University of Guelph

Comprehensive Review of the University's IT Functions

Final Report
June 12, 2017

pwc

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Project Context

The University of Guelph ("U of G") initiated a comprehensive review of major IT functions and organizational structures across the University to (a) understand the current IT landscape, and (b) ensure IT is positioned as a strategic enabler for the future of the institution. The review assesses the state of IT on campus, including identifying best practices for University IT, opportunities for greater effectiveness and efficiencies in service delivery, and any major gaps in IT services, systems, infrastructures, and governance.
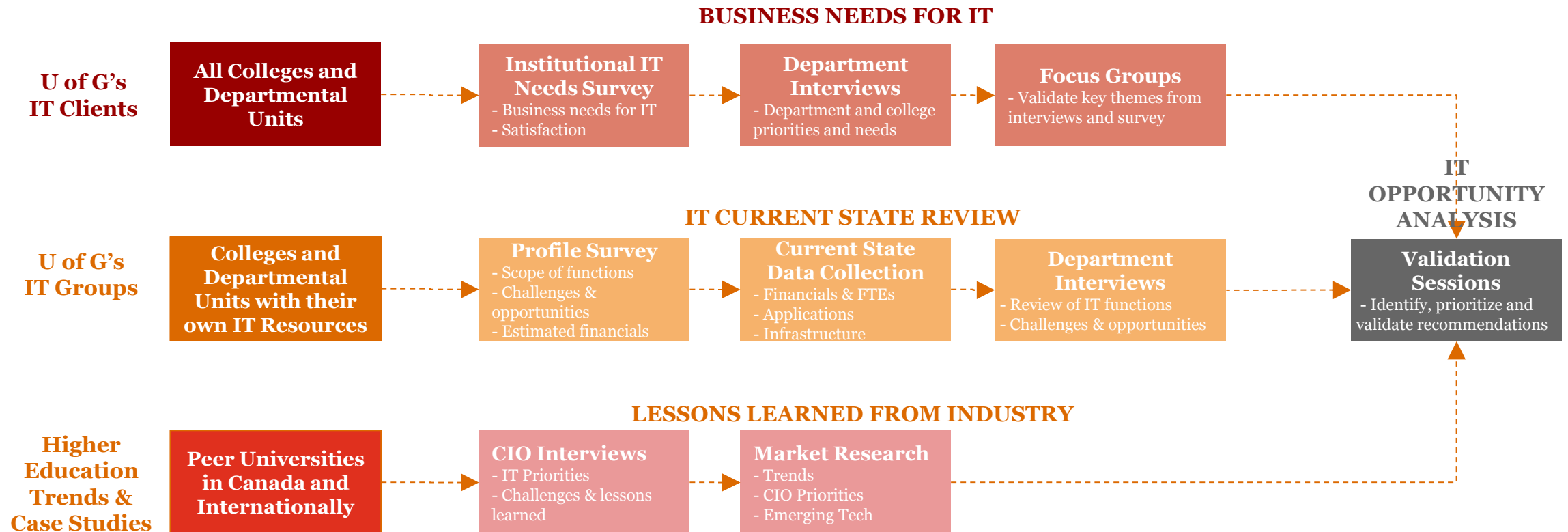
Scope of IT Review - 6 Focus Areas

IT Functions	IT Governance	Major Enterprise Applications	IT Infrastructure	IT Resources (FTEs)	IT Financials
Which colleges or departmental units deliver IT functions?	What IT governance processes exist today?	What are the major business applications used by the University?	What are the infrastructure resources committed to IT across the University?	What are the total, type, and allocation of FTEs committed to IT across the University?	How much is the University spending and investing in IT ($)?
What are the major gaps, risks, or opportunities?	What are the major gaps, risks, or opportunities?	What is their usage, support and cost profile?	Where are they located?	What are the major gaps, risks, or opportunities?	How does it compare internally (colleges or departmental units) and externally (peers, industry, etc.)?
How well is IT running compared to leading practices and other peers?	What are the best practices for IT governance for a university setting?	Which applications require remediation based on their risk or value?	What are the major gaps, risks or opportunities?		What are the projects and their budget?
What are the priority functions to improve?		What are the technology trends emerging in Higher Education?			What are the opportunities to improve the University's IT spend and revenue?

▮ Higher Focus for Review

Methodology - IT Review Approach

The IT Review was completed by gathering a series of inputs internal and external to the University on the needs, challenges, and opportunities with the existing IT environment. These inputs informed a set of recommendations on what actions the institution should take to establish a strong IT foundation to support the University's strategic goals.

BUSINESS NEEDS FOR IT

U of G's IT Clients

| All Colleges and Departmental Units | Institutional IT Needs Survey
- Business needs for IT
- Satisfaction | Department Interviews
- Department and college priorities and needs | Focus Groups
- Validate key themes from interviews and survey |

IT OPPORTUNITY ANALYSIS

IT CURRENT STATE REVIEW

U of G's IT Groups

| Colleges and Departmental Units with their own IT Resources | Profile Survey
- Scope of functions
- Challenges & opportunities
- Estimated financials | Current State Data Collection
- Financials & FTEs
- Applications
- Infrastructure | Department Interviews
- Review of IT functions
- Challenges & opportunities | Validation Sessions
- Identify, prioritize and validate recommendations |

LESSONS LEARNED FROM INDUSTRY

Higher Education Trends & Case Studies

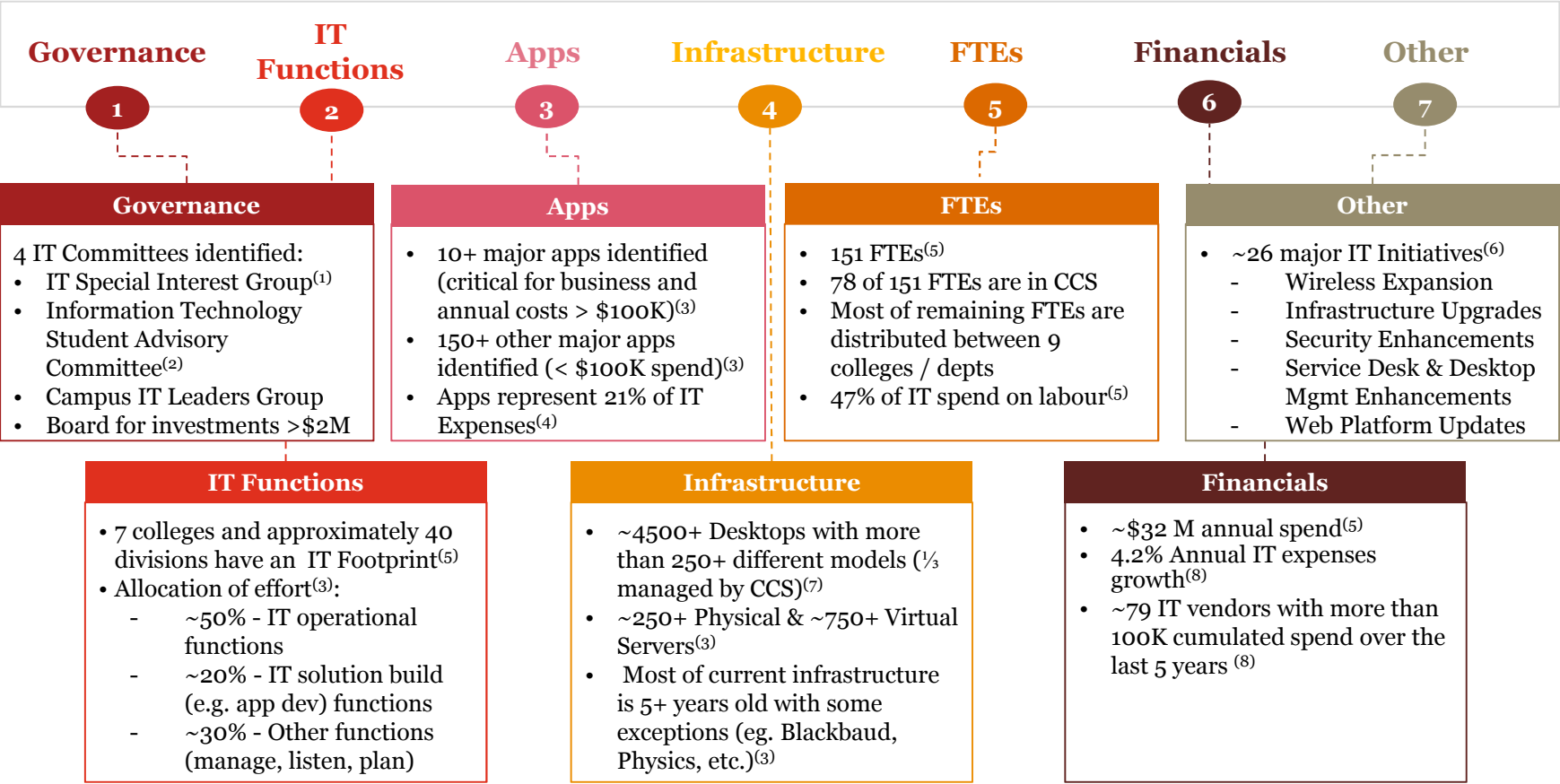| Peer Universities in Canada and Internationally | CIO Interviews
- IT Priorities
- Challenges & lessons learned | Market Research
- Trends
- CIO Priorities
- Emerging Tech |

Methodology - A Collaborative Approach

A core principle of the IT Review was to consult with a broad group of stakeholders across the University to understand the diverse programs and services across divisions and colleges and how that impacts the needs for IT. This included a series of surveys, interviews, and workshops to gather needs from various perspectives, including:

- Senior leadership
- Department and colleges
- IT management
- IT staff
- Students

20+ Divisions consulted

29 Interviews

7 Colleges consulted

150+ People consulted

61 Surveys collected

130+ Documents collected & reviewed

3 Workshops conducted (~120 people)

8 Weekly sponsor touchpoints (status, deliverables, review, etc)

Snapshot: Current State of U of G's IT Footprint

Based on the consultations and data collected, the figure on the right presents a University-wide view of the current IT environment across the different areas of review.

