Waterloo Bridge to 2020

LEVERAGING RESOURCES

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UNIVERSITY OF WATERLOO

Contents

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The Advisory Group on Leveraging Resources, one of seven groups formed to provide context for discussion and consultation as the University of Waterloo develops its Strategic Plan for 2020-2025, prepared this issue paper.

The following individuals provided the insight, time, and effort to put this issue paper together:

Advisory Group Members: Susan Tighe (Chair, Deputy Provost and Associate Vice-President, Integrated Planning and Budgeting), Hassan Baaj (Faculty of Engineering), Bill Baer (Staff Association), Harry Bakker (Plant Operations), James Barnett (Faculty of Arts), Bruce Campbell (IST), Stephen Cook (Procurement & Contract Services), Michael Ditty (Faculty of Science), Bernard Duncker (Faculty of Science), David Kibble (Information Systems Technology), Kimberley Snage (Human Resources), Maria Strack (Faculty of Environment), Mat Thijssen (Sustainability Office), and Steve Vavasis (Faculty of Mathematics)

Support: Sandra Keys (Library), Sarah Brown (Writer), Jana Carson (Institutional Analysis and Planning), Annamaria Feltracco (Institutional Analysis and Planning), Kate Mercer (Library), and Daniela Seskar-Hencic (Institutional Analysis and Planning)

Data and evidence support: Rohem Adagbon and Kerry Tolson (Institutional Analysis and Planning)

Editing support: Cherise Carlaw, George Choy, Annamaria Feltracco (Institutional Analysis and Planning)

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Executive summary

The University of Waterloo operates effectively as a small city, which directly supports or offers services to students, faculty, staff, employers, alumni, and an ecosystem of applicants, other agencies, institutes, suppliers, local community members and more. Waterloo manages over 1,000 acres of land, 100+ distinct buildings that includes teaching, research and office space and manages more than 1.1 million daily logins to information and technology (IT) services from on-campus. The spectrum of services includes those found in many businesses or large institutions, as well as housing, food, health and wellness, parking, athletics and an on-site energy plant. This all relies on a large and complex set of shared technological systems, finances, physical assets, and processes in order to function. The scale of Waterloo's resources is enormous, and ensuring they are managed efficiently is a strategic focus to ensure short and long-term goals can be achieved.

The Leveraging Resources Issue Paper Advisory Group identified university resources including: physical, technological, people, and capital/financial, and noted that there is a strong interconnectedness in the way that these types of resources are governed and managed. The term "effective" is typically used to describe policies, instruments and techniques that achieve what they are intended to do. Related to this, "efficiency" focuses on producing the desired results without wasting materials, time or energy. The current highly decentralized structure provides advantages and often poses a challenge for resource management. For example, investments in cosmetic renovations do not address long-term structural maintenance needs. In thinking about strategic directions for leveraging resources, it is necessary to balance centralization and decentralization of governance, planning, design and renewal.

Transparent governance and holistic resource management

The University of Waterloo needs to engage in effective management of resources, which are transparent and clear with associated intentional governance to optimize management of physical infrastructure over time through usage of lifecycle costing decision-making tools to ensure preservation, maintenance, and rehabilitation costs. It should also support sustainable practices for operating and managing infrastructure. For example, to support high quality education, student experience, and research, there is a need to ensure there is better space utilization and modern workspace designs should be explored. Usage of inventive technology and collaboration tools could provide assistance.

The Advisory Group brainstormed what the landscape would look like by 2025 if effective management of resources was addressed. The group brainstormed that by 2025, effective management of resources will mean streamlining practices wherever possible and avoiding duplication. The built environment will need to be accessible to meet the needs of members of the campus community with a variety of physical abilities to respond to regulatory requirements. Campus master planning and space management will ensure space is allocated in an efficient manner so that it ensures infrastructure can address emerging demands while accommodating expansion for future teaching and research needs. Capital plans and deferred maintenance will be addressed through sufficient staffing and financial resources to proactively

ensure long-term sustainability, accessibility, and growth, while also meeting current maintenance and deferred maintenance needs. Finally, resources will ensure that Waterloo's facilities are positioned to reduce our environmental impact and respond to social, economic, and regulatory demands. It will be increasingly important to manage energy costs and carbon emissions to ensure long-term financial performance of the campus in addition to demonstrating corporate commitment to pressing global challenges. Similar social and regulatory pressures will require a proactive approach to waste management, transportation, water efficiency, grounds maintenance, and climate adaptation from a built environment perspective.

The deployment and use of IT on campus represents both a key challenge and an opportunity for Waterloo. Security has become one of the more important disciplines within the IT community and this can pose some future risk. There are numerous examples of corporations and institutions that have experienced a data breach, denial of service attack or like compromise or threat to its operations. The need to manage these risks will require diligent monitoring and detection, hardware and software tooling, user education and practice. Proactive tracking of new technology, active threats and the new connectedness involved with the "Internet of Things" will need to be monitored. Within a relatively short period of time, cloud services (platforms and applications) have become conventional technology. Responses to requests for proposals (RFPs) and offerings from vendors are predominantly based on services provided in the cloud. This has generally created a shift from local support for technical infrastructure and development to data governance, vendor management, business analysis, architecture and integrations.

Classroom support, recruiting new staff, applications for research funding, development of the course timetable, matching of co-op students and employers, government reporting, payments to suppliers, fundraising and others all rely heavily on technology. This also implies the need for a robust suite of technology-based services to support them. Collaboration is also paramount for informal sharing and supports a number of key activities. Information systems technology (IST) works to develop and enhance key capabilities in the areas of project and portfolio management, data and analytics, and security (and other) and has dedicated areas and programs for their advancement. Consideration is also being given to the increased need for business analysis as well as business process review resources, in conjunction with campus initiatives such as Lean. Infrastructure demands on the campus network are ever increasing, in terms of the number of connected devices, responsiveness and bandwidth.

