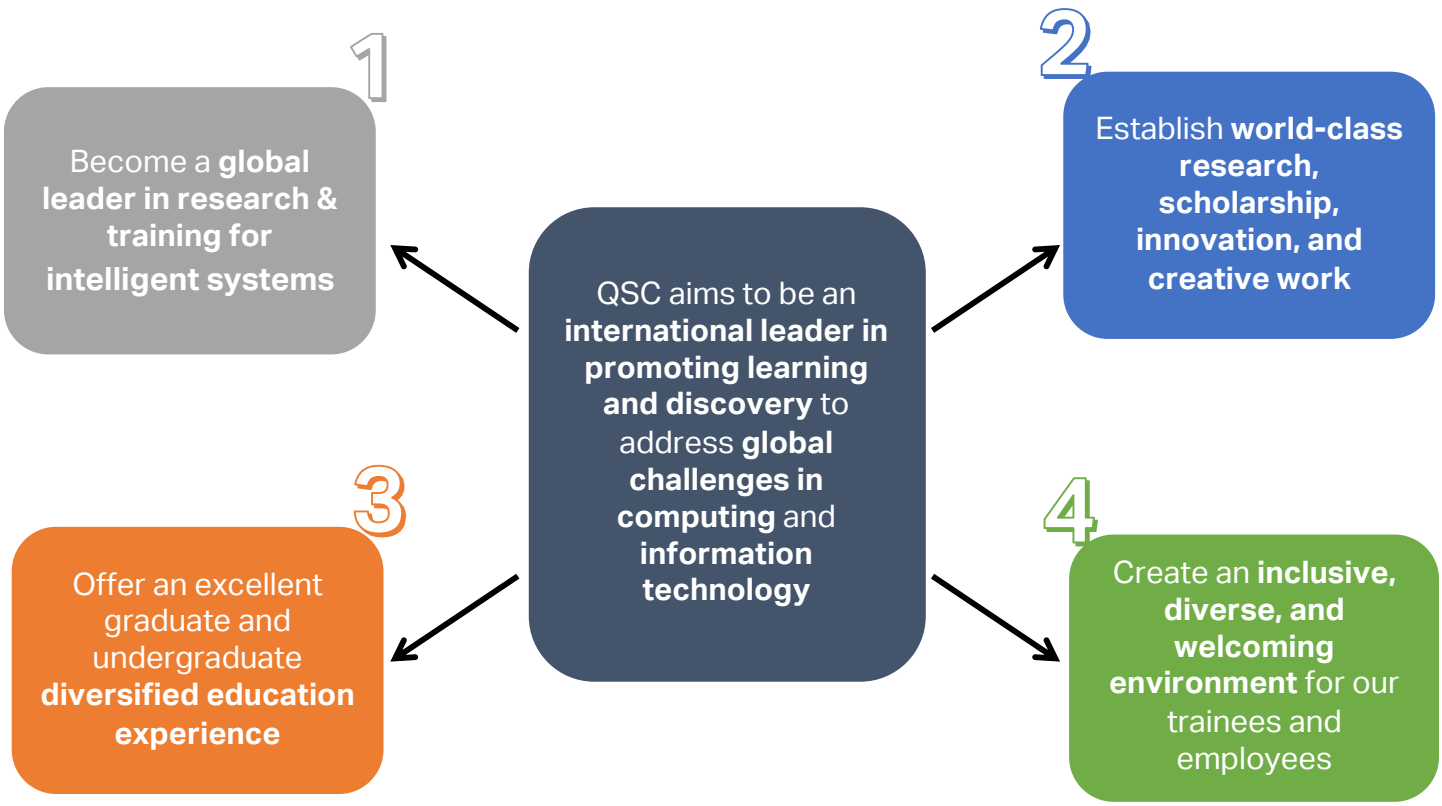
Workshop 6

Phase 4: Implementation Plan:
During April 2020, the growth and change timelines were further developed in detail with the core team and stakeholders. A fourth virtual workshop focused also on the types of spaces that would be triggered by the undertaking and achievement of the each initiative stream. A fifth workshop developed ideas around the groupings of different space types to optimize functional operations.

Phase 5: Master Space Program:
During May 2020, a space needs calculation methodology was developed. This methodology was based on the visionary goals of each of the initiative streams directly with the space types and space allocations needed for them to achieve their goals. Enrollment and population growth projections, together with time spent in designated activities drives the calculated space needs of the future.

Phase 6: Final Plan:
From May to August 2020, a final report was prepared which outlines the future vision for the School of Computing which contains the detailed initiatives the School has agreed to undertake, the resources and timelines needed to undertake the initiatives and a detailed program of the spaces needed to achieve their vision.

SCHOOL OF COMPUTING STRATEGIC PLAN



QSC Strategic Plan

QSC STRATEGIC PLAN

The vision for the future of Queen's School of Computing is founded in the School of Computing 2019 Strategic Plan (shown above).

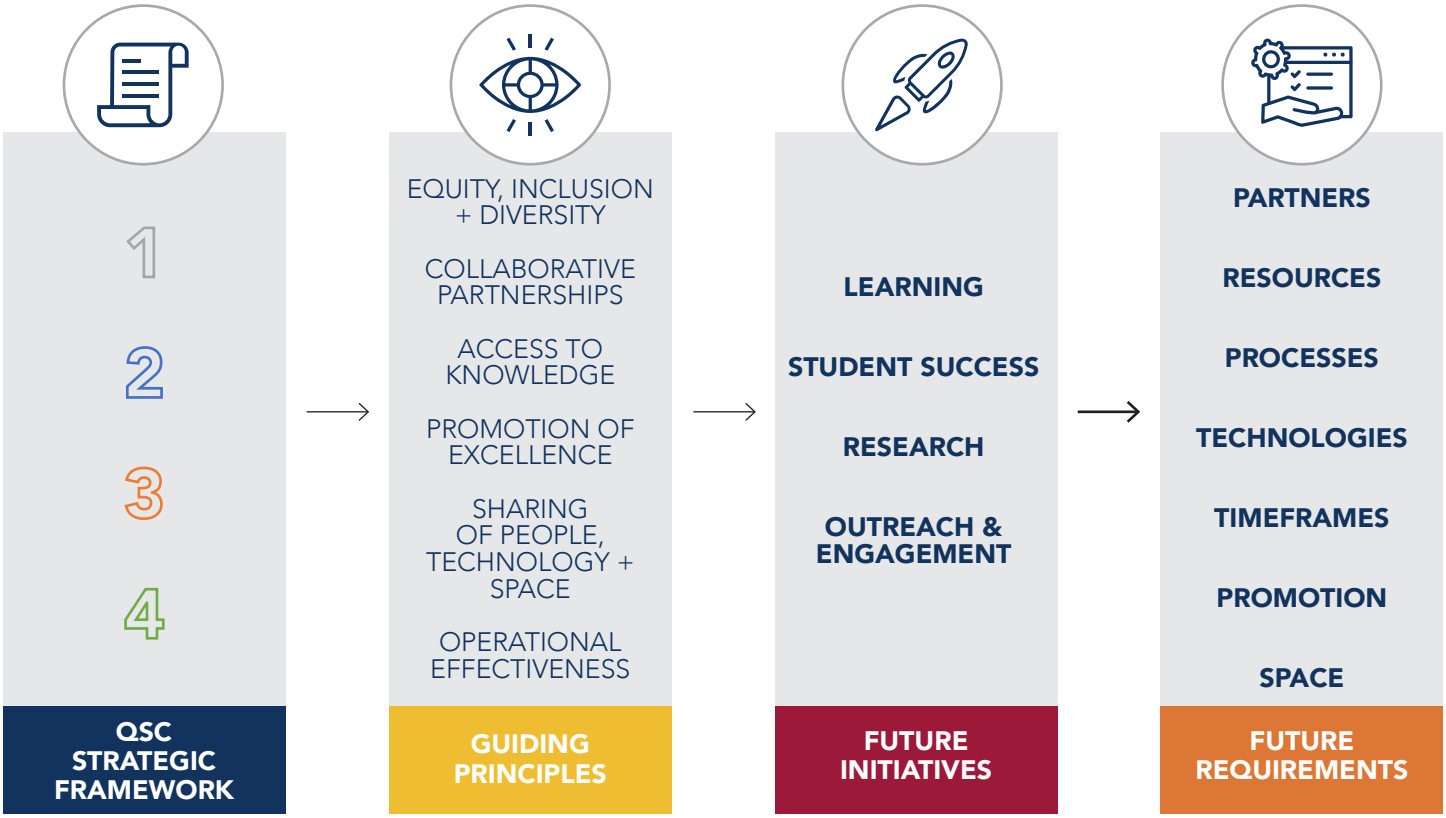
Vision: The Queen's School of Computing (QSC) aims to be an international leader in promoting learning and discovery to address global challenges in computing and information technology.
Mission: To educate computer scientists of the highest caliber and to discover and disseminate new findings from rigorous research that enable, inspire, and improve overall quality of life.

STRATEGIC OBJECTIVES
Education: Deliver exceptional discovery-based experiential learning to students to ensure that they are successful computer scientists and professionals with a well-balanced educational experience.

Develop innovative strategies to educate our undergraduate students with limited faculty. Address opportunities in our graduate programs at the masters and doctoral levels to attract outstanding students, who will be trained to serve in industry, at research centers, in the public sector, and at the very best institutions as tenure track faculty.

Research: Provide impactful solutions to societal challenges through emphasizing a balance of traditional and frontier areas in computer science.

FUTURE PLANNING FRAMEWORK



PLANNING FRAMEWORK

Service: Provide service to Queen's, the Kingston community at large, and Canadians in general. Provide leadership and service to our technical societies for the benefit of the profession and computing education.

Development of the Vision, Mission, and Strategic Objectives enabled the creation of 6 guiding principles for this report.

Equity, Diversity, Inclusion, & Indigeneity: It was recognized early in the process that EDII would be a fundamental part of any initiative considered.

Collaborative Partnerships: Within Queen's and externally with industry, government, and other institutions.

Access to Knowledge: The ability to understand and leverage the knowledge, skills and assets of departments of QSC.

Promotion of Excellence: The need to remain competitive through active external communications.

Sharing: The need to take advantage of collaborative, team-based activities that will raise productivity.

Operational Effectiveness: Identify the opportunities for rationalization of operational and investment processes.

	VISIONING EXERCISE FOR AN OPERATIONAL FRAMEWORK - Strategic Focuses and Initiatives			
QSC 2019 STRATEGIC PLAN GOALS	**LEARNING**	**STUDENT SUCCESS**	**RESEARCH**	**OUTREACH & ENGAGEMENT**
1 Become a Global Leader in Research and Training for Intelligent Systems	Research in Learning	Industry Engagement	Support	Promote Research
Ranked in top two computing departments + the leader in applied intelligent systems regionally with an extensive network of industry and government collaborations	New Curriculum UG Opportunities	Mentoring Speaker Series	Knowledge Management Pre and Post Award	Achievements New QSC Institutes
2 Establish World-Class Research, Scholarship, Innovation and Creative Work	Enrollment and Programs	Faculty / Staff Development	Resources	Promote Partnerships
Ranked in top five departments, through increasing: - h-indexes for all full and associate professors by 20% - Number and scope of research partnerships with private sector companies - dollar value of funding from NSERC, CIHR, OCE and other sources by 20%	Increase MSc and PhD New Graduate Programs	Hiring & Training Advancement	Equipment Investment Partnerships Commercialization	Government + Industry Hosting Events
3 Offer an Excellent Graduate and Undergraduate Diversified Education Experience	New Learning Methods	Student Careers	Learning in Research	Promote Learning
Ranked in top 5 computing departments in 5 years. Ranked in top 3 computing departments worldwide in 2 areas. Top medium-size computing department in Canada. Producing trainees that are well sought after. Increasing the faculty complement and number of students at QSC	Innovation Activity Shifts	Internships Careers	Faculty Accessibility Access to Equipment	Rankings Alumni
4 Create an Inclusive, Diverse and Welcoming Environment for our Trainees and Employees	Interdisciplinary Learning	Equity, Diversity & Inclusion	Diversify People & Work	Promote EDII
Maintain our leadership as the most diverse computing department in Canada at the undergraduate level. Be in the top 3 computing departments in terms of diversity at the graduate level	Joint Courses Project-Based Courses	Leadership Integration	Interdisciplinary Hiring	Internal Events Communications
SPACE NEEDS	**Smart Classrooms** **Project / Maker Space**	**Social Space** **Study / Meeting Space**	**Specialist Labs** **Flexible Labs**	**Event Space** **Demonstration / Exhibition**

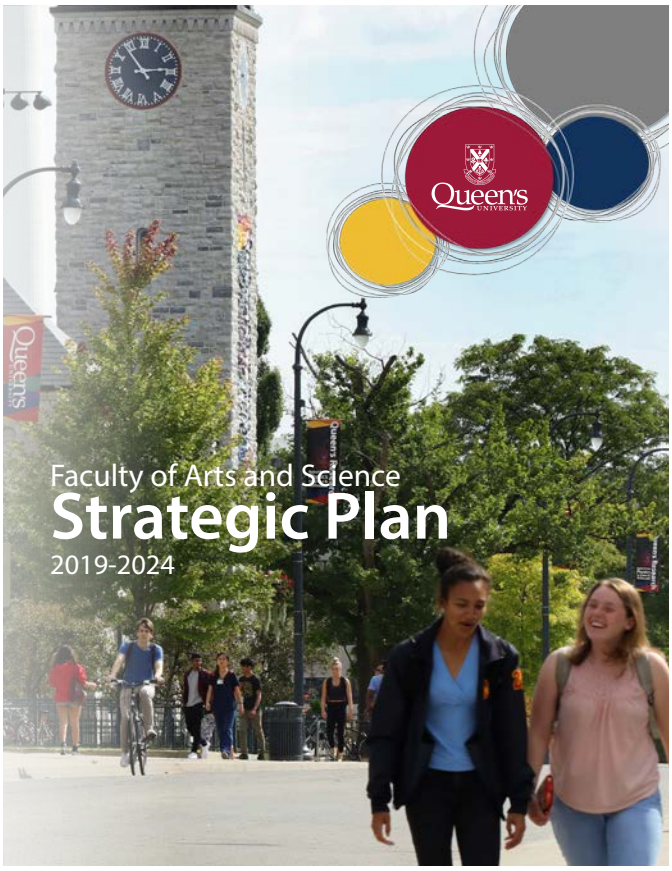
PLANNING INTEGRATION

The Visioning Exercise for an Operational Framework project develops the goals of the School of Computing's 2019 Strategic Plan into a roadmap of Initiatives which consequently define the future space needs of the school. The table above illustrates how the four goals of the QSC Strategic Plan intersect with each of the strategic initiatives and Initiative tactics.

The left-most column summarizes the QSC 2019 Strategic plan goals. The four columns to the right identifies the corresponding initiative strategies and tactics for each goal in the four Strategic focus areas:

- **Learning:** Preparing Students for Future Space
- **Student Success:** Enriching the Student Experience
- **Research:** Strengthening our Research Prominence
- **Outreach & Engagement:** Engaging our Community

The bottom row summarizes how each space category can directly support the implementation of the Future Vision and Operational Framework and achieving the goals of the 2019 Strategic Plan.



Arts + Science Strategic Plan

ARTS + SCIENCE STRATEGIC PLAN

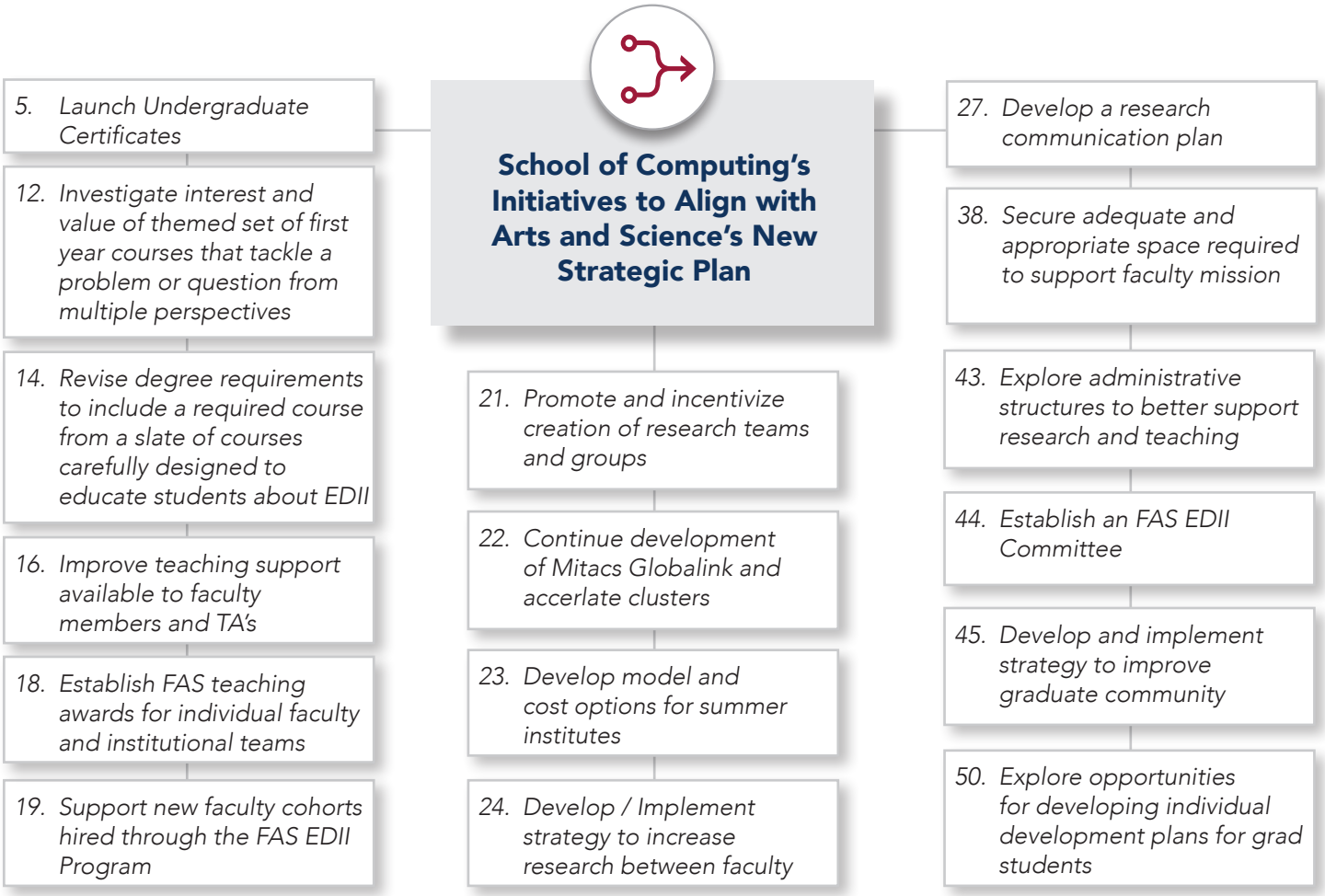
Launched in fall 2019, this plan sets out pathways to strengthening and expanding the Faculty vision in the 21st century. The Strategic Plan provides four guiding principles and four strategic priorities for the 2019-2024 period:

Guiding Principles:

- Equity, diversity and inclusion, including antiracism, decolonization, and Indigenous resurgence
- Excellence in teaching, research, and service
- Transparency, accountability, and fairness
- Continuous learning, professional development, and global engagement

Strategic poriorities, actions, and metrics in place:

Strengthen our research prominence: *Support original, innovative and impactful research and scholarship that promotes curiosity, creativity and social engagement.*
Enrich the Student Experience: *Offer a unique learning environment that fosters a culture of intellectual inquiry and critical thought inside and outside the classroom.*
Transform our space: *Create accessible and inspiring facilities and infrastructures that catalyze learning, discovery, collaboration, and community.*
Support our people: *Build and sustain healthy learning and working environments that foster community, mental health, and well-being.*



*Numbers reflect the ordered list in Faculty of Arts and Science Strategic Plan

QSC ALIGNMENT WITH FAS STRATEGIC PLAN

QSC recognizes the importance and the great value of the current FAS strategic plan. They also recognize that it is important for the department to synthesize with A+S in a coordinated effort to achieve its goals. Queen's School of Computing has listed the following initiative targets to align with the FAS strategic plan.

- *Launch Undergraduate Certificates*
- *Investigate interest and value of themed set of first year courses that tackle a problem multiple perspectives*
- *Revise degree requirements to include a required course from a slate of courses carefully designed to educate students about EDII*
- *Improve teaching support available to Faculty members and TA's*
- *Establish FAS teaching awards for individual faculty and institutional teams*
- *Explore administrative structures to better support research and teaching*
- *Establish an EDII Committee*
- *Develop and implement strategy to improve graduate community*
- *Explore opportunities for developing individual development plans for grad students*
- *Support new faculty cohorts hired through the FAS EDII*
- *Promote and incentivize creation of research teams and groups*
- *Continue development of Mitacs Globalink and Accelerate clusters*
- *Develop model and cost options for summer institutes*
- *Develop a research communication plan*
- *Secure adequate and appropriate space required to Support Faculty mission*

INITIATIVES FRAMEWORK

LEARNING

***Vision**: Preparing Students for Future Success*

***Focus**: Integrate research in learning, grow enrollment to meet economic and societal needs, new and innovative learning methods, and expand interdisciplinary learning*

RESEARCH

***Vision:** Strengthening our Research Prominence*

***Focus**: Increase research quality and awareness, invest in equipment, people and partnerships to expand research, and integrate learning in research*

STUDENT SUCCESS

***Vision:** Enriching the Student Experience*

***Focus**: Industry engagement mentoring, support for faculty and staff, internships and careers, and equity, diversity and inclusion*

OUTREACH & ENGAGEMENT

***Vision:** Engaging our Community*

***Focus**: Promote research, promote partnerships, promote learning, and promote EDII*

INITIATIVES FRAMEWORK

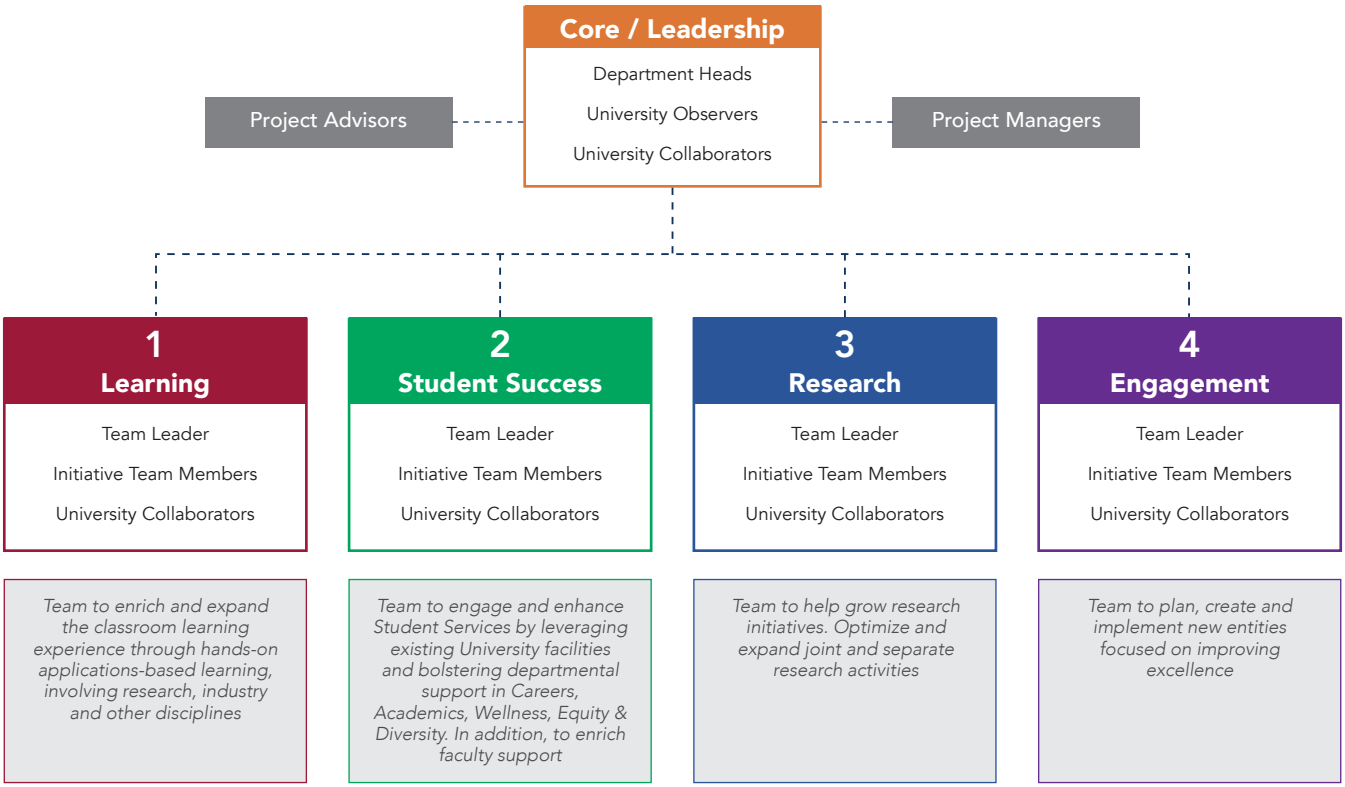
The QSC strategic initiatives and six guiding principles are used to inform the activities contained within each of the four parts of the Initiatives framework.

Learning: Focusing on increasing excellence in the learning experience.
Student Success: Focusing on enhancing the student experience outside the classroom.
Research: Focusing on increasing the quality, productivity and volume of discovery activities.
Outreach and Engagement: Expanding awareness of the excellence of departmental activities in order to recruit the very best students, staff, faculty and partners.

Each of the initiatives will require assistance to ensure success in planning and implementation.

Resources: Existing and future recruits from computing and the university.
Partners: Alumni, industry and government collaborators.
Processes: Changes to university and departmental policies and operational activities.
Timeframes: Definition of realistic periods for initiative planning, execution and maturity.
Technologies: The sharing and investment in equipment, data and software.
Promotion: Support for building internal innovation structures and creating partnerships.
Space: A consequence, driven by undertaking and achieving each of the initiative activities.

FUTURE DEVELOPMENT TEAM



NEXT STEPS

Following completion of this report, the next step will be to identify and mobilize the team members of the Initiative Framework Development Team. This team will be composed of four entities who will focus on the detailed planning, implementation and monitoring of the future initiatives.

Core Team: Comprising the QSC Heads, University Observers and Collaborators from the Arts and Science Faculty Office, Planning, Finance, Student Services and the VP Research Office, who will provide leadership and direction across each of the initiative teams.
Learning Team: Comprising a team leader joint QSC faculty / staff representatives along with curriculum, learning space and pedagogical developers. Ideally it will also include alumni and industry representatives.
Student Success Team: Comprising a team and leader and QSC faculty / staff representatives along with representatives from University Student Services and the Arts and Science Faculty Office.
Research Team: Comprising a team leader and QSC faculty / staff representatives along with representatives from the Arts and Science Faculty Office, and VP Research Office.
Engagement Team: Comprising a team leader and joint departmental faculty / staff representatives, along with representatives from Queen's Office for Partnerships and Innovation, and VP Research Office.

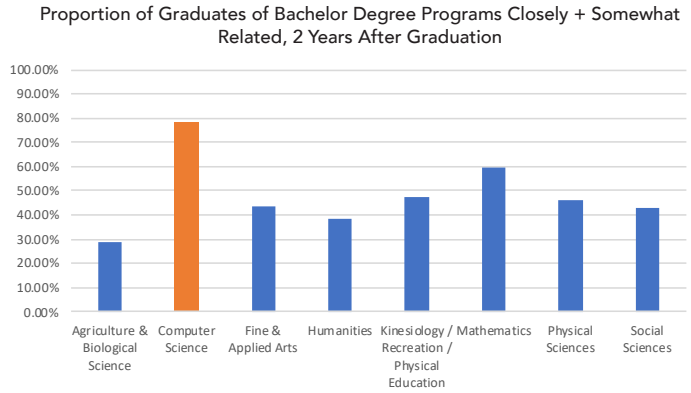
BENEFITS OF INCREASED ENROLLMENT TO THE QSC AND THE FAS

Alignment of the QSC Degree Programs with the SMA3 Metrics

The Queens' School of Computing has entered a phase of growth. Student interest is at an all-time high, rendering Computing one of the most competitive programs at Queen's. Computer science is now a highly interdisciplinary field involving business, the arts, humanities and sciences. It is a hub with the Faculty of Arts and Science and it is only natural that this hub should grow and expand with the increased demand and abundance of opportunities for collaboration.

Recent changes to provincial funding models seek to better align education priorities with current market needs. The degree programs offered by the Queen's School of Computing produce highly skilled, industry-sought graduates with high earning potential. QSC can play a key role within the Faculty of Arts and Science in helping both the Faculty and the University in maximizing our funding potential. It is in the best interest of the Faculty of Arts and Science and the University as a whole to allow the Queen's School of Computing to grow to its full potential.

The Strategic Mandate Agreement 3 (SMA3) defines several metrics on which institutions will be evaluated to determine funding allocations. Maximizing the number of students in key areas, such as Computer Science, will be a strategic move in maximizing our funding potential. Undergraduate degrees in Computing are already strongly aligned with the province's Performance Outcomes in particular, the Graduate Employment Rates, Employment Earnings, Experiential Learning as well as Skills and Competencies and Economic & Community Impact priorities. Increasing the size of the QSC will positively impact all these measures.

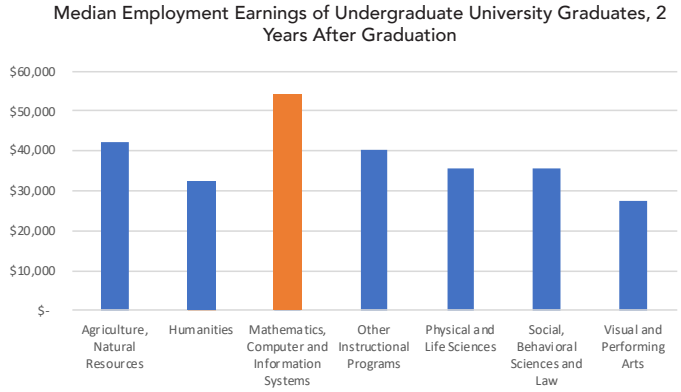


Increasing the number of students in the QSC will increase the overall graduate employment rate of Queen's University
http://www.iaccess.gov.on.ca/OsapRatesWeb/enterapp/home.xhtml

Graduate Employment in a Related Field

Computer Science graduates are highly likely to secure employment in their field after graduation. Based on data from the Ontario Ministry of Advanced Education and Skills Development, in 2016, the 2-year graduate employment rate for Queen's Computing students was 100%, on par with other professional programs such as Medicine, Nursing and Law at Queen's, and by far the highest of all Arts and Science programs.

Over 77% of computer science graduates from 2014 obtained full-time positions that were closely or somewhat related to their studies. This percentage was significantly greater than the average across all fields of study. The data table shows a comparison of the results to other fields of study in the Faculty of Arts and Science.



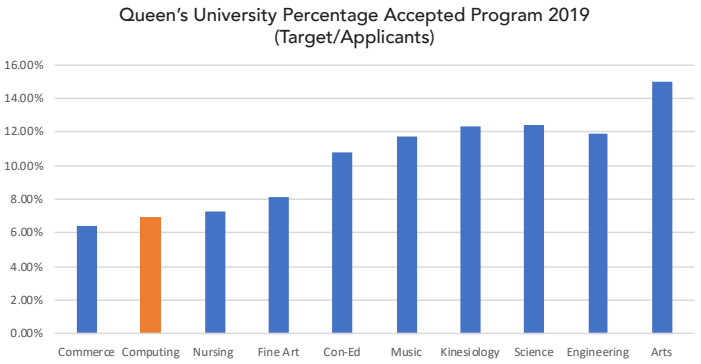
Graduate earnings compared to other fields of study in FAS
https://www150.statcan.gc.ca

Graduate Employment Earnings

Computer science graduates from Ontario Universities have a higher median employment income than other fields of study. According to the most recent (2010-2014 cohort) statistics from the Education and Labour Market Longitudinal Platform (ELMLP) (Statistics Canada), Undergraduate university graduates who studied in the field of Mathematics, Computer and Information sciences earned $54,200, far above the median income for all undergraduate Ontario graduates in other disciplines (and the difference would be even greater now -- 2020).

BENEFITS OF INCREASED ENROLLMENT TO THE QSC AND THE FAS

Alignment of the QSC Degree Programs with the SMA3 Metrics



Queen's acceptance rate by programs in FAS

Queen's University Data

Institutional Strength / Focus

One of the goals outlined in the FAS strategic plan is to strengthen our research prominence. With the expansion of the QSC faculty and the increase in student researchers at all levels, we are poised to provide excellent research outcomes.

Queen's is losing many excellent students due to the difficulty posed on students to enter QSC. The proportion of enrollment in QSC is low compared to other Departments and Faculties at Queen's and other Ontario Universities. The undergraduate program is highly competitive for admissions and as a result, there will be a loss of talented, diverse and qualified students to other Universities.

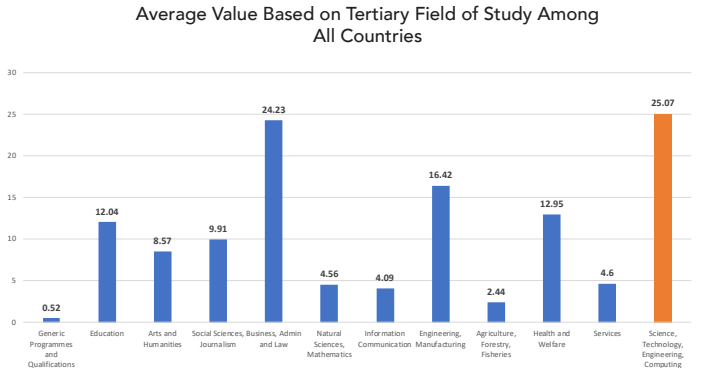
Experiential Learning

The SMA3 identifies the number and the proportion of students who participate in at least one course with mandatory experiential learning. The Queen's University Internship Program (QUIP) has been a key component of the QSC programs for over a decade. Approximately 30% of students go on a 12-16 month internship where they gain valuable industry experience.

Increasing the number of Computing students will increase the overall Experiential learning score of FAS and Queen's as a whole.

Economic & Community Impact

QSC is a significant contributor to Research Funding & Capacity in the FAS. Computing is well funded at all levels of government and has been partnering with large tech companies such as IBM, BlackBerry, and Ericsson for years, with growth in this area expected and encouraged. Looking to community and local impact, from a teaching and research perspective, the School continues to innovate in areas such as autonomous vehicles, 5G networking, and smart city initiatives. This degree of expansion and innovation compliments the long-lasting ties to biomedical computing and the interdisciplinary research at the heart of this.