Governance	IT Functions	Apps	Infrastructure	FTEs	Financials	Other
1	2	3	4	5	6	7

Governance
4 IT Committees identified:
- IT Special Interest Group[1]
- Information Technology Student Advisory Committee[2]
- Campus IT Leaders Group
- Board for investments >$2M

Apps
- 10+ major apps identified (critical for business and annual costs > $100K)[3]
- 150+ other major apps identified (< $100K spend)[3]
- Apps represent 21% of IT Expenses[4]

FTEs
- 151 FTEs[5]
- 78 of 151 FTEs are in CCS
- Most of remaining FTEs are distributed between 9 colleges / depts
- 47% of IT spend on labour[5]

Other
- ~26 major IT Initiatives[6]
  - Wireless Expansion
  - Infrastructure Upgrades
  - Security Enhancements
  - Service Desk & Desktop Mgmt Enhancements
  - Web Platform Updates

IT Functions
- 7 colleges and approximately 40 divisions have an IT Footprint[5]
- Allocation of effort[3]:
  - ~50% - IT operational functions
  - ~20% - IT solution build (e.g. app dev) functions
  - ~30% - Other functions (manage, listen, plan)

Infrastructure
- ~4500+ Desktops with more than 250+ different models (⅓ managed by CCS)[7]
- ~250+ Physical & ~750+ Virtual Servers[3]
- Most of current infrastructure is 5+ years old with some exceptions (eg. Blackbaud, Physics, etc.)[3]

Financials
- ~$32 M annual spend[5]
- 4.2% Annual IT expenses growth[8]
- ~79 IT vendors with more than 100K cumulated spend over the last 5 years [8]

These numbers are directional based on what PwC was able to collect throughout the project

(1) ITSIG - This group meets once a month to discuss IT issues, share information and to foster a greater sense of community amongst IT staff on campus.
(2) ITSAC - Its membership includes representatives from college student governments across campus as well as members at large to discuss current and new IT initiatives and is mandated to submit a report each year.
(3) Detailed Data Collection Template from 9 out 10 of the largest colleges or departmental units with IT footprint; Major Applications as defined by either more than 1 FTE support, highly critical for day to day operations and / or large user group (more than 100 users)
(4) Finance Data - Op Exp Sum by Object Code - 2016/2017 expenses are as of April 10, 2017 - Apps defined as 62710 and 63751
(5) Finance Data - Total Expenses by Unit - 2016/2017 expenses are as of April 10, 2017
(6) IT Review Shared Folder - MAJOR IT INITIATIVES provided by CCS
(7) Based on interview with CCS estimation of current coverage of desktops in the environment and Data Collection Template - a majority of them are standard models (60%+ compliance)
(8) Finance Data - Op Exp By Vendor by Object - 2016/2017 expenses are as of April 18, 2017
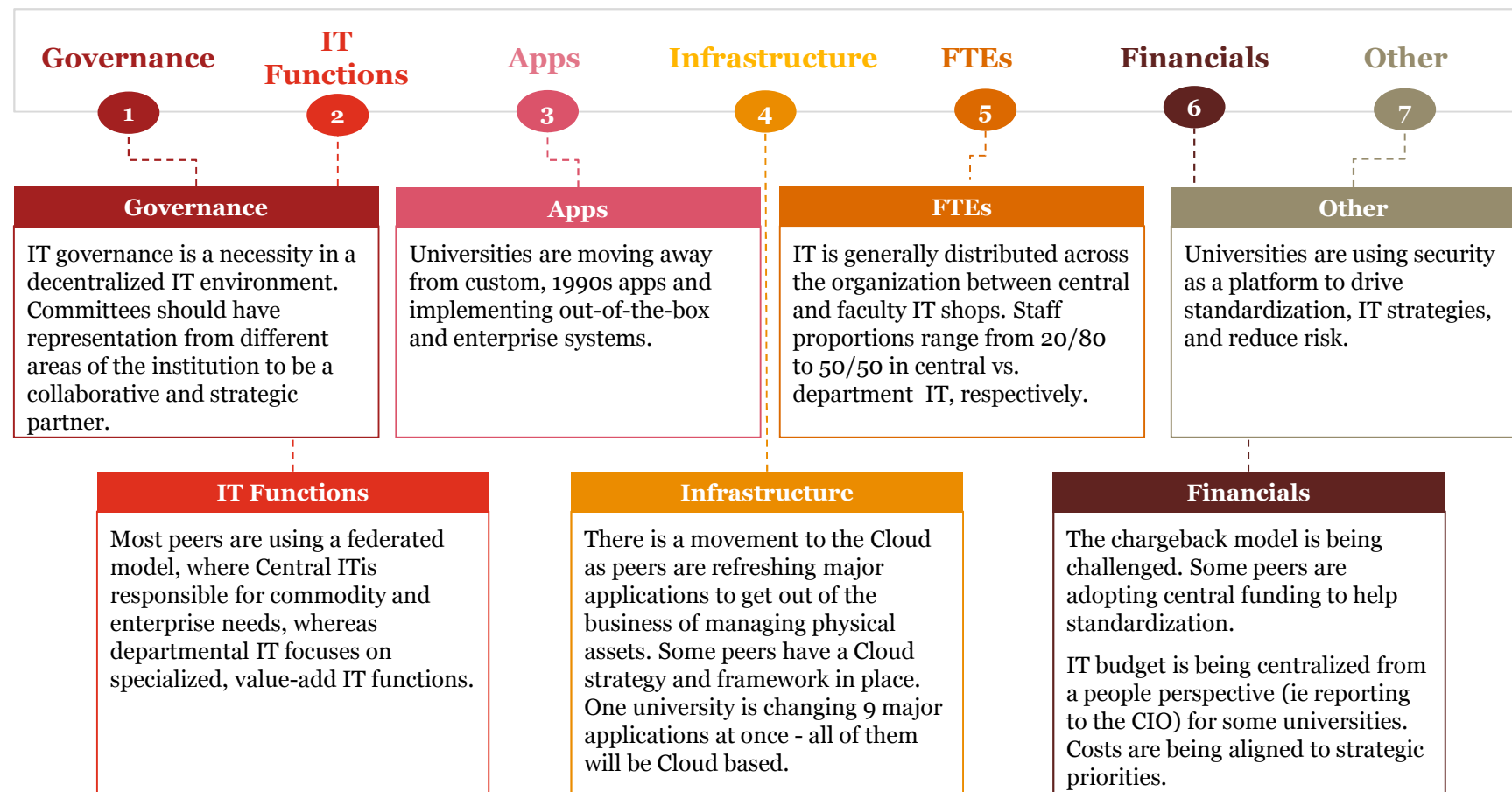
Key Observations on the Current State of IT

Based on the data gathered and stakeholders consulted, the following themes emerged as the **key observations and opportunities** for the University's IT environment, which informed the recommendations:

(1) There is a strong appreciation for the ***importance of IT*** to the future of the University, and a ***willingness to work together*** across colleges and departments to achieve a common goal;

(2) While there are a number of examples of cross-university collaboration, there currently ***lacks formal governance to make decisions*** on IT priorities, investments and policies, impacting the openness, speed, coordination, and rigour of decisions;

(3) IT has ***grown organically*** across departments to address their business needs leading to duplication in functions, but there is an ***appetite to shift more commodity infrastructure services centrally*** to focus on their core business;

(4) CCS has made progress to establish a ***foundation of shared IT services and a secure infrastructure*** to drive efficiency and manage risk for the institution, but have been ***challenged*** with varying adoption;

(5) As a result of constrained resources, many of the ***University's IT assets (enterprise applications, infrastructure) are ageing*** and require re-investment to modernize the institution's operations and manage risk;

(6) ***Data*** is a key concern for most departments and colleges, who are often challenged with being able to access data to do their jobs effectively;

(7) ***Acquiring, retaining, and developing people in IT is a key risk*** for the University in light of ageing workforce, specialized knowledge on customized systems, shortage of resources to transfer knowledge to, and differences in pay scales; and

(8) The primary focus for IT investments has been running the operations and managing risks with some pockets of innovation; there is a ***desire and a need to start leveraging IT as a strategic asset*** for the University in addition to running the day-to-day operations.
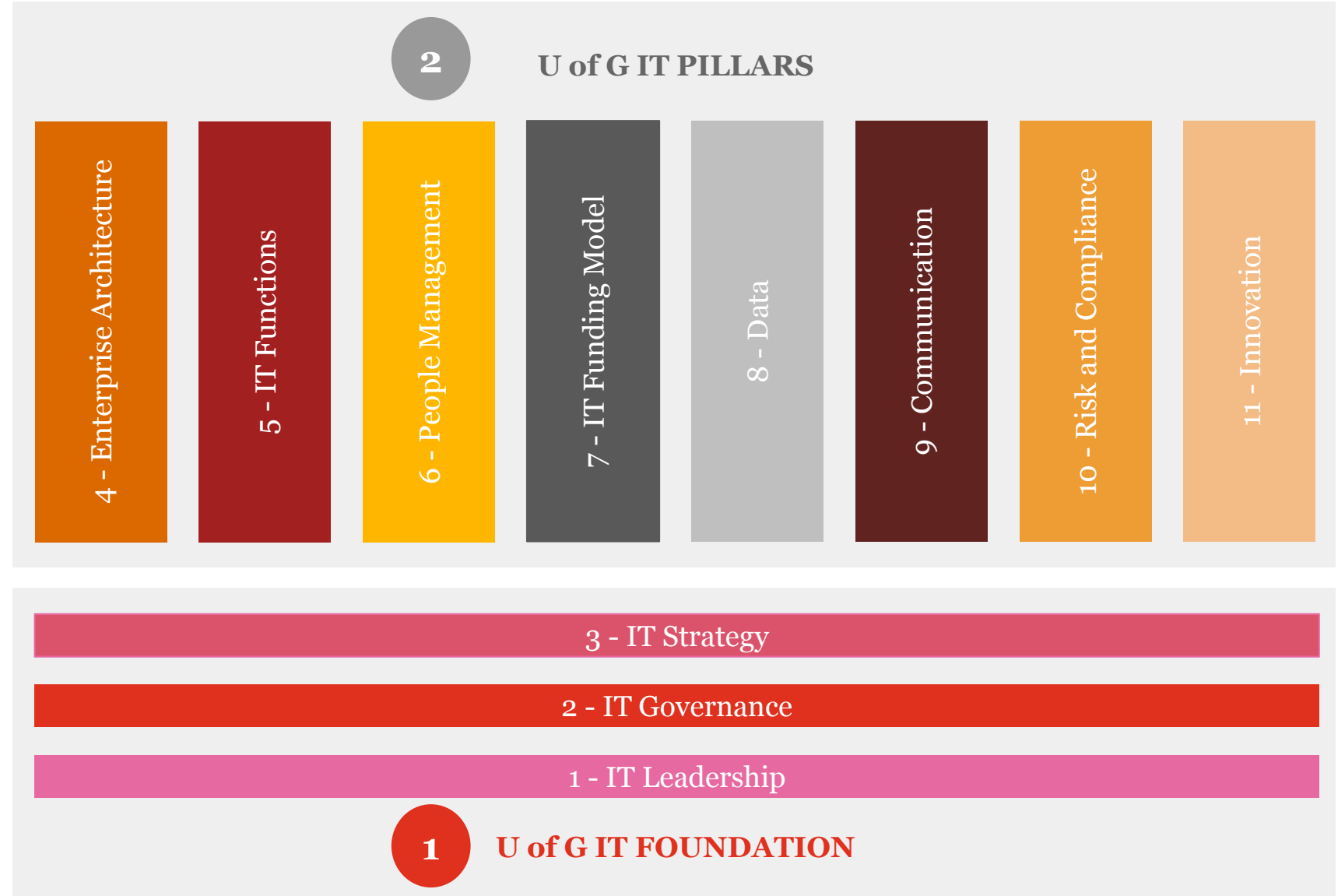
Snapshot: Lessons Learned from Peer Universities

Other universities face similar IT challenges as the University of Guelph and offer the following guidance and lessons learned to consider as part of the University's next steps[1]

Governance — 1
IT Functions — 2
Apps — 3
Infrastructure — 4
FTEs — 5
Financials — 6
Other — 7

Governance
IT governance is a necessity in a decentralized IT environment. Committees should have representation from different areas of the institution to be a collaborative and strategic partner.

Apps
Universities are moving away from custom, 1990s apps and implementing out-of-the-box and enterprise systems.