1.Introduction

While the University of Waterloo is most literally defined as a large educational institution, this description hardly does it justice. In many ways, Waterloo operates effectively as a small city, which directly supports or offers services to more than 196,000 alumni[1], 39,000 students[2], 3,600 faculty and staff[3], 6,700 co-op employers[4], and an ecosystem of applicants, other agencies, suppliers, local community members, and more. Waterloo manages 1,000 acres of land[5], 725,000+ square metres of space[6], 100+ distinct buildings[7], operating revenue of $749 million[8], $205 million in research funding[9], 10,000 campus machines[10], and 1.1 million daily logins to information technology (IT) services from on-campus[11]. The spectrum of services includes those found in many businesses or large institutions, as well as housing, food, health and wellness, parking, athletics, an on-site energy plant, and the list goes on.

All of this relies on a large and complex set of shared technological systems, finances, physical assets, and processes in order to function. The scale of Waterloo's resources is enormous, and drawing attention to how those resources are translated into optimum impact is indeed worthy of strategic focus.

The purpose of this issue paper is to define, explore, and generate discussion on how governance and management of resources affects the University's ability to meet its other strategic goals, and to investigate areas where the University could establish strategic priorities in order to effectively leverage its resources between now and 2025.

2.Process

There are seven strategic issue areas that make up this first phase of the 2020 Strategic Plan development process. For each, an Advisory Group composed of faculty, staff members, and students, from a wide variety of disciplines and organizational departments, has been formed to help articulate these issues and generate discussion through the preparation of Issue Papers.

Resources have not been an explicit area of focus in previous Waterloo strategic plans. Leveraging Resources was added as a focus area for the 2020 planning process in order to draw attention to the importance of resources in underpinning our ability to achieve educational, research, and community service goals. Given the ubiquitous nature of how resources are gained, distributed, and managed through Waterloo's activities, it is expected that some of the other Issue Papers will also identify resource implications and opportunities. Furthermore, in addition to the strategic planning process, many of the ongoing activities at the University contribute to planning and decisions on how we leverage resources. Thus, this paper alone is not meant to comprehensively address all of our resource management questions, but rather to draw attention to some of the overall issues that will be most relevant between now and 2025, and to offer initial ideas of strategic directions for the campus community to react to.

The Leveraging Advisory Group consisted of the following members:

> *Advisory Group Members:* Susan Tighe (Chair, Deputy Provost and Associate Vice-President, Integrated Planning and Budgeting), Hassan Baaj (Faculty of Engineering), Bill Baer (Staff Association), Harry Bakker (Plant Operations), James Barnett (Faculty of Arts), Bruce Campbell (IST), Stephen Cook (Procurement and Contract Services), Michael Ditty (Faculty of Science), Bernard Duncker (Faculty of Science), David Kibble (IST), Kimberley Snage (Human Resources), Maria Strack (Faculty of Environment), Mat Thijssen (Sustainability Office), and Steve Vavasis (Faculty of Mathematics)

Support: Sandra Keys (Library), Sarah Brown (Writer), Jana Carson (Institutional Analysis and Planning), Annamaria Feltracco (Institutional Analysis and Planning), Kate Mercer (Library), and Daniela Seskar-Hencic (Institutional Analysis and Planning)

The Advisory Group met four times between January and May 2018 to work through a series of facilitated questions, develop common understanding, and generate ideas for strategic directions. The group also contributed feedback in reaction to draft versions of the paper. Content for the paper was generated primarily by distilling the meeting notes and incorporating submissions from individuals within the group who took a lead on preparing reports specific to the three focus areas (see Section 5). A literature review was conducted, however very few relevant results were found (see Appendix A), and so, the group felt that it was most relevant to draw from internal knowledge and sources of information held on campus to form the basis of the content in this paper.

3. Defining the issue

The Advisory Group developed the following overall question to guide their exploration of the Leveraging Resources issue area:

> *How do we effectively govern and manage our resources to ensure that the University of Waterloo has the ability to meet its strategic goals?*

To approach this overall question, the group first framed their understanding of this issue by discussing the following three questions related to definitions and underlying principles:

- **What is meant by "resources" in a large academic institutional setting?** Types of resources identified by the group included: physical, technological, people, and capital/financial. There is a strong interconnectedness in the way that these types of resources are governed and managed. Considering that the University's human resources will be explored in other issue papers (particularly the Empowering People Issue Paper), this paper will consider "resources" to mean physical, technological and financial resources.
- **How is "effective" defined related to leveraging of resources?** For the purpose of this issue paper, the term "effective" is meant to encompass aspects of efficiency and intentionality. Effective is typically used to describe policies, instruments and techniques that achieve what they are intended to do. Related to this, efficiency focuses on producing the desired results without wasting materials, time or energy.[12] The group envisioned the concept of resources passing through an input-output model, where the term "effective" is important as the filter through which we judge whether we are intentionally and efficiently translating our available inputs into desired outputs.
- **How can resources best be used to enable innovation and collaboration across a decentralized structure?** The existing University governance structure and relationships between faculties and administration plays a significant role in the way we govern and manage resources. The Advisory Group observed that there are cases when our highly decentralized structure provides advantages and other cases where this is a challenge for resource management. For example, there may often be repetitive iterations of cosmetic renovations completed in the same building as different groups use the space, which causes duplication of costs and doesn't address long-term maintenance needs. In thinking about strategic directions for leveraging resources, the

campus community is encouraged to consider where the effective balance point is between centralization and decentralization of governance, planning and processes.

4.Looking ahead to 2025

To explore the overarching question of "*how do we effectively govern and manage our resources to ensure that the University of Waterloo has the ability to meet its strategic goals?*", the Advisory Group identified a series of desirable outcomes to illustrate their vision for effective governance and management of resources at the University of Waterloo between now and 2025.