Skills-based competency exam

http://gpseducation.oecd.org

Skills & Competencies

Skills and competencies will be measured using the Education and Skills Online Tool, Organization for Economic Co-operation and Development (OECD). The results obtained by this test are comparable to the Programme for the International Assessment of Adult Competencies (PIAAC) which measures proficiency in key information-processing skills - literacy, numeracy and problem solving. STEM (Science, technology, engineering, and mathematics) graduates from Universities across the world score higher on this test than in all other fields of study.

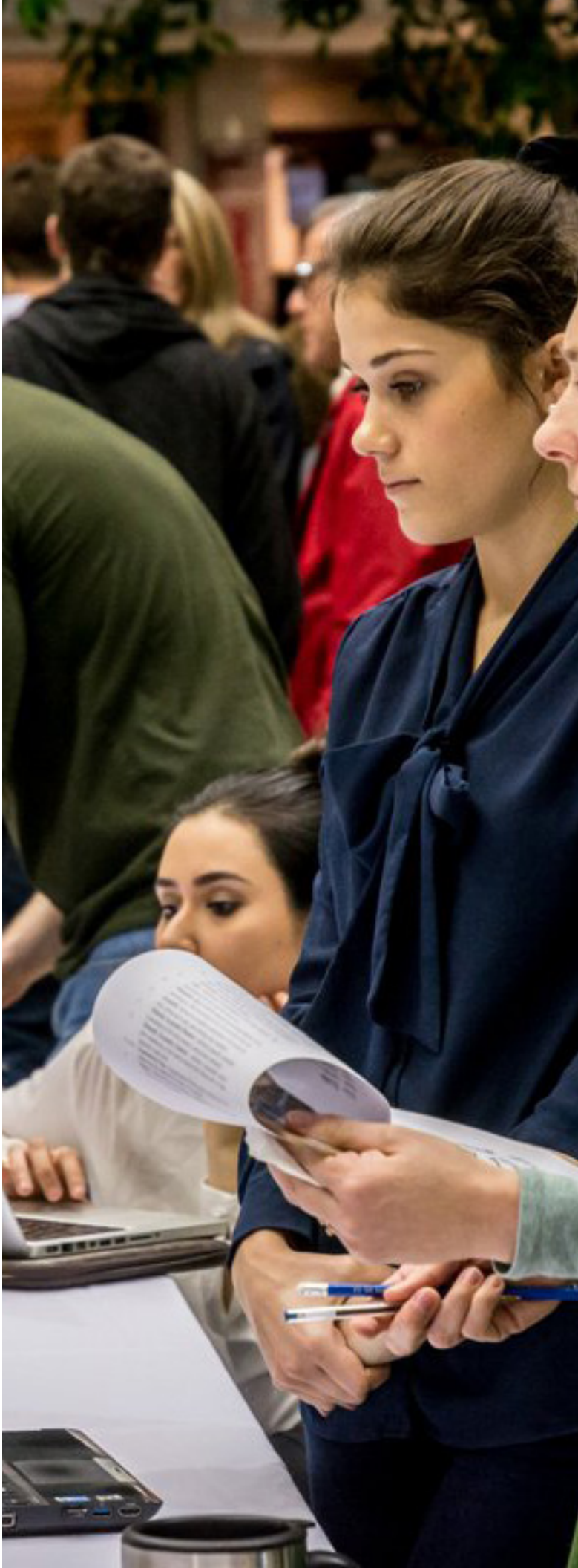
From data collected by the OECD in 2019, the survey found that STEM students scored higher on the skills-based competency exam than students who studied in other undergraduate fields.

Benefits to the QSC and FAS of Increased QSC Enrollment

In addition to contributing positively to the Province's performance outcome metrics, there are a number of important benefits in allowing the QSC to increase its intake of students including the following:

- A high enrollment, coupled with a high admission minimum, signals a successful School, making it more attractive to applicants which, in turn, has a direct positive effect on future enrollment in an extremely competitive market.
- A large population of excellent students has a higher probability of yielding truly exceptional individuals who will, not only inspire their cohort and raise the general academic level, but also go on to garner national and international awards, thereby enhancing the School's reputation.
- A large population of excellent students has a higher probability of producing exceptional student leaders to serve on student government, as well as future inspired industry leaders who will enhance the School's reputation.
- Increased enrollment will increase the likelihood of the School attracting a diverse and inclusive population, as more individuals belonging to minority groups will be encouraged to apply for admission.
- By all indications, Computing is the most influential science due to its transformative impact on every sector of society while also effectively reinventing communication, transportation, education, business, health care, and entertainment. By increasing enrollment in Computing, the Faculty will position itself as a leader, with QSC serving as a powerhouse of exceptional students and exceptional faculty.
- Computing permeates all disciplines, from the traditional natural and physical sciences and mathematics, to the arts, social sciences, languages, and humanities. The QSC strives to break down traditional silos and build bridges to other departments. A healthy population of students in the QSC will create a tremendous synergy conducive to new collaborations, new ideas, and new discoveries.

There is a huge demand for computer scientists. This demand is expected to continue to increase unabated for the next 20 years, eventually reaching a steady state. Simultaneously, there is a decline in demand for other disciplines. If Queen's does not capitalize on this opportunity and claim a prominent place at the table, students will flock to our competitors, and they are many.

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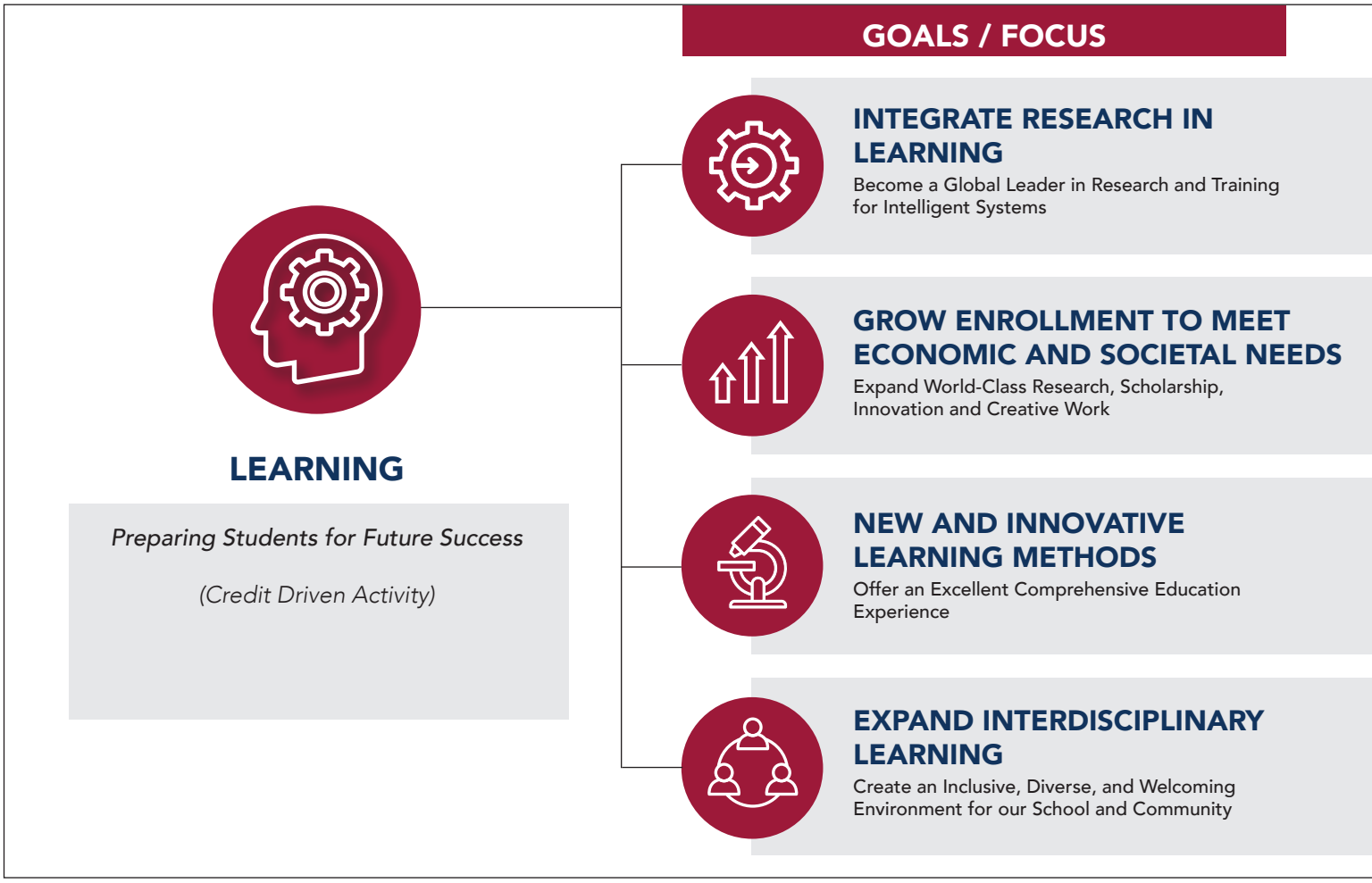
03 LEARNING

LEARNING



INTRODUCTION

Through an engaging visioning process faculty, staff and students unanimously articulated improvements to the quality and variety of the student learning experience as their top priority.

The vision for learning aims to build on the goals of the School of Computing Strategic Plan: become a global leader in research and training for intelligent systems; establish world-class research, scholarship, innovation and creative work; offer an excellent comprehensive education experience; and, create an inclusive, diverse, and welcoming environment for the School and community. The future learning vision is divided into four areas

- Integrate Research in Learning
- Grow Enrollment
- New and Innovative Learning Methods
- Expand Interdisciplinary Learning

These five themes form a framework for the development of strategic initiatives into a series of initiative tactics that define the directions of future implementation.

STRATEGIC INITIATIVES		INITIATIVE TACTICS
F S	***Integrate Research into the Undergraduate Curriculum*** ***Increase Number of Internships & Summer Research Opportunities for Undergraduates***	• *Build on the new undergraduate certificate in data science to encourage research in various discipline* • *Joint Undergraduate and Masters program to encourage undergraduate research and to increase the number of local graduate students* • *Add short term (4-month) internships that will be made available during all terms. Engage with alumni to provide mentoring and development*
F F	***Increase Graduate Enrollment*** ***Introduce New Graduate Programs***	• *Introduce remote, online education offerings, enhance and advertise existing programs* • *Expand offerings in professional degrees and certificates* • *Joint Undergraduate and Masters program to encourage undergraduate research and to increase the number of local graduate students* • *Increase access and awareness for students interested in Intelligent Systems*
S/F S S/F	***Support to Develop New Learning Methods / Styles*** ***Increase Flexibility in Teaching Styles*** ***Expand Project / Activity Based Learning***	• *Increase training initiatives for instructors to learn new teaching styles and new pedagogy. Provide freedom to incorporate activity-based learning. Support research into new learning methods.* • *Transition from practical learning to engaging courses (reduce lecture / independent study). Expand activity-based offerings to all years. Expand lab / design / making component in support of core courses. Align with potential experiential learning mandate.*
F S	***Expand Interdisciplinary Courses and Project Work*** ***Modify Curriculum to Integrate Interdisciplinary Programs and Increase Entrepreneurship***	• *Develop more connections early on in specialized fields e.g. Biomedical Computing in 3rd year. Bridge Creative Arts (drama, art history, film and music) with programming courses and apply them to computing to expand technical skills for the Computing and Creative Arts program.* • *Develop a more flexible course schedule. Improve awareness of courses, programs and certificates through increased advertising. Encourage different specializations in computing.* • *Move courses on ethics, communication skills, and business and entrepreneurship at an earlier time in the undergraduate curriculum (1st or 2nd Year).*

S *Student* **F** *Faculty*

DRIVING PRINCIPLES OF CHANGE

Although there are intersections between the strategic initiatives, each one has been defined with the ability to be achieved independently if necessary. The strategic initiatives are categorized into the following:

- **Integrate Research In Learning:** The development of a team-based curriculum on intelligent systems inspired and informed by research for undergraduates and graduates.
- **Grow Enrollment:** Graduate growth will be accelerated through new online course and program offerings, increased marketing and improved utilization of the graduate student supervision capacity of faculty members.
- **New and Innovative Learning Methods:** Focus on increasing faculty /instructor support to develop new hands-on practical learning techniques featuring design and research, but also utilizing high quality online and digital delivery. Support research into new learning methods. Expand online learning to provide greater flexibility and accessibility
- **Expand Interdisciplinary Learning:** The development of a team-based, research-focused curriculum intersecting health sciences, creative arts, engineering, and other disciplines.

THEMES	PARTNERS	DEPARTMENT RESOURCES
INTEGRATE RESEARCH IN LEARNING	• *Alumni, Industry Partners* • *Queen's Center for Teaching and Learning* • *Queen's Undergraduate Internship Program* • *First Year Academic Coordinator*	• *Interested Faculty + Research Groups* • *Dedicated Staffing Support* • *First Year Academic Coordinator*
GROW ENROLLMENT	• *FAS Faculty Office* • *School of Graduate Studies* • *VP Research Office*	• *Program Development Leader* • *Graduate Steering Committee* • *Marketing and Communications* • *On-line Curriculum and Pedagogy Specialist*
NEW AND INNOVATIVE LEARNING METHODS	• *Alumni* • *Industry Partners* • *Queen's Center for Teaching and Learning*	• *Commitment of Faculty to Relevant, High-Quality Teaching and Pedagogy* • *Expanded Pool of TAs* • *Increase Number of Faculty Hires* • *Curriculum Specialist* • *On-line Curriculum and Pedagogy Specialist*
EXPAND INTERDISCIPLINARY LEARNING	• *FAS* • *FEAS* • *Health Sciences* • *Alumni* • *Industry Partners* • *Business School*	• *Technology Support* • *Increase Teaching Faculty Hiring* • *Curriculum Specialist*

RESOURCE NEEDS

The School of Computing envisions developing and implementing the initiatives expressed in the Learning Vision. To ensure successful completion, each strategic initiative and initiative tactic will require resources and support from within the School of Computing, the Faculty of Arts and Sciences, the University and industry and alumni.

Faculty and staff will be active participants in the development and delivery of these initiatives. The resulting diversion from their regular responsibilities will be taken into account in the planning of the activities.

The above table identifies the people, systems and processes needed for successful completion of the Learning Vision. Most of these initiatives can commence immediately. However, as courses, programs, and enrollment evolve, the limited amount of space will become a deterrent factor in achieving this vision.

Partners: Relevant and effective teaching and learning requires the active involvement from the University and external partners to identify real world case studies, create authentic learning experiences, and develop the curriculum that enables effective learning delivery.

TECHNOLOGY / SYSTEMS	POLICY / PROCESSES	SPACE IMPLICATIONS
• *Centralized Digital Knowledge Management Portal* • *Access to Research Equipment*	• *Research Methodology Training* • *Support and Encourage Summer Schools Inspired by Research Activities*	• *Showcase Space* • *Innovation Hub* • *Partner Meeting Space*
• *Expand Online Digital Delivery Capabilities*	• *Support and Encourage Summer Schools Fueled by Research Activities*	• *Graduate Offices* • *Meeting Space* • *Specialized Graduate Labs*
• *Software and Hardware for Instructors to Test New Learning Methods* • *Investment in Equipment for Making and Designing* • *Improved Audio Visual Equipment in Classrooms and Study Spaces*	• *Establish Teaching-Intensive Faculty Positions* • *Undertake Curriculum / Pedagogy Research* • *Incentivise Faculty to Develop New Techniques*	• *Active Learning Classrooms* • *Media Training Space* • *Project Based Classrooms* • *Design / Maker Space* • *Study Spaces*
• *Improved Audio Visual Equipment in Classrooms and Study Spaces*	• *Introduce New Electives in Ethics, Communications and Entrepreneurship*	• *Collaboration Space with Technology Integration* • *Project Based Multipurpose Space*

Department Resources: Faculty research interests will drive new programs and curricula. However, faculty will need support and training from on-line and in-person learning specialists and new audio visual equipment to develop and deliver new pedagogies and learning outcomes.

Technology / Systems: Access to state-of-the-art equipment and technology will enable undergraduates to effectively learn research methods and actively undertake interdisciplinary, solutions-focused research.

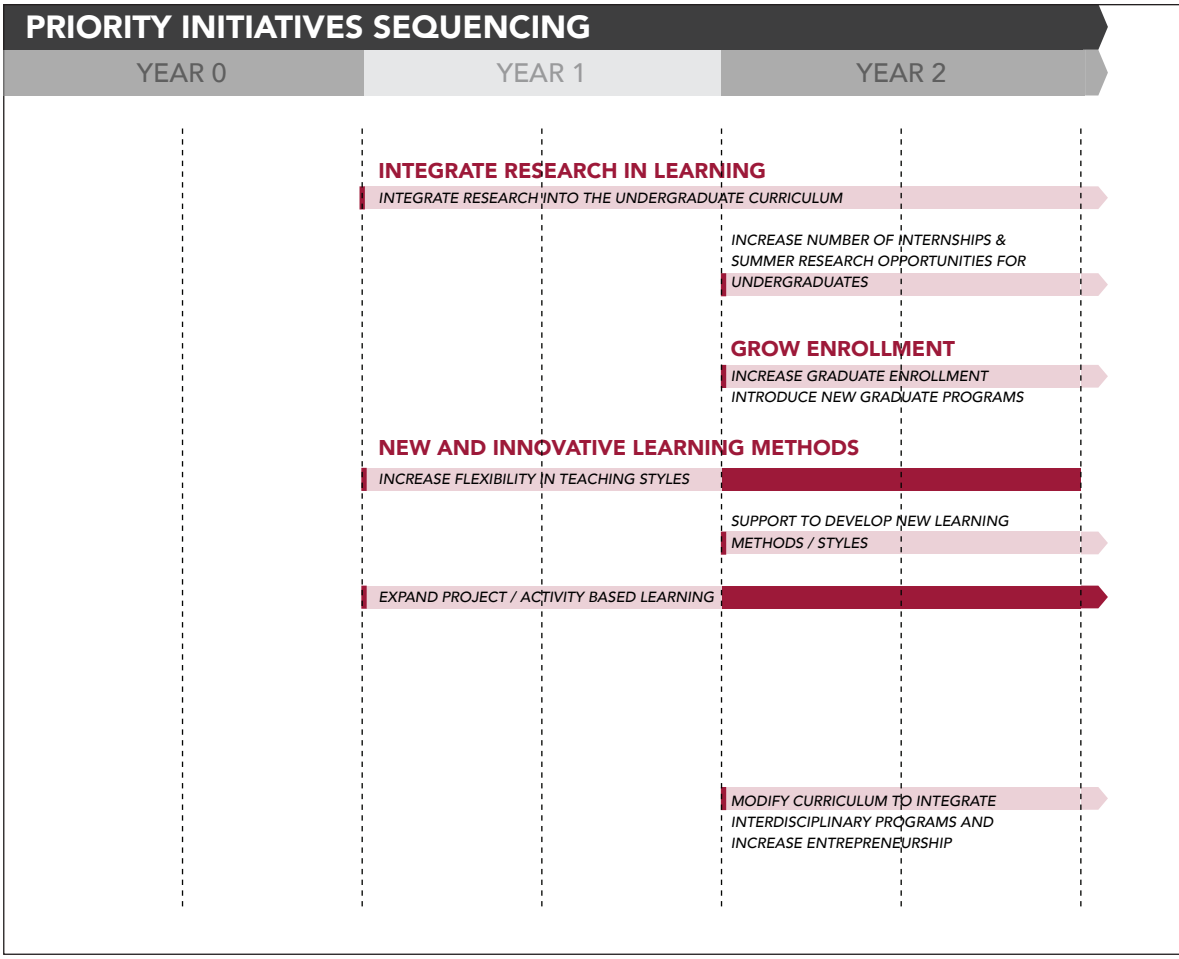
Policy / Processes: Optimizing and growing new methods of online, research-based, mixed-methods and hands-on learning will require shifts and agility in how programs are developed, how funding and resources are applied, as well as new marketing and communications processes.

Space Implications: While existing space may be suitable in the short term, its dispersal across campus, combined with lack of space suitable for design and maker-space activities, as well as project-based learning will inhibit experiential learning and lack of non-scheduled study space will inhibit the growth of leadership and team skills.

LEARNING

Preparing Students for Future Success

(Credit Driven Activity)



INITIATIVES TIMELINE

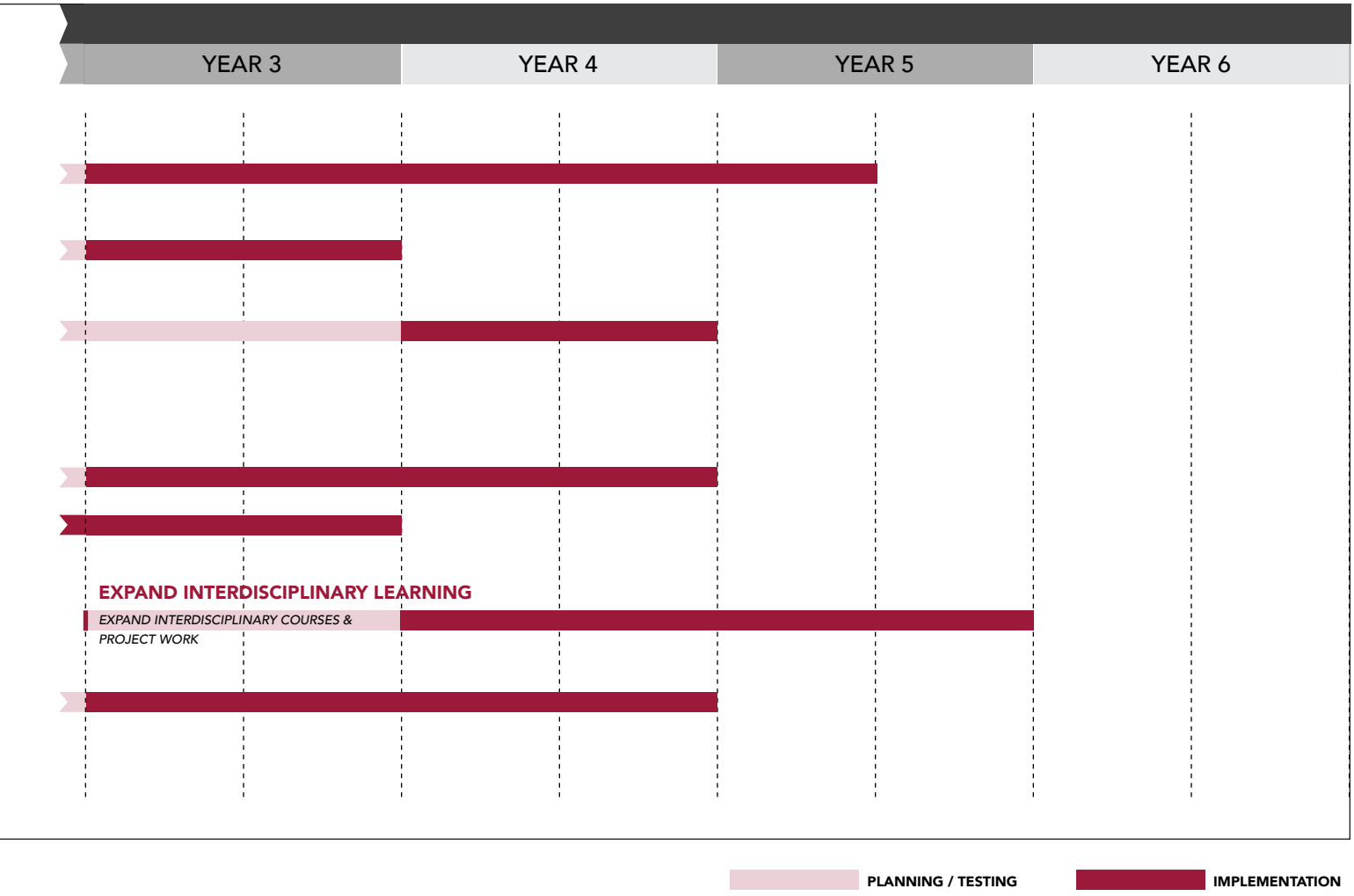
This vision for learning will take several years to achieve. The initiative timeline shown above has been developed with consideration to the limited availability of resources, the requirements of University processes and procedures, as well as the fact that some initiatives require new space to be put in place.

The timeline above is divided into yearly segments but due to the current uncertainty the School is experiencing, we have not specified a start date. Following the mobilization of the Initiative Committee each individual initiative moves through two periods. The light red bars represent the planning and testing phase of each initiative. The dark red bars represent the implementation phase of each initiative. The end of the dark bars indicates that the initiative has entered the normal working processes of the School.

The Learning Initiatives Committee is composed of faculty and staff representatives. This team will lead, manage and develop each initiative. The committee will also engage with and manage other University and School resources needed to develop and implement each initiative.

The learning initiatives consist of the following:

Integrate Research in Learning
Growth in research in undergraduate learning can be integrated into the curriculum almost immediately, although testing and determining the optimal distribution



and assignment of space may take time. Once in progress, development of internships and summer research opportunities can start. Although the School has been a pioneer in blended learning, most in-class learning takes the form of the traditional lecture. Many courses meet the student demand for applications-based, research- focused and hands-on learning, but current facilities do not support these styles of in-class learning for large classes.

Increase Number of Graduate Students
Although this can occur almost immediately by further increasing the student/faculty ratio, effective sustained growth will require faculty hiring and the strategic expansion of the School's offerings.

New and Innovative Learning Methods
Although the expansion of experiential learning can be undertaken almost immediately, the full development of project-based learning and design programs will require new space.

Expanded Interdisciplinary Learning
Introduction of this initiative in existing programs can be undertaken almost immediately. However, it will take 2-3 years to establish new programs in collaboration with other schools, departments, existing programs and alumni.

Currently QSC is excelling at integrating health, art and music with its programs.

INITIATIVES DRIVING SPACE

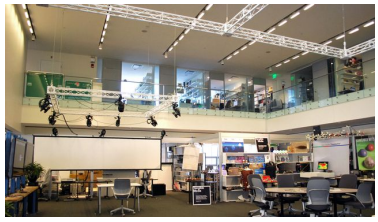
Learning Focus Areas

- Integrate Research in Learning
  - *Multi-Purpose, Large Scale Assembly Space*
  - *Multi-Purpose Project / Innovation / Making Space*
- Grow Enrollment
  - *Graduate Lab Space / Offices*
  - *Meeting / Seminar Spaces*
- New and Innovative Learning Methods
  - *Media Development Space*
  - *Online Learning Capabilities*
  - *Smart Classrooms*
- Expand Interdisciplinary Learning
  - *Black Box Performance, Visualization Space*

Multi-Purpose Large Scale Assembly

Project / Innovation / Making Space

Media Development Space



Graduate Research Lab / Office

Smart Classroom

Black Box Performance / Visualization

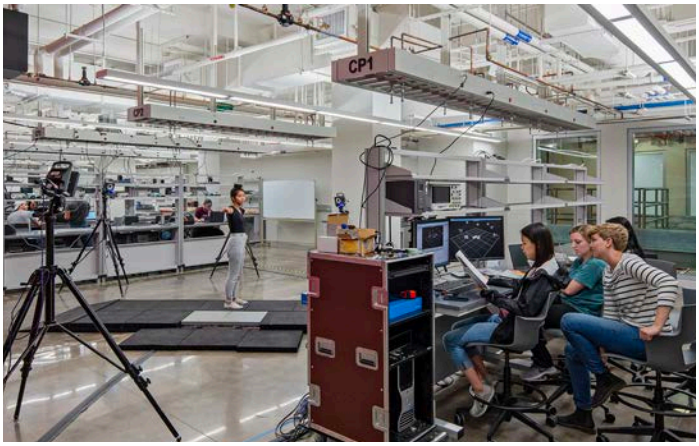
INITIATIVE FOR SPACE

Each strategic initiative provides an opportunity to create a collaborative environment that enhances the learning experience. The chart above illustrates how the development and implementation of visionary initiatives drives the need for new and innovative learning space characteristics.

Each of the learning initiatives highlighted by the School of Computing have a corresponding collaborative learning type that can host and support the needs of the initiative.

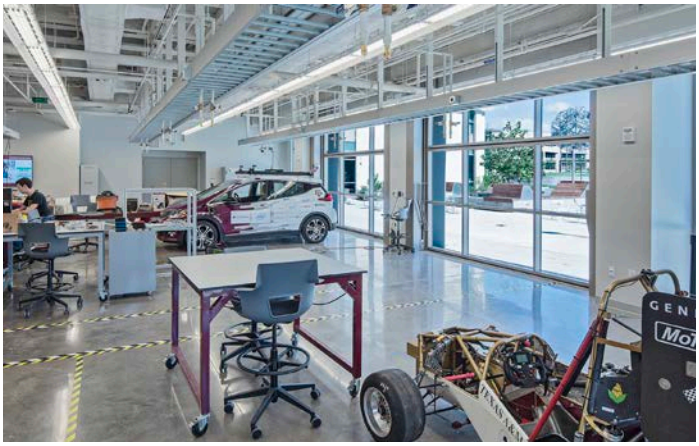
New spaces to introduce but are not limited to are:
- Multi-Purpose, Large Scale Assembly Space
- Multi-Purpose Project / Innovation / Making
- Graduate Lab Space / Offices
- Meeting / Seminar Spaces
- Media Development Space
- On-line Learning Capabilities
- Smart Classrooms
- Black Box performance, visualization space

By incorporating these types of spaces into the learning and teaching offerings, the QSC can provide a diverse platform for multiple high quality learning experiences.



Media Creation Space

Multipurpose Large-Scale Lecture / Event Space



Multipurpose Maker / Project / Design Space

Flexible Smart Classrooms

CASE STUDY

TEXAS A&M UNIVERSITY, ZACHARY ENGINEERING EDUCATION COMPLEX

At Texas A&M University, the Zachary Engineering Education Complex was created to help the university achieve its goal of enrolling 25,000 engineering students by 2025. The newly renovated 530,000-sf facility is highly focused on experiential learning. It features 27,500 sf of different maker spaces all dedicated to undergraduate education and research. It also houses smart-classrooms for project-based and team-based learning, a large-scale lecture / exhibition / event space and a multimedia center for students and faculty.

In addition to housing an advanced design center, there is a machine and equipment shop; an artisan shop; a welding, painting, and prototyping center; and a short-term project-assembly area for students who are working on smaller projects over the course of a semester. A long-term project space is dedicated to students working on year-long capstone and other large-scale projects.

LEARNING INTENSITIES AND SPACE TYPES

Intensity 1

Intensity 2

Intensity 3

Intensity 4

LEARNING INTENSITIES

A core requirement of computer sciences are its teaching facilities. Dynamic collaborative environments that allow experimentation and testing of technologies will be needed to achieve the School of Computing's goals.

When calculating space needs, each program is investigated to understand the type of activity, experience and equipment requirements it has, current and future. Programs have different space needs as varying learning environments have varying learning needs. All learning programs have different mixes of pedagogy, contact hours and complexity of academic activities and curriculum.

Program Intensity 1 has the largest space requirements. Programs in this category require large equipment, large work areas, performance spaces and large collaborative group areas.

Program Intensity 2 are programs that have equipment needs for medium scale activities, akin to scale-up and small construction.

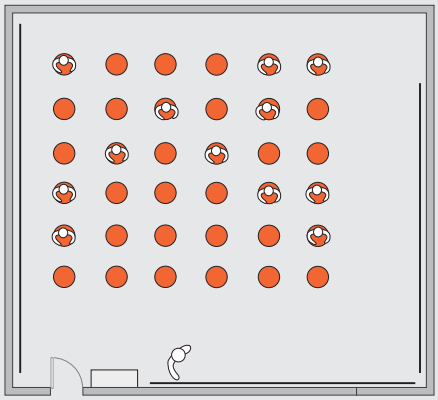
Program Intensity 3 require smaller workspace collaboration but also have smaller workspace requirements for desktop equipment.

Program Intensity 4 has denser environments. These are typically lecture halls with auditorium style seating. Programs in this category can be taught in large groups. They have minimal space requirements.

LEARNING INTENSITY EXAMPLE / DIAGRAM

Intensity 1

Black Box
7.0 SQM / Student

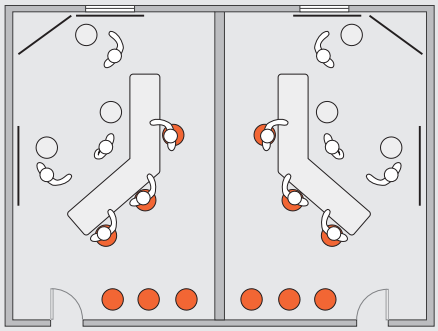


Black Box Example

This space facilitates multi-media learning, performance, artistic installations and conferences using digital and immersive technologies. They contain a three dimensional support framework that enables customized lighting and audio visual installations and acoustic treatments. These rooms typically allocate 7.0 SQM / student.

Intensity 2

Media Development
5.6 SQM / Student



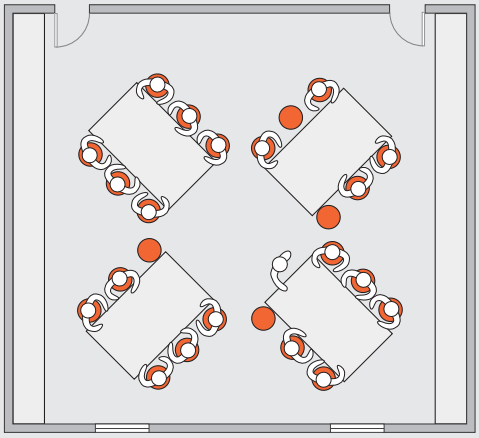
Media Development Example

A media development space facilities the creation of digital and audio-visual media. These spaces contain specialized A/V recording and playback equipment, computational equipment, lighting and acoustic treatments for use by individuals and groups. These rooms typically allocate 5.6 SQM / student.

LEARNING INTENSITY EXAMPLE / DIAGRAM

Intensity 3

Design / Maker Space
4.5 SQM / Student

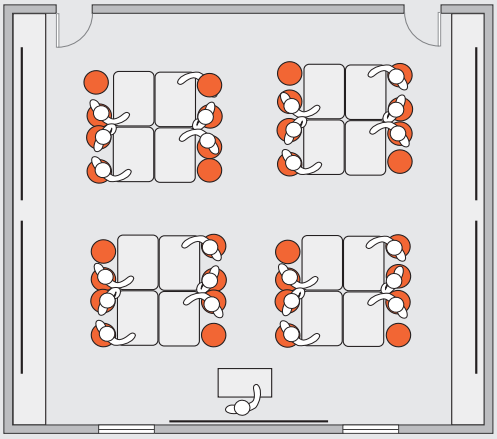


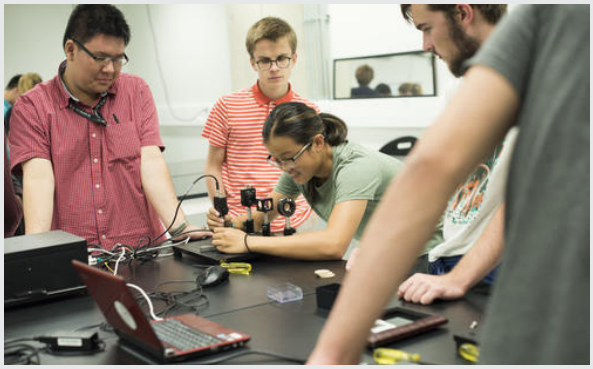
Design / Maker Space Example

A design / maker space allows students to explore short, medium and long term practical and research projects. These rooms utilize larger mobile tables to maximize workspace and flexibility. This promotes individual research as well as group-based explorations. These rooms typically allocate 4.5 SQM / Student.