FTEs
IT is generally distributed across the organization between central and faculty IT shops. Staff proportions range from 20/80 to 50/50 in central vs. department IT, respectively.

Other
Universities are using security as a platform to drive standardization, IT strategies, and reduce risk.

IT Functions
Most peers are using a federated model, where Central ITis responsible for commodity and enterprise needs, whereas departmental IT focuses on specialized, value-add IT functions.

Infrastructure
There is a movement to the Cloud as peers are refreshing major applications to get out of the business of managing physical assets. Some peers have a Cloud strategy and framework in place. One university is changing 9 major applications at once - all of them will be Cloud based.

Financials
The chargeback model is being challenged. Some peers are adopting central funding to help standardization.

IT budget is being centralized from a people perspective (ie reporting to the CIO) for some universities. Costs are being aligned to strategic priorities.

Key Recommendations (1/2)

- A set of 11 recommendations are proposed for U of G to establish a strong IT foundation for positioning the University for the future.

- U of G should start by putting the foundational recommendations in place before building the pillars - the University needs a lead, a plan, and a way to make decisions.

- Many recommendations are interconnected - their real value is realized when they work together as a recipe for a well-functioning IT.

2   **U of G IT PILLARS**

- 4 - Enterprise Architecture
- 5 - IT Functions
- 6 - People Management
- 7 - IT Funding Model
- 8 - Data
- 9 - Communication
- 10 - Risk and Compliance
- 11 - Innovation

3 - IT Strategy

2 - IT Governance

1 - IT Leadership

1   **U of G IT FOUNDATION**

Key Recommendations (2/2)

1 - IT Leadership

Clarify the **role of the CIO** for the University and **hire a new CIO** to drive the recommendations from the IT review forward.

2 - IT Governance

Establish institution-wide **IT governance** as a key vehicle in supporting decisions that advance the Strategic Framework as well as departmental needs and the University's goals.

3 - IT Strategy

Develop a 5-year institution-wide **IT Strategy & Implementation Plan** that defines a vision, roadmap, and metrics for how technology will enable U of G's objectives.

4 - Enterprise Architecture

Define a future state **blueprint and roadmap** for core applications and infrastructure across the institution and how they integrate with each other.

5 - IT Functions

Define the **target operating model** for IT across the University with the core services to be invested in centrally or through partnerships to drive efficiencies while meeting the diverse needs across departments.

6 - People Management

Work with HR to define a **Workforce plan for people in IT** to manage risks within the University around application support, ageing workforce, and IT skillsets required for the future.

7 - IT Funding Model

Refine the **IT Funding Model** to align the IT budget (either centrally or departmentally) with the IT investment priorities and the scope and scale of service delivery.

8 - Data

Improve **access to institutional data** through data standards, clear roles & responsibilities on data ownership, and tools to analyze, visualize, and report on the data from a variety of sources.

9 - Communication

Foster an **open and collaborative IT environment** for departments to learn about common needs, current projects underway, leading practices, and emerging technologies.

10 - Risk and Compliance

Improve U of G's IT risk profile through better visibility and mitigation of cyber security threats at a university-wide level, ensuring regulatory compliance (e.g. AODA) and implementing IT Disaster Recovery in alignment with the Emergency Mgmt. initiative.

11 - Innovation

Establish an IT-enabled **innovation** function to experiment with emerging technologies that will advance academic or research goals and differentiate the University.

U of G is not alone in the challenges it is facing with IT.
The environmental scan has identified a number of lessons learned from peer universities in Canada and internationally who are facing similar challenges.

1.1 - IT Leadership

1- IT Leadership

Clarify the **role of the CIO** for the University and **hire a new CIO** to drive the recommendations from the IT review forward.

Supporting Observations

- The Board recently approved a decision to split the roles of the CIO and Chief Librarian, and as a result, the University is currently in a state of transition while a new CIO is recruited
- Implementing the recommendations of this review will require strong leadership and there currently lacks clarity where this ownership will lie
- There is an inconsistent view in what is the role of IT- whether as a "utility" service or a strategic enabler to the University's goals

Peers' Lessons

Success starts with strong leadership and a clear mandate for IT. IT is increasingly seen as a strategic partner, with some universities raising the profile of a CIO to an AVP level to have sufficient visibility and authority to drive change.

Importance

- Not having a CIO will make it challenging to execute on most recommendations of the review forward
- Some recommendations can be started, but will take longer to execute or not fully function without a CIO in place
- There is risk of "rework" if recruitment is delayed as the CIO will be looking to shape their own agenda as part of their mandate
- Clarity around the role for the future CIO is critical to the selection of the right CIO and the mandate they will fulfill

"It has to start with leadership and how they see IT and what technology is going to bring to the University".

1.2 - IT Leadership Scope

Key Questions to Answer

What is the type of CIO leader U of G is looking for?
What environment is needed for the CIO to be successful?

Objectives

To clarify the role of the CIO and recruit the next CIO for U of G.

Leading Practice Design Principles

- Not one university is alike in term of structure and title. It's about creating the right environment for the CIO, which is critical not only for attracting but also retaining them
- Success measures need to be tied to control level (e.g. if cost efficiency then CIO should be able to validate spend)
- Timing to recruit should be factored in the recruitment strategy
- CIO attributes needs to be in line with IT strategy

Key Components To Define

Priorities for IT

Desired CIO Attributes

CIO Role, Title and Reporting Relationship

Recruitment Strategy for CIO Candidates

CIO Performance / Success Measures

The first step in planning to recruit the next CIO is to clearly define what his or her priorities will be for U of G - finding the right balance of supporting, advancing / growing and differentiating the University through IT.

Support the business

In the past, CIOs were focused on efficiency supporting the business with optimal operational performance.

Advance the business

Now CIOs are also expected to advance the business – developing flexible capabilities to increase effectiveness, enabling the business to grow.

Differentiate the business

And there is an increasing expectation to drive innovation – adopting new technologies to differentiate the business.
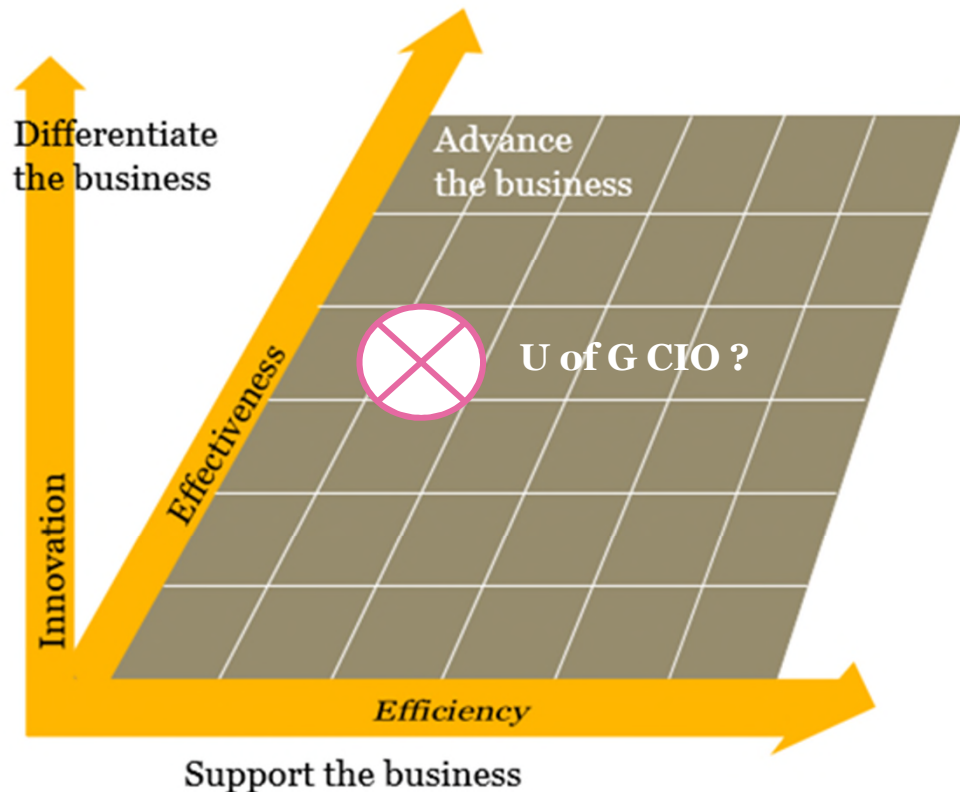
(1) PwC's IT consulting CIO advisory solutions, 2011

Based on the priorities, the desired attributes of a CIO should be defined that will inform the recruitment process. In addition to technical competence, stakeholder management and strategic thinking have become differentiating attributes to be successful in a Higher Education environment where IT is a key investment, yet often decentralized.

Attribute	Rank 1	Rank 2	Rank 3
Strong stakeholder management skills	33%	29%	13%
Visionary and strategic thinking	24%	29%	22%
Deep understanding of the business	13%	15%	24%
A seat at the top management table	18%	7%	9%
Oversight of all relevant resources: people, spend, etc.	5%	15%	
Technical background and expertise	5%	9%	
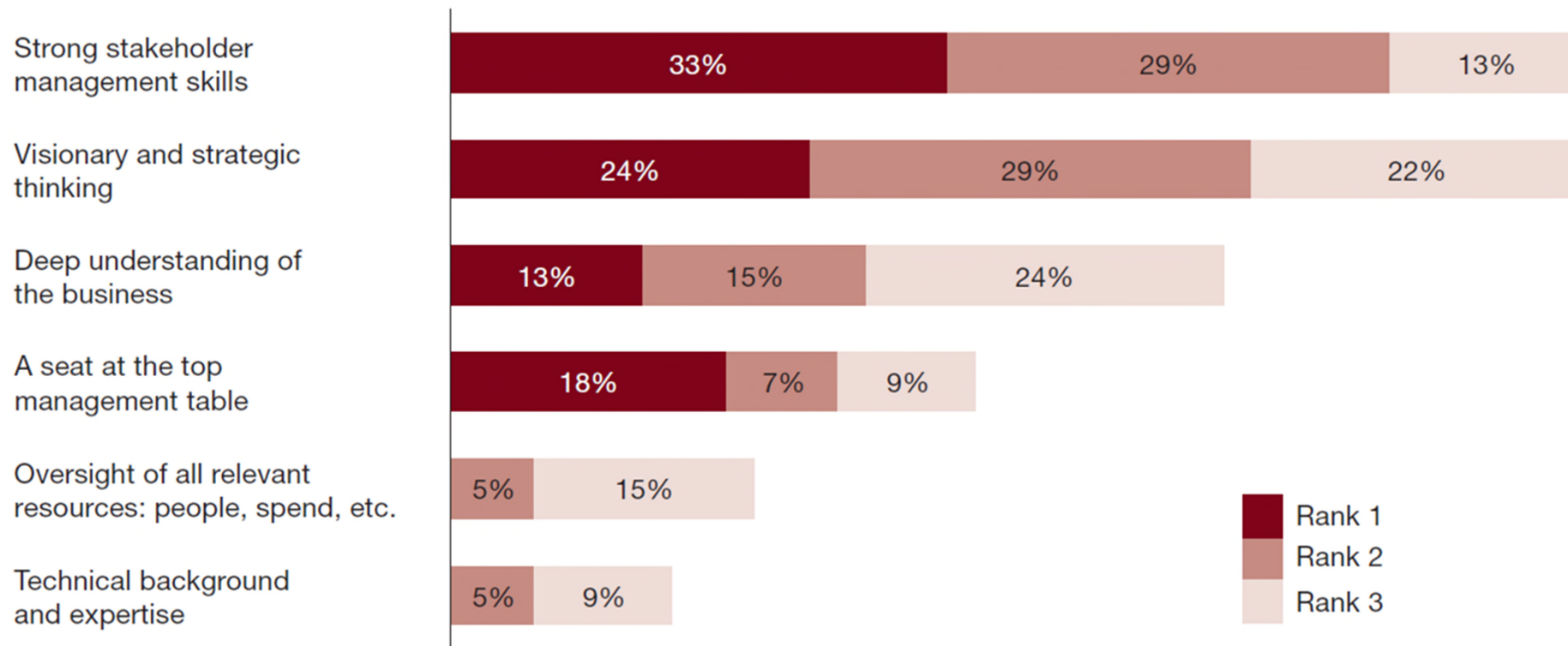
(1) Strategy& / PwC - Memo to the CEO - Are you getting the best out of your CIO? (CIO Success Factors)

1.5 - IT Leadership Framework - Who does the CIO report to?