Transparent governance of resources

For the campus community to engage in effective management of resources, there needs to be transparent and intentional governance of those resources. To ensure that our resource use is in alignment with our organizational values, periodic reviews of resource use and availability should be conducted and shared with the campus community. Thinking of the effective balance principle introduced above related to centralization, the group favours better campus-wide coordination of strategic projects and processes. Further, the group thought that participation in sharing resources could be encouraged by ensuring that clear and accountable governance is established for shared resources (e.g. equipment, classrooms, IT) as well as for cross-functional processes.

Ideas to help get us there include:

- Assign clear accountability for governance and oversight for all administrative and support departments.
- Develop an IT governance policy and a consistent approach to data governance.
- Implement a robust process and accountability for the management of contracted services.

Holistic resource management

As an educational leader and public institution, Waterloo has a responsibility to manage its resources in way that is holistic over space and time. Looking at the full end-to-end lifecycle of our assets and resources (from acquisition to decommissioning) will help us to optimize the investment in that resource and to account for the off-campus impacts of our resource use. Sustainability has not yet been articulated as a core value of the institution nor is it included directly in the current Strategic Plan, which limits the ability to use sustainability as a lens when making institutional or organizational unit decisions. Managing our physical infrastructure over time is important to ensure we get to a point of having limited or no deferred costs, maintenance, and liabilities.

Ideas to help get us there include:

- Embed sustainability directly into the next Strategic Plan as a core value.
- Ensure that lifecycle analysis and total cost of ownership decision-making tools are being used for all purchasing decisions.
- Renew the master plan, taking into account forecasts of functional and geographic requirements of the academy and academic support units.
- Develop a robust long-term capital plan including necessary staffing and financing.
- Initiate financial mechanisms to bridge operating and capital funding requirements within the budget model.

Managing space and physical assets in new ways

The way that we approach space and physical resources is evolving in keeping with broader workplace trends. It is important to find new ways to optimize our research, teaching, learning, and office space and avoid empty and wasted space, but also allow some flexibility for spontaneous "coming together". There were questions raised regarding how closely space allocation is tied to research funding, which can create a protectionist mentality, and is not adaptable to the reality that some research areas need more space than others. Fair distribution of space and resources may not always mean equal distribution, but rather smart and flexible distribution that helps all to be successful. Further, can we consider ways to provide University resources and space for strategic research approaches that may not be competitive for external funding, but that, if successful, will change the world?

Ideas to help us get there include:

- Create more shared and reconfigurable lab space.
- Employ efficient and adaptable work space designs to allow for better space utilization and opportunities.
- Utilize inventive technology and collaboration tools (e.g. database/inventory for shared equipment, surplus sharing[13]).

A culture of innovation, improvement, and working better together

It's time for Waterloo to embrace innovation in our operations the same way we do in our research and education. Today's strategic and mobile workforce is well-positioned to embrace a workplace culture that embeds continuous improvement and innovation into business practices. By 2025, the group envisioned effective management of resources will mean that we avoid duplication and streamline practices wherever possible. It is vital to understand that many of our most important processes cross organizational unit boundaries or require connections, so we need to have good mechanisms for people to work together. The Advisory Group would like our people to be empowered to focus more strongly on the customer/client outcome and not be constrained by organizational boundaries or excessive bureaucracy in doing so. We have an untapped opportunity to better align our service capabilities to our institution's innovation brand.

Ideas to help get us there include:

- Hold process innovation workshops.
- Implement an organization-wide focus on excellence, innovation, and wellness issues.
- Measure and benchmark the effectiveness of our core processes.
- Build capacity and skills in common approaches to project management.

5.Focus areas

To ground the overall issue in the reality of what's happening on campus, the Advisory Group thought it would be helpful to provide further information in three focus areas: physical resources and environmental sustainability, technological resources, and efficiency and processes. These are three key areas in which we can more effectively and wisely use University resources in a way that ensures we have the time, energy, and assets needed to achieve our strategic goals. For each focus area, an overview is provided of where we are at right now, what others are doing, and ideas on where we could go from here.

5.1 Focus area: physical resources and environmental sustainability

Waterloo's buildings and grounds are foundational for delivering our core mission of teaching and research. Is the physical infrastructure at Waterloo positioned to deliver a high-quality and efficient environment for students, employees, and visitors over the long term? Waterloo's physical plant and many of our buildings are increasing in age, and require substantial investments to maintain and renew. This infrastructure renewal will incur considerable costs, and are not optional items, but essential for the campus to continue to function and avoid critical failure. During this required renewal process, it will also be important to consider a number of critical topics to ensure renewal proceeds in a manner that supports Waterloo's mission and values, and "future-proofs" long term infrastructure decisions against social, environmental, and economic demands, such as:

- **Accessibility**: Are we providing a built environment that meets the needs of members of the campus community with a variety of abilities and responds to regulatory requirements? New legislation through the Accessibility for Ontarians with Disabilities Act, for example, will require substantial investments in physical space improvements.
- **Campus master planning and space management**: Are we currently allocating space in an efficient manner and ensuring that infrastructure can address emerging demands while accommodating expansion for future teaching and research needs?
- **Capital plans and deferred maintenance**: Are we establishing sufficient staffing and financial resources to proactively ensure long-term sustainability, accessibility, and growth, while also meeting current maintenance and deferred maintenance needs?
- **Environmental sustainability:** How can we ensure that Waterloo's facilities have minimal environmental impact and respond to social, economic, and regulatory demands? For example, Waterloo will spend hundreds of millions on energy costs alone between now and 2050, with further increases through carbon pricing making "business as usual" increasingly expensive. Managing energy costs and carbon emissions is critical to the long-term financial performance of the campus in addition to demonstrating corporate commitment to pressing global challenges.

5.1.1 Where are we now?

Campus master planning, capital planning, and space management

Waterloo's 2009 Campus Master Plan remains ongoing, with recent projects including the South Commons. The Master Plan has not necessarily been translated into an implementation plan and in practice is rarely consulted. For example, major renovation plans are not vetted to take into account potential conflict with long range planning or space optimization and substantial shifts in development (i.e. acquisition of BlackBerry buildings) have not been updated in the plan.