Intensity 3

Project Based Classroom
3.0 SQM / Student





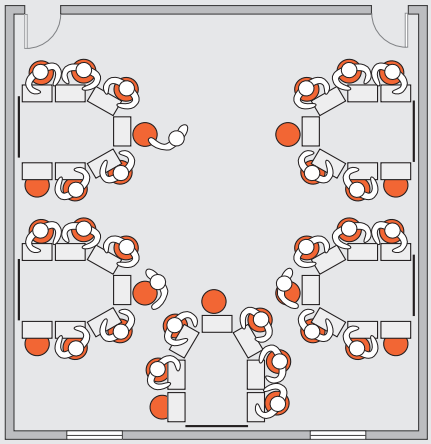
Project Based Class Example

Project-based classrooms are flexible rooms that can adapt to varying types of small scale projects. They are furnished with mobile medium sized tables and chairs to accommodate a variety of group sizes. Ubiquitous access to storage, mobile AV, IT and power enhances the practicality of this space type. These rooms typically allocate 3.0 SQM / Student.

LEARNING INTENSITY EXAMPLE / DIAGRAM

Intensity 4

Classroom
2.0 SQM / Student

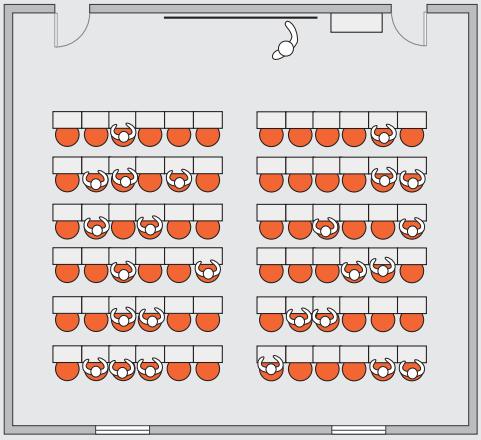


Classroom Example

To accommodate a mixture of formal and group learning and teaching styles, the classroom is fitted with flexible individual chairs, desks and multiple visual aids. These options allow the students to be highly engaged as a class, as a team and as an individual. These areas typically allocate 2.0 SQM / Student.

Intensity 4

Lecture Hall
1.6 SQM / Student



Lecture Hall Example

The least flexible learning style with the lowest retention rate, but the highest density is the lecture hall. Each student station should be have IT/power connectivity. To increase flexibility, seating can be grouped in tiers to enable in-class group breakout. These rooms typically allocate 1.6 SQM / Student.

SPACE CALCULATIONS: **LEARNING**

STUDENT FTE
STRATEGIC GROWTH

ACADEMIC CAREER
UNDERGRADUATE
MASTERS
PHD

AREA OF STUDY
AREA / STUDENT TYPE
ACTIVITY TYPE
EXISTING SPACE TYPES
NEW SPACE TYPES
DEPARTMENT TYPE

PROGRAM INTENSITY	2
UNDERGRADUATE	7.0 SM / Count
MASTERS	4.9 SM / Count
PHD	2.8 SM / Count

SPACE USAGE	ASM	UG	GRAD
CLASSROOM	2.3	20%	10%
ACTIVE CLASS	3.1	20%	30%
LECTURE HALL	1.6	10%	0%
WET LAB	4.2	50% (C)	50% (C)
DRY LAB	3.3	40% (P)	50% (P)
DESIGN SPACE	2.8	10%	10%
CLASS SUPPORT	0.9	8%	2%
LAB SUPPORT	1.9	5%	15%
ONLINE	0.7	25%	25%

MODIFIERS
NUMBER OF STUDENTS
FTE OF STUDENT MAJORS
FTES OF SERVICE LEARNING STUDENTS
ACADEMIC PROGRAM
ACADEMIC CAREER
ACTIVE VS. TRADITIONAL LEARNING
ONLINE LEARNING
CREDIT HOURS

GROWTH DEMANDS
STANDARD LEARNING GROWTH SUPPORT

CORE / INITIATIVES
INTEGRATE RESEARCH IN LEARNING
GROW ENROLMENT
NEW AND INNOVATIVE LEARNING METHODS
EXPAND INTERDISCIPLINARY LEARNING

UTILIZATION	HRS / WK	UTILIZE
CLASS	35	66%
TEACHING LAB	30	80%
ONLINE LAB	15	100%
DESIGN SPACE	40	50%

CREDIT HOUR / CONTACT HOUR TARGET DISTRIBUTION
DISTRIBUTION OF SPACE
ALLOCATION OF TIME SPENT IN SPACES

SEAT FILL / UTILIZATION RATE
TARGETS OF SPACE USE
WEEKLY HOUR NEEDS

LEARNING SPACES

CORE
PROJECT BASED CLASSROOM
CLASSROOM / LECTURE HALL
TEACHING LAB
DESIGN SPACE

SUPPLEMENT
CLASS SUPPORT
LAB SUPPORT
ONLINE LEARNING

FORECASTED LEARNING SPACE

**ASM from Higher Ed Space Allocation Guidelines **Room utilization from Queen's Registrar Course Scheduling **Classrooms are centralled timetabled, Design space and labs are not*

SPACE CALCULATION METHODOLOGY

The priority initiatives in learning have space needs that have to be accounted for in order to ensure comprehensive delivery of the vision. To project future learning space needs, a calculation method has been created that incorporates the visionary goals of Queen's School of Computing.

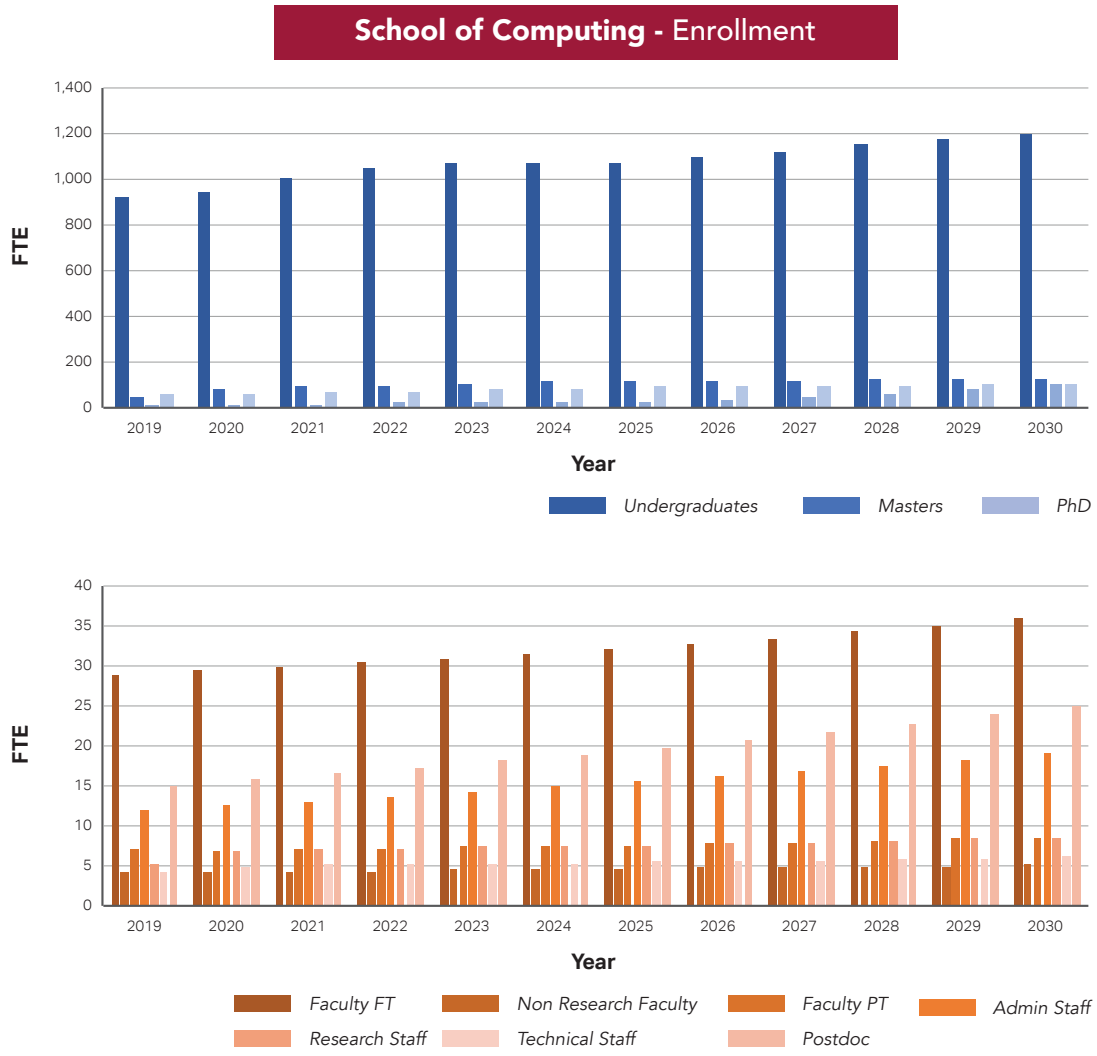
The methodology is based firstly on the growth of undergraduate majors and service learners, as well as masters and doctoral students, all of whom have different space allocation requirements. Secondly, the calculation takes into account the differences in space needs per student for different learning activities (classrooms, labs, design space). To accommodate future initiatives, modifiers for new types of collaborative and project based learning are also incorporated.

Thirdly, the calculation takes into account varying student space allocations for School of Computing learning activities.

The overall space requirement by room-type derived from above is then modified by allocating hourly utilization and seat fill targets and an online learning discount. When combined with credit hour targets and desired section sizes this provides a detailed breakdown of the numbers, types and sizes of all spaces required for all credit driven learning activities.

We need to move up in the national and international ranking of our school

-Faculty, Workshop 1



Growth

Undergraduate
To 2030 - 3.8%

Masters
To 2030 - 8.7%

PhD
To 2030 - 5.9%

Growth Ratios

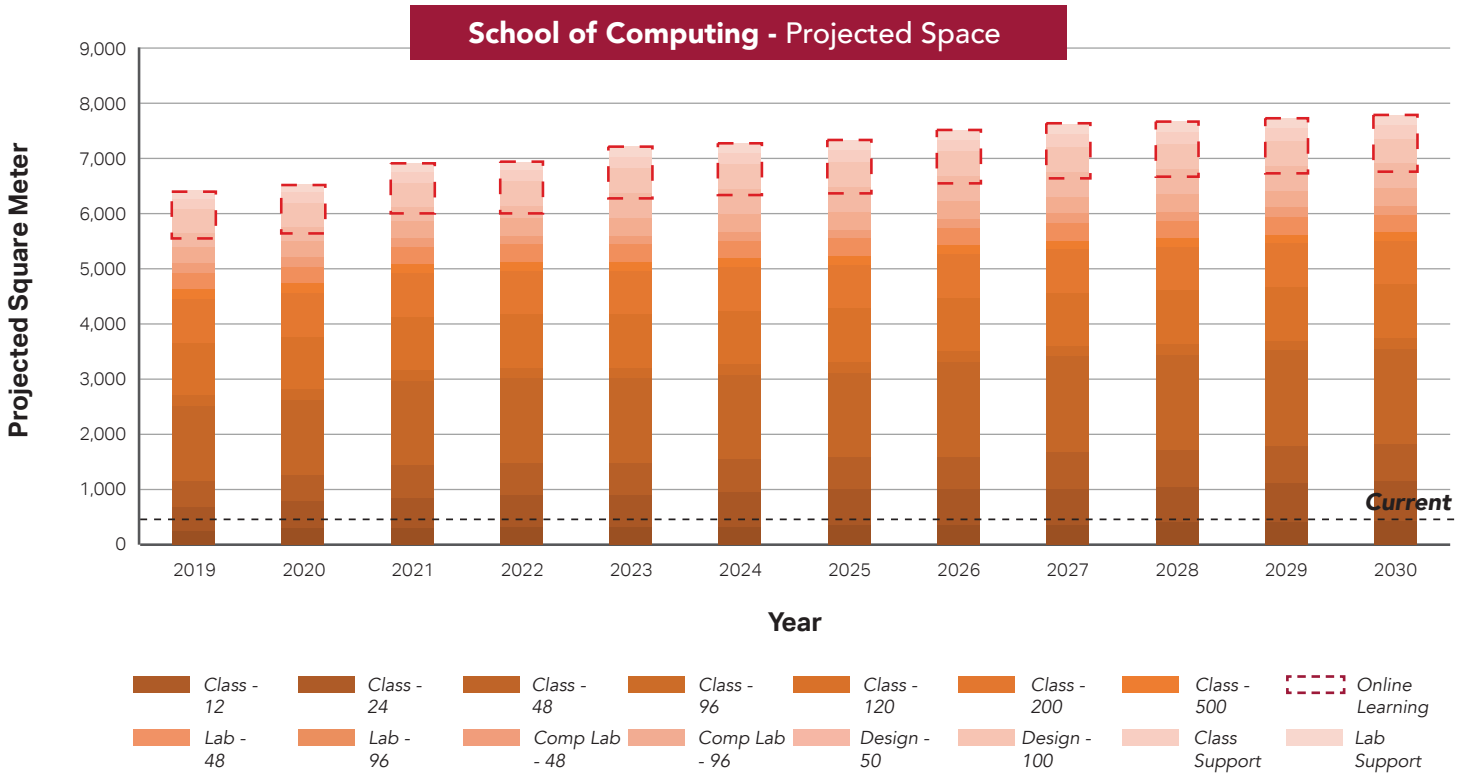
2030 Target
PhD - Faculty = 2.78
Master - Faculty = 6.11
Total Grad - Faculty = 9.10

2019 Current
PhD - Faculty = 1.83
Master - Faculty = 1.93
Total Grad - Faculty = 3.90

ENROLLMENT GROWTH / CHANGE MODEL

The primary driver in calculating learning space requirements is the full time equivalent enrollment (FTE) of students. For this calculation, it is important to note that headcount has been used as a proxy for FTE due to the minimal part time learners enrolled in School of Computing. The enrollment growth of undergraduates is restricted by the Faculty of Arts and Science. Graduate growth is not constrained by university enrollment restrictions and has potential to grow. Growth in Masters and Doctoral programs is dependent on the number of Faculty and their capacity to accommodate progressively more students. The table above illustrates the projected enrollment of QSC. Current and projected populations for QSC are:

School of Computing	Current	2030
Undergraduate	950	1200
Masters	79	220
PhD	58	100
Faculty FT	29	36
Non-Research Faculty	4	5
Faculty PT	7	8
Admin Staff	12	19
Research Staff	5	8
Technical Staff	4	6
Postdoc	15	25



(SQM)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Projected	**5,557**	**5,638**	**5,994**	**6,010**	**6,266**	**6,337**	**6,370**	**6,558**	**6,645**	**6,668**	**6,730**	**6,753**
Current	**376**	**376**	**376**	**376**	**376**	**376**	**376**	**376**	**376**	**376**	**376**	**376**

Space Calculation Projection Comparison (SM)

Learning space is categorized as spaces with assigned credited hours. These are rooms used for teaching and learning with credit assignment. The core types of learning spaces are classrooms, active classrooms, lecture hall, teaching labs, and design spaces. Secondary learning space types of class support, lab support and online learning are introduced to accommodate future initiatives.

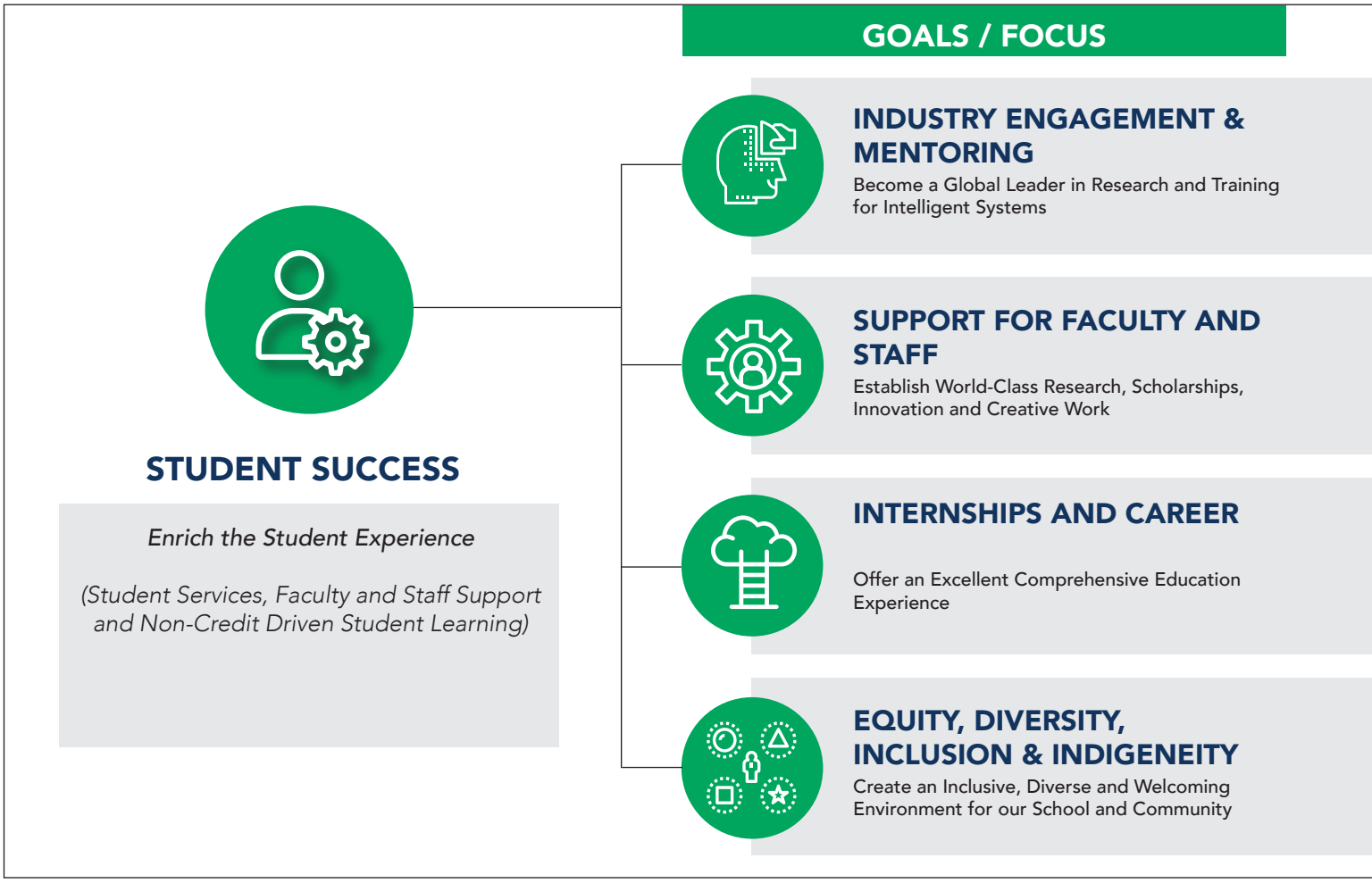
The diagram above illustrates the projected need compared to the existing learning spaces used by the School of Computing. However, note that large portions of classroom projections will be absorbed into the central classroom distribution.

QSC (SQM)	**Projected Needs**
Classrooms (12/24/48/96/120/200/500)	5,004
Labs (48/96)	475
Comp Labs (48/96)	475
Design Space (50/100)	900
Support / Secondary	420
Online Learning	*-1021*


COMPUTING
Golden Gaels

04 STUDENT SUCCESS

STUDENT SUCCESS



INTRODUCTION

Through an engaging visioning process, faculty, staff and students identified changes and improvements to a variety of aspects that impact student success. The vision for student success establishes dedicated support capabilities that directly respond to the characteristics of School of Computing students. Delivery of these services will leverage existing Faculty of Arts and Science and University resources to ensure full support in achieving the School's goals. Space calculations are focused on student study, meeting and maker spaces, which were other areas of deficiency highlighted in team engagements.

Future student success is divided into four themes:

- Industry Engagement and Mentoring
- Support For Faculty and Staff
- Internships and Career Development
- Equity, Diversity,Inclusion, & Indigeneity

These four themes form a framework for the development of strategic initiatives into a series of initiative tactics that define the direction for future implementation.

STRATEGIC INITIATIVES		INITIATIVE TACTICS
F	***Expand Invited / Distinguished Seminar Program***	• *Dedicate internal support to source a regular flow of diverse speakers from industry, alumni and academic leaders* • *Allow the series to be accessed remotely as well as in person. Ensure accessibility of events. Provide recordings or lectures to students* • *Provide seminars with topics of interest to undergraduates* • *Dedicate staff and resources to establish and allocate mentoring connections with alumni and industry* • *Earlier access to mentor support starting in 3rd year* • *Curate and recommend programs based on interest and needs, advertise programs in acceptance packages* • *Craft and refine program to better help students maximize success by allowing opportunities for extra curricular activities and course choices* • *Implement better communication to capture students early on*
F	***Increase Industry Partnerships and Engagement with Alumni***	
F	***Create Dedicated Mentorship and Role Models to Expand Student Mentoring Programs***	
F	***Increase Formal Training and Teaching Support for Faculty***	• *Provide formalized curriculum development and training resources to support faculty and TAs to develop new online / in-person delivery methods* • *Provide recording studio / classroom with cameras, lighting sound and software / hardware to research, test, and create online and in-person research-based, project-based, work-like learning pedagogies* • *Formalize program with training opportunities for TAs* • *Provide formalized and individualized career development programs for faculty and staff* • *Support research-career development at all levels, but specifically to nurture the most talented early career researchers and members of underrepresented groups*
F	***Formalize a TA Training Structure***	
F	***Strengthen Formal Career Development Programs for Faculty and Staff***	
S/F	***Increase Work Integrated Learning Opportunities (Internships)***	• *Integrate lifelong learning, soft skills updates and workforce alignment appreciation into undergraduate and graduate courses* • *Create a dedicated and comprehensive QSC program with QUIP to establish short, medium, and long-term internships by engaging alumni and industry partners, and through the alignment of workforce needs* • *Dedicate QSC staff to connect students directly with industry for full time job opportunities* • *Build resources for QSC skill development, resume creation, and interview development aligned with industry trends and needs*
S	***Create Focused Committee to Lead EDII Initiatives***	• *Create EDII committee that is a cross section of student, faculty and staff groups. Promote EDII events and training activities outside the classroom* • *Identify barriers and use results to develop specific initiative focuses to attract more students from diverse, minority or underserved backgrounds. Develop database to monitor progress. Promote inclusivity to high school students* • *Integrate inclusivity in faculty / staff recruitment. Identify underrepresented groups in programs and develop strategies to recruit. Integrate EDII training into orientation* • *Target and customize support for specific demographic groups. Additional support for 1st year international students.* • *Identify issues with respect to mental health. Develop strategy to promote and supplement what is provided at the University level* • *Foster and promote inclusive environments. ex. creating mother's room to make a building more inclusive*
F	***Create EDI Data System and Monitor Initiatives***	
S	***Diversify Recruiting Applicant Pool***	
S/F	***Diversify Initiatives for Enrollment***	
F	***Support for Students with Diverse Backgrounds***	

S *Student* F *Faculty*

DRIVING PRINCIPLES OF CHANGE

Although there are intersections between the strategic initiatives, each has been defined with the ability to be achieved independently if necessary. The strategic initiatives are categorized into the following:

Industry Engagement and Mentoring: Dedicate resources to build relationships with alumni and industry to develop a formalized external speaker series and student mentoring program.

Support For Faculty and Staff: Strengthen formalized career development for faculty and staff. Develop new capabilities in the development and deployment of innovative in-person and online learning methods.

Internships and Career Development: Dedicate resources to build a comprehensive QSC internship and future career development program.

Equity, Diversity, Inclusion & Indigeneity: Strengthen QSC's dedication to EDII through the creation of a committee to identify barriers and lead initiatives, events, recruitment, and training.

THEMES	PARTNERS	DEPARTMENT RESOURCES
INDUSTRY ENGAGEMENT & MENTORING	• *Leaders in Industry* • *Alumni* • *Academic Leaders*	• *Dedicated Internal Technical Support* • *Faculty* • *Dedicated Marketing and Communications Specialist* • *QSC Advisory Board*
SUPPORT FOR FACULTY AND STAFF	• *University Human Resources* • *FAS Faculty Office* • *Queen's University Faculty Association*	• *Dedicated Resources Focused on Career Development Support* • *Dedicated Resources to assist in the Development of New Curriculum and Pedagogy* • *Dedicated Support for TA Training*
INTERNSHIPS AND CAREER	• *Queen's Career Services* • *Queen's University Internship Program* • *Alumni* • *Industry Partners*	• *Dedicated Careers Staff* • *Increase Faculty Hiring* • *Dedicated Staff for Industry Relations*
EQUITY, DIVERSITY, INCLUSION AND INDIGENEITY	• *A+S Faculty Office* • *Queen's Office of Equity and Diversity* • *Queen's Office of International Students* • *Queen's Mental Health Services*	• *EDII Committee* • *Extracurricular / Club Support* • *University Available Technical Resources* • *Recruit + Train Cultural and EDII Mentors* • *UG and Grad Year Reps* • *UG and Grad Elected Ombudsperson*

RESOURCE NEEDS

It is envisioned that the QSC team will undertake the development and implementation of the initiatives enshrined in the Student Success Vision. To ensure successful completion, the strategic initiatives and initiative tactics will require resources and support from the School of Computing, from the Faculty of Arts and Science, from the wider University and from industry and alumni beyond.

Engaging faculty and staff to develop and deliver initiative plans will divert them from other academic activities and this will be taken into account in the development of initiative team's activities. The above table sets out the people, systems and processes needed for the successful completion of the Student Success Vision. Although most of these initiatives can take place almost immediately, without constraint, as student services delivery changes and grows, there will be space implications that will need to be addressed in order to achieve the vision.

Partners: The involvement of industry, alumni and University services is a prerequisite to identify mentors, internships and prepare students for future employment. Remaining at the forefront of equity, diversity and inclusion for students, faculty and staff requires the active involvement of QSC and university resources.

TECHNOLOGY / SYSTEMS	POLICY / PROCESSES	SPACE IMPLICATIONS
• *Virtual Presentations Platform Capability* • *CRM Type System for Managing Alumni and Industry Relationships*	• *Formalize the Process of Dedicated 1-on-1 mentoring for Each Student*	• *Symposium* • *Event Space* • *Technology Showcase / Demonstration Space* • *Social / Meeting Space with Catering Capability*
• *How to Supervise TAs program* • *How to Teach Course Guidelines* • *Leverage University Career Building Resources and Material*	• *Formal On-boarding Plan* • *Purchase a System that Tracks Career Development, e.g. Workday* • *Dedicated Research Career Support, Especially for New, Young and Diverse Faculty*	• *Recording Studio / Classroom with Lighting and Sound* • *Flexible Classroom Space* • *Expand Higher Quality Social and Amenity Spaces* • *Expand Workrooms, Study and Meeting spaces*
• *Proactive Student Communications - Awareness + Relevance of Employment and Internship Opportunities* • *Formal database of opportunities related to CRM system*	• *Increase Departmental Careers Events* • *Job Fair Day* • *Discipline Night*	• *TA Space* • *Expand Higher Quality Social and Amenity Spaces* • *Expand Non-Scheduled Study and Meeting Spaces*
• *Digital Online EDII Course Material, Tools* - *Academic Integrity - Behaviors* - *Misogyny - Empowerment Resources* - *Student Professional Behaviors* - *Teaching Practices*	• *Undergraduate / Graduate Assistant Training* • *Faculty and Staff Concierge Training* • *Increased Communications of Resources and People* • *Regular Visits from Queen's Equity and Diversity Office* • *Departmental Diversity and Inclusion Celebrations*	• *Event Space* • *Common Spaces / Dedicated Spaces* • *Expand Higher Quality Social and* • *Amenity Spaces* • *Expand Non-Scheduled Study and Meeting Spaces*

Department Resources: Collaboration between existing and new QSC staff, and faculty, in conjunction with other internal and external partners will provide integrated support across mentoring, careers, new learning delivery and EDII.

Technology / Systems: The University provides excellent digital and physical materials and has systems for all aspects of student, faculty, and staff support. However, a proactive plan for how this material applies to QSC, how it is digitally and physically developed and delivered to students, faculty and staff is required.

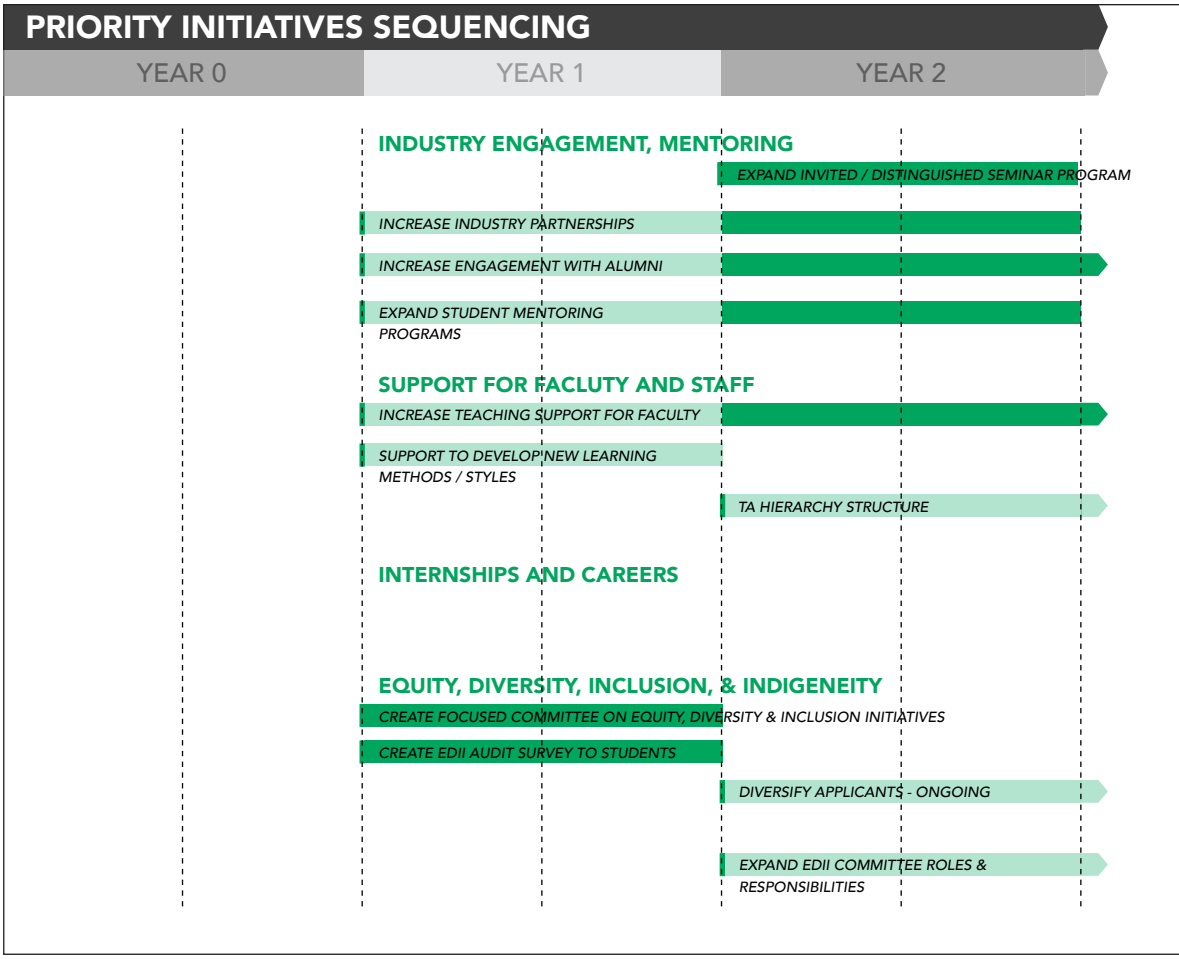
Policy / Processes: Building on existing QSC and FAS processes will require the formalization of staff, faculty, student training and rules to enable the proactive delivery of student success activities

Space: While existing University and FAS resources are available, and may be suitable in the short term, lack of dedicated social and amenity space, event space, study space, offices and meeting rooms will inhibit successful student support. Our space calculations in this section focus on expansion of non-scheduled study spaces to support these initiatives. Other spaces are included in subsequent chapters.

STUDENT SUCCESS

Enrich the Student Experience

(Student Services, Faculty and Staff Support and Non=Credit Driven Student Learning)

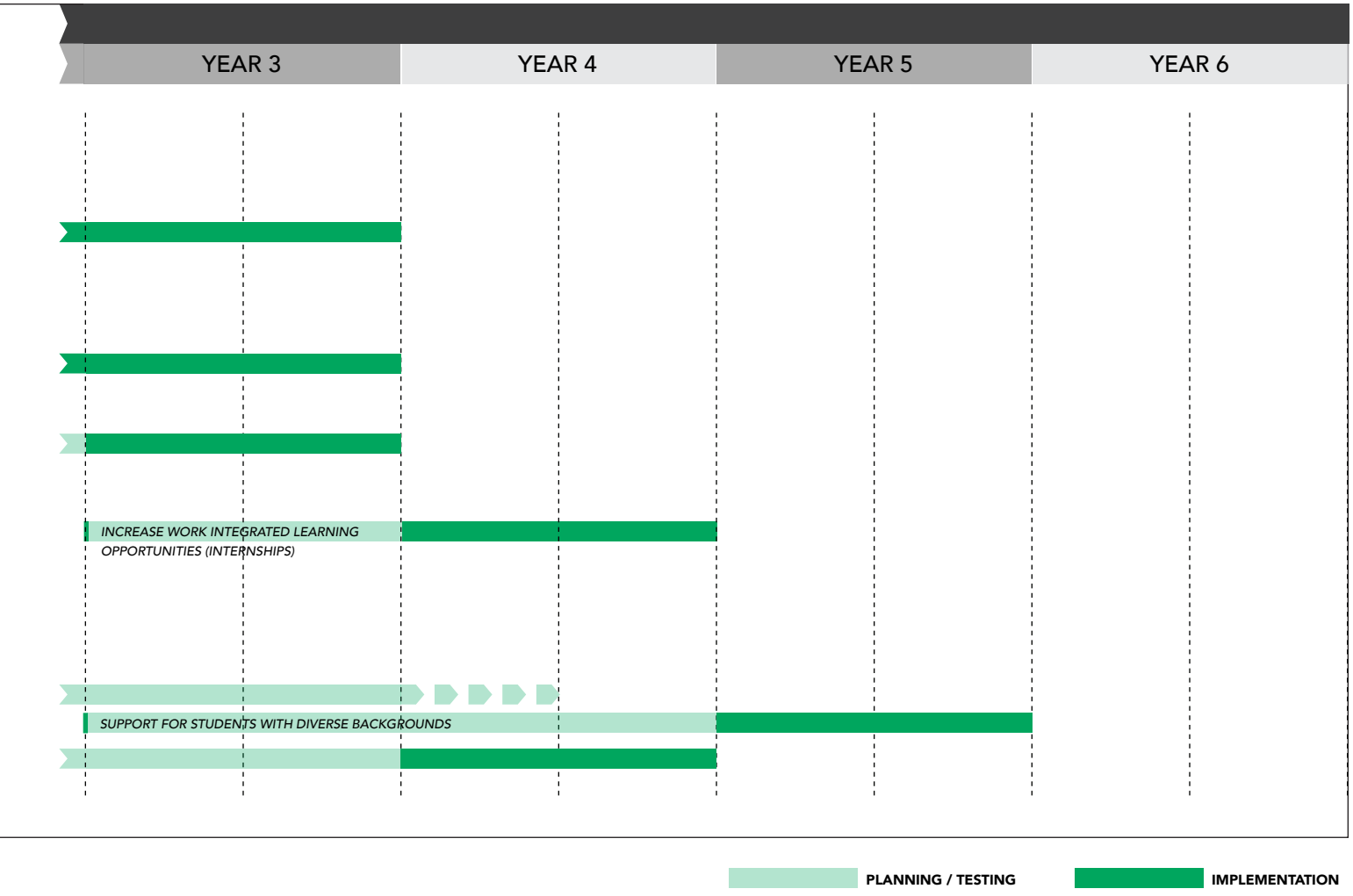


INITIATIVES TIMELINE

Implementing the vision for student success will require a number of years to complete. The initiative timeline shown above has been developed to take account of finite resource availability, the requirements of University processes and that some initiatives require new space to become available.