The CIO also needs to be positioned with the right authority to drive IT's mandate. Most university CIOs report to the Provost and/or CFO, with an accountability to a University-wide IT governance committee to implement the institution's IT priorities.

University of Saskatchewan[1,2,7]

Information Systems Steering Committee

VP Finance and Resources

Provost

CIO

Queen's University[1, 3,8]

Vice-Principals' Operations Committee

VP Finance and Administration

Associate Vice-Principal (IT Services) & CIO

McMaster University [1,4,9]

Executive Committee

Provost & VP (Academic)

VP Administration

Assistant VP & CTO

University of Waterloo[1,5,10]

Governance Committees (multiple)

VP, Academic & Provost

CIO

University of British Columbia[1,6,11]

Executive Committee

VP, Academic & Provost

CIO

— Functional Reporting
— Governance Reporting

(1) Based on Interviews with CIO
(2) http://www.usask.ca/avp-ict/governance/stewardship-model.php
(3) http://queensu.ca/cio/governance
(4) http://www.mcmaster.ca/uts/groups_comm/index.html
(5) https://uwaterloo.ca/it-portfolio-management/methodologies/roles-and-responsibilities/it-governance
(6) https://cio.ubc.ca/it-governance
(7) http://www.usask.ca/avp-ict/about/organizational-structure.php
(8) http://www.queensu.ca/its/about-its/organization-overview#DIRECTOR
(9) https://www.mcmaster.ca/vpadmin/documents/mac-org-chart-letter.pdf
(10) https://uwaterloo.ca/secretariat/sites/ca.secretariat/files/uploads/files/org15_2.pdf
(11) https://cio.ubc.ca/about-cio

1.6 - IT Leadership Actions Recommended

1. Start hiring a dedicated CIO now (6 months - 1 year)

The CIO should:

1) Be the **Department Head of central IT** (CCS) to deliver efficient and IT services to the institution

2) Have **enterprise/institution-wide responsibility** for IT such as:

- A. Define and enforce IT policies and standards
- B. Lead university-wide IT strategic planning
- C. Manage IT risk across the institution
- D. Promote common solutions and reuse of investments
- E. Review and approve major IT purchases to ensure compliance to policies and reuse of investments

3) Continue to functionally **report to the Provost**

4) Be **accountable to an IT governance board** made up of senior leadership across the University to:

- A. Implement their directions on IT priorities and policies
- B. Report on the progress against those priorities

5) Be **positioned at a senior level** (e.g. AVP) to be perceived as a partner to Heads of departments and colleges

2. Manage the transition with an interim CIO

1) Consider appointing an **interim CIO** to maintain momentum from the IT Review by beginning the process of developing a new governance framework (recommendation #2) through investigation of leading practices to identify suitable options for Guelph. The framework will establish a strong foundation for IT priority-setting and decision-making for the incoming CIO, who will have an opportunity to provide input, finalize, and implement the governance framework once on-boarded.

Possible options for bringing onboard additional help in the interim:
- Maintain current interim CIO
- Appoint new interim CIO from internal
- Appoint new interim CIO from external - Hire contractor (eg. former/retired peer university CIO)
- Other

2.1 - IT Governance

2- IT governance

Establish institution-wide **IT governance** as a key vehicle in supporting decisions that advance the Strategic Framework as well as departmental needs and the University's goals.

Supporting Observations

- U of G Strategic Framework will require institution-wide decisions on IT
- U of G currently lacks a university-wide IT governance structure to make key IT decisions for the institution such as IT priorities, investments, solutions, policies, and standards
- CIO is currently engaged through relationships with departments on major IT purchases; current practices do not require formal IT review against policies and reuse of existing investments
- IT costs are growing year-over-year faster than U of G's revenue, putting increased financial pressure on the institution
- Speed of decisions on previous applications has lagged (interviews highlighted 2-3+ years between identifying a need and approval)
- Consistently #1 response identified by stakeholders during interviews, focus groups, and by other universities as foundational

Peers' Lessons
An IT governance needs to be established to make key decisions and guide the direction of IT - it should be collaborative across the University, with IT as a key partner, but not ultimate leader.

Importance

- Governance is a cornerstone for driving central planning, coordination, and control in a decentralized IT environment
- Proper controls on acquisition of IT assets (e.g. purchasing Cloud services) is critical to avoiding duplicate investments, mitigating security risks, and ensuring solutions will be supportable
- A proper decision framework on IT investments, with well articulated benefits and risks, is critical to making informed decisions on IT
- Speed and agility of the decision process is critical to be responsive, given the pace of market change
- Funding more IT projects and budgets every year will not help to deliver IT responsibly to meet needs without a proper governance to align spend and U of G priorities

"IT needs to be a key partner at the table - not leading it"

"Governance needs to be collaborative - across levels and units"

2.2 - IT Governance Scope

Key Questions to Answer

Who makes IT decisions across the University?
How does the University improve the speed and agility of IT decision-making?
How do you ensure that IT decisions are made in a unified way across the organization?

Objectives

To direct and oversee actions on the priorities, funding, implementation and sustainment of the University's IT projects and operations.
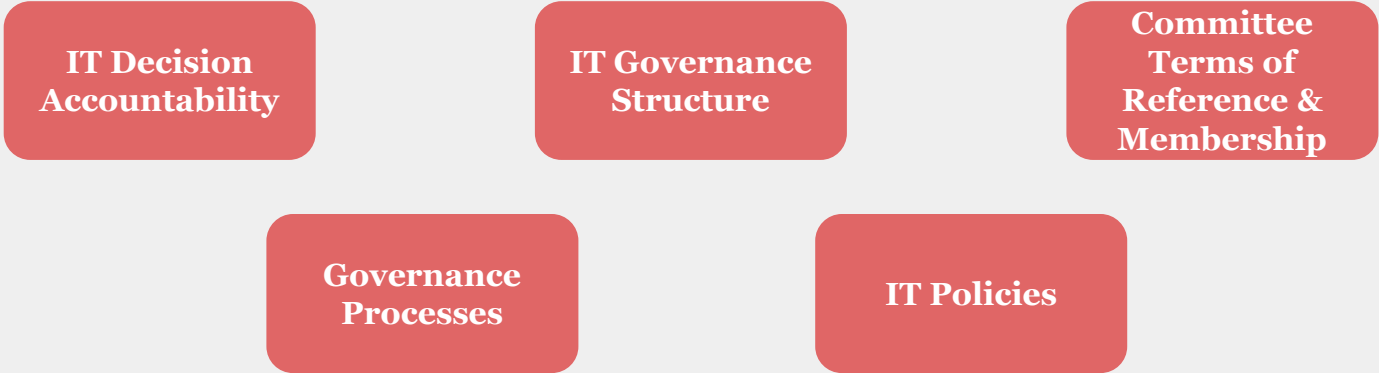
Leading Practice Design Principles

- Focus on **making IT decisions** for the University as a whole
- Establish **clear accountability** for IT decisions
- Avoid **"death by committee"**
- Driven by the **"business"** in partnership with IT
- Committees have **fair representation** across departments and colleges
- Members wear their **"institutional hats"**
- Make **proactive decisions** on IT investments grounded in a 5-year IT strategic plan
- **Balance** oversight with ensuring governance does not become a roadblock to success
- **Not a "one size fits all"** - tailor the level of governance applied to the size and risk of initiative

Key Components To Define

IT Decision Accountability

IT Governance Structure

Committee Terms of Reference & Membership

Governance Processes

IT Policies

2.3 - IT Governance Framework - Decisions

Key IT Decisions	Governance Committee(s)	CIO	Department / College Head	Other
IT Strategy				
IT Policies				
IT Investment Prioritization				
Technology Standards				
IT Purchases				
…				

Need clear definition of:
- *Who is accountable as the decision-maker?*
- *Who is responsible for making recommendations?*
- *Who needs to be consulted for decisions?*
- *Who needs to be informed of the decisions?*

2.4 - Sample University IT Governance Structure

The following model is a hybrid of peers' IT governance structures based on current structures and lessons learned[1-6].

As a general principle there is no "one model fits all" and no perfect governance model to be replicated. It's about carefully crafting the framework and identifying requirements for U of G IT moving forward (e.g. IT priorities).

Executive Steering Committee

Approve IT strategy, policies and investments for the university
Members: CIO, Provost, VP Research, CFO

Research Advisory Groups

Academic Advisory Groups

Administrative Advisory Groups

Recommend IT priorities and investments for respective areas to the Executive Steering Committee
Members: CIO, Faculty Deans

Subcommittees and Working Groups

Responsible for advising on specific topics such as emerging trends, applications, or projects. For example, some organizations have set up a special task force on developing a Cloud Computing Framework to support the decisions of when to adopt Cloud services.

(1) Based on Interviews with CIO
(2) http://www.usask.ca/avp-ict/documents/strategic-direction/IT-Strategic-Plan.pdf
(3) http://queensu.ca/cio/governance
(4) http://www.mcmaster.ca/uts/groups_comm/index.html
(5) https://uwaterloo.ca/it-portfolio-management/methodologies/roles-and-responsibilities/it-governance
(6) https://cio.ubc.ca/it-governance

Executive decision

Advisory

Reporting relationship

2.5 - IT Governance Actions Recommended

1. Define clear accountability for IT decisions in the federated environment

Sample U of G Decision Matrix To Be Refined in Next Steps				
Key IT Decisions	**Governance Committee(s)**	**CIO**	**Department / College Head**	**Students**
IT Strategy	A	R	C, I	C, I
IT Policies	A	R	C, I	C, I
IT Investment Prioritization	A	R	C, I	I
Technology Standards	C	A, R	R	I
Major IT Purchases	I	A-2	A-1, R	I

R - Responsible / Recommender
A - Approve
C - Consulted
I - Informed

2. Implement multi-tier structure to make decisions

Sample U of G Governance To Be Refined in Next Steps

1) Executive Committee
- Approve IT strategy, policies and investments for the University
- *Members: CIO, Provost, VP Research, CFO, External partners*

2) Advisory Groups (Academic, Administrative, Research)
- Recommend IT priorities and investments for respective areas to the Executive Committee
- *Members: CIO, Faculty Deans, Department Heads*

3) IT Policies, Architecture & Standards Group
- Review and recommend institution's IT policies and technology directions to Executive Committee
- *Members: CIO, Department IT Leads. Subject Matter Specialists*

4) IT Project Review Committee
- Review status of IT projects across the University, identify opportunities for collaboration, provide advice to ensure success
- *Members: CIO, Department IT Leads. Subject Matter Specialists*

3. Define key policies to enforce IT governance and accountabilities

Sample of key IT policies to be reviewed in next steps:
- Major IT purchase approval requirements
- IT project approval requirements
- IT principles
- IT standards compliance, for example security, desktop, and applications

3.1 - IT Strategy

3 - IT Strategy

Develop a 5-year institution-wide **IT Strategy & Implementation Plan** that defines a vision, roadmap, and metrics for how technology will enable U of G's objectives.