Many of Waterloo's buildings are increasing in age and will require substantial retrofits and modernization efforts over the coming years. A 2017 external audit of the University's buildings places the facilities condition index (FCI) for the campus at 9% with nearly 23% of the buildings considered to be in poor condition, that is, they have a facility condition index of more than 10%. The audit suggests an average annual capital investment of nearly $98 million for the next 25 years will be necessary to maintain a campus FCI of 9%.[14]

There has been a focus on optimizing space within the Ring Road to be used for academic and critical academic support unit functions. Other units and functions are being relocated to periphery buildings. There is an ongoing effort to socialize space and employ more efficient work space designs to allow for better space utilization and more modern work space design. Improvements in classroom utilization are also ongoing.

Environmental sustainability

Waterloo has seen some improvements in water and greenhouse gas emissions intensity[15] and has implemented some conversation projects on campus. However, Waterloo's energy use has been gradually increasing (+8% per m^2 and +30% absolute since 2010), and almost all emissions improvements are due to provincial policy rather than campus action.[16]

Waterloo's waste diversion rate remains low at 41%,[17] and is buttressed by two waste streams (yard waste and scrap wood) where data quality is subject to a wide margin of error. For waste within Waterloo's buildings, more than 77% of all waste created by students and employees is sent to landfill rather than recycled or diverted. Waterloo's waste audits consistently show that approximately 75% of this landfilled waste could be recycled or composted.

The number of students and employees commuting to campus by walking, cycling, transit, and carpooling is strong among local institutions.[18] Waterloo's Campus Master Plan has reinforced the need for supportive services and infrastructure to shift demand away from driving to reduce parking costs, optimize campus space, ensure a vibrant and safe environment, and reduce emissions.[19]

Sustainability is not included as a core value of the institution or included directly within the current Strategic Plan, which limits the ability to use sustainability lens when making institutional or organizational unit decisions. As such, there are few decision-making tools in use (i.e., lifecycle costing or total cost of ownership, design standards, guidelines, employee training, and even monitoring and measurement systems)[20] although staff are working to strengthen these.

Waterloo adopted its first Environmental Sustainability Strategy in 2017, which contains all goals and objectives for the campus. Key excerpts from this strategy that are of relevance to the points above are contained in Appendix B, as well as highlights of what other leading institutions are doing on sustainability and climate change.

Waterloo's budget allocation model creates strong disincentives to action, as the costs of inefficiency (waste, energy, transportation) are borne at an institutional level while control of budgets and space occurs at a faculty or space owner level, and there are limited tools to bridge capital expenditure (capex)/operating expenditure (opex) to address these disincentives. Although some funding has been allocated to specific projects, there remains limited ongoing financial commitment and staff capacity to make material changes to energy, waste, and transportation performance indicators.

5.1.2 Where do we want to go from here?

Campus master planning, capital planning, and space management

Moving ahead, Waterloo should more closely coordinate space planning, capital planning, and deferred maintenance planning to minimize the disruption of required deferred maintenance. There will be a continued commitment to the preservation of critical swing space within the

Ring Road, and transformation of office space to meet evolving workforce needs. To tackle upcoming needs for the campus' physical infrastructure, we should seek to:

- Renew the campus master plan, taking into account forecasts of functional and geographic requirements of the academy and academic support units;
- Advance the collaboration between space planning, capital planning, and advancement;
- Develop robust methods by which growth, adaptive reuse and rationalization are planned and approved;
- Explore improvements in classroom utilization;
- Improve renovation cost estimation and control and project management;
- Develop policies and standards that guide the allocation and design of new space, as well as tools that can be used for space utilization, move management, and move scenario modeling; and
- Implement methodology and timing for regular utilization assessment in all buildings (e.g. recently completed for East Campus 1, 2, 3, and 5).

Environmental sustainability

The institution's direction has been established through Policy 53: Environmental Sustainability, Waterloo's Environmental Sustainability Strategy, and commitments made through the Council of Ontario Universities. Key objectives in the material issues referenced above include:

- Carbon neutral by 2050;
- Zero waste by 2035; and
- Improve active and sustainable transportation through 2025.

These targets are ambitious. They require going beyond marginal changes to infrastructure and towards changes to Waterloo's central plant, full building retrofits, and integration of renewable energy. They need a whole-system approach to identify reduction opportunities, and a long-term perspective on infrastructure.

These targets are in line with commitments made by other leading academic institutions in North America (see Appendix B). Given the urgency of challenges, they are also necessary and commensurate with the scale of effort needed globally to reduce the worst impacts of climate change. These will be critical to Waterloo's institutional corporate social responsibility and have significant potential to drive our reputation for innovation by linking research, student learning, and real-world efforts to make Waterloo into a living laboratory of what a sustainable future could look like.

5.2 Focus area: technology

The deployment and use of IT on campus represents both a key challenge and an opportunity for Waterloo. This focus area is framed by the evolution of technology and market forces, but is also influenced by factors related specifically to the higher education community and unique circumstances at this University. Some of the most crucial considerations related to leveraging technological resources include:

- **Increased risk**: Security has become one of the more important disciplines within the IT community. Institutions routinely face the risk of a data breach, denial of service or like threat. These risks can be mitigated, but require significant effort in terms of

monitoring and detection, hardware and software tooling, user education and practice. Tracking of new technology, active threats and the new connectedness involved with the 'Internet of Things' is also needed.

- **High expectations**: Waterloo attracts students who often arrive with greater experience in computing and online environments – for commercial use, social interactions and in their previous academic experiences. These factors naturally raise the expectations students may have with respect to connectivity, labs, administrative services and classroom tools.
- **Rate of change**: In a short timeframe, cloud services have become the norm. This has created a shift from local support for technical infrastructure and development to data governance, vendor management, business analysis, architecture and integrations. This change can also be seen in areas such as teaching and learning, where instructors wish to make use of the plethora of new tools.
- **Pervasiveness:** Recruiting staff, applications for research funding, course timetable development, matching coop students and employers, payments to suppliers, and fundraising are just some of the vast number of University functions that rely heavily on technology.
- **Small city paradigm**: A typical business might include systems for human resources, finance, customer relationship management, supply chain and logistics. Waterloo operates effectively as a small city with a broad set of needs requiring a distinct approach to decisions surrounding the acquisition and support of technology.