The timeline is divided into yearly segments but due to the period of uncertainty the School is currently experiencing, there is no specified start date. Following the mobilization of the Initiative Committee, each individual initiative moves through two periods. The light-green bars represent the planning and testing phase of each initiative. The dark-green bars represent the implementation phase of each initiative. The end of the dark-green bars represents that the initiative has entered the normal working processes of the School of Computing.

The Student Success Committee is composed of faculty and staff representatives from the School of Computing. This team will lead, manage, and develop each joint or separate initiative. The committee will also engage with and manage other University and QSC resources needed to develop and implement each initiative.



The student success initiatives consist of the following:

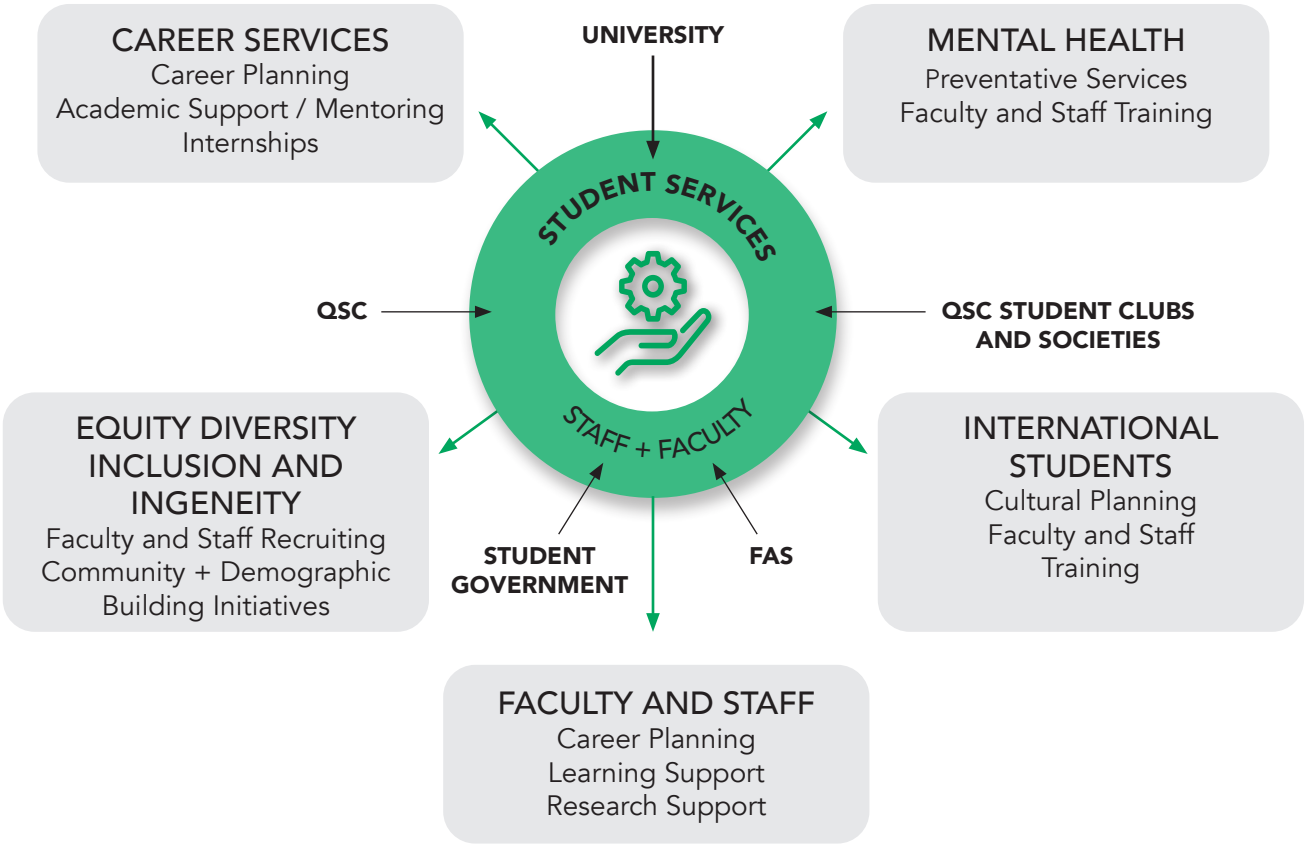
Industry Engagement and Mentoring
Expanding a distinguished seminar program and industry / alumni engagement can begin immediately, but it will take a year to gain traction with a dedicated mentoring program.

Support For Faculty and Staff
The need to create dedicated faculty career support across the spectrum of teaching, research and student support is critical in achieving the goals of the vision, and should begin immediately as it will drive all the other objectives.

Internships and Careers
The need to create dedicated internships and career support is critical in achieving the goals of the vision, and should begin in parallel with increased alumni and industry engagement.

Equity, Diversity, Inclusion & Indigeneity
Creating a committee which will establish EDII initiatives can begin immediately, however, it may take time to implement activities that yield discernible diversity change in the faculty, staff and student populations.

FUTURE STUDENT SERVICES MODEL



FUTURE STUDENT SERVICES MODEL

The visioning process identified the important need for dedicated departmental level student services provision. The process highlighted, that although School of Computing students experience common challenges, their access to resources that reflect their unique circumstances was limited. The shared services model shown above identifies Faculty of Arts and Science and University human and technological resources that would be dedicated to the School of Computing. Space would be provided in the school for these resources to engage with trained faculty and staff in providing services customized to the needs of student's needs.

This would enable the school to cost effectively focus preemptive services in the following priority areas:

- Availability of mental health services
- Mentoring, internships and structured interactions with future employers
- Community building through diversity in faculty, staff and student recruiting
- Dedicated culturally focused support for international students
- Career support and skills building for faculty and staff
- Support for Indigenous students

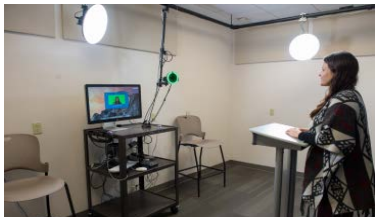
INITIATIVES DRIVING SPACE

Student Success Focus Areas

- Industry Engagement, Mentoring
  - *Meeting Space*
  - *Collaboration Space*
- Support for Faculty and Staff
  - *Media Development*
  - *Meeting Space / Workrooms*
- Internships and Careers
  - *Student Support Center*
- Equity, Diversity and Inclusion
  - *Meeting and Study Space*
  - *Event Space*
  - *Student Support Space*
  - *Dedicated Student Space*

Open Project / Collaboration Space

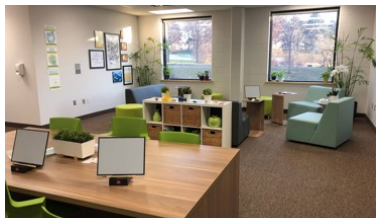
Meeting Space and Study Space



Media Development

Making / Design / Project Space

Flexible Social Meeting Space



Student Support Center

INITIATIVE FOR SPACE

Each strategic initiative provides an opportunity to create a collaborative environment that enhances the student support experience. The chart above illustrates how the development and implementation of visionary initiatives drives the need for new and innovative space characteristics.

Each of the initiatives identified by the School of Computing stakeholders has a corresponding student support type that can host and support the needs of the initiative.

New spaces to introduce include:

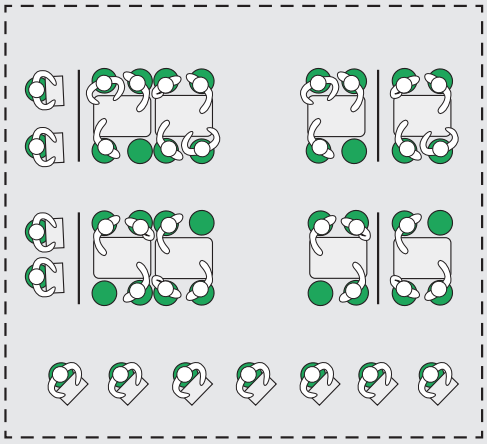
- Open Project /Collaboration Space
- Meeting Space and Study Space
- Making / Design Space
- Media Development Space
- Flexible Social Meeting Space
- Student Support Center

By incorporating these types of spaces into the learning and teaching offerings at Queen's, the University can provide a diverse platform for all learners.

STUDENT SUPPORT SPACE DIAGRAM

Open Study

3.20 SQM / Student

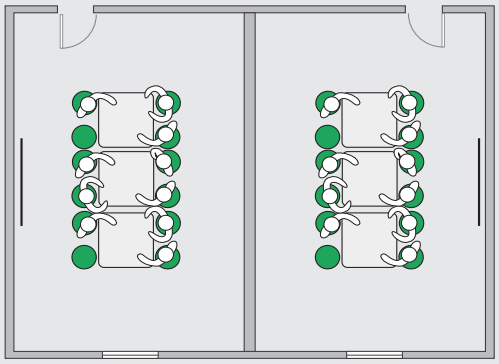


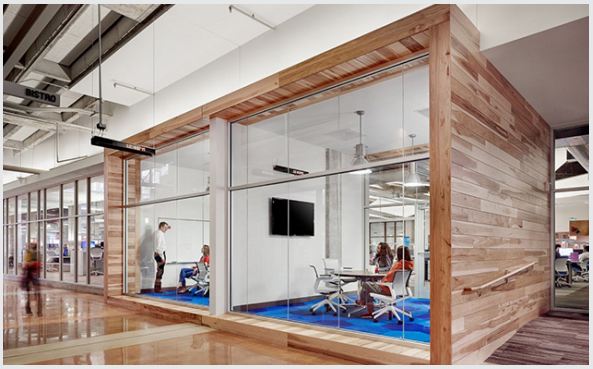
Plan and Sample Image

An open study space is a flexible environment that can support a variety of students' study styles. An open study environment will contain of a variety of furniture and visual aids to support individual study, group study and small conferencing. These rooms typically allocate 3.2 SQM / Student, including circulation.

Enclosed Study

2.40 SQM / Student





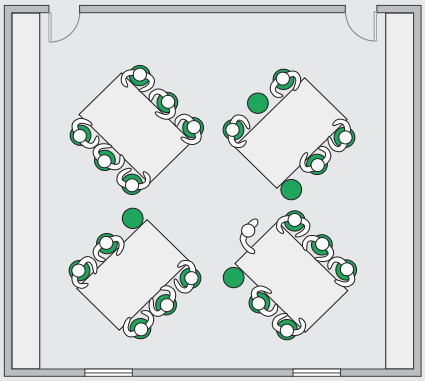
Plan and Sample Image

An enclosed study room provides small to medium group concentrated work. Typically seating 4-8 people, these spaces allow flexible collaboration with digital media and marker boards. These rooms are ideal for group ideation and group study and typically allocate 2.4 SQM / Student.

STUDENT SUPPORT SPACE DIAGRAM

Design / Maker Space

4.50 SQM / Student



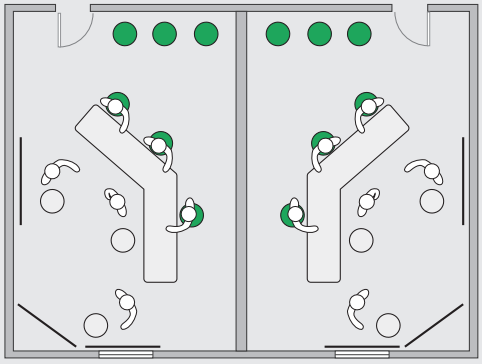
**Some design work requires quiet work and should be separated from noisier maker spaces*

Plan and Sample Image

The use of design space allows students individually or in groups to explore short, medium, and long term practical and research projects outside of scheduled design class time using specialist equipment. These rooms utilize larger mobile tables to maximize workspace and flexibility and typically allocate 4.5 SQM / Student.

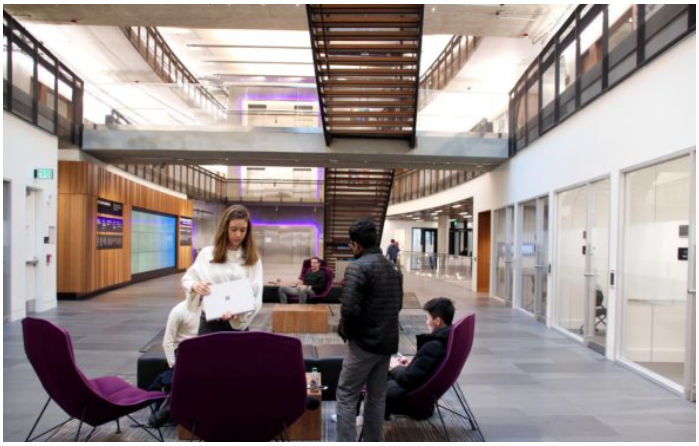
Media Development

5.60 SQM / Student



Plan and Sample Image

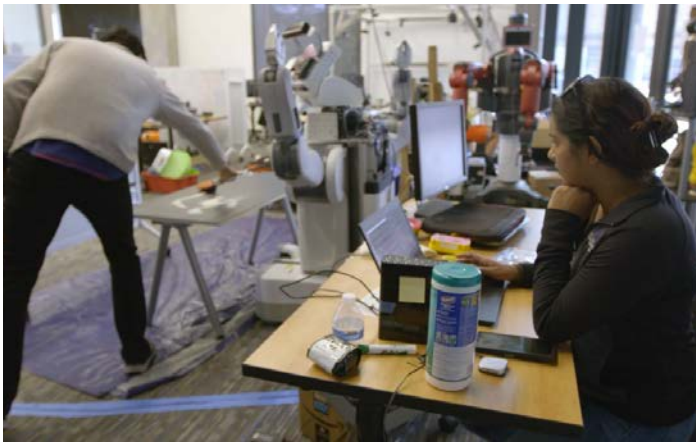
Media creation spaces are designed to support faculty, staff and students in the development of digital and audio-visual media. These spaces contain specialized A/V recording and playback equipment, lighting and acoustic treatments software and computation equipment for individuals and groups and typically allocate 5.60 SQM / Student.



Undergraduate Open Collaboration Space

Graduate Students Lounge

Undergraduate Collaboration Space



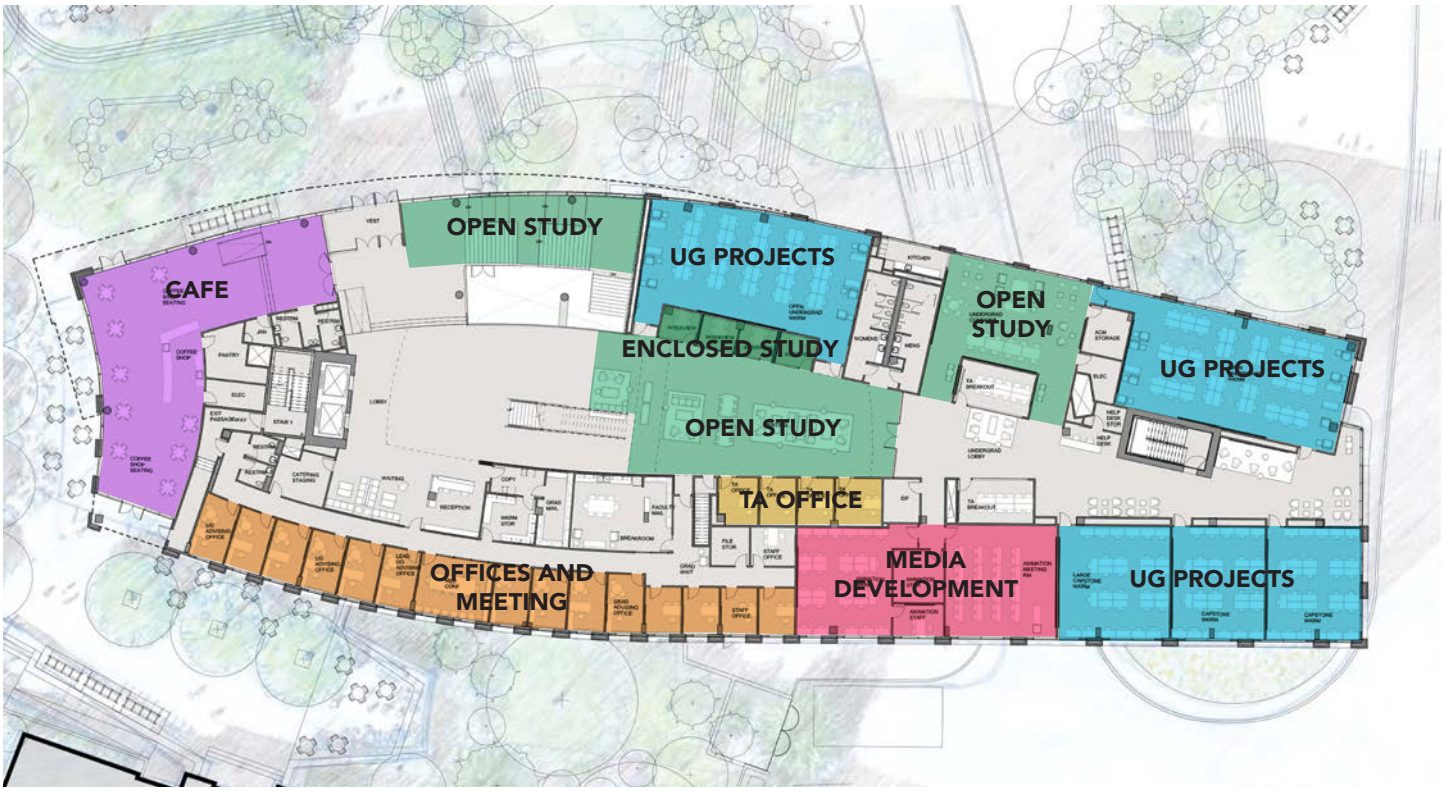
Undergraduate Project / Robotics Lab / Maker Space

CASE STUDY

UNIVERSITY OF WASHINGTON, BILL & MELINDA GATES CENTER FOR COMPUTER SCIENCE & ENGINEERING

The 135,000 square foot building, opened in January 2019, assists the Department of Computer Science in taking a leadership role in innovation and education and facilitating collaboration among students, faculty, staff and visitors, including regional and global stakeholders. The facility enabled the Paul G. Allen School of Computer Science & Engineering to double its annual degree production.

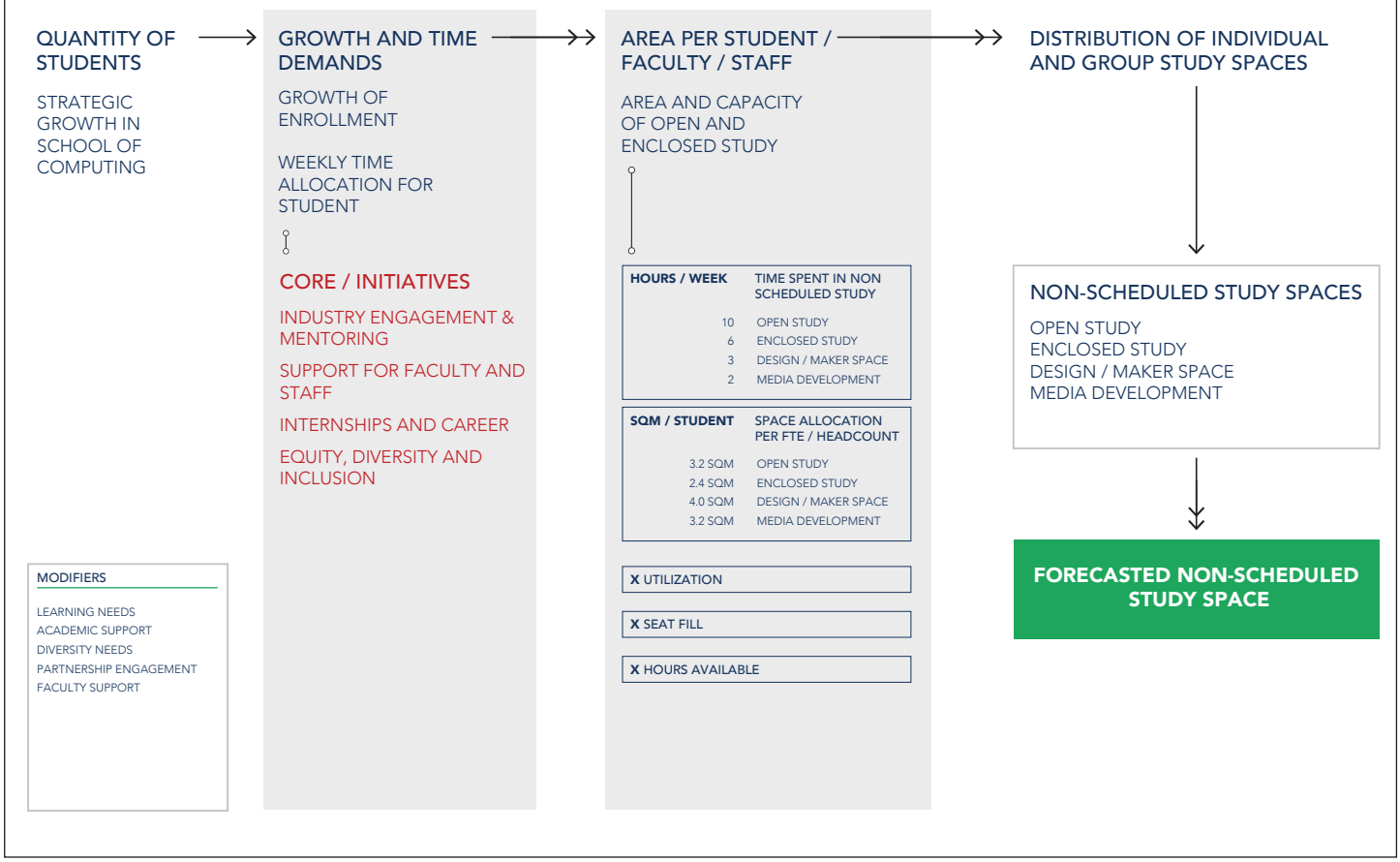
The building contains classrooms, offices, and collaborative spaces, research labs, a 250-seat auditorium, and a flexible event space. It also includes a sophisticated maker space, an undergraduate commons that will serve as a "home away from home" for students enrolled in the major, a wet lab for leading-edge research in molecular information systems, a 3,000 square foot robotics lab, workrooms for the interdisciplinary computer animation capstone, and interview rooms where industry representatives can meet with students.



Center for Computer Science & Engineering Floorplan

Center for Computer Science & Engineering Exterior

SPACE CALCULATIONS: **NON-SCHEDULED STUDY**



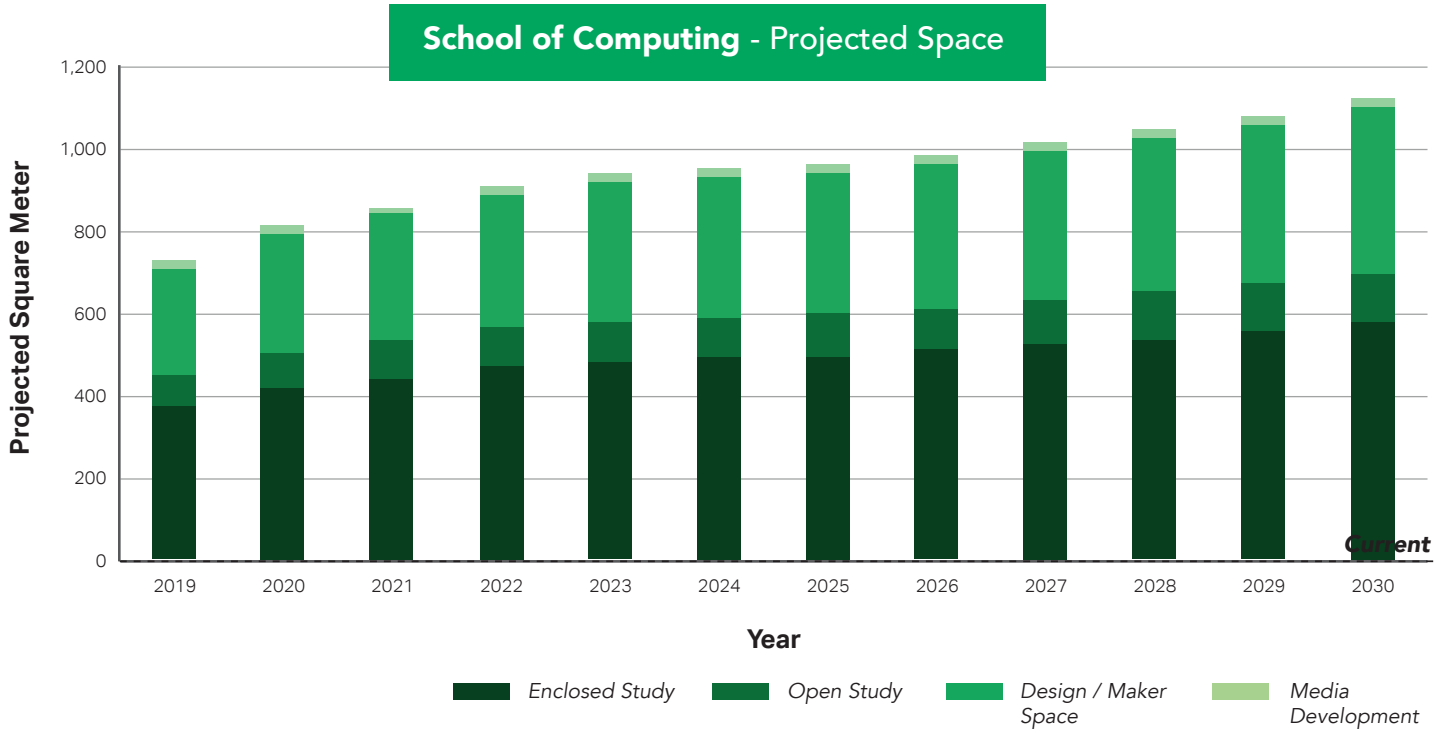
SPACE CALCULATION METHODOLOGY

The priority initiatives in Student Success will have a variety of space implications that will need to be accounted for to ensure their future success. This section focuses on a space calculation methodology that addresses deficiencies in the provision of non-scheduled study space at the School of Computing. Offices, meeting rooms, conference and public space are considered in later sections of this document.

The methodology is built on the quantity of students enrolled at the School of Computing, but excludes service learners. Faculty and staff numbers are considered for the development of media creation space only.

A demand model is built using assumed weekly hourly time needs for the student population for each space type: conference, study, open study, design space and media creation space.

Modifiers for seat fill, weekly time utilization and space availability are then applied to project the future space requirement.



(SQM)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Projected	**726**	**813**	**859**	**907**	**937**	**949**	**963**	**989**	**1,017**	**1,048**	**1,082**	**1,121**
Current	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Space Calculation Projection Comparison (SM)

ENROLLMENT GROWTH/ CHANGE MODEL

Student Success space is categorized as non-credited learning space. These are rooms used for study and support by students outside scheduled class labs and classrooms. The core types of space are enclosed study rooms, open study areas, design space, maker space and media development. The diagram above illustrates the projected need of student success space for the School of Computing.

The projections are calculated based on an assumed hour / week occupancy by an enrolled student FTE as well as an assigned SQM area / Student.

These projections also account for seat fill, weekly hour availability and time utilization to ensure flexibility for future demand and pedagogical shifts.

QSC (SQM)	Projected Needs
Enclosed Study	577
Open Study	119
Design / Maker Space	401
Media Development	24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05 RESEARCH

RESEARCH

INTRODUCTION

Through an engaging visioning process, faculty, staff and students collectively articulated how the School of Computing can grow, change and increase the quality of their research activities.

The vision for research aims to improve institutional knowledge, strengthen research support services, broaden collaborations with internal and external partners, deepen investment in high quality faculty, equipment and facilities and increase expenditures.

Future research initiatives are divided into four themes:

- Further Increase Research Quality
- Invest in Equipment and Partnerships
- Integrate Undergraduate Learning Into Research
- Diversify Research Capabilities

These four themes form a framework for the development of strategic initiatives into a series of initiative tactics that define the direction for future implementation.

STRATEGIC INITIATIVES		INITIATIVE TACTICS
F	***Understand our Knowledge and Capabilities***	• *Create an accessible database of our research with digital technology. Collaborate with Queen's to advertise QSC research.* • *Target awards, relationships and partners directly to our strengths* • *Elevate our QSC profile internally via Queen's National Scholars program and other internal awards* • *Focus resources on identifying nominations of faculty to high profile leadership positions in NSERC, IEEE, ACM etc. and editorial roles in the top journals and conferences, representation on key committees and advisory boards* • *Establish stronger relationships with the major agencies, e.g. CFAR, VECTOR, CRC* • *Strengthen resources to provide support in establishing and maintaining excellent grant writing and management* • *Dedicate resources to increasing h-indexes for all full and associate professors by 20%.*
F	***Increase Promotion of Outstanding Research***	
F	***Expand Support of Computing Research***	
F	***Invest in Research Infrastructure***	• *Undertake equipment inventory and create a shared equipment management plan within QSC and with other departments* • *Dedicate resources to focus on CFI Grants-as to increase investment in infrastructure* • *Dedicate resources to identifying and increasing the number of private sector company partnerships* • *Dedicate resources to creating translational research targets and processes for commercialization identifying commercialization opportunities and assisting faculty entrepreneurship* • *Dedicate resources to dollar value of funding from NSERC, CIHR, OCE and other sources by 20% through increases in individual faculty productivity, staff support, leadership in large grant and improving applications and win rate* • *Strengthen the department's private and industry backed endowed professorships*
F	***Increase Entrepreneurship / Commercialization***	
S/F	***Target Larger / Prestigious Grants***	
F	***Increase Publication / Citations***	
S/F	***Target & Increase Company Partnerships***	
S/F	***Expand Undergraduate Research Projects***	• *Improve communications between faculty / graduates and undergraduates to increase research awareness* • *Establish undergraduate involvement in faculty research in years 3 and 4* • *Establish undergraduate research in projects in years 2, 3 and 4* • *Expose undergraduates to research equipment and encourage use in projects and research* • *Create dedicated research equipment for undergraduate use* • *Expand masters and PhD students involving undergraduates in their research projects and in directing student research projects* • *Improve the infrastructure of student AI laboratories to incorporate leading-edge technology to enable novel applications of smart spaces*
S/F	***Provide Greater Undergraduate Access to Research Equipment***	
F	***Increase our Links with a Diverse Set of Other Queen's Departments and Disciplines***	• *Establish more research-focused events with other departments within Queen's* • *Establish a larger volume of joint interdisciplinary research funding proposals, joint graduate student supervision and projects with a diversity of other Queen's faculty* • *Establish leading edge unconventional interdisciplinary research emphasis e.g... on the ethical and societal aspects of AI* • *Focus talent acquisition resources on securing a high-profile hires CRC-1 as well as diverse young faculty* • *Undertake aggressive graduate student recruitment, especially at the PhD level and from diverse underserved backgrounds* • *Shared technicians staffing and research support plan*
F	***Hire Upcoming / Distinguished Faculty***	
F	***Align Research Technician Hires with Future Research Requirements***	
F	***Engage in Industry Research Collaboration***	

S *Student* F *Faculty*

DRIVING PRINCIPLES OF CHANGE

Although there are intersections between the initiatives, each has the ability to be achieved independently if necessary. The strategic initiatives are categorized into the following:

Further Increase Research Quality
- Understand our knowledge and capabilities
- Increase promotion of outstanding research
- Expand support of computing research

Invest in Equipment and Partnerships
- Invest in research infrastructure
- Increase entrepreneurship / commercialization
- Target larger / prestigious grants
- Increase publication / citations
- Target and Increase Company Partnerships

Integrate Undergraduate Learning Into Research
- Expand undergraduate research projects
- Provide greater undergraduate access to research equipment

Diversify Research Capabilities
- Increase our links with a diverse set of other Queen's departments and disciplines
- Hire upcoming / distinguished faculty
- Align research technician hires with future research requirements

THEMES	PARTNERS	DEPARTMENT RESOURCES
FURTHER INCREASE RESEARCH QUALITY	• *Library (Research Data)* • *VP Research* • *University Advisory Committee* • *QSC Advisory Board* • *Queen's Marketing for Promotion and Advertising*	• *Dedicated Research Knowledge Manager* • *Grant Applications Specialist* • *Research Management Specialist* • *Graduate Student Grant Writing Support / Training* • *Postdoc Fellow Support / Training*
INVEST IN EQUIPMENT AND PARTNERSHIPS	• *Advancement / Development Office* • *Queen's Center for Advanced Computing* • *University Finance Office* • *FAS Faculty Office* • *Alumni / Industry Partners* • *Queen's Office for Partnerships and Innovation* • *Endowed Professorships*	• *Dedicated Equipment Manager* • *Dedicated Marketing and Communications Staff* • *Interested Faculty* • *Industry Liaison Officer* • *Adjunct and Enterprise Professorships Funded by Partnerships*
INTEGRATE LEARNING INTO RESEARCH	• *Queen's Center for Teaching and Learning*	• *Interested Faculty* • *Masters and PhD Students* • *Graduate Steering Committee* • *Academic Coordinators*
DIVERSIFY RESEARCH CAPABILITIES	• *FEAS* • *Biology Department* • *Health Sciences* • *VP Research* • *FAS Faculty Office*	• *Interested Faculty* • *Early Career Grants Specialist* • *Increase Postdocs and Domestic Grad Students*

RESOURCE NEEDS

It is envisioned that a School of Computing team will undertake the development and implementation of the initiatives in the Research Vision. To ensure successful completion, each strategic initiative and initiative tactic will require resources and support from the School, from the Faculty of Arts and Sciences, from the wider University and from industry and alumni beyond.