Supporting Observations

- U of G's new Strategic Framework doesn't have an accompanying IT plan; however, technology is expected to be significant enabler
- There are currently no key IT initiatives or clear IT metrics tied to achieving the Strategic Framework
- There is an inconsistent view in what is the role of IT - whether as a "utility" service, or a strategic enabler to the University's goals
- There are endless opportunities to invest in IT, but the foundational and high priority items to focus on given that the budget is constrained need to be clearly outlined and communicated
- There is an opportunity to identify common business needs that require common solutions across the institution
- Student expectations of IT are increasing (e.g. paperless, self service, wifi, etc.)

Peers' Lessons
IT needs a strategy that is 1) communicated across the organization, 2) actionable, and 3) measurable, to prioritize its investments and to be a strategic partner to the rest of the institution.

Importance

- The institution's goals and expectations need to be translated into IT needs. Without a plan, U of G IT will lack a clear path forward and will continue to focus on the day-to-day operational pressures
- IT is key enabler to achieve U of G's Strategy and there are some key foundational pieces (e.g. IT strategy, governance) that are not in place today that are necessary for IT to be an enabler of the Strategy
- The IT Strategy may include a vision for 2022 and strategic choices for applications, infrastructure and Cloud, integration, vendor management, and even emerging technologies to guide the future of U of G's IT investments.

"IT should be a strategic partner of the University in addition to operational tasks"
"Data and Metrics are important for strategy and prioritizing key initiatives"

3.2 - IT Strategy Scope

Key Questions to Answer

What IT investments are required to achieve U of G's Strategic Framework and departmental goals?
What are highest priority investments for the University?
What is the plan to execute on those priorities?

Objectives

To develop 5-year institution-wide Technology Strategy and Implementation Plan that defines a vision, roadmap, and metrics for how technology will enable U of G's objectives.

Key Components To Define

Institution's Vision

Business and Technology Capabilities Required

Current State Gaps

Initiatives & Business Cases

5-Year Integrated Roadmap of Initiatives

Leading Practice Design Principles

• Focus on **enabling the institution's strategy** and goals
• Develop in **partnership** with administration, department, college, and IT leadership
• Start with **defining the target state** before being constrained by the current state
• Identify **common needs across departments and colleges** to address with enterprise technologies
• Think **broader than traditional IT** systems (i.e. how industrial technologies used in the field can be leveraged)
• Take **measured risks** that are grounded on business cases
• The IT Strategy should be **measurable** in terms of institutional outcomes (e.g. metrics around student experience, research funding)

3.3 - Strategy Framework - How will IT enable U of G's Strategic Framework
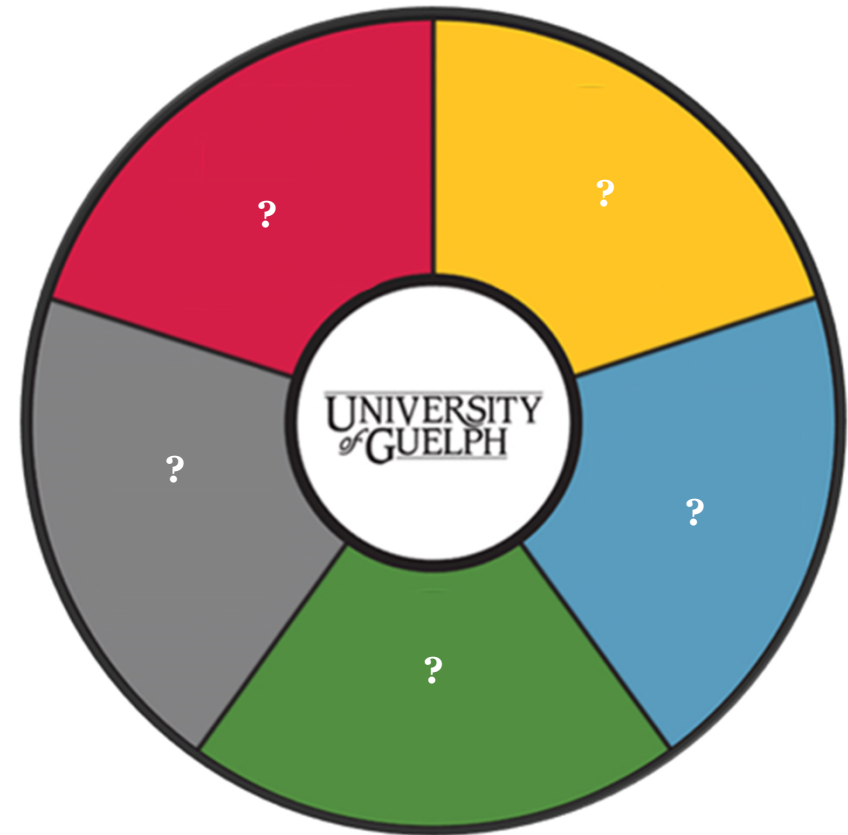
The IT Strategic Plan should follow the University's direction, as set out in the University's Strategic Framework. Many of the areas of the Strategic Framework are enabled by IT, providing a starting point for outlining IT priorities in the institution.
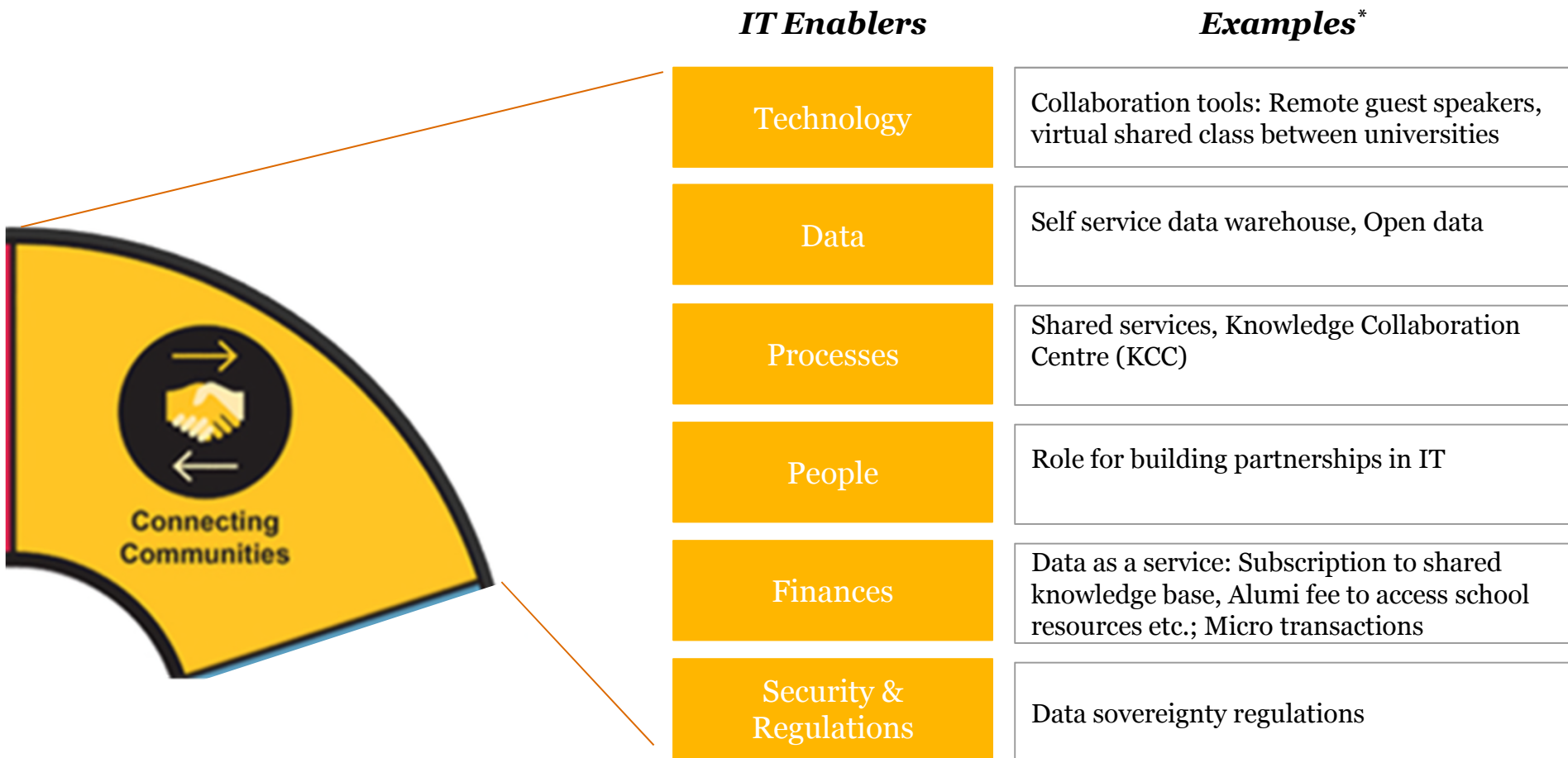

University's Strategic Framework

IT Priorities

What does it mean for IT?

3.3 - Strategy Framework - How will IT enable U of G's Strategic Framework - Examples of IT Enablers for "Connecting Communities" theme

As a starting point, the areas where IT enables the Strategic Framework can be identified from several perspectives (e.g. technology, people, data, processes, etc.), helping inform IT priorities. Some high level examples have been provided.

IT Enablers	Examples[*]
Technology	Collaboration tools: Remote guest speakers, virtual shared class between universities
Data	Self service data warehouse, Open data
Processes	Shared services, Knowledge Collaboration Centre (KCC)
People	Role for building partnerships in IT
Finances	Data as a service: Subscription to shared knowledge base, Alumi fee to access school resources etc.; Micro transactions
Security & Regulations	Data sovereignty regulations

Connecting Communities

*The examples provided were selected without an in-depth review of the Strategic Framework. Proper due diligence is required to verify the IT enablers of the Framework.

3.4 - Sample Peer University IT Strategies

University of Saskatchewan[1]

Overarching Concepts: Built in collaboration across the University, links its priorities to the institution's goals and objectives

Priorities:
1) **Research & Discovery**: Establish a cohesive set of information systems, tools and services to meet researchers' current and evolving needs, both broadening the use of IT and supporting its more specialized application.
2) **Teaching & Learning:** Assemble a flexible ecosystem of teaching and learning technologies, services, and facilities to support a broad range of learning modes and teaching methods and to enable innovative pedagogical directions.
3) **Collaboration & Community**: Establish partnerships and expand tools and services to enable a broader community to engage in teaching and learning, research and administrative activities throughout the province and beyond.
4) **Administration**: Provide a complete set of information systems and services to support the administrative activities and decision making of the university in a user friendly and efficient manner
5) **Information Systems & Planning**: Develop a more agile information systems organization, aligned to the University's goals and directions, responsive to its changing needs, and efficient in execution and support.