5.2.1 Where are we now?

Waterloo is fortunate to have a number of solid foundational pieces in place, which provide good operational support and can meet some of the above challenges.

- **Systems renewal**: In the past three years, a number of key information systems have been or are about to be replaced, including, finance, human resources, research, co-operative education and identity management. Others are underway or in the planning stages (e.g., advancement, health/wellness, Quest).
- **Collaborations:** There is a strong practice of collaboration and partnership in many IT activities. Internally, there is a multi-department group which supports the teaching and learning ecosystem and opportunities for staff to share at our own IT conference (WatITis). Externally, the University is an active participant in such groups as Canadian University Council of Chief Information Officers (CUCCIO). The library is part of Tri-University Group (TUG) and also participating in the new Ontario Council of University Libraries sponsored systems initiative.
- **Best practice:** In recent years, dedicated areas for project and portfolio management, data and security have been developed. IT is also aligned with the increased need to provide business analysis as well as business process review resources, in conjunction with campus initiatives such as Lean. Waterloo has been able to influence national directions with its participation in the recently created Compute Canada Cybersecurity task force.
- **Infrastructure:** The campus network renewal effort will address ever-increasing, demands in terms of the number of connected devices, responsiveness and bandwidth. IST also maintains a large, flexible and redundant virtualized environment in its overall data center operation. The University also supports several external partnerships, including the Graham supercomputer center.

The IST 2018-2020 Strategic Plan builds on these and a number of key capabilities, including communication, data, governance, knowledge and delivery. Two important reviews are also due to be launched in 2018, one for IT governance and another to establish an IT digital strategy.

5.2.2 What are others doing?

The 2017 EDUCAUSE review of the top 10 IT risks noted the following as the most common priorities for its member institutions: information security, student success and completion, data-informed decision making, strategic leadership, sustainable funding, data management and governance, higher education affordability, sustainable staffing, next-gen enterprise IT, and digital transformation of learning.

This aligns in many respects with the experience at Waterloo and for Canadian higher education. Maturity, needs and circumstances at each institution guide their current roadmaps and work plans. The University of British Columbia (UBC) has launched a major process and technology project, a complete cloud implementation of Workday (a new Human Resources Management System) for its student, human resources, and finance systems. Several universities have recently created the equivalent of a project or portfolio office to help with governance and prioritization. Their mandates vary, with some at an enterprise level, others focused on IT. Some universities have recently adopted a focused “digital strategy” that encompasses the implementation of a new student system, along with a customer relationship management platform.

5.2.3 Where do we want to go from here?

Projecting an “end state” for information technology in 2025 is a difficult exercise. IT by its very nature moves quickly and a three year horizon is often more reliable. With that caveat, however, it is reasonable to consider the following as objectives for the near future:

- Fostering an IT environment where priorities for investment are made in a well understood framework, the mechanisms for decision-making are clear and resources are allocated in an optimal manner.
- Ensuring student success through the use of modern learning environments and tools which align to the pedagogy in use in our various programs.
- Developing a well-established data and analytics capability which includes data stores that amalgamate information from all key sources, along with easy to use tools for access and staff with expertise in the practice across campus.
- Adopting a complete applications set which fills some of the identified gaps we have today, including customer and case management.

To achieve these objectives, the following considerations will be important:

- **Governance**: Decisions and activity for IT are currently managed in a decentralized manner. Committees may be advisory in nature without decision-making ability, where those with authority may only focus on a single application or system. Support, planning and the intake of work is divided between IST, academic support units and Faculties for specific student and researcher activity. Teaching and learning technology is generally governed by and aligned to pedagogical need and practice. Ideally, a new model would provide good visibility into work, make optimal use of the resources available and sound investment decisions moving forward.

- **Sustainability and capability**: Infrastructure, services and applications currently support most major functions, though some gaps remain. Direct support for researchers is a growing need, as external requirements become more rigorous and international collaborations become more common. Greater investments may be more appropriate in areas that are differentiators (e.g., co-operative education) as compared to commodity services (e.g., email). IT must also be flexible enough to account quickly for external developments, such as accessibility legislation, open learning and courseware initiatives.
- **Data and information:** Data has become a key strategic resource and supports a broad range of activities – program accreditation, scheduling decisions, budget projections, admissions targets, and strategic enrolment planning. There is an acknowledged need for skilled "data analysts". Staff and faculty would benefit from a more robust knowledgebase of process and related information.

5.3 Focus area: efficiency and processes

It is time for Waterloo to embrace innovation in our operations the same way we do in our research and education by finding new ways to efficiently manage our resources, avoid duplication and streamline operations. Considering that many important processes cross organizational unit boundaries or require connections, we need to have good mechanisms for people to work together. This could be supported by using processes that are documented, stored, maintained, and adapted as needed.

Lean methodology provides a consistent framework and set of tools for improving processes. It is founded on the principles of continuous improvement and respect for people by empowering employees to develop solutions around inefficient processes. Lean Higher Education is a strategy supported by principles and practices that create a new university culture which: meets or exceed expectations of individuals served; frees up wasted resources for reinvestment; values and engages all university employees ("own the process"); and can transform the university into a true learning organization.