Engaging faculty and staff to develop and deliver initiative plans will divert them from other academic activities and this must be taken into account in the development of the initiative team's activities.

The above table sets out the people, systems and processes needed for the successful completion of the Research Vision. Although a number of these initiatives can take place almost immediately, research activities rely on specialist equipment and facilities and there will be space implications that will need to be addressed in order to fully achieve the vision.

Partners: Remaining competitive at the forefront of interdisciplinary research requires that QSC proactively targets collaborations in order to identify funding opportunities, assemble teams, produce compelling grant applications and deliver the science.

TECHNOLOGY / SYSTEMS	POLICY / PROCESSES	SPACE IMPLICATIONS
• *Knowledge Management System* • *Research Performance Reporting: Faculty, Equipment, Graduates Supervised*	• *Key Academic Indicators* • *Key Financial Indicators* • *Grant Writing Support Funds* • *Technical Contract Research Capability* • *Monitoring Research Performance*	• *Flexible General Research Labs* • *Demonstration / Exhibition / Performance Capable Labs to promote Faculty / Student / Partner Joint and Separate Research*
• *Undertake Equipment Inventory and Review* • *Create Shared Equipment Management System*	• *Shared Equipment Investment Fund* • *Pre-Award University Matching Equipment Funds* • *Research Operating Fund for Maintenance and Critical Needs*	• *Flexible High Bay / Specialist Research Labs* • *Specialist Equipment Space* • *Flexible General Space for External Partner Projects and Commercialization* • *Satellite Site in Toronto* • *Flagship / Showcase / Innovation Labs*
• *Award System to Enable Pooling of Grad and Postdoc Resources*	• *Research Methodology Training* • *Support and Encourage Summer Schools Fueled by Research Activities* • *Policy on Faculty Incorporating Undergraduates in Individual Research Projects*	• *Project Based Classrooms* • *Design / Maker Space with Research Type Equipment Located Adjacent to Research Labs* • *Flexible Graduate Research Labs*
• *Research Knowledge Management System*	• *Cluster Hiring Initiative* • *Endowed Postdoc Positions* • *Joint Faculty Retreats* • *Joint Funding Support Resources* • *Joint Graduate Student Supervision*	• *Flexible General Labs Dedicated to Joint Research Projects*

Department Resources: Increased collaboration between existing QSC research support personnel combined with new funding for targeted new recruits for specialist pre/post award and technical support is required.

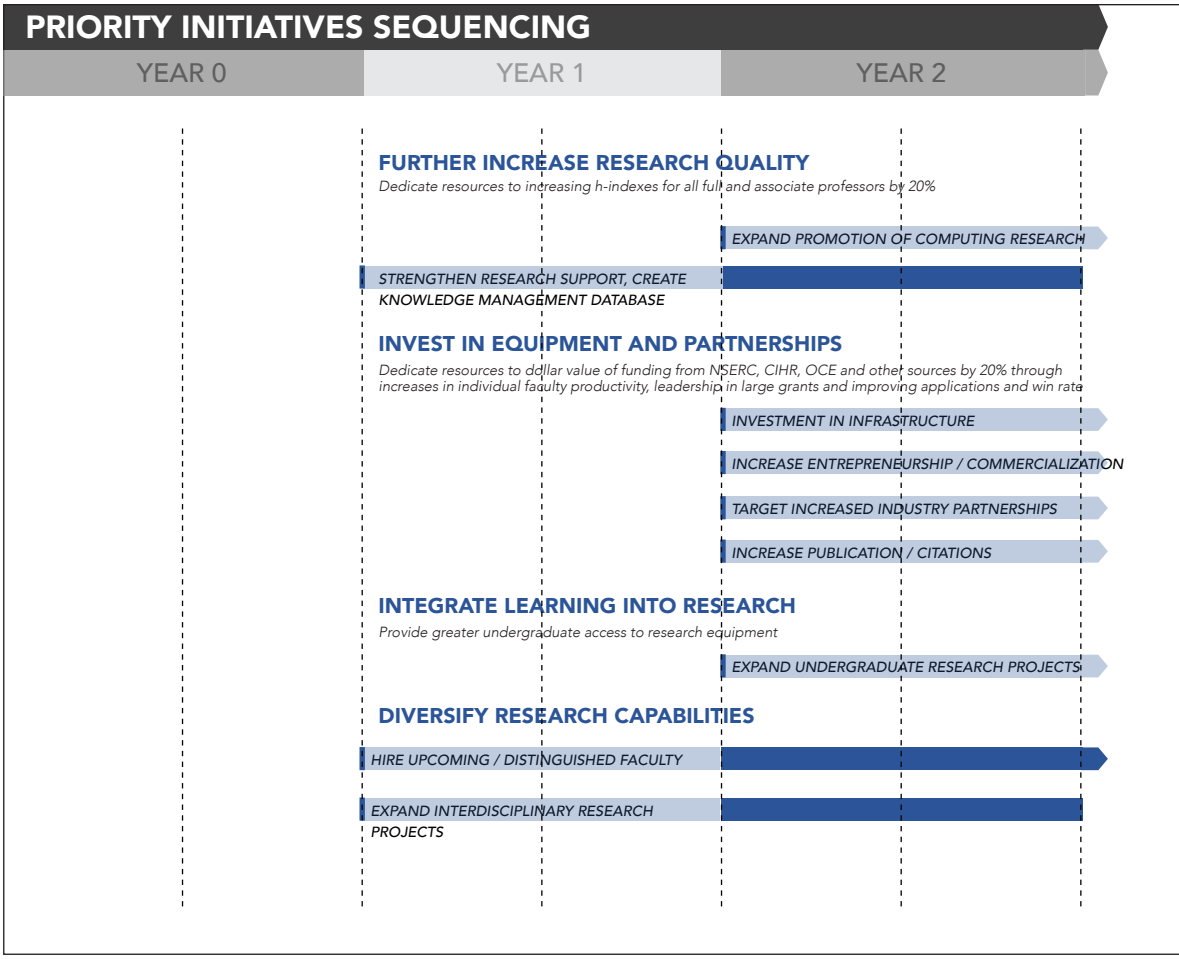
Technology / Systems: Investment in a knowledge management system will enable faculty to more effectively identify like-minded colleagues for increased collaborative teaming. When applied to equipment it will increase sharing, productivity and utilization.

Policy: Creating new processes that enable the joint use, maintenance and investment in new equipment, upcoming faculty and research support, together with performance monitoring will not only drive down operational costs, but also increase competitiveness, recruiting, and research quality.

Space: The low quality and size of research space in Goodwin Hall and other locations lowers the School's ability to attract new researchers and partners and lowers their competitiveness at the cutting edge of computer science. Future space needs include specialist high bay research labs, demonstration and exhibition type lab space as well as general flexible lab space.

RESEARCH

Strengthen our Research Prominence

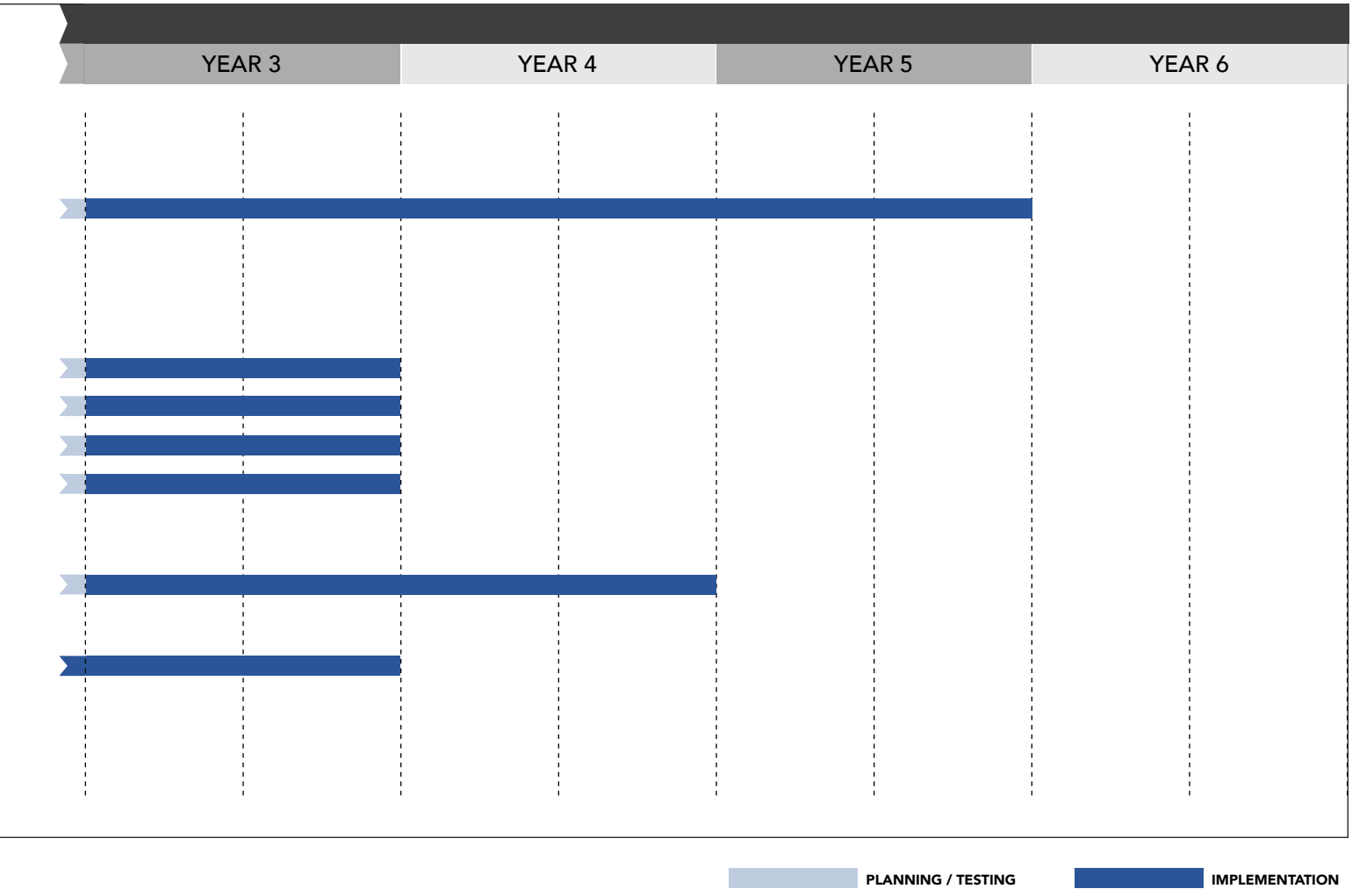


INITIATIVES TIMELINE

Implementing the vision for research will require a number of years to complete. The initiative timeline shown above has been developed to take account of finite resource availability, the requirements of University processes and that most initiatives require new space to be implemented.

The timeline above is divided into yearly segments but due to the period of uncertainty the School is experiencing, there is no specified start date. Following the mobilization of the Initiative Committee, each individual initiative moves through two periods. The light-blue bars represent the planning and testing phase of each initiative. The dark bars represent the implementation phase of each initiative. The end of dark-blue bars indicates that the initiative has entered the normal working processes of the departments.

The research committee is composed of faculty and staff representatives from the School of Computing. This team will lead, manage and develop each initiative. The committee will also engage with and manage other University and QSC resources needed to develop and implement each initiative.



The research initiatives consist of the following:

Further Increase Research Quality
Start immediately to create a knowledge management system and strengthen dedicated pre-award support resources. Develop capabilities for the promotion of research over subsequent years.

Invest in Equipment and Partnerships
Immediately create an equipment inventory, a sharing / management system and an investment plan. A dedicated team in industry engagement can be established immediately in order to target corporate, government, industry and other institutions.

Integrate Learning in Research
Incorporating undergraduates into faculty and graduate research will take at least two years to begin.

Diversify Research Capabilities
Identifying suitable partners from Queens along with interdisciplinary projects can begin immediately, but will take a year to formalize. The same conditions apply to the hiring of exceptional, upcoming and diverse talent.

INITIATIVES DRIVING SPACE

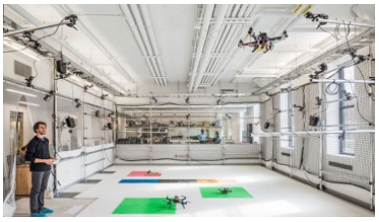
Research Focus Areas

- Further Increase Research Quality
  - *Flexible Generic Lab Space*
  - *Showcase / Demonstration Labs*
- Invest in Equipment and Partnerships
  - *Flexible Specialist Partner Labs*
  - *Specialist Equipment / Large Scale Labs*
- Integrate Learning into Research
  - *Project / Maker Space Integrated into Adjacent Research Labs*
- Diversify Research Capabilities
  - *Shared Flexible Generic Lab Space*
  - *Collaboration Lab Space*

Flexible Generic Research Labs

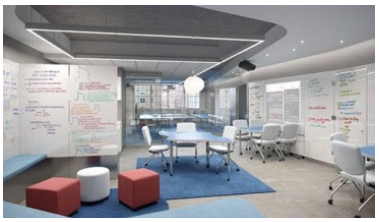
Showcase / Demonstration Lab

Flexible Partner Labs



Specialist Equipment / Large Scale Lab

Project / Maker Space



Collaboration Lab

INITIATIVE FOR SPACE

Each strategic initiative provides an opportunity to create a collaborative environment that enhances the research experience. The chart above illustrates how the development and implementation of visionary initiatives drives the need for new and innovative learning space characteristics.

Each of the research initiatives highlighted by the School of Computing have a corresponding research space type that can host and support the needs of the initiative.

New spaces to introduce include:

- Flexible Generic Research Labs
- Showcase / Demonstration Lab
- Flexible Partner Labs
- Specialist Equipment / Large Scale Labs
- Project / Maker Space
- Shared Flexible Generic Lab Space
- Collaboration Lab Space

By incorporating these types of spaces into the learning and teaching offerings, QSC can provide a diverse platform for multiple high quality collaborative research experiences.

Labs on Display

Flexible Research Labs

Exhibition Space

Flexible Event Space

CASE STUDY

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, MEDIA LAB

Founded in 1985, the MIT Media Lab is one of the world's leading research and academic organizations. Unconstrained by traditional disciplines, Media Lab designers, engineers, artists, and scientists strive to create technologies and experiences that enable people to understand and transform their lives, communities, and environments.

The Media Lab occupies a six-floor structure with approximately 163,000 square feet of laboratory, office, and meeting space.

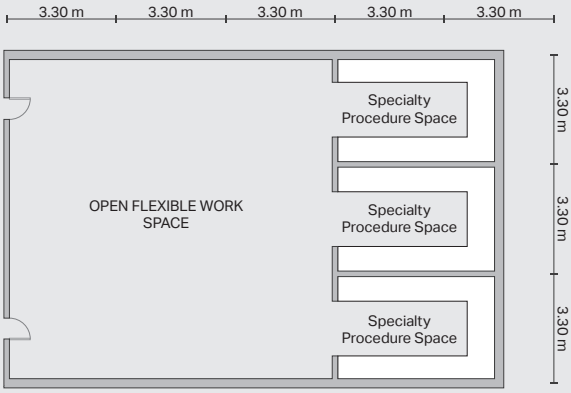
Nine flexible laboratories are organized around a soaring central atrium. Clustering rows of offices around the labs encourage creative interaction, and transparent partitions offer extended sight-lines through the building in every direction, allowing multiple activities to be seen from any vantage point.

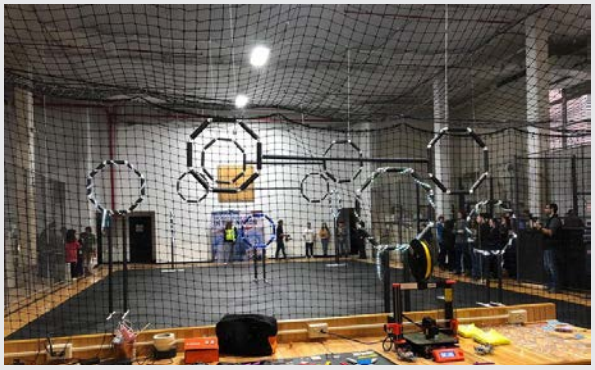
The building also contains top-floor event and display spaces, lecture and conference rooms, and a cafe – all overlooking the Charles River and the Boston skyline.

RESEARCH SPACE EXAMPLES

Intensity 1 - Research Space

152.5 SQM / PI



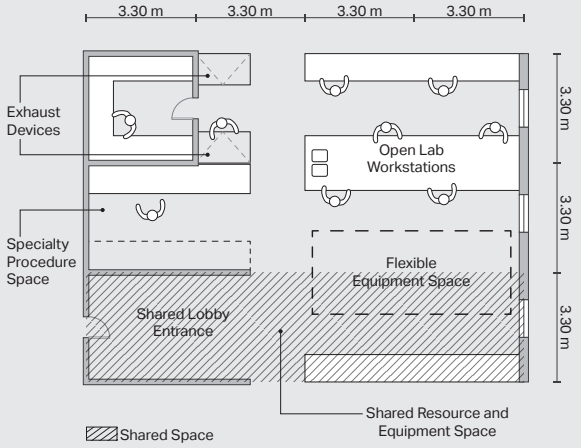


Plan and Sample Image

The primary distinguishing feature of Intensity 1 labs are the need to accommodate larger, moving equipment, capabilities for large scale fabrication, the requirements for wet services, specialist isolation and safety of storage and disposal. High bay space and moveable workstations allow research flexibility. These rooms typically allocate 152.5 SQM / PI.

Intensity 2 - Research Space

102.2 SQM / PI



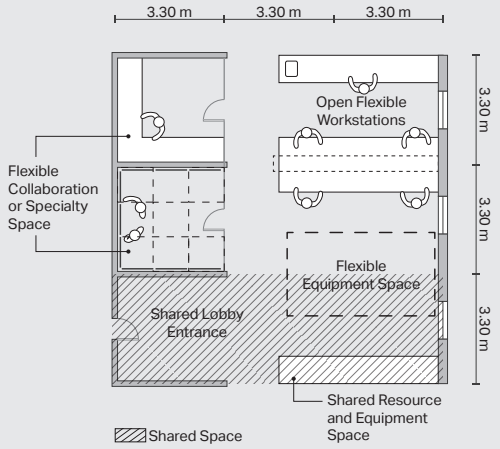
Plan and Sample Image

The primary distinguishing feature of Intensity 2 labs are the need to accommodate exhaust devices, floor mounted equipment, capabilities for medium scale fabrication, the requirements for wet services and safety of storage and disposal. Flexible workstations allow research collaboration. These rooms typically allocate 102.2 SQM / PI.

RESEARCH SPACE EXAMPLES

Intensity 3 - Research Space

60.4 SQM / PI

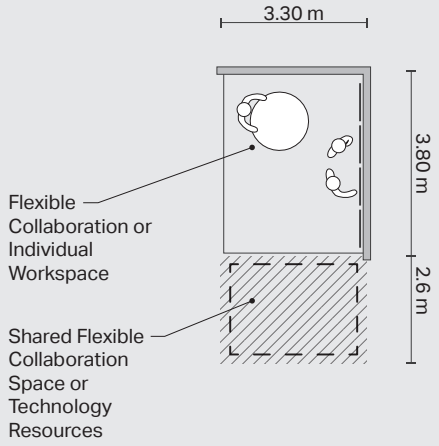


Plan and Sample Image

Flexible generic research labs are characterized by their need to house a wide range of smaller scale desktop equipment and experiments. Essential aspects are access to temperature, humidity controls and clean / variable power. Furniture and audio / visual equipment will be flexible, movable, and interchangeable. These rooms typically allocate 60.4 SQM / PI.

Intensity 4 - Small Research Space

13.9 SQM / PI



Plan and Sample Image

These spaces support small scale theoretical, desktop and software research. Typically focused on computational modeling, visualization and virtual reality, these spaces require specialist acoustics and lighting, as well as flexible technology and furniture. They can be grouped together to create large collaborative / shared space. These rooms typically allocate 13.9 SQM / PI.

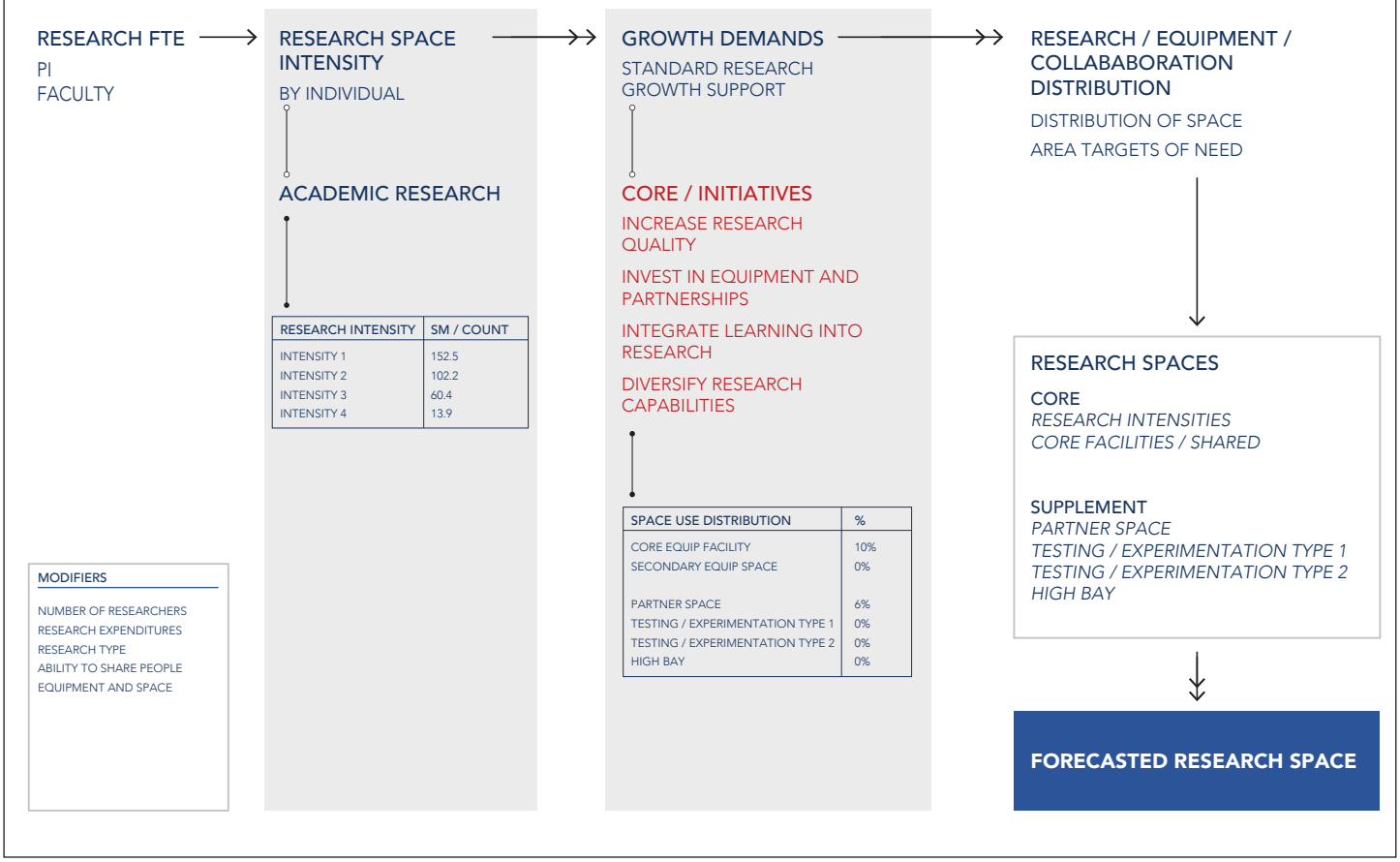
RESEARCH DISTRIBUTION PLAN

The table identifies the research targets determined by Queen's School of Computing.

NO.	PRINCIPAL INVESTIGATORS	FOCUS AREA 1	FOCUS AREA 2	ARTIFICAL INTELLIGENCE	BIOMEDICAL COMPUTING	DATA ANALYTICS	HCI & GAMING	SECURITY	SOFTWARE ENGINEERING	SYSTEMS & NETWORKS	THEORY OF COMPUTING
1	BRAM ADAMS	Software Engineering	Mining Software Repositories			■			■		
2	SELIM AKL	Parallel Computing	Unconventional Computation								■
3	FURKAN ALACA	Security	IoT					■		■	
4	DOROTHEA BLOSTEIN	Biomechanics	Adaptive Tensegrity	■	■	■					
5	STEVEN DING	Data Mining	Machine Learning	■		■		■		■	
6	JUERGEN DINGEL	Software Analysis	Model-Driven Engineering						■		
7	QINGLING DUAN	Machine Learning	Bioinformatics	■	■						
8	JANA DUNFIELD	Programming Languages	Type systems						■		■
9	RANDY ELLIS	Medical Data Analysis	Computer Assisted Surgery		■						
10	GABOR FICHTINGER	Computer Assisted Surgery	Interventions		■						
11	SIDNEY GIVIGI	Machine Learning	Autonomous Vehicles	■			■			■	
12	NICK GRAHAM	Game Development	Human Computer Interaction				■		■		
13	AHMED HASSAN	Software Systems	Mining Software Repositories			■			■		
14	HOSSAM HASSANEIN	5G Wireless Networks	IoT							■	
15	TING HU	Complex Networks	Bioinformatics	■	■						
16	DAVID LAMB	Software Design	Software Architecture						■		
17	BURTON MA	Biomechanics	Computer Aided Surgery		■						
18	SARA NABIL	Computational Spaces	Objects & Wearables				■				
19	PARVIN MOUSAVI	Computer Assisted Diagnosis	Machine Imaging	■	■						
20	CHRISTIAN MUISE	Deep Learning	Knowledge Compilation	■							
21	DAVID RAPPAPORT	Discrete + Comp. Geometry									■
22	KAI SALOMAA	Complexity of Automata									
23	AMBER SIMPSON	Medical Imaging	Computer Aided Surgery	■	■						
24	DAVID SKILLICORN	Adversarial Knowledge	Security			■		■			
25	SAMEH SOROUR	Discovery Autonomous	IoT							■	
26	JAMES STEWART	Vehicles Computer-Assisted	Image Processing		■						
27	CATHERINE STINSON	Surgery Ethics of Artificial	Machine Learning	■							
28	YUAN TIAN	Intelligence Deep Learning	Recommender Systems	■		■				■	
29	FARHANA ZULKERNINE	Data Analytics	Cognitive Science	■		■					
30	MOHAMMAD ZULKERNINE	Software Reliability	Security					■	■	■	
	Cross Appointees										
	TOTAL CURRENT										
1	FUTURE NEW HIRE			■						■	
2	FUTURE NEW HIRE					■	■				
3	FUTURE NEW HIRE			■	■						
4	FUTURE NEW HIRE					■			■		
5	FUTURE NEW HIRE								■		
6	FUTURE NEW HIRE										
7	FUTURE NEW HIRE			■			■				
8	FUTURE NEW HIRE							■		■	
9	FUTURE NEW HIRE										■
	TOTAL FUTURE										
	TOTAL OVERALL										

LAB SPACE INTENSITY				SPACE PRIORITIES		GRADUATE STUDENTS		CURRENT LOCATION		FUTURE LOCATION	
High			Low	Research Space Priority	Associated Space Priority	Current	Future (2025)	Lab Location 1	Lab Location 2	Lab Location 1	Lab Location 2
1	2	3	4								
				Office	Collaborative	3		QSC		QSC	
				Office	Collaborative	2		QSC		QSC	
				Office	Collaborative	1		QSC		QSC	
				Lab		1		QSC		QSC	
				Office	Collaborative	6		QSC		QSC	
				Office	Collaborative	5		QSC		QSC	
				Lab	Collaborative	3		DBMS	QSC	DBMS	QSC
				Office	Collaborative	2		QSC		QSC	
				Lab		6		QSC	KGH	QSC	KGH
				Equipment		4		QSC	KGH	QSC	KGH
				Drones	Collaborative	5		QSC	Mitchell	QSC	Mitchell
				Installations	Simulation	4		QSC		QSC	
				Office	Collaborative	10		QSC		QSC	
				Lab	Collaborative	10		QSC		QSC	
				Office	Collaborative	2		QSC		QSC	
				Office	Collaborative	1		QSC		QSC	
				Lab		0		QSC		QSC	
				Maker / Design	Exhibition	2		QSC		QSC	
				Equipment		6		QSC	KGH	QSC	KGH
				Office	Collaborative	2		QSC		QSC	
				Office	Collaborative	0		QSC		QSC	
				Office	Collaborative	4		QSC		QSC	
				Equipment	Collaborative	6		QSC	DBMS	QSC	DBMS
				Office	Collaborative	6		QSC		QSC	
				Office	Collaborative	4		QSC		QSC	
				Lab		2		QSC		QSC	
				Office		0		QSC	Philosphy	QSC	Philosphy
				Office	Collaborative	3		QSC		QSC	
				Office	Collaborative	7		QSC		QSC	
				Office	Collaborative	12		QSC		QSC	
						6		QSC		QSC	
1	7	9	13	**30**		**125**	**176**				
				Large	Collaborative			QSC		QSC	
				Lab				QSC		QSC	
				Lab				QSC		QSC	
				Lab	Collaborative			QSC		QSC	
				Lab	Collaborative			QSC		QSC	
				Lab	Collaborative			QSC		QSC	
				Lab	Collaborative			QSC		QSC	
				Office	Collaborative			QSC		QSC	
				Office	Collaborative			QSC		QSC	
2	3	2	2	**10**		**0**	**27**				
3	10	11	15	**40**		**125**	**203**				
5.0%	22.5%	32.5%	40.0%								

SPACE CALCULATIONS: **RESEARCH**

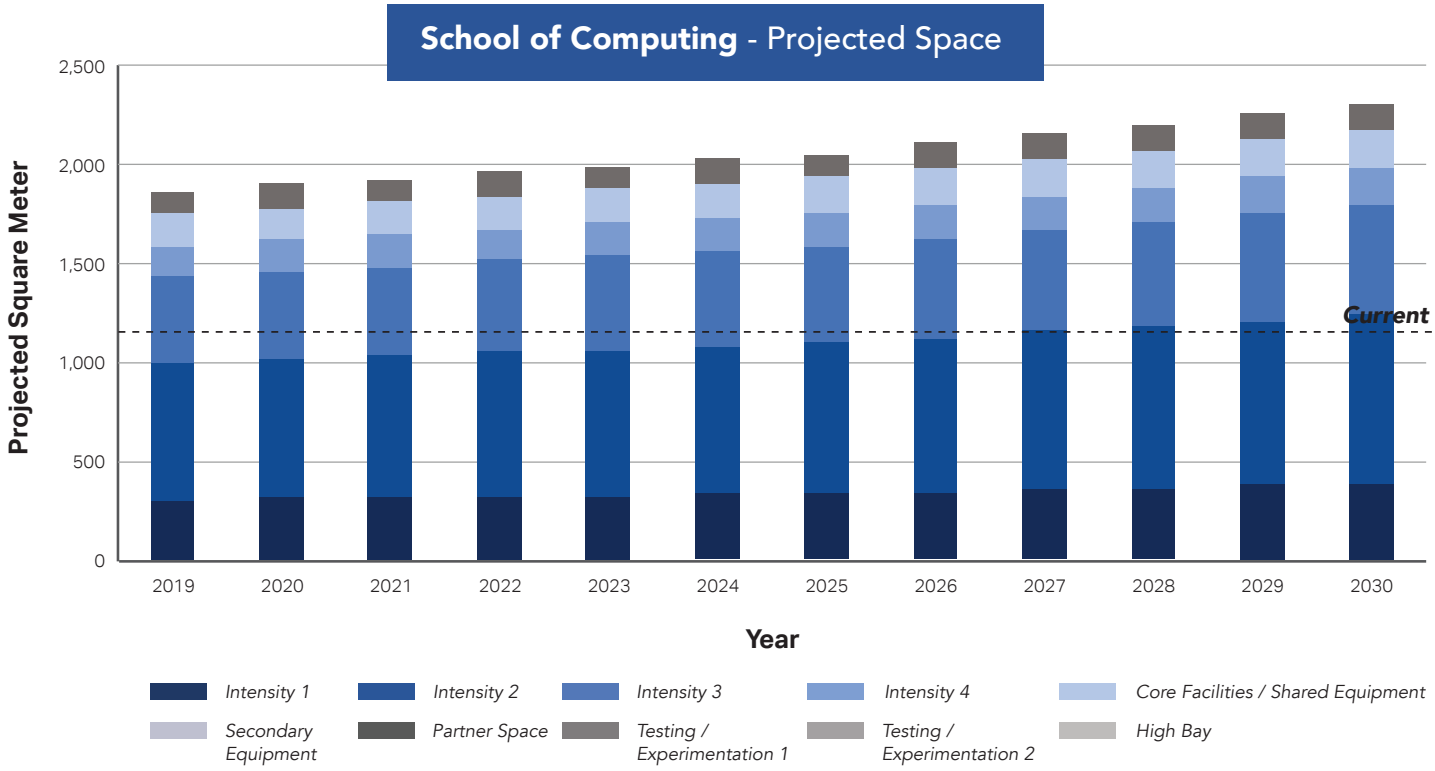


SPACE CALCULATION METHODOLOGY

The priority initiatives in research have space needs that have to be accounted for in order to ensure comprehensive delivery of the vision. To project future research space needs, a calculation methodology has been created that incorporates the visionary goals of the School of Computing.

The methodology is based firstly on the growth of research PI FTE and faculty, all of whom have different space allocation requirements based on their type of research. Secondly, the calculation considers the differences in space needs per PI by intensity of research activities, and also accounts for equipment space to support research. To accommodate future initiatives, modifiers for new types of research support spaces are also incorporated.

The overall space requirement by research room type is derived from a space use distribution of research and equipment, and with additional allocation to secondary support spaces of partner spaces and specialist labs.