University of Waterloo[2]

Overarching Concepts: Data-driven, measureable, new iteration is focused on building in collaboration with the departments

Priorities:
1. **Revitalize our student IT environment:** keep pace with trends and advancements in order to provide a great experience to students
2. **Grow our technology-enabled teaching and learning environment:** Make online learning tools to be extensible, so features and functionality can be added, and adaptable, to allow ease of use and teaching innovation. Evolves classrooms with technologies that make them flexible for changing needs.
3. **Build upon information and technology foundations to support research and administration**: Provide extensible, forward-looking IT systems that allow growth, adaptation to new technologies, and resilience. Enable access to high quality data and information when, where and how it is needed, while upholding data security, integrity, and privacy.

3.5 - IT Strategy Actions Required

1. Leverage the IT governance structure to develop a 5 year IT strategic plan

Creation of the IT Strategic Plan should include:
- Reviewing U of G's Strategic Framework and defining requirements for IT
- Reviewing department and colleges' goals to identify common needs for IT
- Identifying gaps in current state (leveraging existing investments where possible)
  - Review U of G's current technology blueprint to understand gaps and future needs
  - Review U of G's organization structure to understand gaps in IT functions and the right delivery model, to formulate a vision that translates into a target state IT
  - Review the technology trends and current roles to inform where there are emerging gaps in skill sets to understand how to equip staff to succeed in the future
- Identifying initiatives that will help align IT with the University's Strategy and address gaps in the current state
- Prioritizing initiatives and business cases into a 5 years integrated Roadmap
- Reviewing current projects underway or planned at the University to ensure that they are aligned with the IT strategy and that existing investments are leveraged where possible
- Identifying measurable institutional outcomes tied to the IT Strategy (e.g. metrics around student experience, research funding)
- Identifying potential partnerships to help the University deliver IT

Process for creating the plan should leverage the IT Governance Structure (recommendation #2):
- Advisory Groups to recommend IT priorities for respective areas (academia, research, administration)
- Executive Committee to approve IT strategy

4.1 - Enterprise Architecture

4 - Enterprise Architecture

Define a **future state blueprint and roadmap** for core applications and infrastructure across the institution and how they integrate with each other.

Supporting Observations

- Applications are planned in siloed manner with a lack of integration and documentation
- Legacy core systems (HR, Finance, SIS) have increasing risk levels around support (talent & complexity)
- Applications and technology infrastructure are ageing
- There currently lacks a blueprint that covers all the core systems structure, as well as a plan on how to add new systems moving forward (e.g. what happens if U of G changes HR systems?)
- Expertise on each system is spread across the organization
- U of G has accumulated a lot of "technical debt" (e.g. bolts over bolts on core systems challenging the ability to drive efficiencies within systems and increasing the risk level of support internally and from the vendor)

Peers' Lessons

A plan (i.e. blueprint) should be developed for the IT systems that looks at the systems as a whole across the organization and how they will work together.

Importance

Some advantages of having an Enterprise Architecture roadmap are:
- Help reduce costs around development, maintenance, upgrades, and support for key IT systems
- Contribute to reduced risk and complexity of U of G's current environment
- Make it simpler to add new systems / change core systems and allow faster purchase and implementation timelines

"Just as buildings need blueprints, IT needs a blueprint."
"Look at systems as a whole across the organization and how they will work together."
"Moving towards enterprise applications and away from custom applications."

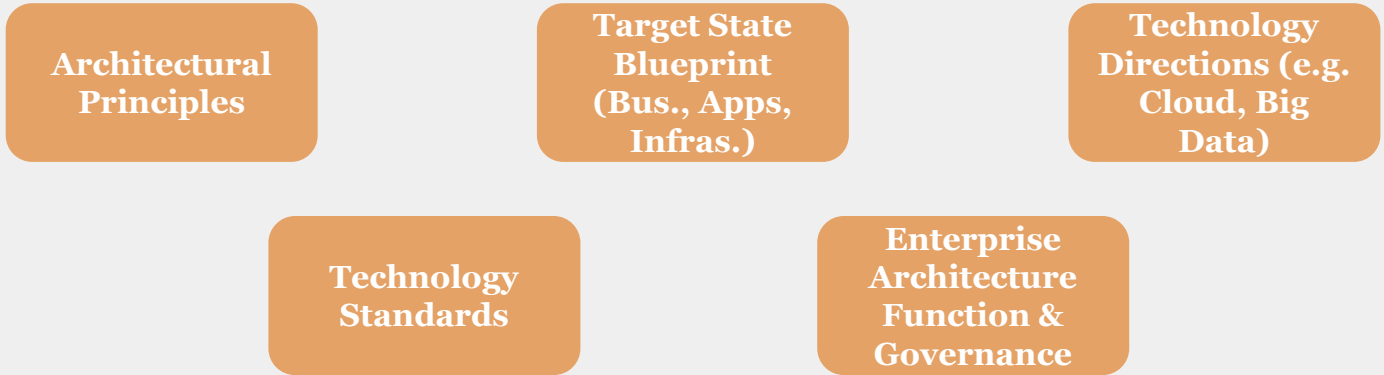# *4.2 - Enterprise Architecture Scope*

Key Questions to Answer

How does U of G ensure it has the right applications to support the University moving forward?
How does U of G ensure applications are planned and built in an integrated manner?
How does U of G adopt new unfamiliar technologies, e.g. Cloud computing, big data analytics, and "smart" infrastructure?

Objectives

To ensure that the rebuilding of the same applications / functionality is limited and that U of G is architecting solutions that are properly decoupled and allow growth and change without a massive overhaul.

Key Components To Define

Architectural Principles

Target State Blueprint (Bus., Apps, Infras.)

Technology Directions (e.g. Cloud, Big Data)

Technology Standards

Enterprise Architecture Function & Governance

Leading Practice Design Principles

13 worst EA practices to avoid[1]
1. No Link to business strategy and targeted business outcomes
2. Confusing Technology Architecture with Enterprise Architecture
3. Focusing on the current-state architecture first (or primarily)
4. Excessive governance and overbearing assurance
5. Creating a standard for everything
6. Engrossed in the art and language of EA rather than business outcomes
7. Strict adherence to EA frameworks and industry reference models
8. Adopting an "Ivory Tower" approach to EA
9. Lack of continuous communication and feedback
10. Restricting the EA team to IT resources only
11. Lack of key performance metrics
12. Purchasing an EA tool before understanding the use cases and critical capabilities required by the organization
13. "We're Done"

(1) Gartner - Avoid the 13 Worst EA Practices and Navigate to EA Success - 25 February 2016

4.3 - Enterprise Architecture Framework - Architecture Bridges the Strategy / Execution Gap and is Key to Creating and Capturing Business Value[1]

Business Strategy

Enterprise Architecture Capability[1]

Execution
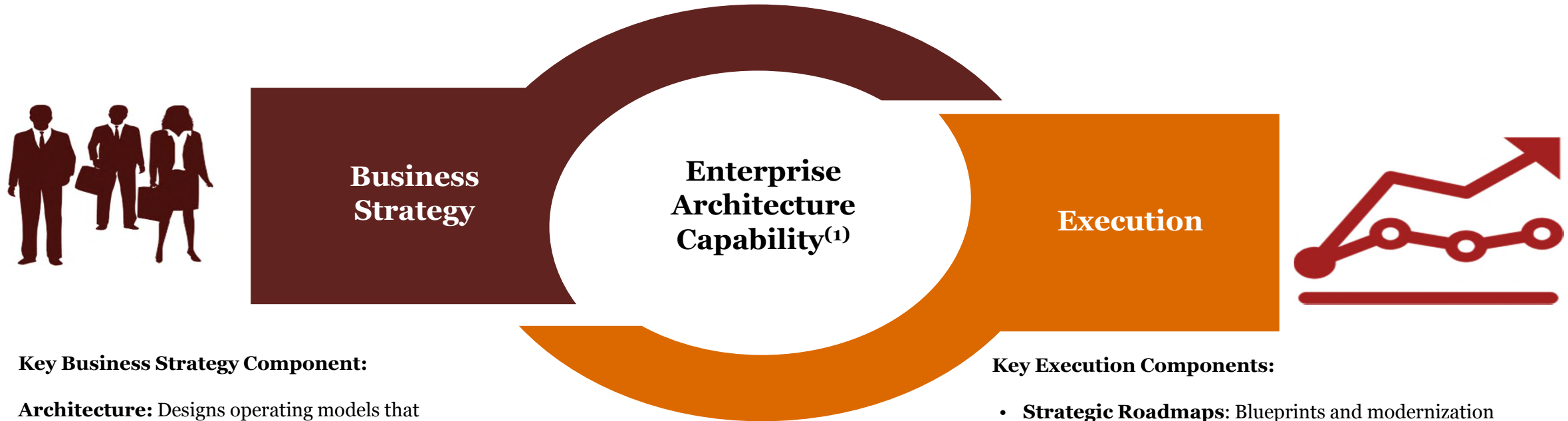
Key Business Strategy Component:

Architecture: Designs operating models that logically organize and describe all aspects of the Company, including:

- The ambition and business model
- The products, services, and customers
- The business capabilities
- The people, processes, information, and technologies
- The corporate structure
- The interactions amongst these components (such as Governance)

Key Execution Components:

- **Strategic Roadmaps**: Blueprints and modernization plans for business areas. Typically a 3-5 year view.
- **Reference Architectures**: Reusable patterns for technical and operations solutions
- **Guiding Principles**: Statements used as filters for decision making
- **Standards**: A library of stable technologies and processes for consistency
- **Project Support**: Architecture involvement in implementation

4.4 - Enterprise Architecture - Current State U of G Major Applications by Risk Level

A critical component of EA is planning the roadmap for the University's business applications and how they work together. A high-level risk assessment was completed on a sample of major applications to assess their need for change. Most key stakeholders identified opportunities to improve the university-wide applications, but also noted that there have not been any major incidents.

Major Applications [1]	Age	Level of Customization	Level of Business Criticality	Risk
Web (Drupal or HTML)	N/A	1 to 4 depending on websites	1	Medium (AODA)
Student Information System (Ellucian)	1997	2	4	High
CourseLink (D2L)	2000	2	4	Medium
Financial Systems (Oracle eBusiness Suite)	1990's	4	4	High
Human Resource and Payroll System (SumTotal Cyborg)	1990's	4	3	Very High
Destiny One (Destiny Solutions)	2016	2	3	Medium
Database Systems (Oracle)	1997	4	3	High
Cannon (Blackbaud)	2016	2	2	Low
Voyager (ExLibris)	1997	2	3	Medium
Office and Office 365 (Microsoft)	2016	1	4	Low
LIMS (LabVantage Solutions)	2001	4	3	High
Primo (ExLibris)	2009	3	3	Medium
Gold (Oracle)	1992	2	4	Medium
PEAR (PeerEvaluation and Review) (Internally Developed)	2008	4	1	High
ResearchLink - Office of Research	In development			

As depicted in the table shown left, there are multiple applications at risk within U of G's IT environment that are mission critical but are legacy platforms and highly customized. The most pressing ones to review are the HR and Student Information systems.