5.3.1 Where are we now?

The University of Waterloo has committed to the integration of the Excellence Canada Excellence, Innovation, and Wellness (EIW) standard across the university as a national quality standard against which to measure and enable organizational excellence, innovation and wellness. In 2017, three University departments achieved the EIW silver standard (the Office of the VP Academic and Provost, President's Office, Human Resources, and Organizational Human Development), while another three units achieved bronze (Faculty of Applied Health Sciences, the Library, and Faculty of Math).[21]

Within the last year, surveys and focus groups were held across campus and working groups were formed to assess Waterloo's enterprise-wide strengths against the Excellence Canada driver requirements. To support Excellence Canada initiatives and the development of a Lean culture on campus, an internal Lean consortium representing eight departments was created. The purpose of the consortium is to work collectively to achieve a sustainable, continuous improvement culture that encourages simplicity, increases effectiveness, and delivers exceptional value to the University community. Objectives underway for 2018 include:

1. Developing a shared understanding and a common framework
2. Raising awareness in continuous improvement
3. Enabling effective continuous collaboration

4. Achieving measureable improvements

Work is actively underway in several administrative departments and two academic units supporting Lean initiatives. For example, the Registrar's Office has 13 projects underway to streamline scheduling and timetabling to ensure a better experience for students. Human Resources redesigned every core employee process prior to the implementation of Workday ensuring that campus stakeholders were included at every step. University Relations used Lean to redesign the project intake process to enhance communication between all sub-units and provide better support to clients across campus.

One of the Lean projects completed at Waterloo won the best practice award in 2017 at a province-wide showcase of Lean organizations. The project was focused on improvements to the staff approval to recruit process at Waterloo, and resulted in the average time of the process going from 99 days to an average of 7.4 days, and the number of times a position went through the approval cycle was reduced from three times to one.

Additional examples of other Lean projects ongoing at Waterloo can be found in Appendix C.

5.3.2 What are others doing?

Lean is actively being practiced in several academic institutions in Canada, the United States, and abroad. For example, in 2009, Miami University adopted Lean as a business strategy, and since then, a total of 833 completed projects have accumulated $40.4M in financial improvements ($25.6M in cost avoidance, $9M in cost reduction, and $5.8M in increased revenue), and more than 75% of the completed projects have documented evidence of productivity improvement.[22]

A systematic review of the accumulated body of research on Lean published in 2016 by Balzer et. al., found that Lean has significant and measurable value when used to improve academic and administrative operations in higher education, and that these improvements can be effective when applied at the department/unit level or throughout the entire institution. Further, the study concluded that "implementing Lean within an institution is a serious undertaking that is most impactful if it involves long-term, strategic planning".[23]

Institutions which do not follow a Lean approach or methodology lose the opportunity to differentiate in a competitive market, carry the cost of 80-90% process waste, and fail to capitalize on the full potential of employees while providing opportunities for growth.[24] Some of the hidden costs related to process inefficiency include prevention costs (checking and reviewing work), internal failure costs (rework, lost students), and external failure costs (penalties, reputation).[25]

5.3.3 Where do we want to go from here?

Excellence Canada: The University has committed to integrating the EIW standard university-wide at the gold level. The key outcomes of the gold level are:

- Positive achievements in meeting and exceeding strategic goals;
- An organization-wide focus on excellence, innovation and wellness issues;
- Positive results are being achieved across all drivers, across all areas/departments of the organization; and
- Widespread quantifiable improvement as a result of moving from reactive to proactive approaches and practices.

Lean: To meet the Lean internal consortium 2018 objectives and ensure process standards are met for Excellence Canada, the following tactics are underway or being planned:

- Identifying all institutional core business processes including measurements and opportunities for improvement (student and employee);
- Creating a Lean toolkit for campus distribution and use;
- Hosting campus events to showcase Lean projects completed to share learnings and approaches (e.g. Waterloo staff conference and upcoming Waterloo Lean Fair);
- Training employees on process mapping, problem-solving techniques and Lean tools;
- Providing Lean facilitation support to campus departments as requested; and
- Supporting the completion of a large process redesign spanning cross functional departments.

6. Connections between Leveraging Resources and other issue papers

- There are linkages between research funding and space that are hard to disentangle. Sharing of research equipment is a key opportunity to increase effective resource use and promote collaboration. There is wasteful expenditure happening on equipment that is already owned on campus.
- Could we reconsider our key performance indicators (KPIs) around research funding? If we are tracking success based on just the research dollars coming in, is there another measure we could use in addition to (or in place of) this to measure how we are managing those dollars to produce results? What are those dollars used for?
- There are linkages between emerging best practices in teaching and learning, and the student learning environment and best use of technology.

7. Questions for the campus community

Overarching questions:

- What does it look like in 2025 if the University of Waterloo is governing and managing its resources in a way that ensures it has the ability to meet its strategic goals?
- How can resources best be used to enable innovation and collaboration across a decentralized structure? Are there any cases or areas where more centralized governance of resources would be appropriate?
- Which performance metrics could be introduced to assess the effectiveness of how Waterloo is governing and managing resources between now and 2025?

Questions related to the focus areas:

- How can we ensure that resource management decisions made across campus are reflective of Waterloo's sustainability goals?
- Should information technology at Waterloo be primarily a robust and reliable enabler which supports the key mission of the university, or should it be more aligned with the image of innovation as a strategic differentiator in and of itself?
- How can Waterloo best utilize its international, entrepreneurial, teaching, and research strengths to make progress on integrating a continuous improvement mindset in our operations?

- Should Waterloo focus on increasing opportunities to share space and research infrastructure? If so, how?

Appendix A: Summary of literature scan efforts

Two librarians from the University of Waterloo Library conducted a literature review based on the group's original research question of: "Overall, how do we effectively allocate resources to improve the value of the University?" The main challenge was identifying relevant and appropriate search terms from the research question. The search was limited to direct terms that were pulled out from the question. The search terms identified included: "resource allocation," "value improvement," "resource allocation value," "value proposition," and several other combinations, and then included terms for narrowing such as "institutional," "higher education," "non-profit."

Accurately searching high level terminology can be less accurate then when more specific terms are used to guide searching. For example, value was assumed to be interpreted as referring to value proposition. Significant searching centered on value was completed, and produced limited results without additional defined search terms. The search results were significantly different depending if value or value proposition was searched. Similarly when searching for 'resources,' it was a challenge to find literature that did not include 'natural resources' without removing potentially relevant results.