(SM)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Projected	**1,864**	**1,895**	**1,927**	**1,958**	**1,991**	**2,024**	**2,057**	**2,106**	**2,157**	**2,208**	**2,261**	**2,315**
Current	**1,207**	**1,207**	**1,207**	**1,207**	**1,207**	**1,207**	**1,207**	**1,207**	**1,207**	**1,207**	**1,207**	**1,207**

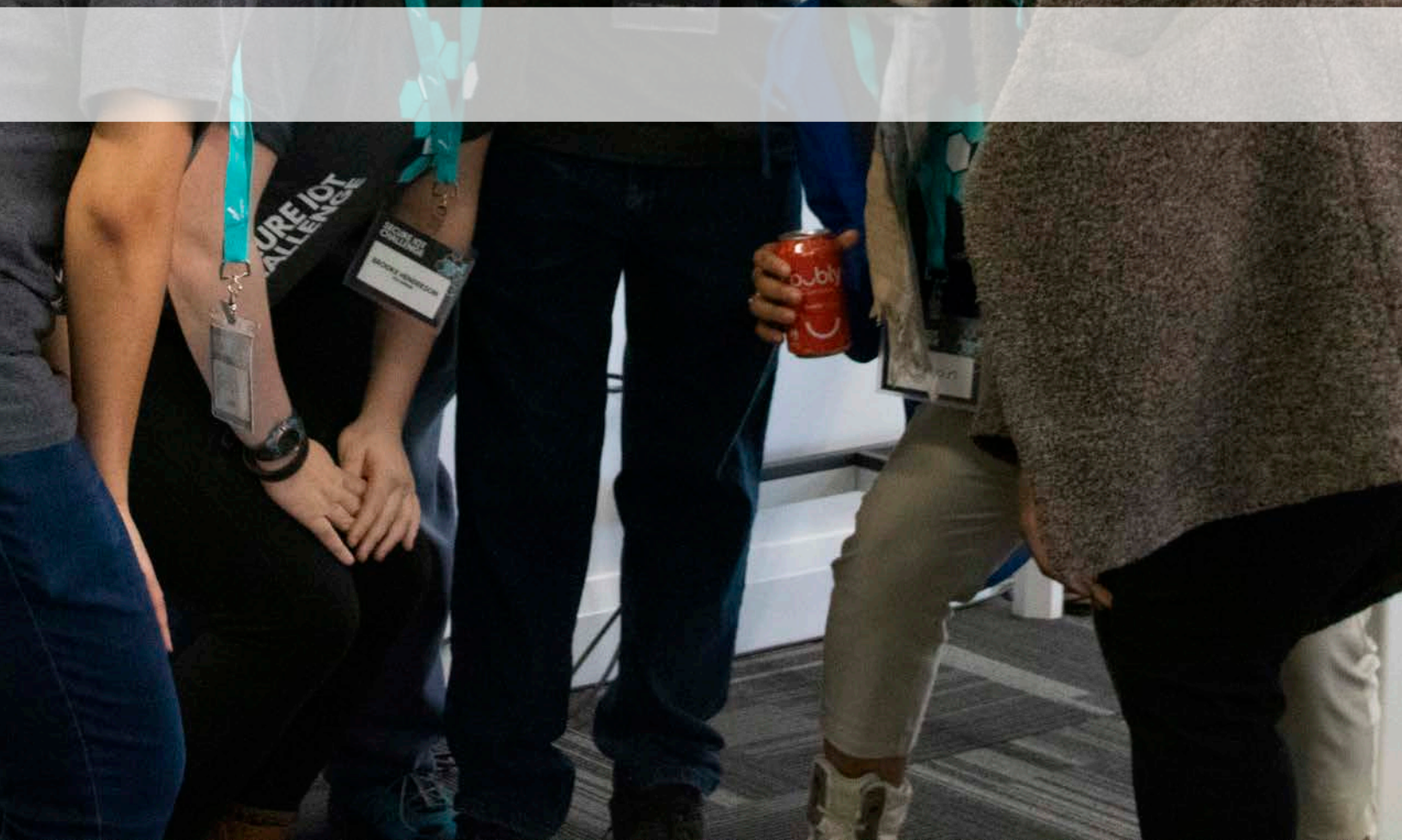
Space Calculation Projection Comparison (SM)

RESEARCH GROWTH / CHANGE MODEL

Research space is categorized as spaces with assigned SQM by PI based on program and type of research. These are rooms used for research and equipment support. Primary research spaces have their designated and dedicated support space. Secondary research spaces consist of core facilities and other shared equipment space. Specialized research areas that respond to future vision initiatives are partner spaces, testing and experimentation spaces and drone labs. An allowance to allocate primary lab space to external partners has also been identified.

QSC (SQM)	Projected Needs
Research Intensity 1	385.3
Research Intensity 2	860.9
Research Intensity 3	547.8
Research Intensity 4	190.6
Core Facilities / Shared	199.3
Secondary Equipment Space	0.0
Partner Space	131.0
Testing / Experimentation 1	0.0
Testing / Experimentation 2	0.0
High Bay	0.0


PITCHFEST
1. CrashLytics
2. TeleAngel
Queens



06 OUTREACH & ENGAGEMENT

OUTREACH & ENGAGEMENT

INTRODUCTION

Through an engaging visioning process, faculty, staff and students collectively articulated how the School of Computing can grow, change and increase the quality of its outreach and engagement activities.

The vision for Outreach and Engagement aims to strengthen and expand state of the art research and learning through deliberate engagement with academic peers, government agencies and corporate partners. The goal is to promote excellence in research, learning equity, diversity and inclusion across the QSC community.

Future outreach and engagement is divided into four themes:

- Promote Research
- Promote Partnerships
- Promote Learning
- Promote Equity, Diversity, Inclusion, & Indigeneity

These four themes form a framework for the development of strategic initiatives into a series of initiative tactics that define the direction for future implementation.

STRATEGIC INITIATIVES		INITIATIVE TACTICS
F	***Expand Promotion of Computing Research Excellence***	• *Researchers to share research news and achievements with dedicated marketing staff to promote* • *Generate the "Queen's" Story – how we differ from other computing schools* • *Target funding agencies to promote overall capabilities – currently done individually* • *Reinforce commitment to advertisement brochures to highlight our strong clusters of research* • *Reinforce efforts to increase our international ranking – these efforts are led by our strategic planning committee with a special focus on our hiring plans* • *Develop ideas around a QSC specialist research institute*
F	***Create Institute For Specialist Research***	
F	***Expand Industry Relation Capabilities & Partnerships***	• *Strengthen relationships with AI institutes – Vector, MELA* • *Focus on promoting ourselves with government initiatives, i.e. "non-Toronto" funding* • *Build and Formalize speaker series from industry and government* • *Build QSC Alumni network* • *Strengthen members and operations of the advisory board to work on promotion of QSC*
F	***Increase Engagement with Alumni***	
F	***Increase Promotion of Outstanding and Unique Learning Experiences***	• *Raise brand and awareness, social media presence for unique learning generally.* • *Expand promotion of distance education courses to non-traditional / underrepresented groups* • *Strengthen teaching and mentorship awards by ensuring that they are communicated and celebrated more widely across the School and throughout Queen's.* • *Increase global and national footprint by investigating the offering of its current or new degrees to a wider international student pool.* • *Build on research-oriented conference (CSearch) that is being led by our undergraduate and graduate students.* • *Strengthen staff support for all departmental public facing promotion needs*
S/F	***Host Seminars and Events that Celebrate EDII***	• *Reinforce support for communications and public awareness to address EDII issues, build on recent EDII best practices document and output from EDII committee.* • *Establish regular major events focused on exploring multiple topics and celebrating EDII, similar to the achievement of the Canadian Celebration of Women in Computing Annual event* • *Expand invitations to other departments, promote on QSC website* • *Do research on EDII and determine where improvements can be made* • *Acknowledge and promote stories of traditions, cultures, genders etc. publicly on QSC website* • *Build EDII more widely into undergraduate and graduate programs, building on CISC 497 - Societal, Ethical and Legal Issues in Computing and Masters Research Method course* • *Work closely with FAS faculty level groups and leverage university collateral more deliberately*
S/F	***Increase Digital Communications of EDI Events and Initiatives***	

S *Student* F *Faculty*

DRIVING PRINCIPLES OF CHANGE

Although there are intersections between the strategic initiatives, each has been defined with the ability to be achieved independently if necessary. The strategic initiatives are categorized into the following:

- **Promote Research:** The reinforcing of existing marketing and communications through internal knowledge management, as well as focusing research excellence in a new institute for specialist research format.
- **Promote Partnerships:** The creation of a management capability for marketing, fundraising and operations of research projects, mentoring, careers and internships.
- **Promote Learning:** The reinforcing of existing marketing and communications to future students, focused on new learning experiences and career opportunities
- **Promote Equity, Diversity, Inclusion, & Indigeneity:** The strengthening of existing internal communications, collateral and events. Promotion of this aspect in recruiting faculty, staff and students.

THEMES	PARTNERS	DEPARTMENT RESOURCES
PROMOTE RESEARCH	• *VP Research Office* • *Advancement / Development Office* • *FAS Faculty Office*	• *Dedicated Marketing and Communications Staff* • *Interested Faculty* • *Technical Managers* • *Conferences and Events Manager*
PROMOTE PARTNERSHIPS	• *Queen's Office for Partnership and Innovation* • *Industry / Government Partners / Alumni* • *Advancement / Development Office* • *City of Kingston* • *Local School Districts*	• *Dedicated Marketing and Communications Staff* • *QSC Industry Liaison Officer* • *Dedicated Staff to Target / Manage Alumni* *Interested Faculty* • *QSC Advisory Board*
PROMOTE LEARNING	• *Alumni* • *FAS Faculty Office* • *Local School Districts*	• *Dedicated Marketing and Communications Staff* • *QSC Undergraduate and Graduate Student Councils*
PROMOTE EQUITY, DIVERSITY AND INCLUSION	• *Queen's Equity and Diversity Office* • *Queen's University International Centre* • *Queen's Women's Network* • *Positive Space Program*	• *Dedicated Marketing and Communications Staff* • *QSC Undergraduate and Graduate Student Councils* • *Conferences and Events Manager* • *QSC EDII Committee*

RESOURCE NEEDS

It is envisioned that a School of Computing team will undertake the development and implementation of the initiatives in the outreach and engagement vision. To ensure successful completion, each strategic initiative and initiative tactic will require resources and support from within the School, from the Faculty of Arts and Sciences, from the VP Research Office and Alumni.

Engaging faculty and staff to develop and deliver initiative plans will divert them from other academic activities and this will be taken into account in the development of initiative team's activities.

Although a number of these initiatives can take place almost immediately, without constraint, as engagement and research activities grow, there will be space implications that will need to be addressed.

Partners: Remaining competitive at the forefront of interdisciplinary research and solutions-focused learning requires that the School of Computing proactively targets internal and external partners and formalizes collaboration structures with service propositions that provide tangible value for all parties.

TECHNOLOGY / SYSTEMS	POLICY / PROCESSES	SPACE IMPLICATIONS
• *Benchmark Funding Formally to Align Marketing with Relationship Building* • *Database of applications and capture success rate* • *Formally Track Research Rankings Improvements Against Plan*	• *Grants / Endowments Capture Plan* • *Benchmark Capture Processes with Other Institutions* • *Technical Packages for Contract Research*	• *Visible Showcase Research Labs* • *Demonstration / Performance Space* • *Exhibition Space*
• *Partners Commitment Package* • *Translational Research Package* • *Virtual Engagement Strategy as well as In-Person* • *More Regular Advisory Board Meetings* • *Formally Track Commercialization Against Plan*	• *Local School District Open Houses* • *Community Open Houses* • *Set Term Limits / Targets for Advisory Board Members* • *Set Nomination / Turnover Procedure* • *Reporting of Partnership Targets Against Actions / Activities*	• *Visible Industry Partner Workspace* • *Meeting Rooms* • *Co-Locate Marketing / Communications / Partnership Liaison Functions*
• *Social Media Promotion Using Student / Parent Friendly Channels* • *Formally Track Academic Rankings Improvements Against Plan*	• *Student Engagement Plan* • *Engage Alumni in Curriculum Improvement and Development*	• *Visible Showcase Hands-On Learning* • *Visible Showcase Design / Fabrication Space*
Promote EDII Course Material / tools: • *Academic Integrity - Behaviors* • *Misogyny - Empowerment Resources* • *Student Professional Behaviors* • *Teaching Practices* • *Queen's DEAP Tool* • *Online Resources / Support Modules* • *Dean's Dashboard*	*Promote / Host EDII Events:* • *Faculty, Staff and Student Training* • *Student-Focused Quizzes and Events* • *Regular Visits from Queen's Equity and Diversity Office* • *Departmental Diversity and Inclusion Celebrations*	• *Large Interactive Meeting Space*

Department Resources: Increased collaboration between motivated faculty and QSC marketing and communications staff with FAS and university support will enable the development of new and the strengthening of existing outreach initiatives

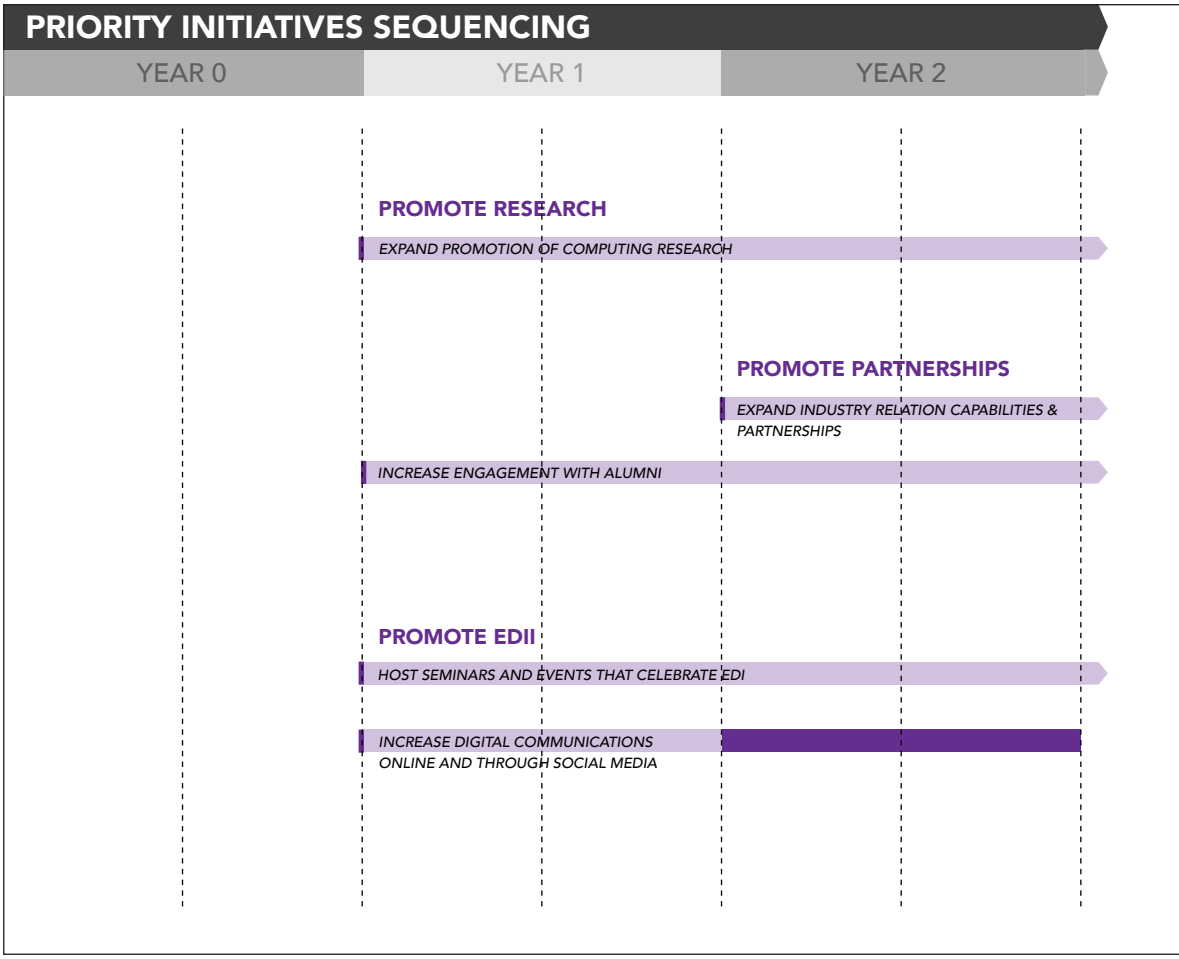
Technology / Systems: Investment in proactive planning, marketing and benchmarking should focus on the development of high-value partnership services packages similar to those being employed by competitor institutions.

Policy: Creating new processes that enable the direct promotion and hosting of learning, research and EDII initiatives / events will accelerate the achievement of the goals of the engagement and outreach Initiatives.

Space: While existing space may be suitable in the short term, lack of good quality cost effective conference, amenity and meeting space will disrupt the ability to undertake credible promotion.

OUTREACH & ENGAGEMENT

Engaging our Community

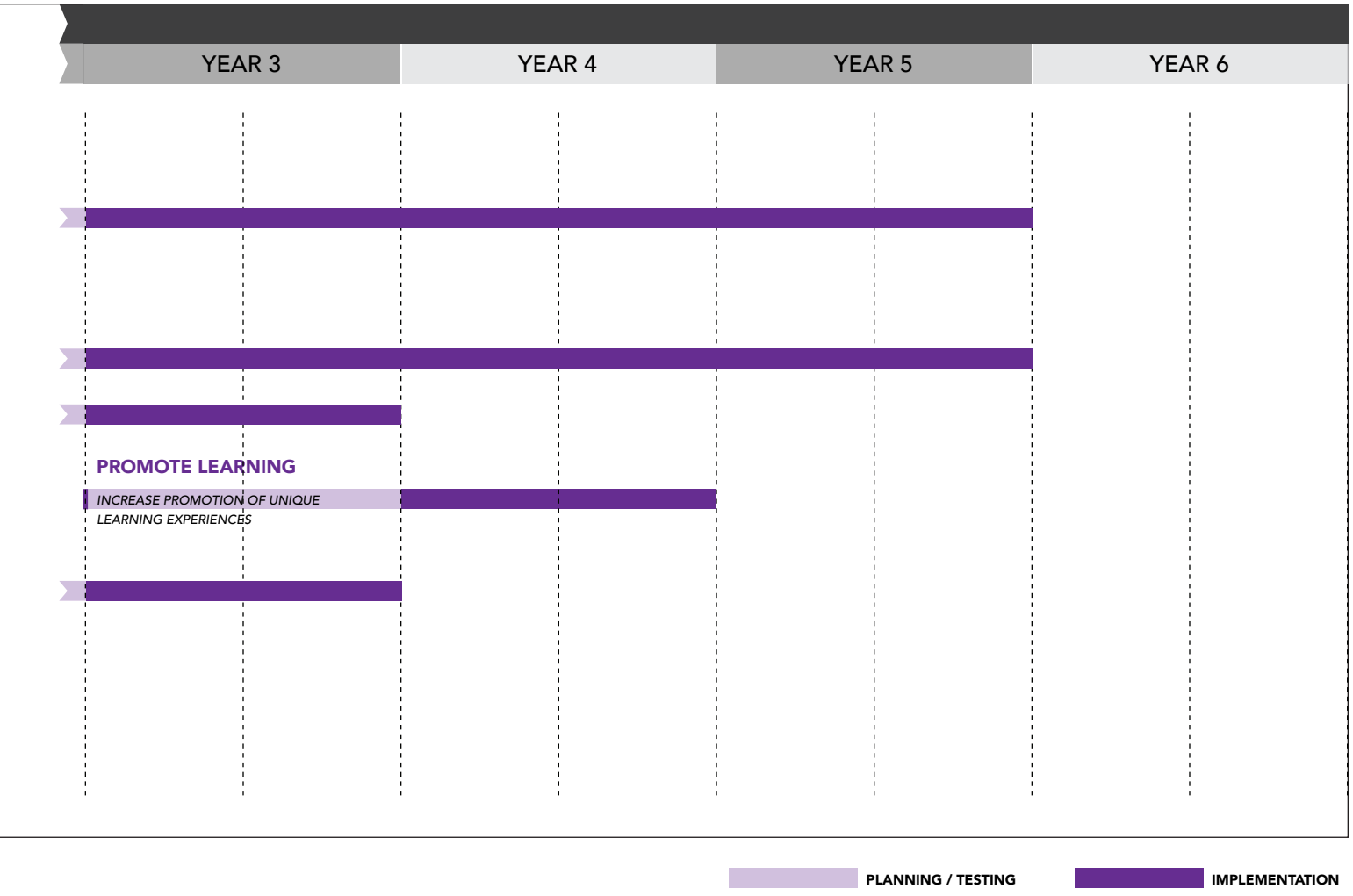


INITIATIVES TIMELINE

Implementing the vision for outreach and engagement will require a number of years to complete. The initiative timeline shown above has been developed to consider the finite resource availability, the requirements of University processes and that some initiatives require new space to be implemented.

Although the timeline above is divided into yearly segments, a specified start date is to be determined. Following the mobilization of the Initiative Committee each individual initiative moves through two periods. The light bars represent the planning and testing phase of each initiative. The dark bars represent the implementation phase of each initiative. The end of the dark bars represents that the initiative has entered the normal working processes of the departments. This signifies the completion of the respective initiative.

The outreach and engagement initiatives committee is composed of faculty and staff representatives from QSC. This team will lead, manage and develop each initiative. The committee will also engage with and manage other University and QSC resources needed to develop and implement each initiative.



The outreach and engagement initiatives consist of a series of collaborative, communications, marketing and organizational initiatives that expand QSC's ability to engage with funders, partners, prospective recruits and the general public.

Promote Research: The implementation of increased research promotion can begin immediately. A new Research Institutes can be in operation within 3 years.

Promote Partnerships: More effective management of alumni and Advisory Board members, as well as targeted partnership development will help to achieve QSC research, fundraising and commercialization targets in 3 years.

Promote Learning: The creation of a capability for promoting unique and outstanding learning can take place immediately. However, moving to a critical mass of engagement will require new facilities.

Promote EDII: The creation of a capability for promoting and hosting EDII and other outreach events can take place immediately. However, moving to a critical mass of engagement will require new facilities.

INITIATIVES DRIVING SPACE

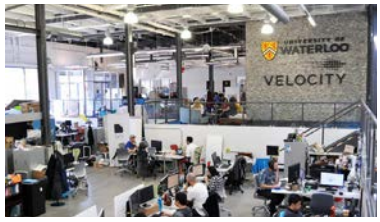
Public Engagement Focus Areas

- Promote Research
  - *Visible Showcase Research Labs*
  - *Demonstration / Performance Space*
  - *Exhibition Space*
- Promote Partnership
  - *Industry Workspace*
  - *Large Interactive Meeting Space*
- Promote Learning
  - *Visible Showcase Hands-On Experiential Learning Space*
  - *Visible Showcase Design / Fabrication Space*
- Promote EDII
  - *Conference / Meeting Space*

Showcase Labs on Display

Demonstration / Performance Space

Exhibition Space



Public / Industry Workspace

Showcase Learning / Design Space

Large Interactive Meeting Space

PUBLIC ENGAGEMENT OPPORTUNITIES

Each strategic initiative provides an opportunity to create a collaborative environment that enhances the engagement experience. During workshops, students, faculty and staff voiced the desire to more effectively display their learning and research activities.

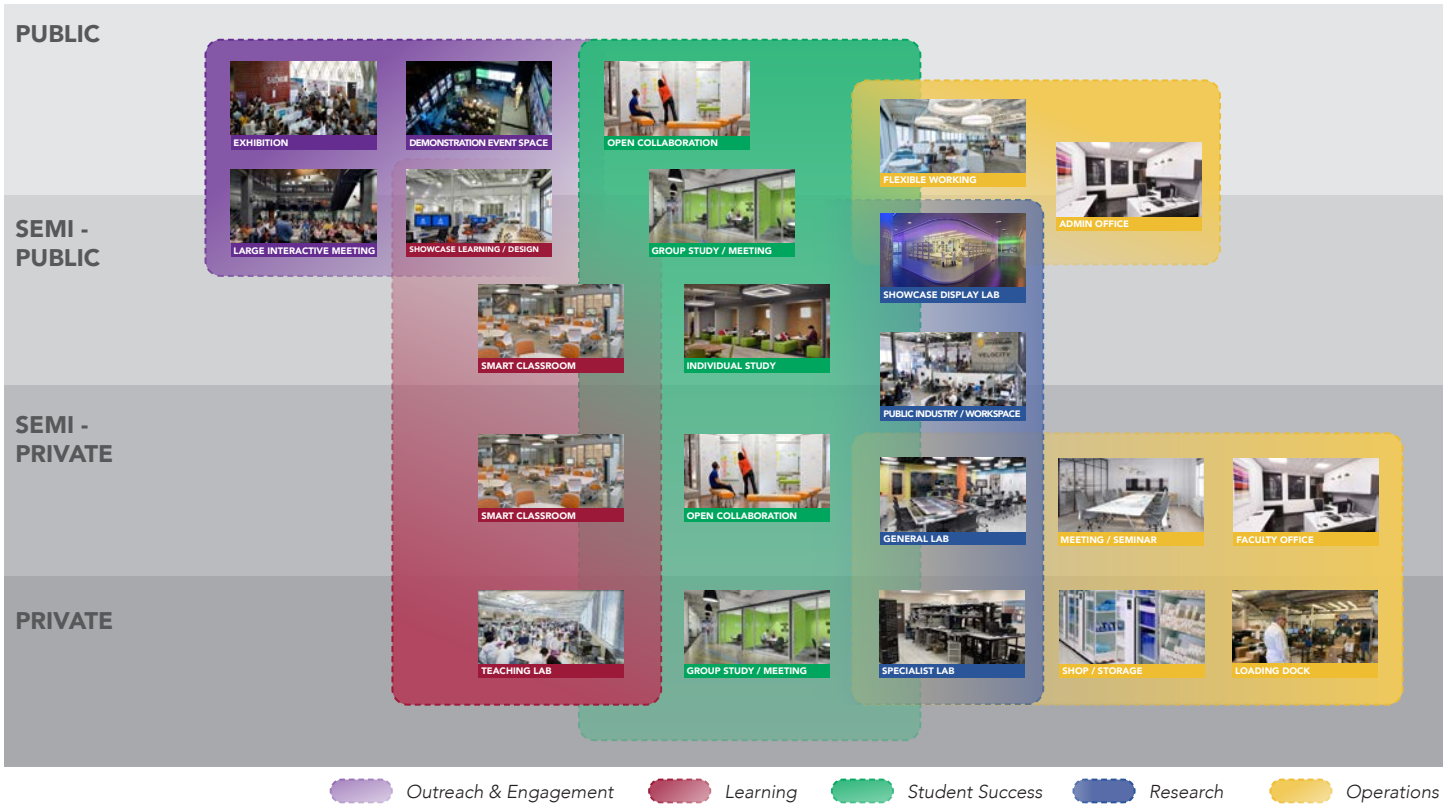
The chart above illustrates examples of how a range of multipurpose spaces can be incorporated into public and semi-public areas for the purposes of promotion and engagement.

Public / industry workspaces is in research calculator. Large interactive space is a part of exhibition / demonstration space.

New spaces needed to achieve the goals of the Outreach and Engagement Vision are:

- Multi-Purpose Public Space can be used for exhibitions, conferences, performance and displays using mobile furniture and technology.
- Design / Maker Space can be placed in conjunction with circulation and used for public enrichment and demonstrations, as well as scheduled and non-scheduled learning activities.
- Research Labs, Coworking space and Classrooms can be provided with transparency for visitors and potential partners and funders

ADJACENCIES DIAGRAM OF INITIATIVE DRIVEN SPACES



ADJACENCIES PRIORITIES

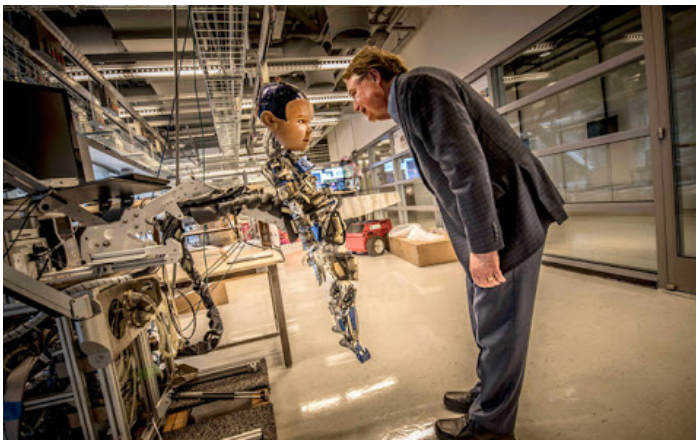
Stakeholders were engaged to participate in a workshop investigating how to align the strategic space types driven by QSC initiatives with public to private proximity.

The workshop challenged the participants to imagine a variety of engagement and outreach activities and align them with the space types most suited to those activities. The workshop also provided an in depth understanding of the different operational and locational characteristics needed across all space types.

The resulting relationships, shown above, illustrate a desire to co-locate certain showcase research, industry partnership, learning and student success spaces with public interaction space.

Ultimately, this aligns space characteristics and adjacencies with the QSC vision of increasing public engagement, industry engagement, and the awareness of EDII.

Multipurpose "Black Box" Conference / Performance Space



Maker / Robotics Testing Space

Multipurpose Interactive Exhibition Space

Demonstration Space

CASE STUDY

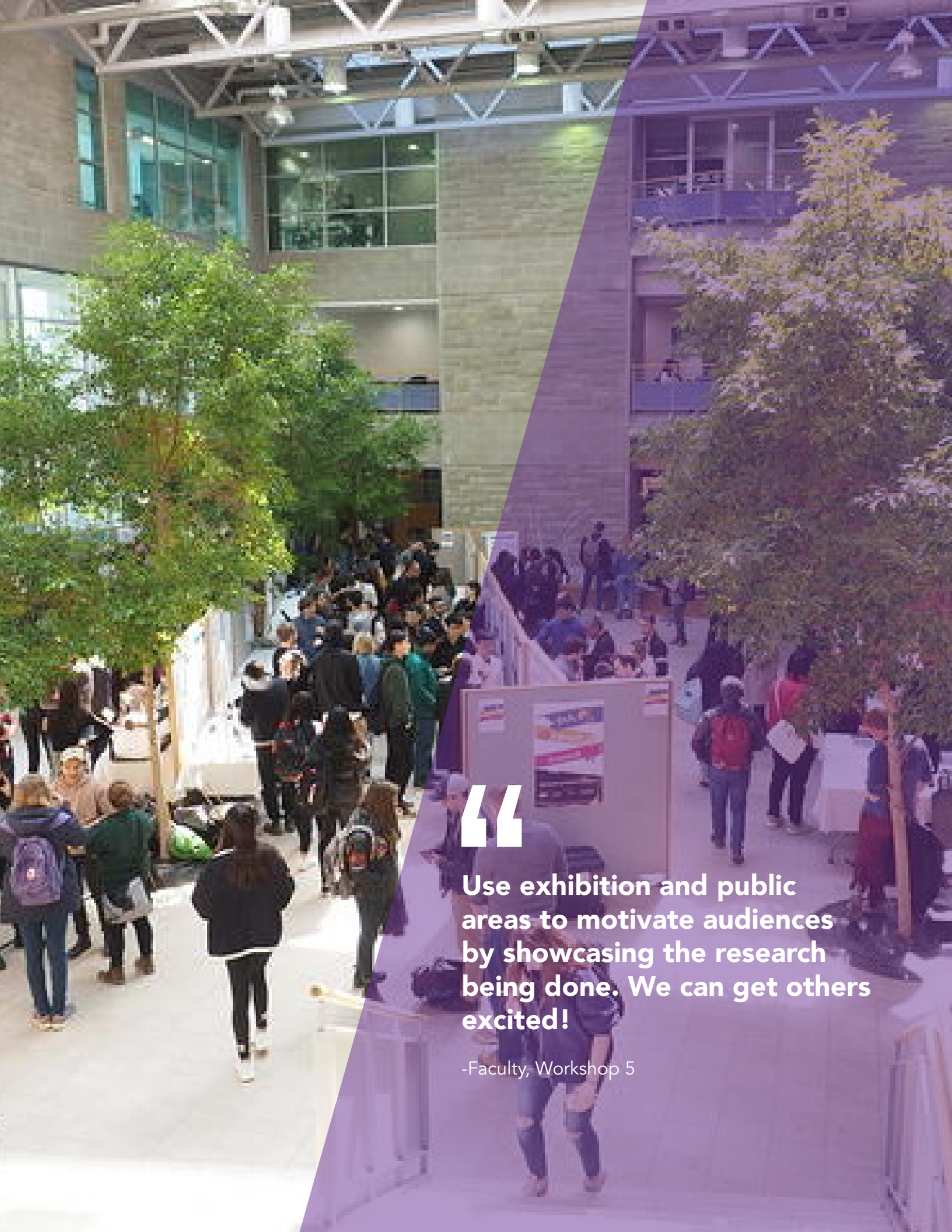
UNIVERSITY OF CALIFORNIA SAN DIEGO, CAL IT2 - ATKINSON HALL

Mission:

- Build interdisciplinary links between university departments for mutual benefit
- Support involvement of faculty, students, industry, government, and community partners in real life solutions
- Enables prototyping in Calit2 "living laboratories."
- Provides technical professionals as the bridge between academia and industry in commercialization

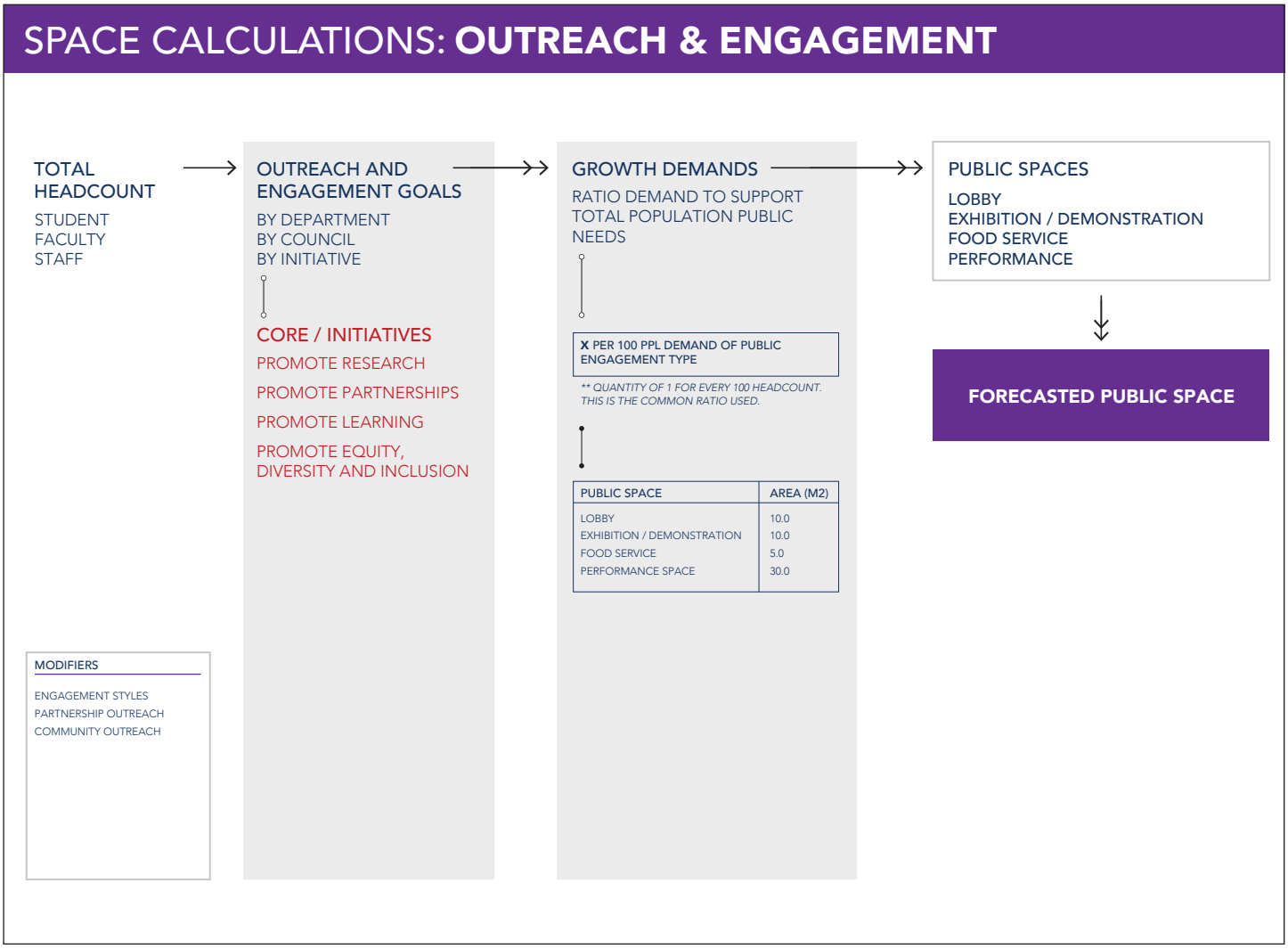
Atkinson Hall, is designed as an instrument of research and learning that encourages partners to combine in unusual teams to make fundamental discoveries. As a result, one of its defining characteristics is a constant state of change.