Whether considering updating or changing an application, U of G should complete a study and business case for each application in consideration of requirements, market offerings, and total cost of ownership to make an informed decision.

The risk assessment was informed by data collected on application business criticality, age, customization, integration challenges, recent incidents, support, and business priorities. This assessment is directional and not the result of an in-depth technology assessment of the application health. It is also not representative of an "immediate risk" for the IT environment. It reflects an ongoing risk that increases over time based on how supportable, flexible, and resilient the systems are to change.

(1) Detailed Data Collection Template from 9 out 10 of the largest colleges or departmental units with IT footprint; Major Applications as defined by either more than 1 FTE support, highly critical for day to day operations and / or large user group (more than 100 users)
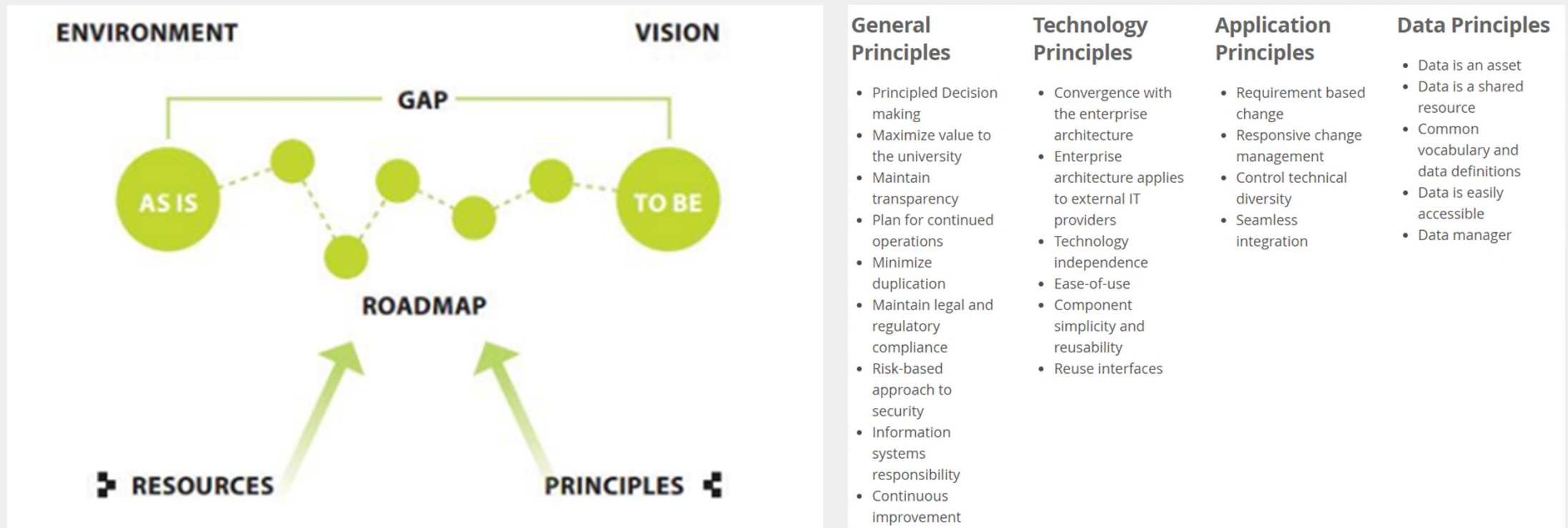(2) Level of customization - Scale from 1 to 4: 1 - Not Customized and 4 - Highly Customized
(3) Level of business criticality - Scale from 1 to 4: 1 - Not Critical (university can run for a month) and 4 - Highly Critical (university stops)

4.5 - Peer University - Enterprise Architecture at University of Saskatchewan

University of Saskatchewan[1]

- University of Saskatchewan used Enterprise Architecture (EA) to provide a holistic view of the processes, data, application systems, and technology infrastructure that exists within the University.
- University of Saskatchewan has matured the EA function to be able to identify different types of principles that apply to all decisions made at the University regarding information system changes.

General Principles
- Principled Decision making
- Maximize value to the university
- Maintain transparency
- Plan for continued operations
- Minimize duplication
- Maintain legal and regulatory compliance
- Risk-based approach to security
- Information systems responsibility
- Continuous improvement

Technology Principles
- Convergence with the enterprise architecture
- Enterprise architecture applies to external IT providers
- Technology independence
- Ease-of-use
- Component simplicity and reusability
- Reuse interfaces

Application Principles
- Requirement based change
- Responsive change management
- Control technical diversity
- Seamless integration

Data Principles
- Data is an asset
- Data is a shared resource
- Common vocabulary and data definitions
- Data is easily accessible
- Data manager

(1) http://www.usask.ca/avp-ict/governance/enterprise-architecture.php#PurposeofArchitecturePrinciples

4.6 - Enterprise Architecture Actions Recommended

1. Establish an Enterprise Architecture function

1) Create a **Head Architect** function and provide the appropriate resource complement to establish an Enterprise Architecture function.

Some possible options for filling the role of Head Architect include:

- Hiring a full-time Head Architect
- Hiring a contractor
- Hiring a vendor to provide EA services

2) Define **services** for the function to the institution, such as:

A. Define IT architectural principles

B. Define application and technology blueprints

C. Research and define technology directions (e.g. Cloud, Big Data)

D. Provide project support on solution design and selection decisions

3) Allocate **funding** centrally to establish the function

4) **Communicate** services and **educate** the institution on the role and value of Enterprise Architecture

2. Define principles and blueprint for priority applications

1) In alignment with the IT Strategy, develop **IT architecture principles** with directions to guide the selection, implementation, and maintenance of   all institution's IT systems.

2) Develop a **blueprint for high priority applications***:

A. Review the current state of applications
B. Review application vendor roadmaps and scan of other market solutions
C. Identify dependencies between applications which will be used to outline data flows and policies in the organization
D. Use IT strategy to identify technology directions (e.g Cloud, Big data, etc.)
E. Define the target state vision for the applications
F. Build the application "blueprint" roadmap to target state and outline implications / dependencies to current state

*Priority applications for U of G to focus on due to their opportunity to modernize processes or their age/risk:

A. Human Resource and Payroll System

B. Student Information Systems

C. ResearchLink - exploring how to realign to help facilitate the implementation of existing investment moving forward

5.1 - IT Functions

5 - IT Functions

Define the **target operating model** for IT across the University with the core services to be invested in centrally or through partnerships to drive efficiencies while meeting the diverse needs across departments.

Supporting Observations	Importance
• IT has grown organically across departments to address their business needs, leading to duplication in functions. However, there is an appetite to shift more commodity infrastructure services centrally to focus on their core business • Many units are dealing with external customers (Labs, Health Center, Hospitality, Open Ed, etc.) and cannot compromise on service levels required to deliver the unit's services • There is an opportunity to centralize common needs such as email, managed servers, and storage • There is an appetite from divisions to own/share more IT functions around business needs (e.g. business analysis)	• Opportunity to operate as a connected university, while appreciating the diverse needs across departments • Opportunity to better manage risk through a secure infrastructure and security capabilities across the University • Opportunity to drive efficiencies through consolidation of IT contracts (increase buying power by leveraging the scale of U of G) • Opportunity to drive a coordinated, strategic approach to IT through central planning • Opportunity to avoid duplication of IT functions

Peers' Lessons

In larger organizations, IT should centralize where it makes sense - finding the right balance and implementing function distribution in a consistent way.

"Larger organizations should centralize where it makes sense - find the right balance and implement it in a consistent way."

5.2 - IT Functions Scope

Key Questions to Answer

Which IT functions should be delivered centrally vs. by departments and colleges?
What IT functions are opportunities to leverage partnerships with third parties vendors or other universities?

Objectives

Outline a model for IT service delivery that centralizes common needs and allows colleges and departments to focus on their unique and value-add IT needs.

Leading Practice Design Principles

- **Centralize common IT** services across the organization to leverage economies of scale
- **Decentralize unique services** (e.g. applications, service levels) to colleges and departments to allow them to focus on value-add IT functions
- Position central IT as:
  - **A broker of services** between clients and service providers
  - **A trusted advisor** to departments on how technology can meet their business needs

Key Components To Define

- Target Operating Model (TOM)
- Readiness Assessment
- Eligibility for IT Functions
- Degree of Alignment ith Centralization
- Alignment of IT Org. to the TOM

5.3 - IT Functions Assessment Framework

The Target Operating Model (TOM) for an organization has multiple factors that need to be defined. Finding the right balance of centralized vs. decentralized IT functions is one of the key factors for U of G. Sample questions to determine whether functions should be centralized vs. decentralized are provided.

Defining Target Operating Model End-State[1]
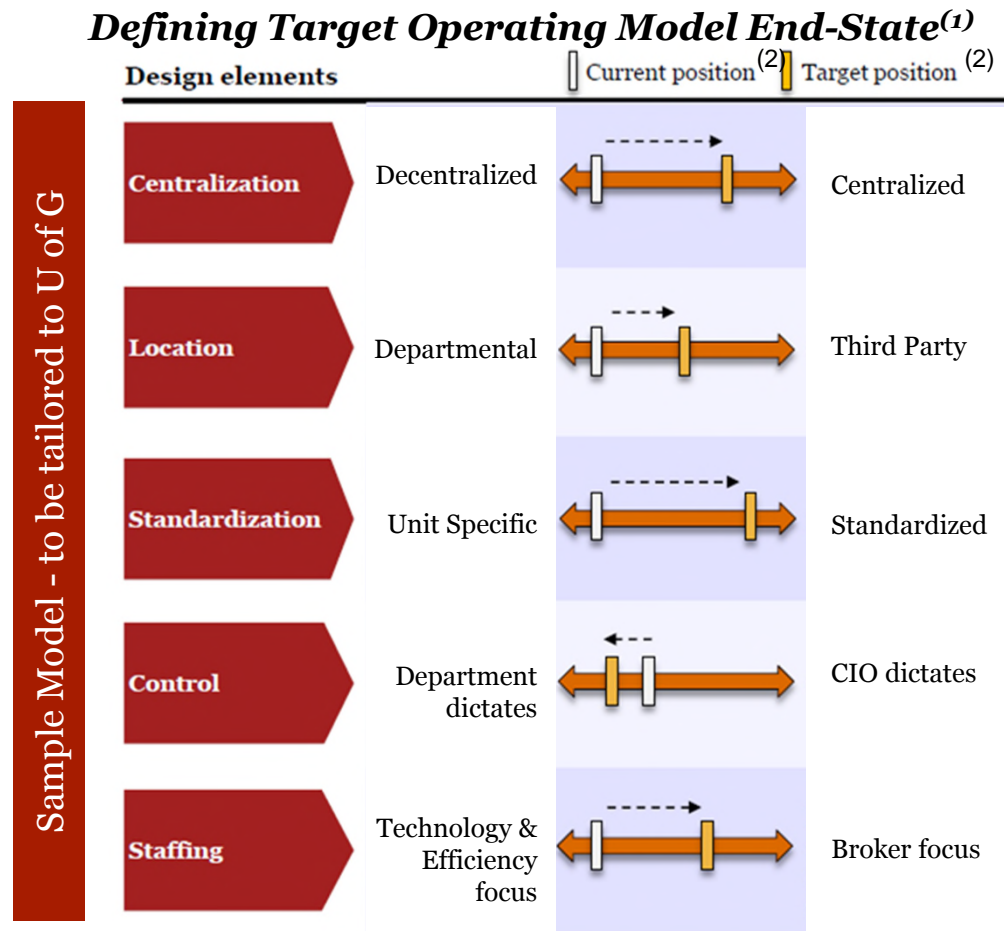
Key Questions to Determine Centralized vs. Decentralized IT Functions[3]:

• Does this function align with the University's Strategy?
• Is it difficult to isolate this function as an independent entity?
• Will this function require a high level of collaboration with departments?
• Are there legal / regulatory / data considerations that could constrain centralizing?
• Is there a high level of maturity for delivering this work function to different users?
• Is this work function a stable/mature service in the U of G IT environment?