Limited relevant results were found, and much of the research is very dated (going back to the 1960's with the majority being from pre-2000's). One of the most significant finds is from a recent special issue of the *Journal of Management* specifically on resource allocation. The weightiest take away is the editorial that introduces the special issue, which emphasizes that there is not a large body of literature around the allocation of financial, physical, technological and human resources, and that what does exist is very dated:

> *Given its importance to strategic management, it is surprising to find that there is not a larger body of strategy research specifically about the allocation of financial, physical, technological, and human resources that support firm strategies. A search of major management journals for strategic management research with resource allocation or closely related terms, such as capital allocation, capital investment, and strategic investment, in the abstract, title, or keywords yielded <50 articles*[20]

Defining "allocation," "leveraging," and "resources" in large institutions depends greatly on the type of institution. For example, when searching for resource management white papers in higher education institutions, the focus was typically on the asset management area, and specifically digital asset management, and did not include scope or definition information about specific terms.

An International Standard (ISO5501:2014) was found on asset management. The ISO specifies that asset management: "provides a structured approach for the development, coordination and control of activities undertaken on assets by the organization over different life cycle stages, and for aligning these activities with its organizational objectives" and consists of:

- an asset management policy;
- asset management objectives;
- a Strategic Asset Management Plan (SAMP); and
- Asset Management Plan.

The standard also requires that the "organization shall establish, document and maintain asset management plan(s) to achieve the asset management objectives. These asset management plan(s) shall be aligned with the asset management policy and the SAMP."

It further defines a SAMP as: A SAMP is defined by ISO 55000 as documented "information that specifies how organizational objectives are to be converted into asset management objectives, the approach for developing asset management plans, and the role of the asset management system in supporting achievement of the asset management objectives." An AMP is defined as: "information that specifies the asset level operational activities, resources and timescales required for an individual asset, or a grouping of assets, to achieve the organization's asset management objectives."

Appendix B: Supplementary environmental sustainability information

Excerpts from the Environmental Sustainability Strategy

Waterloo's Environmental Sustainability Strategy articulates the goals and objectives the campus will be working towards to advance environmental sustainability. It was developed between 2016-2017 by the President's Advisory Committee on Environmental Sustainability through a collaborative process.

This strategy has three interdependent goals:

- Be a leader in sustainability education and research
- Operate the campus sustainably
- Imbed sustainability practices into campus culture

These are meant to be broad and inspirational, and are further broken into 27 more specific objectives and five foundational actions to build momentum.

Key excerpts that draw attention to active implementation strategies for material points addressed in Section 5.1 include but are not limited to:

- **Sustainability Action Fund** exists to support student and employee-led projects across campus (this is better understood as an engagement and small projects tool, not able to address the scope of climate, waste, transportation, etc.)
- **Climate and Energy Working Group** is strengthening forecasting and planning on an integrated Climate and Energy Action Plan as per the direction of the Environmental Sustainability Strategy and Council of Ontario Universities commitments
- **Waste Working Group** is implementing organics waste collection and standardized bin design to increase campus diversion rates. Anticipated launch through spring 2018 in Food Services dining halls as phase 1.
- In-progress development of **secure bike cage** and **electric vehicle charging stations** to support sustainable transportation choices
- **Pilot of Sustainability Certificate** for employees – seven part series developed collaboratively between Organizational and Human Development and Sustainability Office to educate employees
- **Green Office Program** - participation from approximately 35 departments on campus

More information is available in the environmental sustainability strategy.

Promising practices from other institutions

Many have signed onto pan-university/industry commitments on sustainability and climate change, including the Talloires Declaration,[26] Global Compact,[27] US Presidents' Climate Change Commitment,[28] University Climate Change Coalition,[29] and Council of Ontario Universities Going Greener pledge.[30]

Leading universities across North America and globally are translating these commitments into comprehensive and integrated climate and energy action plans. Institutions are recognizing the strong business case for action (utility savings), driving factors such as student and community pressure, and corporate social responsibility on global challenges. Examples of promising practice include:

- A commitment to carbon neutrality (emissions offset are greater than any produced onsite), including Arizona State University, UBC, Harvard, University of Calgary, Cornell University, McGill University, Laval University, University of California at Berkeley, Simon Fraser University, University of California at Los Angeles as some examples; Also see Queens University and Stanford University for examples of deep carbon commitments (70% + reductions)
- Many universities are also strengthening commitment to Zero Waste, with various definitions but generally a minimum 90% waste diversion. Examples include UBC, Western University, University of Ottawa, McGill University, University of California at Berkeley, Simon Fraser University; as well as strong increases in diversion (>70%) Laval University and Dalhousie University.
- These efforts are being integrated into capital plans, operating budgets, and increasingly linking with community plans and academic mandates to support student projects and faculty research.

Appendix C: Select examples of Lean projects completed on campus

Housing and Residence Department, Accessible Housing Process Improvement

Describe the project – what work was completed?

Incoming students to the University of Waterloo are guaranteed housing and it is a part of our responsibility to ensure the appropriate and/or accessible accommodations are available. During the spring of 2016, there were a number of challenges with our past process. This resulted in poor customer service, incomplete applications, and a low-level of awareness of student issues. Housing and Residences (in coordination with housing providers at Renison, St. Jerome's, and St. Paul's) collaborated with AccessAbility Services to host a process mapping session with an external consultant (Scott Smith) to outline our current process and develop an ideal future state. The resulting process allowed for students to better understand expectations related to registering for Accessible Housing, staff have clear communications, the development of new submission form, and a better understanding as to how on-campus housing providers are able to meet the (medically documented) functional limitations of incoming students. Now students are able to arrive with fewer concerns and an awareness that their accommodations on campus meet their needs.

What determined the focus in this particular area?