The building promotes the coexistence indeed, the interaction of opposites. The design nurtures the intimacy of ideas at the level of one-on-one office or laboratory-oriented dialogue; chance encounters in halls, stair landings, and lounge areas; collaborative interactions in the unbounded research neighborhoods; group interactions in visualization and conference rooms; and collective gatherings in the auditorium, CAVE, and courtyard.



Use exhibition and public areas to motivate audiences by showcasing the research being done. We can get others excited!

-Faculty, Workshop 5



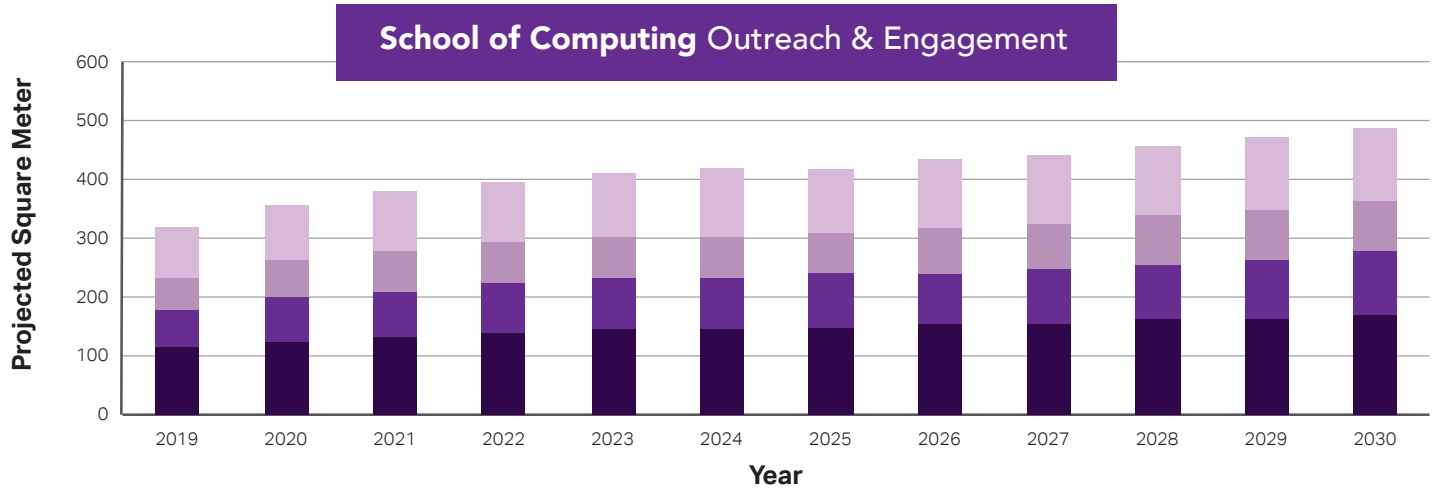
SPACE CALCULATION METHODOLOGY

The priority initiatives in outreach and engagement will have several space implications that will need to be accounted for to ensure its future success. This section focuses on a space calculation methodology that addresses deficiencies in public space, including lobbies, conference, food service and amenity.

The methodology is built on the expected quantity of students, public and other visitors expected to enter the public spaces of the School of Computing.

A demand model is built using an assumed weekly traffic expected through public areas. The model determines a quantity need based on every 100 headcount. This quantity is then multiplied by an area per quantity determined by each different public space type.

Showcase labs and partner / industry workspaces are considered in the previous research chapter on page 89. Showcase learning and design space are considered in the previous learning chapter on page 57.



(SM)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Projected	**317**	**354**	**374**	**394**	**407**	**412**	**418**	**430**	**443**	**456**	**471**	**488**

Space Calculation Projection Comparison (SM)

Lobby *Exhibition* *Food Service* *Performance / Showcase*

GROWTH / CHANGE MODEL

Outreach and engagement space is categorized as spaces with assigned SQM by headcount based on total school population flow. These are rooms used for public outreach, event hosting, social gathering and industry/partner engagement.

The types of outreach and engagement spaces are but not limited to: lobby space, exhibition space, food service space, and performance / showcase spaces. These spaces are driven by the initiatives of alumni engagement, partnership engagement, public engagement, conferences, events, symposiums and community engagements.

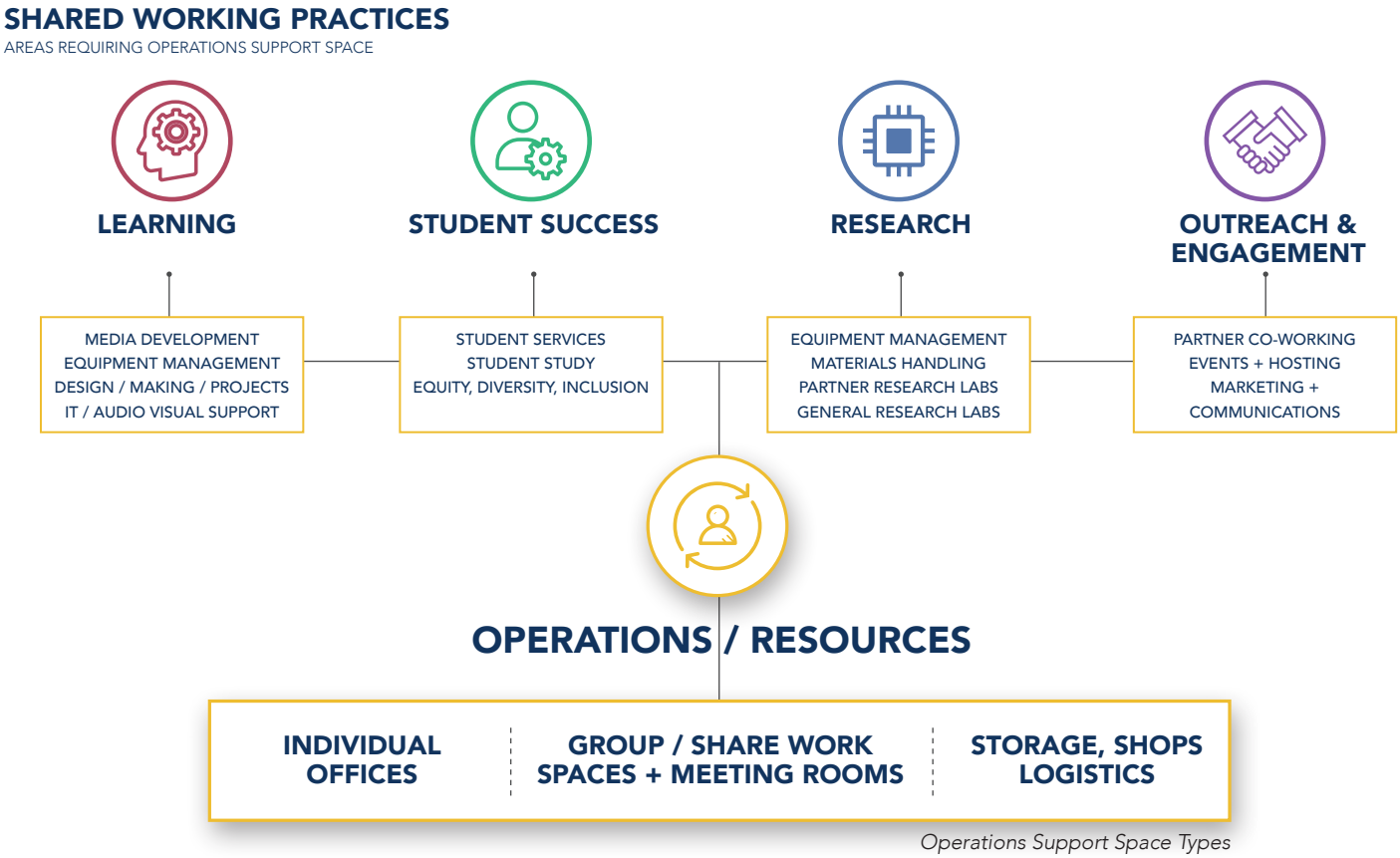
The projections for outreach and engagement are as follows:

School of Computing: 488 SQM

These numbers represent an overall prediction of the outreach and engagement spaces needed to accommodate future goals of outreach and engagement initiatives.

07
OPERATIONS

OPERATIONS



Operations Support Space Types

INTRODUCTION

In addition to articulating a vision and goals for Learning, Student Success, Research, and Engagement and Outreach, the visioning process identified future working practices and services required to support the four primary initiative foci.

This Operations section covers two important aspects:

- Aligning the growth in numbers and future working practices of faculty, staff, graduate students, visitors and partners with the need for an increase in the types, number and quality of offices and meeting space.
- Optimizing the efficiency of storage, materials handling and technical maintenance operations through the sharing of staff, equipment, consumables and space.

It is envisioned that each of the four implementation teams will develop and coordinate new operational working practices that will drive their part of an overall shared support model. This will enable detailed determination of the optimal space requirements.

OPERATIONS SUPPORT - SPACES

Operations Support

- Growth in Academic and Student Support
  - *Office - Faculty / Staff*
  - *Office - Student Support*
  - *Office - Career Services Internal*
- Graduate Students, Postdocs, Partners, Staff - Group / Sharing
  - *Co working / Open Plan Office*
  - *Shared Office*
  - *Work Room*
- Office Support
  - *Conference Room*
  - *Break / Lounge*
- Logistics Support
  - *Loading Dock / Materials Handling*

Individual Office

Co working / Open Plan / Shared Office

Conference Room

Break / Lounge

Loading Dock / Materials Handling

Work Room

FUTURE OPERATIONS MODEL

Aligning the growth in numbers of faculty, staff, graduate students, visitors and partners will inform the demand for future office and meeting spaces. Future detailed coordination of QSC operational working practices, will enable development and adaptations of office space for increased mobile, remote and co-working to be accommodated.

The chart above illustrates examples of how a range of office and meeting spaces can be utilized to achieve the goals of this road-map.

Spaces to include are:

- Individual offices - Faculty, staff, student support, career services
- Group / Sharing spaces - Co-working, open plan, shared offices for graduate Students, partners and staff
- Office Support - Conference, meeting rooms break rooms and work rooms
- Logistics Support - Loading dock, stores, technical services shops, large freight elevator

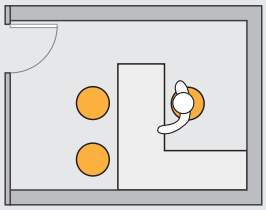
Career services internal will require new dedicated staff.

Student support for counseling and mental health will also require new dedicated staff.

OPERATIONS SPACE DIAGRAM

Enclosed Office (Faculty, Staff, Student Service)

11.0 SQM Office

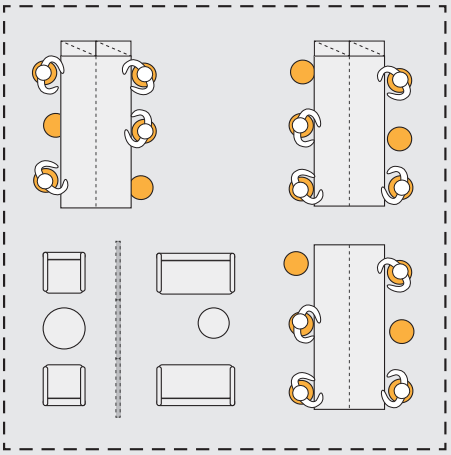


Plan and Sample Image

An enclosed office provides private space for concentrated work. Typically seating 1 person plus 1-2 visitors these spaces require digital media, storage and marker boards. These rooms typically allocate 11 SQM / person.

Open Office (Staff, Graduates, Postdocs)

7-9 SQM / Person



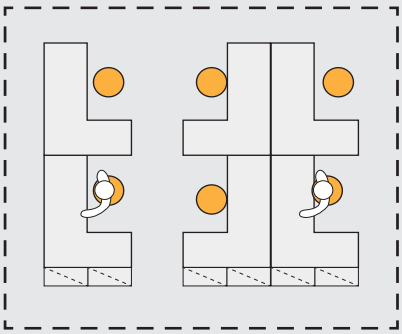
Plan and Sample Image

An open office space is a flexible environment that can support a variety of working styles. An open office environment will contain cubicle or bench based furniture with storage and visual aids These rooms typically allocate 4.5 - 9 SQM / person, excluding circulation.

OPERATIONS SPACE DIAGRAM

Co Working Space (Internal and External Visitors)

4.5-9 SQM / Person

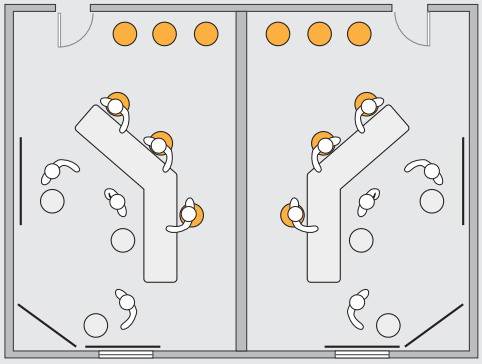


Plan and Sample Image

Co-working Space is a flexible office environment that can support a variety of working styles for mobile faculty, staff, internal and external visitors and partners. This environment will contain cubicle or bench based furniture with storage and visual aids These rooms typically allocate 4.5 - 9 SQM / person, excluding circulation.

Media Development

5.6 SQM / FTE



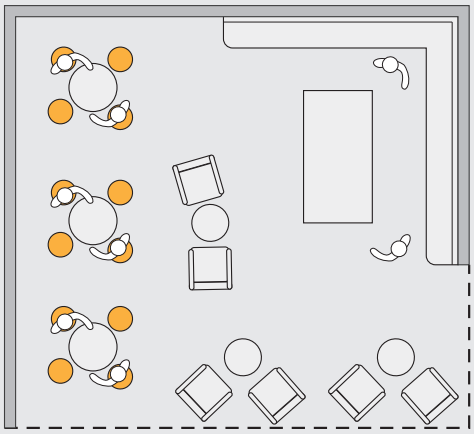
Plan and Sample Image

Media development spaces are designed to support faculty and staff in the development of digital and audio-visual media. These spaces contain specialized A/V recording and playback equipment, lighting and acoustic treatments software and computation equipment for individuals and groups. These rooms typically allocate 5.60 SQM / Person

OPERATIONS SPACE DIAGRAM

Break Room / Lounge

50-80 SQM Room

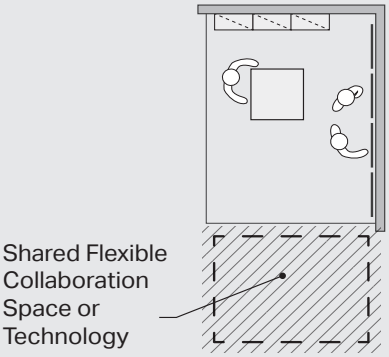


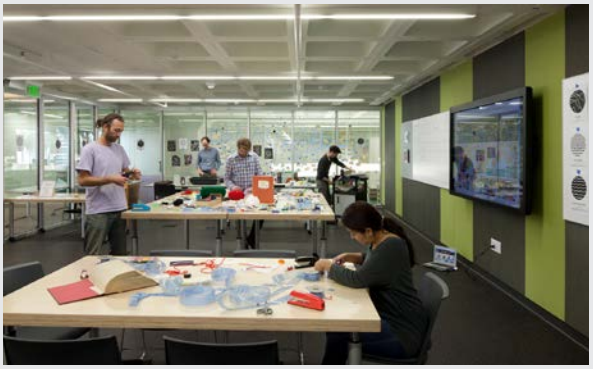
Plan and Sample Image

A break-room / lounge provides an informal environment for food and beverage preparation, informal meetings and other social engagements. It will contain of a variety of cafe and lounge style furniture and visual aids along with kitchen equipment and storage. These rooms typically allocate around 50-80 SQM.

Work Room (Faculty / Staff Only)

2.4 SQM / Person





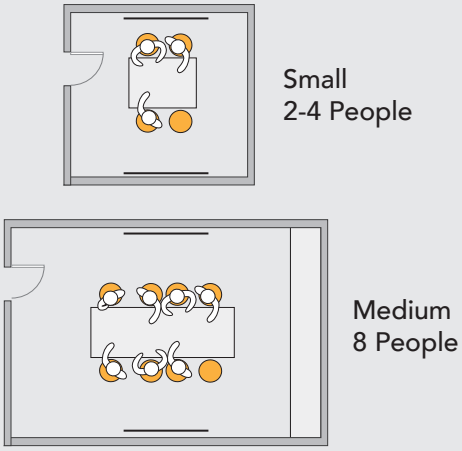
Plan and Sample Image

A work room is an enclosed space used by small groups of people to assemble and create physical artefacts. Typically accommodating 4-8 people, these rooms allow flexible collaboration with storage, printing and copying, digital media and marker boards. These rooms typically allocate 2.4 SQM / Person.

OPERATIONS SPACE DIAGRAM

Conference Rooms: Small + Medium

2.0 SQM / FTE

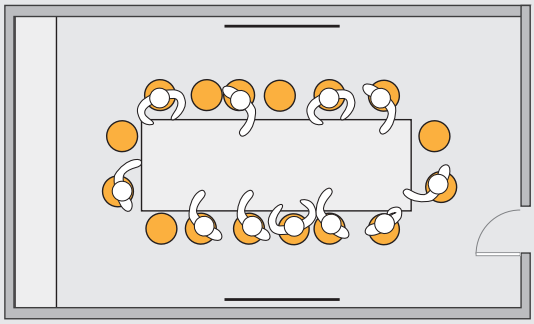


Plan and Sample Image

Conference rooms are a critical component of operational space needs. These rooms allow enclosed group gatherings of varying sizes. These rooms are furnished with A/V equipment for digital engagement. They are also furnished with marker boards for team collaboration. These rooms typically allocate 2.0 SQM / Person.

Conference Rooms: Large

2.0 SQM / FTE



Plan and Sample Image

Conference rooms are a critical component of operational space needs. These rooms allow enclosed group gatherings of varying sizes. These rooms are furnished with A/V equipment for digital engagement. They are also furnished with marker boards for team collaboration. These rooms typically allocate 2.0 SQM / Person.

Open Meeting Space

Open Office Space with Private Meeting / Workspace

Enclosed Meeting Space

Multipurpose Gathering Space

CASE STUDY

VECTOR INSTITUTE, TORONTO, CANADA

The Vector Institute is an independent, not-for-profit dedicated to research in the field of artificial intelligence, machine and deep learning.

Launched in March 2017 in partnership with the University of Toronto and other universities. It works with institutions, industry, start-ups, incubators and accelerators to advance AI research and drive its application, adoption and commercialization.

The Institute hosts a mixture of classes, meetings, public and private events for education, research, outreach, and product development. It also hosts individuals and groups to use their space for collaborative short, medium, and long-term projects.

A mixture of highly flexible open and enclosed office and meeting spaces, of a variety of sizes have been provided for large town hall events, seminars, one-on-one meetings, and group discussions.

SPACE CALCULATIONS: **OFFICE**

OFFICE FTE

FACULTY
STAFF ADMIN
STAFF TECHNICAL
PHD STUDENT
MASTERS STUDENT
POSTDOCS
PARTNERS

MODIFIERS

TYPE OF OFFICE USED
AMOUNT OF SHARED OFFICE
AMOUNT OF GROUP SHARING
COWORKING NEEDS
FUTURE SHARING GOALS
AT HOME VS IN PERSON WORKING

GROWTH DEMANDS

OPTIMIZE GROWTH RATIO BETWEEN FACULTY / STAFF AND STUDENT ENROLMENT

CORE / INITIATIVES

LEARNING
- Research in Learning
- Project-Based Learning
- Design / Making

STUDENT SUCCESS
- Student Study
- Student Support
- Faculty Support
- Equity, Diversity + Inclusion

RESEARCH
- Generic Labs
- Specialist Labs
- Partner Labs

OUTREACH + ENGAGEMENT
- Exhibition
- Performance / Events

OFFICE SPACE PER EMPLOYEE

STANDARD OFFICE GROWTH SUPPORT

OFFICE SPACE PER STUDENT

OFFICE - INDIVIDUAL	ROOM CAPACITY	ROOM AREA (M2)
OFFICE - FACULTY	1.0	11.0
OFFICE - STAFF ADMIN	1.0	8.5
OFFICE - STAFF TECHNICAL	1.0	8.5
OFFICE - STUDENT SUPPORT	1.0	11.0
OFFICE - CAREER SERVICE	1.0	11.0

OFFICE - GROUP / SHARE	% INVOLVE	AREA (M2)
COWORKING / OPEN	50%	4.5 / Person
SHARED OFFICE - MASTERS	75%	4.0 / Person
SHARED OFFICE - PHD	75%	5.0 / Person
WORK ROOM	50%	3.2 / Person
CONFERENCE ROOM	25%	2.0 / Person

OFFICE - SUPPORT	QTY PER 100 PPL	ROOM AREA (M2)
MEDIA SUPPORT	1.0	28.0
BREAK / HUB	1.0	80.0
MOTHERS ROOM	1.0	12.0
RECEPTION	1.0	20.0
STORAGE / OFFICE SERVICES	2.0	20.0

DISTRIBUTION OF INDIVIDUAL AND GROUP SHARING SPACES

50% PERCENTAGE OF COWORKING

GROUP / SHARE DISTRIBUTION BY DESIGNATED SHARING POPULATION WITH CAPACITY

OFFICE SUPPORT DISTRIBUTION BY QTY PER 100 PPL

OFFICE SPACES

INDIVIDUAL
OFFICE - FACULTY / STAFF
OFFICE - STUDENT SUPPORT
OFFICE - CAREER SERVICES

GROUP / COWORKING
COWORKING / OPEN COLLAB
SHARED OFFICE
WORK ROOM
CONFERENCE ROOM

SUPPORT
MEDIA SUPPORT
BREAK / MOTHERS ROOM
RECEPTION / STORAGE

FORECASTED OFFICE AND OFFICE SUPPORT SPACE

***CAPACITY AND UTILIZATION DISTRIBUTION IS CONSIDERED IN PROJECTION*

SPACE CALCULATION METHODOLOGY

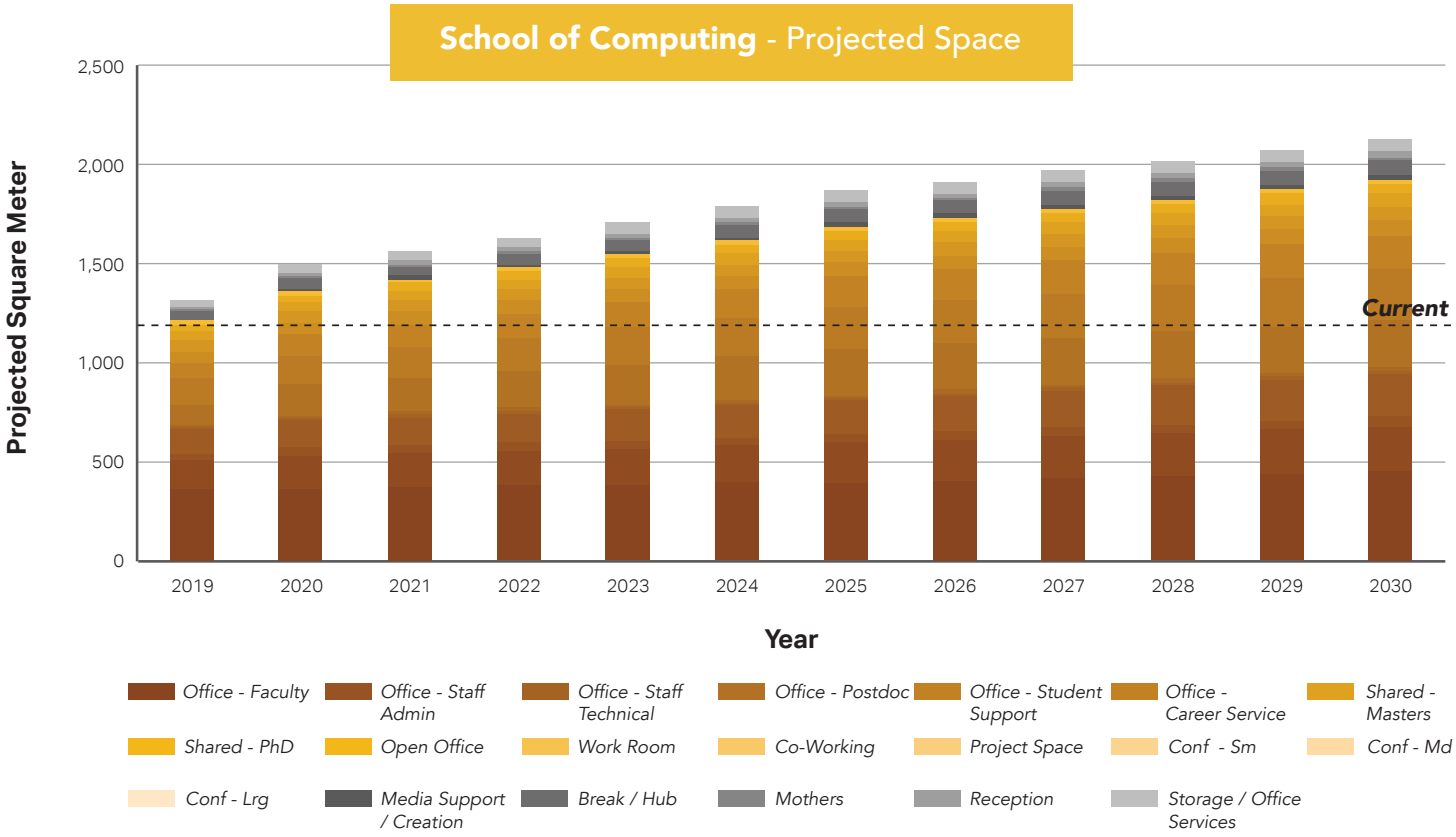
Offices, meeting rooms and associated support space are provided on the basis of the projected headcount of faculty, staff, postdoctoral fellows and graduate students. An allowance is also made for co working space for partners, collaborators and other visitors who will require periodic workspace at QSC.

Faculty and certain staff will receive an enclosed office. Other staff and postdoctoral fellows will receive open plan or shared permanent offices. Graduate students will receive open office space on a bookable timeshare basis.

In addition to providing office and shared workspace support to the initiatives, additional logistics support has to be accounted for.

The methodology is based on the total net area of projected learning, research, student success, outreach and engagement, and operation spaces.

A percentage of the net sum is used to determine the necessary supporting back of house spaces. These spaces include loading docks, secure holding space, general storage, waste, and recycling.



(SQM)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Projected	**1,316**	**1,495**	**1,561**	**1,631**	**1,706**	**1,785**	**1,870**	**1,918**	**1,968**	**2,019**	**2,072**	**2,127**
Current	**1,258**	**1,258**	**1,258**	**1,258**	**1,258**	**1,258**	**1,258**	**1,258**	**1,258**	**1,258**	**1,258**	**1,258**

Space Calculation Projection Comparison (SM)

OFFICES AND SUPPORT GROWTH / SUPPORT MODEL

Spaces in operations are categorized as individual offices, open offices / co-working, and office support. These rooms are used for supporting work needs of faculty, staff, PhD, Master's, Postdoctoral fellows and internal / external visitors. Enclosed office projections are calculated based on headcount, and then open offices are calculated on the basis of future shared working, depending on the mobility of occupants.

The current projections for operational space demands shows deficit with the current space available. As the school grows, by 2030, there will be a heavy deficit in operational space needs. Additional offices and co-working environments will need to be invested in order to ensure that Queen's is operating at the optimal capacity.

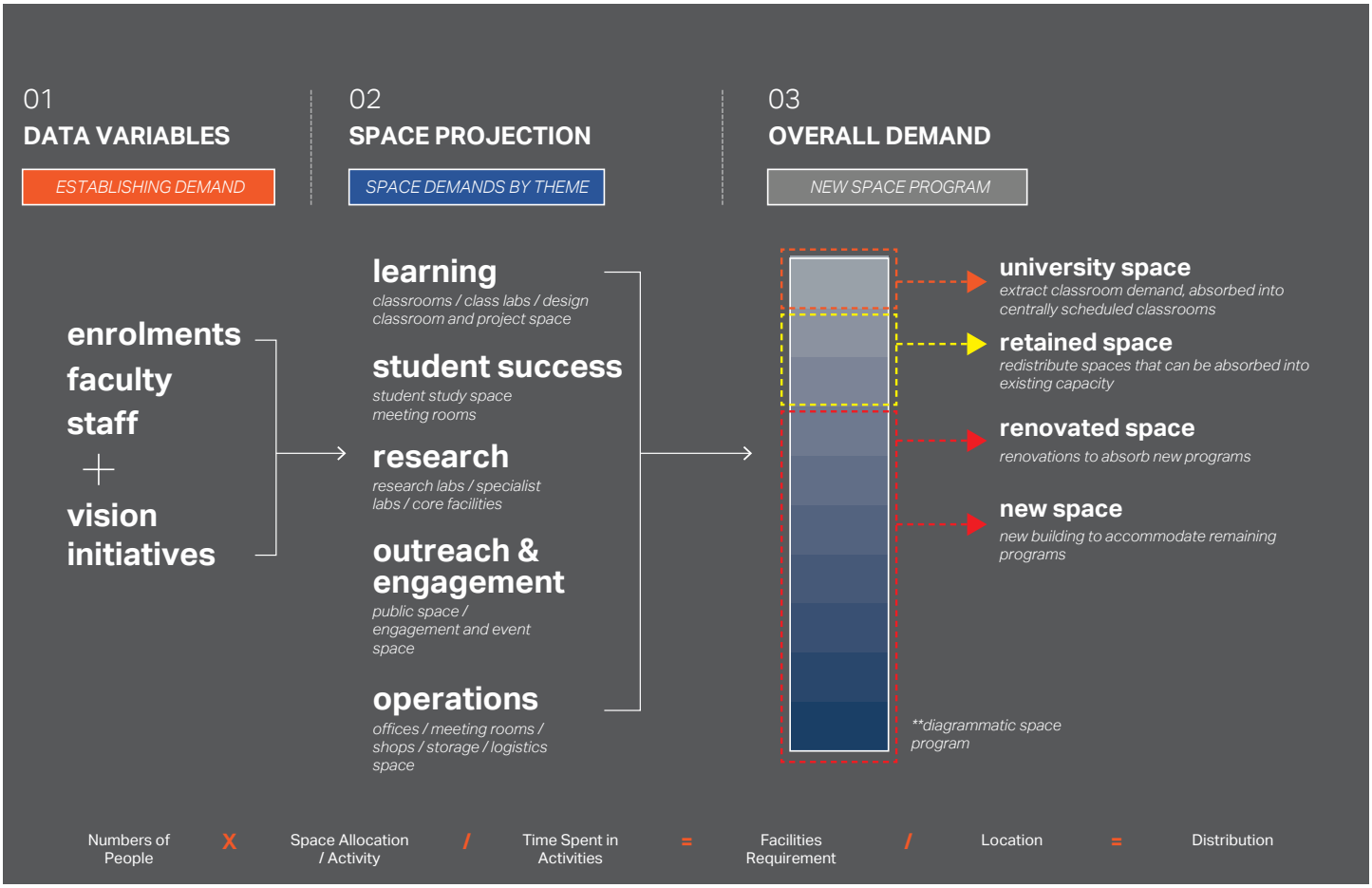
QSC (SQM)	2019	2030
Office + Support Space	1,316	2,127

“Create and refine programs to better help students maximize success through extra-curricular activities and course selection

-Student, Workshop 4

08 SPACE

SPACE



INTRODUCTION

The space prediction model involves a four-step process to determine the space needs of the School of Computing.

1. **Population:** Student growth projections to 2030, by department, coupled with the associated faculty and staff projections form the basis of the space calculations.
2. **Vision Initiatives**: Space and time allocations for future activities undertaken by the population are defined by the requirements of each of the Vision Initiatives.
3. **Space Demand:** The output of the population - space and time allocations is a master functional space program.
4. **Space Allocation:** The space demand is then divided into four location based categories:

    - Existing space that will be retained as is
    - Centrally scheduled classrooms allocated to the overall University pool
    - Consolidated space required to meet the programmatic requirements of the department that is not included in the first two categories

CURRENT OCCUPIED SPACE (2020)

Learning

Classroom:	**37 SM**
Teaching Lab:	**316 SM**
Lab Support:	**53 SM**

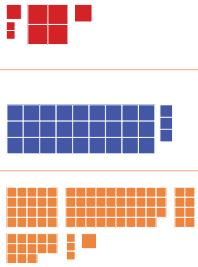
Research

Labs:	**1,141 SM**
Core Facilities:	**0 SM**
Lab Support:	**66 SM**

Operations

Offices / Meeting:	**986 SM**
Support / Storage:	**271 SM**

Total NSM: **2,841 NSM**



CURRENT DEMAND (2020)

Learning

Comp Labs:	**475 SM**
Design / Project:	**675 SM**
Learning Support:	**140 SM**

Research

Research Labs:	**1,599 SM**
Partner Space:	**106 SM**
Core Facilities:	**161 SM**

Operations

Offices / Meeting:	**1,110 SM**
Conference Room:	**101 SM**
Support / Storage:	**104 SM**

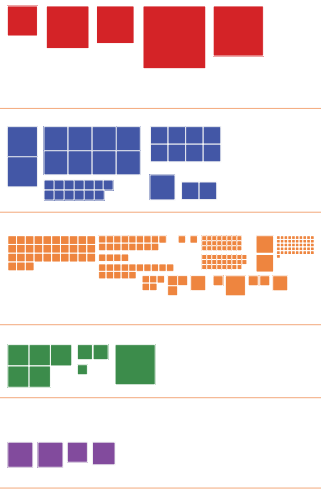
Student Success

Study Space:	**727 SM**

Outreach & Engagement

Lobby / Exhibition:	**178 SM**
Performance / Other:	**139 SM**

Total NSM:	**5,515 NSM**
Total GSM:	**8,273 GSM**



SPACE DEMAND (2030)

Learning

Comp Labs:	**475 SM**
Design / Project:	**900 SM**
Learning Support:	**185 SM**

Research

Research Labs:	**1,984 SM**
Partner Space:	**131 SM**
Core Facilities:	**199 SM**

Operations

Offices / Meeting:	**1,789 SM**
Conference Room:	**139 SM**
Support / Storage:	**197 SM**

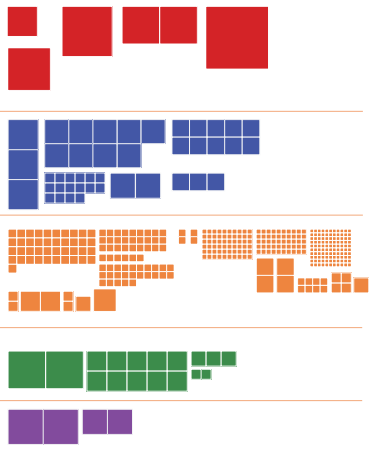
Student Success

Study Space:	**1,121 SM**

Outreach & Engagement

Lobby / Exhibition:	**274 SM**
Performance / Other:	**214 SM**

Total NSM:	**7,611 NSM**
Total GSM:	**11,416 GSM**

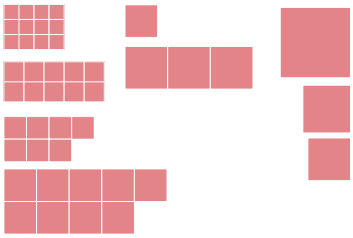


UNIVERSITY CENTRAL CLASSROOM DEMAND (2030) **

Learning

Class - 12:	**432 SM**
Class - 24:	**720 SM**
Class - 48:	**672 SM**
Class - 96:	**1728 SM**
Class - 120:	**192 SM**
Class - 200:	**960 SM**
Class - 500:	**800 SM**
Class Lab - 48:	**158 SM**
Class Lab - 96:	**317 SM**
Class Support:	**235 SM**
Online Learning:	*-1021 SM*

Total NSM:	**5,193 NSM**



*** Projected central classroom needs from the School of Computing. This is to be absorbed by Central classrooms inventory already on campus.*

MASTER SPACE PROGRAM

The Master Space Program is divided into four locational categories. There are four projected needs:

Current Occupied Space: 2,814 NSM

This is the currently how much the School of Computing uses.

Current Demand: 5,515 NSM
8,273 GSM

This is the projection for how much the School of Computing currently would need to fulfill its future vision and pedagogy based on today's numbers. The current demand of 5,515 NSM represents the demand without university space.

Space Demand 2030: 7,611NSM
11,416 GSM

This is the projection for how much the School of Computing would need to fulfill its future vision and pedagogy based on 2030 projections.

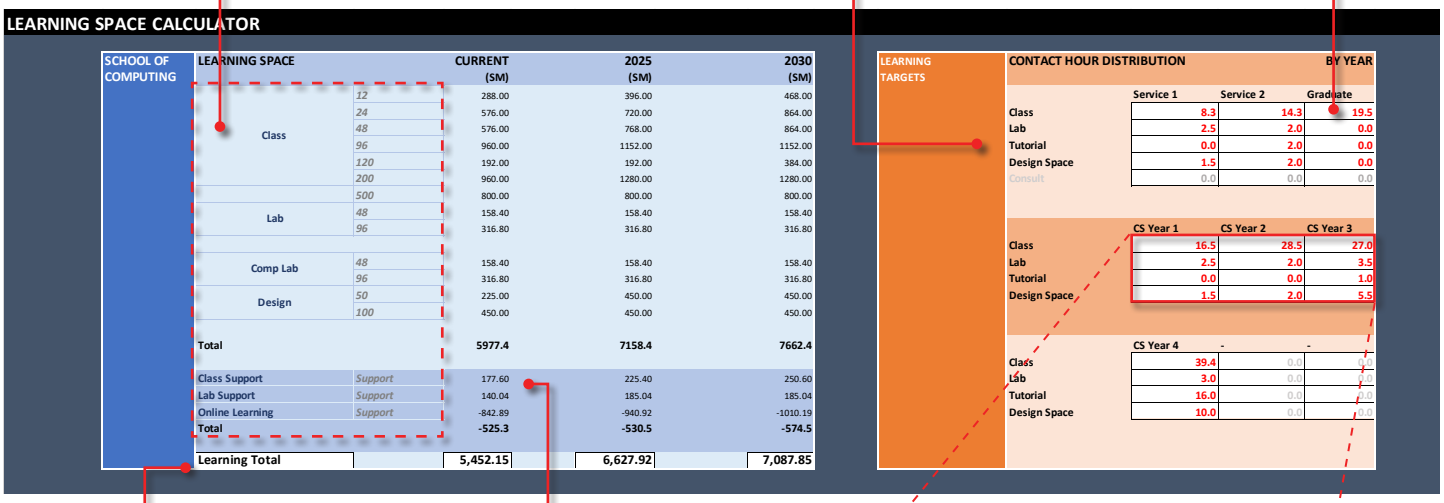
University Central Classroom Space 2030: 5,193 NSM

This space identifies the overall credit classroom requirements for the School of Computing. This will be managed by the University and fulfilled by other locations on campus.

Learning space breakdown. By space type and by room size.

Learning space type distribution. Categories available to each program.

Learning group by department and year.



LEARNING SPACE CALCULATOR

SCHOOL OF COMPUTING	LEARNING SPACE		CURRENT (SM)	2025 (SM)	2030 (SM)
	Class	12	288.00	396.00	468.00
		24	576.00	720.00	864.00
		48	576.00	768.00	864.00
		96	960.00	1152.00	1152.00
		120	192.00	192.00	384.00
		200	960.00	1280.00	1280.00
		500	800.00	800.00	800.00
	Lab	48	158.40	158.40	158.40
		96	316.80	316.80	316.80
	Comp Lab	48	158.40	158.40	158.40
		96	316.80	316.80	316.80
	Design	50	225.00	450.00	450.00
		100	450.00	450.00	450.00
	Total		5977.4	7158.4	7662.4
	Class Support	Support	177.60	225.40	250.60
	Lab Support	Support	140.04	185.04	185.04
	Online Learning	Support	-842.89	-940.92	-1010.19
	Total		-525.3	-530.5	-574.5
	Learning Total		5,452.15	6,627.92	7,087.85

LEARNING TARGETS	CONTACT HOUR DISTRIBUTION			BY YEAR
		Service 1	Service 2	Graduate
	Class	8.3	14.3	19.5
	Lab	2.5	2.0	0.0
	Tutorial	0.0	2.0	0.0
	Design Space	1.5	2.0	0.0
	Consult	0.0	0.0	0.0
		CS Year 1	CS Year 2	CS Year 3
	Class	16.5	28.5	27.0
	Lab	2.5	2.0	3.5
	Tutorial	0.0	0.0	1.0
	Design Space	1.5	2.0	5.5
		CS Year 4	-	-
	Class	39.4	0.0	0.0
	Lab	3.0	0.0	0.0
	Tutorial	16.0	0.0	0.0
	Design Space	10.0	0.0	0.0

Projected current and future total space need by square meter.

Class support is % of classrooms. Lab support is % of labs.

16.5	28.5	27.0
2.5	2.0	3.5
0.0	0.0	1.0
1.5	2.0	5.5

Allocate and change contact hour distribution by learning space type.

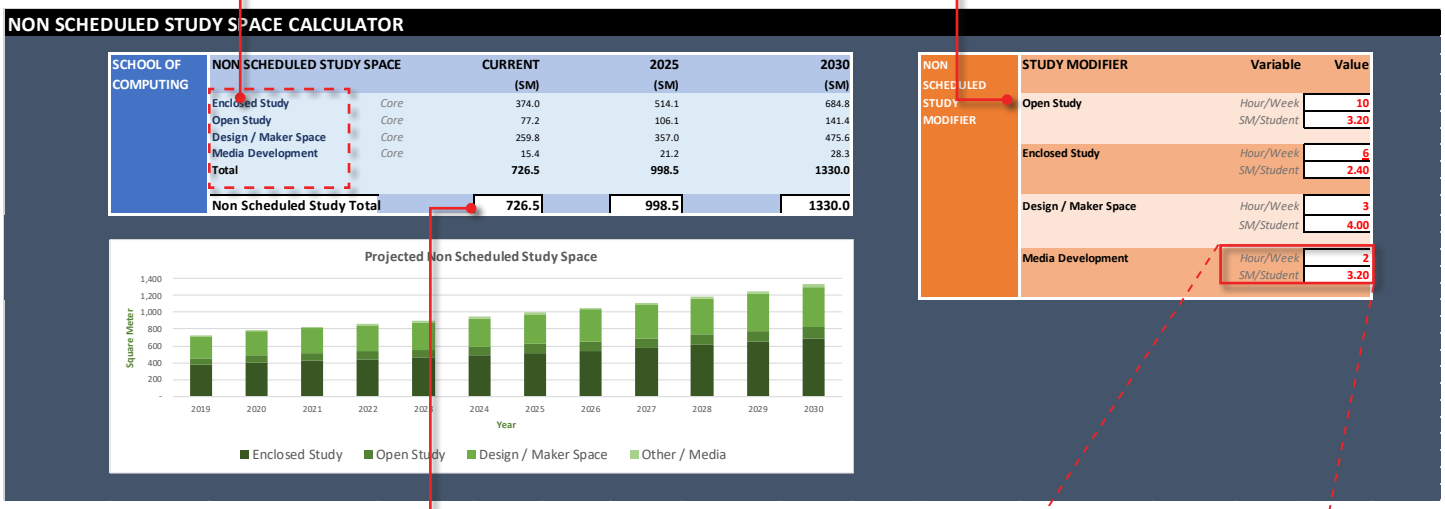
SPACE CALCULATOR - LEARNING

The learning space calculator predicts the space demand for classroom, teaching lab, design / making space, classroom support, and lab support. The projections are derived from the variables of contact hours in physical space or on-line by course, year and student type. The orange table to the right is customizable to how the School wishes to distribute their learning contact hours in the future.

The table is broken into space type categories of classroom, lab, tutorial, and design space. The projections are further broken down to individual room sizes based on a space allocation per student, according to the activity being undertaken in that space.

Non Scheduled space type breakdown. By space type.

Study space type distribution



Projected total space need by square meter.

Hour/Week	5
SM/Student	3.20

Designate the number of hours in a week allocated to an individual student by space type. Assign SM per student for space.

SPACE CALCULATOR - STUDENT SUCCESS

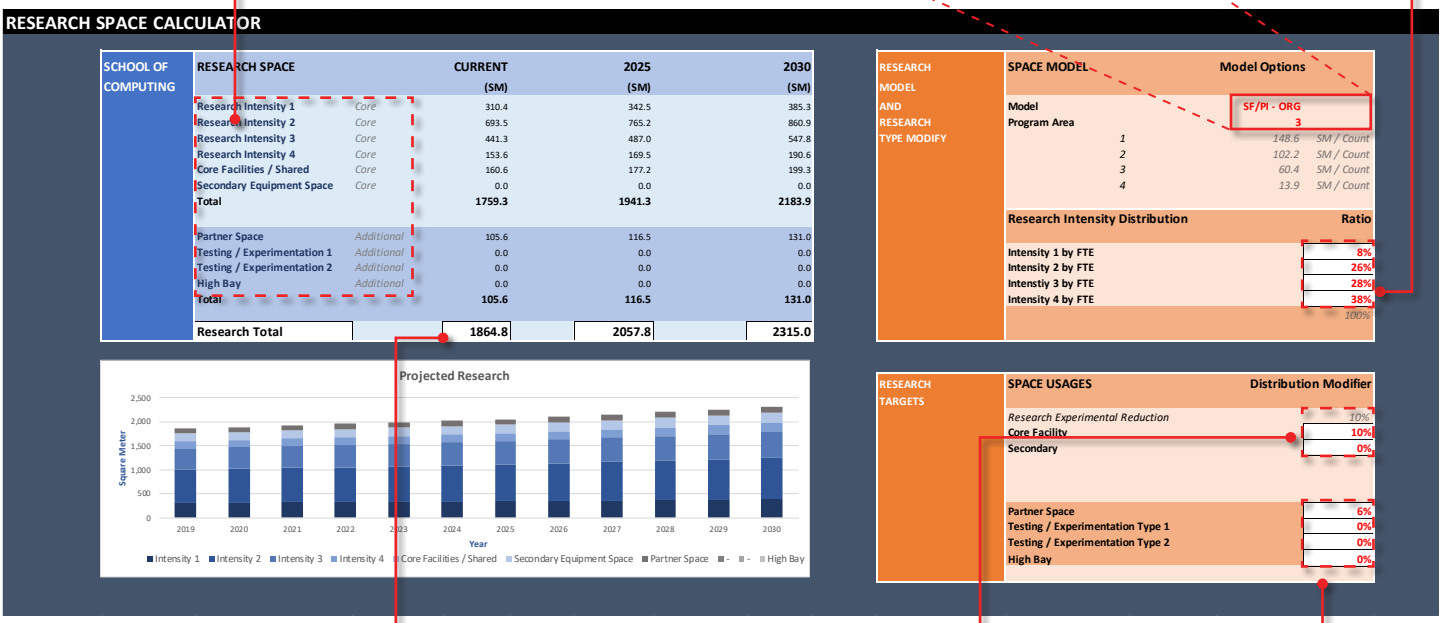
The Student Success space calculator calculates the demand for open study, enclosed study, design / maker space and media space needs. This projection is derived from the total student FTE taking majors in the School of Computing. This space is used for non-credit individual and group study, as well as for club meetings and student support meetings.

This calculator assigns a variable for the number of hours a student would use each type of space per week. It also allocates an area per student for each type of space.

Research space type breakdown. Includes additional space types from vision initiatives.

Model dictates variances in how area is distributed across group type intensities. Program Area dictates the intensity you identify with.

PI research intensity types and their distribution



Projected total space need by square meter.

Percentage distribution of core spaces from total projections.

Percentage added of additional spaces from projections.

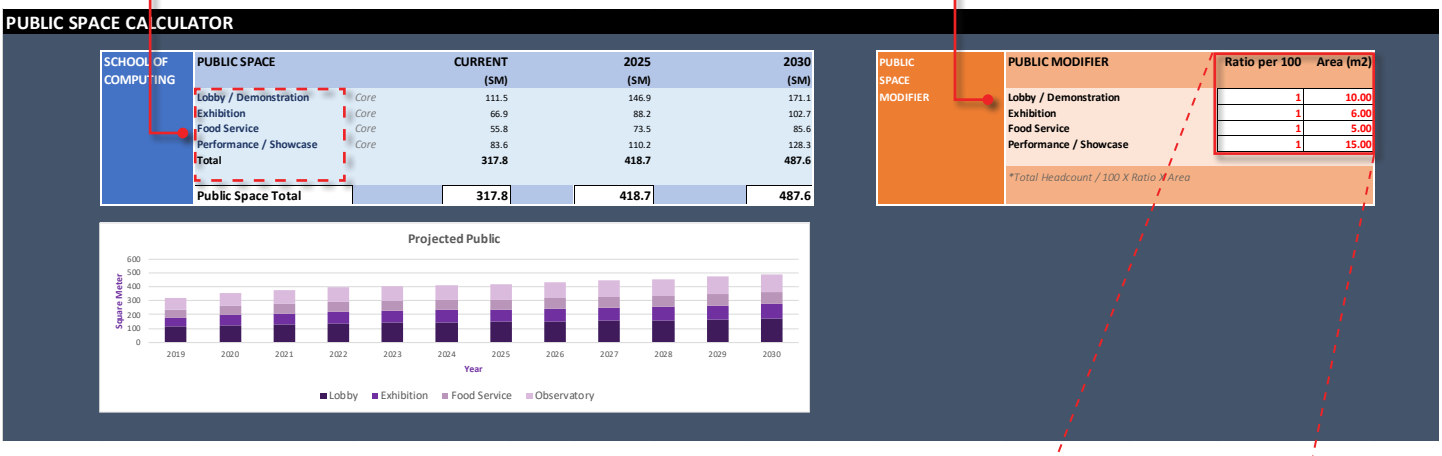
SPACE CALCULATOR - RESEARCH

The Research space calculator predicts general and additional research spaces. General research space consists of research labs, core facilities, and equipment spaces. Additional research spaces consist of partner spaces and specialist labs.

Research spaces is calculated by allocating general space allocation per principal investigator according to their research intensity. A percentage of space is then allocated to shared, core facilities and additional research facilities. The orange boxes highlights the space distribution modifiers.

Public space type breakdown. By space type.

Public space type distribution. Categories with their associated modifiers.



Determine the quantity of area needed by ratio of population. Determine the area m2 per each quantity.

Ratio per 100	Area (m2)
1	10.00
1	6.00
1	5.00
1	15.00

SPACE CALCULATOR - OUTREACH

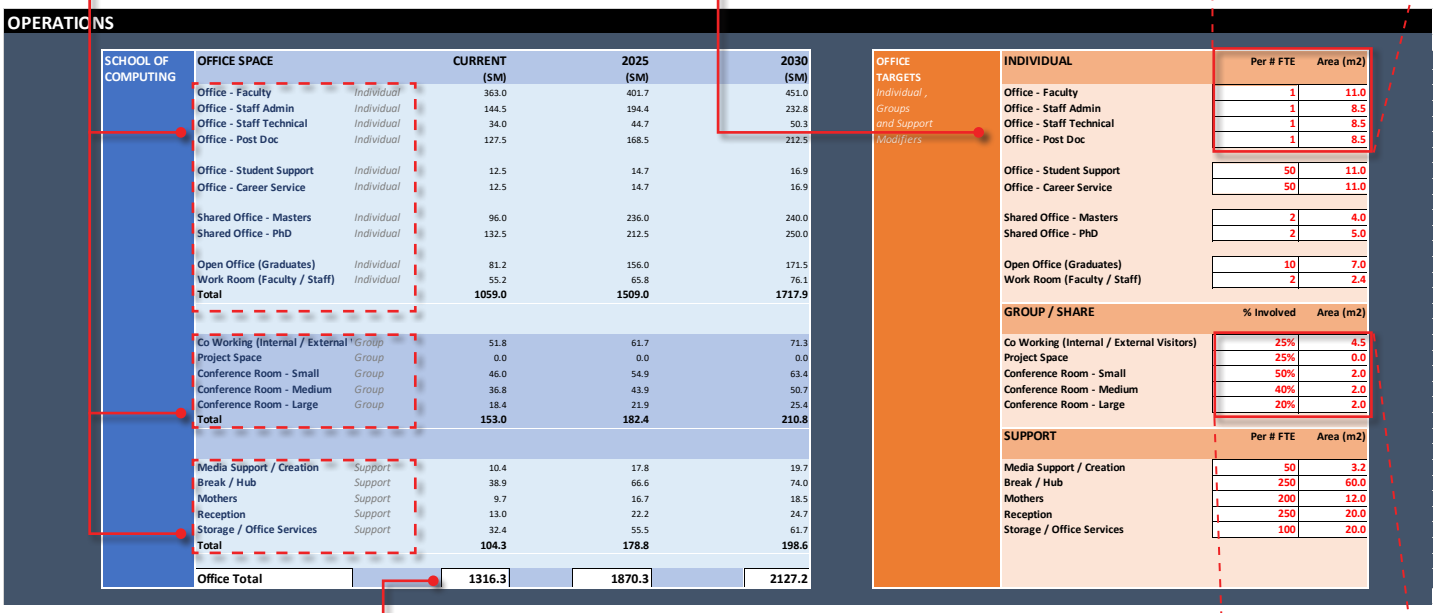
The Outreach space calculator determines the required public spaces used for engagement activities. It calculates lobby, exhibition, food service, and performance/showcase spaces.

The calculator uses a ratio-per-100 people modifier. This includes all users involved in this building: all undergraduates, graduate students, faculty and staff in the School of Computing. Each space category is also assigned an area per type.

Operations space type breakdown. By individual office types, group sharing types and by support space types.

Operation space type distribution. List with their associated modifiers.

Determine assigned area by space type. Per FTE identifies how many will receive an individual space.



OPERATIONS

SCHOOL OF COMPUTING	OFFICE SPACE		CURRENT (SM)	2025 (SM)	2030 (SM)
	Office - Faculty	Individual	363.0	401.7	451.0
	Office - Staff Admin	Individual	144.5	194.4	232.8
	Office - Staff Technical	Individual	34.0	44.7	50.3
	Office - Post Doc	Individual	127.5	168.5	212.5
	Office - Student Support	Individual	12.5	14.7	16.9
	Office - Career Service	Individual	12.5	14.7	16.9
	Shared Office - Masters	Individual	96.0	236.0	240.0
	Shared Office - PhD	Individual	132.5	212.5	250.0
	Open Office (Graduates)	Individual	81.2	156.0	171.5
	Work Room (Faculty / Staff)	Individual	55.2	65.8	76.1
	Total		1059.0	1509.0	1717.9
	Co Working (Internal / External	Group	51.8	61.7	71.3
	Project Space	Group	0.0	0.0	0.0
	Conference Room - Small	Group	46.0	54.9	63.4
	Conference Room - Medium	Group	36.8	43.9	50.7
	Conference Room - Large	Group	18.4	21.9	25.4
	Total		153.0	182.4	210.8
	Media Support / Creation	Support	10.4	17.8	19.7
	Break / Hub	Support	38.9	66.6	74.0
	Mothers	Support	9.7	16.7	18.5
	Reception	Support	13.0	22.2	24.7
	Storage / Office Services	Support	32.4	55.5	61.7
	Total		104.3	178.8	198.6
	Office Total		1316.3	1870.3	2127.2

OFFICE TARGETS	INDIVIDUAL	Per # FTE	Area (m2)
Individual , Groups and Support Modifiers	Office - Faculty	1	11.0
	Office - Staff Admin	1	8.5
	Office - Staff Technical	1	8.5
	Office - Post Doc	1	8.5
	Office - Student Support	50	11.0
	Office - Career Service	50	11.0
	Shared Office - Masters	2	4.0
	Shared Office - PhD	2	5.0
	Open Office (Graduates)	10	7.0
	Work Room (Faculty / Staff)	2	2.4
	GROUP / SHARE	**% Involved**	**Area (m2)**
	Co Working (Internal / External Visitors)	25%	4.5
	Project Space	25%	0.0
	Conference Room - Small	50%	2.0
	Conference Room - Medium	40%	2.0
	Conference Room - Large	20%	2.0
	SUPPORT	**Per # FTE**	**Area (m2)**
	Media Support / Creation	50	3.2
	Break / Hub	250	60.0
	Mothers	200	12.0
	Reception	250	20.0
	Storage / Office Services	100	20.0

Per # FTE	Area (m2)
1	11.0
1	8.5
1	8.5
1	8.5

Projected total space need by square meter.

Co-working % - assign faculty and staff with will engage with partners Determine % of faculty and staff will utilize group/share spaces. Assign area per FTE for each space type.

% Involved	Area (m2)
25%	4.5
25%	4.5
50%	2.0
40%	2.0
20%	2.0

SPACE CALCULATOR - OPERATIONS

The Operations space calculator determines the required office and support functions for QSC. This calculator projects enclosed office, shared office, open office, project space, co-working, conference room, media support, break, mother's and reception spaces.

Individual rooms use an area-per-FTE method. For group-sharing spaces, a percentage of faculty and staff who require group sharing will be assigned an area. In addition, all support spaces use a group count per FTE calculation.

Research labs are fundamental in increasing grad school enrollment and hiring. We need these labs to be flexible and be able to accommodate specialized spaces.

-Student, Workshop 3

CURRENT EXISTING SPACE PROGRAM

LEARNING		ALL QTY	AREA/ROOM	AREA (SM)
Classroom	12	0	0.0	0.0
Classroom	24	1	36.6	36.6
Classroom	48	0	0.0	0.0
Classroom	96	0	0.0	0.0
Classroom	120	0	0.0	0.0
Classroom	200	0	0.0	0.0
Classroom	500	5	63.3	316.4
Teaching Lab	48	0	0.0	0.0
Teaching Lab	96	0	0.0	0.0
Design / Project Space	50	0	0.0	0.0
Design / Project Space	100			
		0	0.0	0.00
Class Support		2	11.5	22.95
Lab Support		0	0.0	0.00
Online Teaching				
Subtotal				**376.0**

NON-SCHEDULED				
Enclosed Study		0	0.0	0.0
Open Study		0	0.0	0.0
Design / Maker Space		0	0.0	0.0
Media Development		0	0.0	0.0
Subtotal				**0.0**

RESEARCH				
Research Intensity 1		0	0.0	0.0
Research Intensity 2		0	0.0	0.0
Research Intensity 3		27	42.3	1141.1
Research Intensity 4		0	0.0	0.0
Core Facilities / Shared		3	22.0	66.1
Secondary Equipment Space		0	0.0	0.0
Partner Space		0	0.0	0.0
Testing / Experimentation 1		0	0.0	0.0
Testing / Experimentation 2		0	0.0	0.0
High Bay		0	0.0	0.0
Subtotal				**1207.2**

OPERATIONS		ALL QTY	AREA/ROOM	AREA (SM)
Office	Faculty	39	14.3	556.3
Office	Staff Admin	20	14.6	292.6
Office	Staff Technical	0	0.0	0.0
Office	Postdoc	3	12.4	37.2
Office	Student Support	0	0.0	0.0
Office	Career Service	0	0.0	0.0
Office	Shared - Masters	0	0.0	0.0
Office	Shared - PhD	8	17.3	138.0
Open Office		1	35.5	35.5
Work Room		0	0.0	0.0
Co-Working		0	0.0	0.0
Project Space		0	0.0	0.0
Conference	Small	0	0.0	0.0
Conference	Medium	0	0.0	0.0
Conference	Large	0	0.0	0.0
Media Support / Creation		0	0.0	0.0
Break / Hub		0	0.0	0.0
Mother's Room		0	0.0	0.0
Reception		0	0.0	0.0
Storage / Office Services		13	15.3	198.6
Subtotal				**1258.2**

PUBLIC / OUTREACH				
Lobby		0	0.0	0.0
Exhibition		0	0.0	0.0
Food Service		0	0.0	0.0
Performance / Showcase		0	0.0	0.0
Subtotal				**0.0**

SUBTOTAL (NET)	**2,841 NSM**
TOTAL CURRENT (GROSS)	**XX,XXX GSM**
NO CURRENT BUILDING HUB	

Central Classrooms

CURRENT SPACE PROGRAM

The current space use of the School of Computing is shown above. This table highlights its lack of necessary spaces to support its future vision.

It is recommended that the School of Computing renovates existing specialist labs that cannot be moved and build a new building to accommodate its future projected needs as well as creating an undergraduate and graduate hub for the school.

Currently, the School of Computing uses the following:

Teaching Lab & Design Space	376	SM
Research Space	1,207	SM
Offices & Operations Space	1,258	SM
Non-Scheduled Space	0	SM
Public Space	0	SM
Building Support	0	SM

This creates a net total of 2,841 NSM.

The gross total is difficult to calculate with how dispersed the School is.

FUTURE SPACE PROGRAM

LEARNING		ALL QTY	AREA/ROOM	AREA (SM)
Classroom - *Seminar*	12	12	36.0	432
Classroom - *Active*	24	10	72.0	720
Classroom - *Active*	48	7	96.0	672
Classroom - *Standard*	96	9	192.0	1728
Classroom - *Lecture*	120	1	192.0	192
Classroom - *Lecture*	200	3	320.0	960
Classroom - *Lecture*	500	1	800.0	800
Teaching Lab	48	1	158.4	158
Teaching Lab	96	1	316.8	317
Comp Lab	48	1	158.4	158
Comp Lab	96	1	316.8	317
Design / Project Space	50	2	225.0	450
Design / Project Space	100	1	450.0	450
Class Support		1	235.2	235
Lab Support		1	185.0	185
Online Teaching				-1021
Subtotal				6753.5

NON-SCHEDULED				
Enclosed Study		10	57.7	577.2
Open Study		3	39.7	119.2
Design / Maker Space		2	200.4	400.8
Media Development		2	11.9	23.8
Subtotal				1121.0

RESEARCH				
Research Intensity 1		3	133.8	385.3
Research Intensity 2		9	92.0	860.9
Research Intensity 3		10	54.3	547.8
Research Intensity 4		14	13.9	190.6
Core Facilities / Shared		2	99.7	199.3
Secondary Equipment Space		0	0.0	0.0
Partner Space		3	43.7	131.0
Testing / Experimentation 1		0	0.0	0.0
Testing / Experimentation 2		0	0.0	0.0
High Bay		0	0.0	0.0
Subtotal				2315.0

OPERATIONS		ALL QTY	PER USER	AREA/RM	AREA (SM)
Office	Faculty	41	11.0	11.0	451.0
Office	Staff Admin	27	8.5	8.5	232.8
Office	Staff Technical	6	8.5	8.5	50.3
Office	Postdoc	25	8.5	8.5	212.5
Office	Student Support	2	8.4	8.4	16.9
Office	Career Service	2	8.4	8.4	16.9
Office **	Shared - Masters	60	2.0	4.0	240.0
Office **	Shared - PhD	50	2.5	5.0	250.0
Open Office **	Grad Students	110	1.6	16	171.5
Work Room	Staff / Faculty	2	1.2	38.0	76.1
Co-Working		2		35.7	71.3
Project Space		0		0.0	0.0
Conference	Small	8		7.9	63.4
Conference	Medium	4		12.7	50.7
Conference	Large	1		25.4	25.4
Media Support / Creation		2		9.9	19.7
Break / Hub		2		37.0	74.0
Mother's Room		2		9.3	18.5
Reception		1		24.7	24.7
Storage / Office Services		1		61.7	61.7
Subtotal					2127.2

PUBLIC / OUTREACH				
Lobby	1		171.2	171.2
Exhibition	1		102.7	102.7
Food Service	1		85.6	85.6
Performance / Showcase	1		128.4	128.3
Subtotal				487.6

** Grad student population work areas are distributed between shared offices and open offices to accommodate workstyle variances

Central Classrooms

SUBTOTAL (NET)	**12,804 NSM**
SUBTOTAL (WITHOUT CENTRAL CLASSROOM)	*7,611 NSM*
PROJECTED TOTAL (GROSS)	**19,206 GSM**
PROJECT TOTAL (WITHOUT CENTRAL CLASSROOM)	*11,416 GSM*

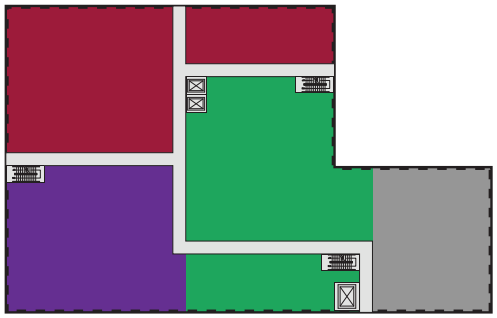
FUTURE SPACE PROGRAM

The total projected space needs of the School of Computing are shown above. These new spaces provide an opportunity for the School to create optimal space programming and adjacencies to align with their future visioning.

It is recommended that the future building will house state-of-the-art flexible teaching labs, design teaching spaces, student support and modernized research facilities. This will create a hub for its students and future collaborations and partnerships, internally and externally.

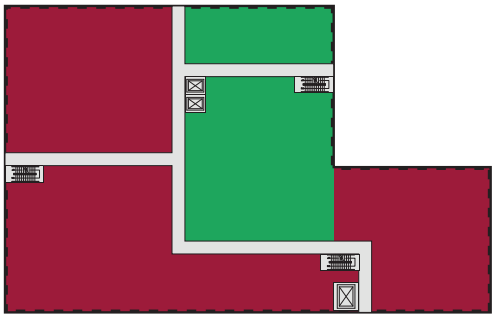
It is projected the School of Computing will need:

Teaching Lab & Design Space	1,560	SM
Research Space	2,315	SM
Offices & Operations Space	2,127	SM
Non-Scheduled Space	1,121	SM
Public Space	488	SM
This creates a net total of	7,611	NSM.
The projected gross total is	11,416	GSM.



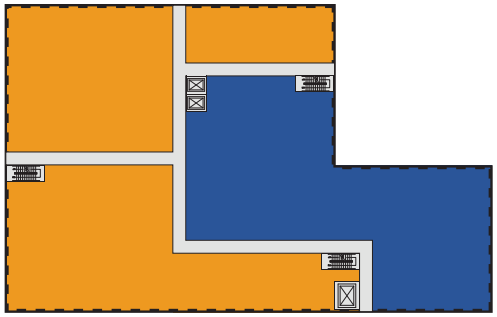
1st Floor

High Bay, Design Space, Teaching Lab, Loading Dock, Storage, Building Support, Student Success, Public Space, Lobby



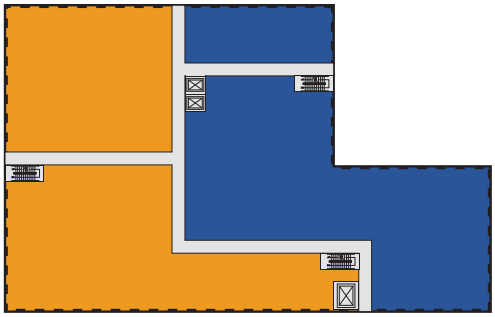
2nd Floor

Design Space, Teaching Lab, Student Success, Study Rooms



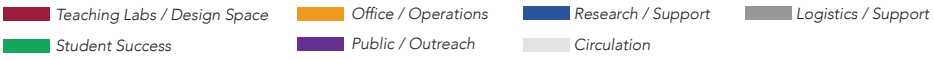
3rd Floor

Research Space, Offices, Shared Offices, Conference Rooms, Meeting Rooms



4th Floor

Research Space, Offices, Shared Offices, Conference Rooms, Meeting Rooms



SPACE PROGRAMMING DIAGRAM

It is proposed that the projected area needs for School of Computing to be located into a singular hub. The diagrams above illustrate how the projected space demands from the School can be placed into a building.

The first level includes a high bay, loading dock, public space, lobby, teaching, and student support areas.

The second floor will be a dedicated learning floor with teaching labs, design space, and student success areas.

The third and fourth upper floors can be programmed with offices, research space, conference rooms and shared working spaces to create research focused floors.

There will be great opportunity for the future success of the School of Computing when all of their needs are combined into one location.