Through issues brought forward from students, parents, and staff members it was determined that:

- AccessAbility Services was not focusing on their key areas (vetting and verifying documentation),
- Housing providers were not able to articulate the steps in the process,
- Students were incorrectly entering a process not intended for them,
- Medically documented functional limitations were not known to housing providers, and
- Student housing accommodations were at a risk of not meeting a student's needs.

These issues were then discussed openly between AccessAbility Services and each of the housing providers on campus to determine a change was necessary. These gaps (and bottlenecks) were identified during the process mapping exercise that spanned two days.

What were the overall results?

The overall results benefited students, families, and staff members here at Waterloo.

Staff:

- Fewer students entering the Accessible Housing process with applying into residence. 270 in 2016 (175 of those applications were incorrect), which was decreased to 139 in 2017 (50 of which were incorrect).
- Clear delegation of roles and responsibilities for the overall process. AccessAbility Services focused on vetting and verifying medical documentation while housing providers provided the student service.
- Stronger connections between staff members in different departments. This was accomplished through meetings, training, and collaboration opportunities.

Students/families:

- Clear understanding of the Accessible Housing process, which was outlined through a separate website and reinforced by each housing provider.
- New submission form, which required a medical professional to complete and verify a medically documented need.
- Follow-up communications regarding the decision and recommended adjustments for housing accommodations.
- Greater opportunities for students to be placed in communities where they would prefer to live (i.e. more opportunities for students to live at a University College residence).
- More welcoming environment for students when arriving on campus by ensuring the modifications to the accommodations were complete prior to arrival.

What did you learn? (challenges and positives)

Challenges:

- The new process was intended to affect the incoming first-year student process, but was quickly modified and adjusted to support the assessment process for non-first year students looking to secure housing accommodations. Not all staff were prepared for this adjustment.
- The ideal state was not achievable (due to constraints in technology changes), but improvements were apparent.
- Automated messages were not sent, which created a time where there was not a clear understanding of the next steps in the process.
- Challenges in sharing confidential documentation between departments (SharePoint vs. SendIt).
- Opportunities to involve more departments/areas on campus in the process were missed. For example, many students are bringing forward issues with food related allergies. Food Services should be involved in the future.

Positives:

- Campus collaboration allowed for some efficiencies in each department.
- Clear documentation allow for better training/cross-training opportunities for staff involved in the process.
- Outlining our ideal process (regardless of the technology/system) produced powerful results.
- Having clear requirements for the process resulted in fewer incorrect and frustrated students.
- Staff who either modify the space (Facilities) or create the positive environment (Residence Life) had more time to prepare to welcome students with medically documented needs.
- Awareness of functional limitations and modifications needed to spaces.

Office of the Provost, Employee handbook - Streamlining access to common documents and processes

Describe the project – what work was completed?

The Office of the Provost documented all their processes and core documents into one binder. This binder is available for all employees within the Office of the Provost on the main drive as an electronic copy. They have 13 main sections and each section has an owner. The owner for each section is typically the one responsible for the processes documented under that section. The owner is also responsible for ensuring everything in their section stays up to date. This means if there are any changes to a process, they will need to update the hard copy as well as the soft copy. This process is also documented in the binder.

This project began with a major cLeaning of the main drive and the provost website. This ensures only the most updated documents are available. A project schedule and process map of this project was created and SMEs were identified for each section under the Office of the Provost. The project took four months to complete with two to three hours a day dedicated to meeting with SMEs to document steps in each process.

What determined the focus in this particular area?

This project was initiated for Excellence Canada. There was a gap identified, processes of the Office of the Provost was not documented anywhere and the drive was unorganized. One of the main objectives of this project was to organize all core documents and to have all processes documented in one centralized area.

What were the overall results?

All processes are now documented which ensures the continuation of work in the case of an absent employee, whether they are on vacation or sick, anyone from the department can look up any process through the electronic binder and learn how to do a certain process step by step.

Everyone in the department now uses the electronic binder specifically for checklists of certain processes and procedures.

What did you learn (positives and challenges)

Positives:

- Getting organized
- Drive and website is now cLean and only has updated documents
- Helps with any future training
- The more people that were involved in this process the better, everyone felt a sense of responsibility and accountability towards ensuring the binder is always up to date
- Better communication between employees within the department and more team collaboration to document all processes

Challenges:

- Having a common consensus at the beginning and getting everyone to see the benefit of this initiative
- Asking people to do this on the side of their regular day to day operations
- Train people on how to properly update contents of the binder
- Sticking to the schedule initially created for this initiative

References and notes

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[12] Effective. (n.d.) In *Merriam Webster* online. Retrieved from https://www.merriam-webster.com/dictionary/effective

[13] Example tool used at McMaster University: https://www.qreserve.com/

[14] Provided by Harry Bakker, Plant Operations

[15] See 2016 Environmental Sustainability Report available at https://uwaterloo.ca/sustainability-report/ : -22% water intensity since 2010, -18% emissions intensity since 2010.

[16] Without provincial changes to the electricity grid through the phase-out of coal power, Waterloo's Scope 1 and 2 emissions would have increased by approximately 27% between 2010 and 2016.

[17] See 2016 Environmental Sustainability Report available at https://uwaterloo.ca/sustainability-report/; 2017 Waste Audit contains a similar finding although the data has not been released yet.

[18] See 2016 Environmental Sustainability Report available at https://uwaterloo.ca/sustainability-report/ : Approximately 47% of employee trips to campus are made by walking, cycling, carpooling, transit, or telework. This number is closer to 90% for students, but the data quality of student trips is far lower.

[19] See 2009 Campus Master Plan, in particular support for transit connectivity and for a campus environment that is supportive of walking and cycling.

[20] Lifecycle costing has been included in Policy 53, but a methodology and implementation is still in development. For monitoring and measurement, the Sustainability Office maintains an environmental management system internally and is working with parts of Plant Operations to build a platform to share this. Actual infrastructure (such as sub-metering of buildings) is either non-existent or disparately tracked.

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