(1) PwC - Target Operating Model Design elements
(2) Example positions shown for demonstration. Not a representation of current or target position for U of G's controls
(3) PwC Assessment Criteria for centralization / decentralization

5.4 - Peer Universities - Which Functions are Being Centralized?[1]

Other universities vary in terms of the level of centralization of IT functions. However, general trends indicate that most institutions are centralizing enterprise applications and commodity-like services such as infrastructure and service desk, while departmental-specific applications or services are retained within departments.

	Peer 1	Peer 2	Peer 3	Peer 4	Peer 5	Peer 6
Enterprise Apps	Central	Central	Central	Central	Central	Central
Department Apps	Central	Departments	Departments	Departments	Departments	**Both**
Infrastructure	Central	Central	**Both**	Departments	Central	Central
Service Desk	Central	Central	Central	Central	Central	Central
Project Management	Central (Across org)	Central (Across org)	**Both** (For Central IT)	Departments (Central Enterprise projects)	Central	Central
Specialized Computing (e.g. Research)	Central	Departments	Departments	Departments	Departments, matures to Central	Departments

(1) Interview - not validated by CIO

5.5 - IT Function Actions Recommended

1. Define IT Target Operating Model

1) Define and implement a **Target Operating Model (TOM) for IT** across the institution that supports the IT Strategy and will define:

    A. What functions are best delivered centrally or by departments?

    B. What functions should be delivered by third party IT service providers?

    C. What functions are opportunities to collaborate with peer universities?

    D. What locations should functions be delivered from?

    E. What level of standardization is required for functions?

    F. What are maturity of functions and what actions are required to improve them (people, process, technology)?

    G. Where are functions delivered (i.e. location)?

The Target Operating Model should be approved by the Executive Committee of the IT Governance Structure.

Sample Candidate IT Functions for Centralization To Be Refined in Next Steps

Central IT	Department or College IT
• Strategic planning • Enterprise Architecture • Project management • Enterprise applications • Security • Network • General computing infrastructure • Level 1 service desk	• Department applications • Department data and analytics • Advanced computing infrastructure • Other specialized IT requirements (service levels, unique needs)

6.1 - People Management

6 - People Management

Work with HR to define a **Workforce plan for people in IT** to manage risks within the University around application support, ageing workforce (average age is 47 years old), and IT skillsets required for the future.

Supporting Observations

Acquiring, retaining, and developing people in IT is a key risk for the University in light of:
- Ageing workforce (without succession planning)
- Deep, specialized knowledge within key staff on customized systems (without proper documentation)
- Shortage of resources to transfer knowledge to
- Differences in pay scales
- Need for more engagement by leadership in strategic IT decision-making, priority-setting

Some systems are so customized that IT vendors are no longer able to provide support to U of G.
Some skills and ageing technologies required to maintain some systems are very scarce on the market.

Peers' Lessons
Employee training and succession planning should be put in place to address changing skill sets and minimize risk of knowledge drain.

Importance

The level of risk around application support in every division is increasing every year, coupled with an increasing complexity of updating systems. U of G could face key system shut down for prolonged periods of time without the proper workforce planning and contingency plan.

Additionally, the skills required today to run the IT environment might not be the skills required to run the future IT vision (Cloud, Digital, etc.) and there is an urgent need to plan and train people accordingly.

"Success will require a culture change."
"The skillsets are changing and we need to adapt."
"With small shops and people leaving, there is a great need for succession planning that is not there today."

6.2 - People Management Scope

Key Questions to Answer

How does the University ensure it has knowledge transfer?

The skills needed for U of G's IT environment today are not the skills needed tomorrow in a Cloud Hybrid environment, how will U of G transition?

Higher Education is one of the least appealing sector for millennials[1]; how is U of G going to keep attracting millennials to apply in IT?

Objectives

Equip the University's staff with the skills to deliver IT services in a way that provides the functions to meet demand and is adaptive to changes such as market technology adoption and staff availability.

Key Components To Define

Gaps in Skill Set

Knowledge Risks

Owner of Workforce & Skill Planning

Workforce Demand Requirements

Succession Plan

Leading Practice Design Principles

Use market trends in technology adoption to gauge which skill sets will be needed by IT staff.

Managers should be involved in talent development programs to increase the effectiveness of programs.

Disperse knowledge - Service delivery of an IT function should not be in jeopardy if a staff member is unavailable or leaves the organization.

Behaviour & Governance: Workforce planning needs to be centralized, with a view into each function and business unit. HR should own the workforce planning process, while partnering with Finance and IT shops (central and departmental) to understand needs.

(1)

6.3 - Readying the IT Organization for the Future - Emerging Skillsets and Roles[1]

Adoption of Cloud and other emerging technologies impacts the organization and the types of skills, attitudes, and behaviours needed to be a successful IT organization.

Role of Traditional IT	Role of Modern IT
Support the business	Engage the business
Constrain supply	Stimulate demand
Deliver applications	Aggregate services
Protect the perimeter	Protect intellectual property
Infrastructure for stability	Platform for innovation
Technological depth	Technological and business breadth
Cost centre	Business investment option
Business specifies	Business self-service
CIO shapes technology supply	CIO embraces business demand and delivers value

Emerging Roles in IT
Service Manager
Business Advisor
Provider Manager
Financial Manager
Cloud Architect
Automation Engineer
Cloud Administrator

(1) EMC Corporation 2012, *Capitalizing on Cloud: Preparing People and Processes for It's Organizational Challenge*

6.4 - People Management - Workforce Planning Framework[1]

Questions to Answer[1]:

What skillsets does U of G need for the future based on market trends?

How does U of G minimize the risk of:
- Knowledge loss
- Poor alignment with organizational priorities and culture
- Poor talent attraction
- Role vacancy
- Underdeveloped succession planning

How does U of G ensure that there are sufficient resources to meet the organization's demand?

What training programs/ tools do staff need to learn the required skills?

Step 1: Articulate the University's strategy and workforce demand

Step 2: Model future workforce needs

Step 3: Analyze workforce supply and conduct gap analysis

Step 4: Identify and develop plans to remediate workforce gaps

Step 5: Implement strategic workforce plan

Step 6: Monitor impact and progress

(1) PwC Approach to Talent Management - Managing Talent to Deliver Value - June 2015

6.5 - How Other Universities are Getting the Most Out of their IT Staff

Queen's University[1]

> *Understanding staff, skills, and talent internally and finding the best ways to utilizing them.*

Focus: Define the IT organization to inform initiatives such as:

- Succession planning, tracking, training, and IT's resourcing plan
- Tracking skill sets to be able to better utilize staff and understanding potential growth.
- Understanding skills between groups

Remedy for Addressing Demand:
Use long term students (Internships and AIESEC-generally 8 month work term) to fill gaps in skill sets, leverage current technology skills, have a dedicated staff with continuity, and potentially bring international perspectives.

Other University Spotlights

University of Guelph (Hospitality Services)[2]

Remedy for addressing demand:
Use co-op students for projects due to shorter timeline (4 month work term) and dedicated support.

University of Waterloo[1]

Remedy for Addressing Demand:
Use external contractors to augment staff on project functions/roles, allowing the University to leverage current market talent that is not available in house. Staff augmentation for projects also allows IT staff to focus on operations while having dedicated project resources.

(1) Interview with CIO
(2) Interview with University of Guelph Hospitality Services

6.6 - People Management Actions Recommended

1. Mitigate People Risk

Establish a Knowledge Transfer plan for legacy applications, which includes:
- System and Process Documentation
- Cross-training (i.e. skill training across team)
- Knowledge transfer sessions
- Plans for upgrade or replacement of legacy applications

2. Develop IT Workforce Plan

Develop a workforce plan for the future to support the IT Strategy that includes:
- Demand requirements (capacity and skills required)
- Current skillsets and capacity
- Identifying gaps in current workforce
- Outlining a remediation plan (e.g. staff training)

3. Establish IT Talent Pool

Develop plan for recruiting top talent for the future of IT.
U of G needs to differentiate itself as an IT employer and create a clear value proposition to attract a pool of talent. This will ensure U of G has the skills to deliver the skill requirements for the next 5 years and beyond.

Possible options for differentiating:
- Joint ventures in innovation
- Implement leading technologies to draw millennial talent pool

U of G should also explore options for sourcing services from third parties to address needs for specialized skillsets.

7.1 - IT Funding Model

7 - IT Funding Model

Refine the **IT Funding Model** to align the IT budget (either centrally or departmentally) with the IT investment priorities and the scope and scale of service delivery.

Supporting Observations

- IT expenses are growing at a faster rate than U of G revenue
- U of G is spending less in IT than industry average[1] by:
  - Not refreshing apps (core apps are from 1990's)
  - Providing limited support
  - Having IT resources wear "multiple hats" in terms of responsibilities
  - Levering students
- The chargeback model does not compensate for full cost of services
- Significant investment in IT may be required for the University to modernize its operations (i.e. "play catch up") and support the Strategic Framework; "who will pay for this" is unclear
- There is appetite for more shared solutions across units to address common needs, putting additional pressure on the central budget
- "Haves" vs. "Have nots" - Profit center units that collect money tend to have a better IT maturity compared to cost centers

Peers' Lessons

IT requires a funding model that 1) aligns the funding to deliver services with services provided, and 2) offers a competitive costing solution to service users.

Importance

- Without funding available on time and in line with projects, U of G is increasing the risk of not being able to respond to emerging business needs and achieve overall strategic goals
- Funding more IT projects and budgets every year will not help without a proper governance to **align spend and U of G priorities**
- Chargebacks without clear objectives and simple processes can lead to expensive administrative/transaction costs creating inefficiencies

"Rethink alignment of funding and the chargeback model."

"Thinking creatively about IT funding."

(1) Gartner 2017 - Higher Ed North America

7.2 - IT Funding Model Scope

Key Questions to Answer

How can U of G align funding with IT priorities?
How can U of G stop spending on lower-value IT initiatives and operations not coherent with the strategic framework?
Is the budgeting process well aligned with the IT strategy planning process?
Does U of G invest enough to fuel its distinctive IT capabilities?

Objectives

To develop a funding model that 1) aligns the funding to deliver services with services provided, and 2) offers a competitive costing solution to service users.
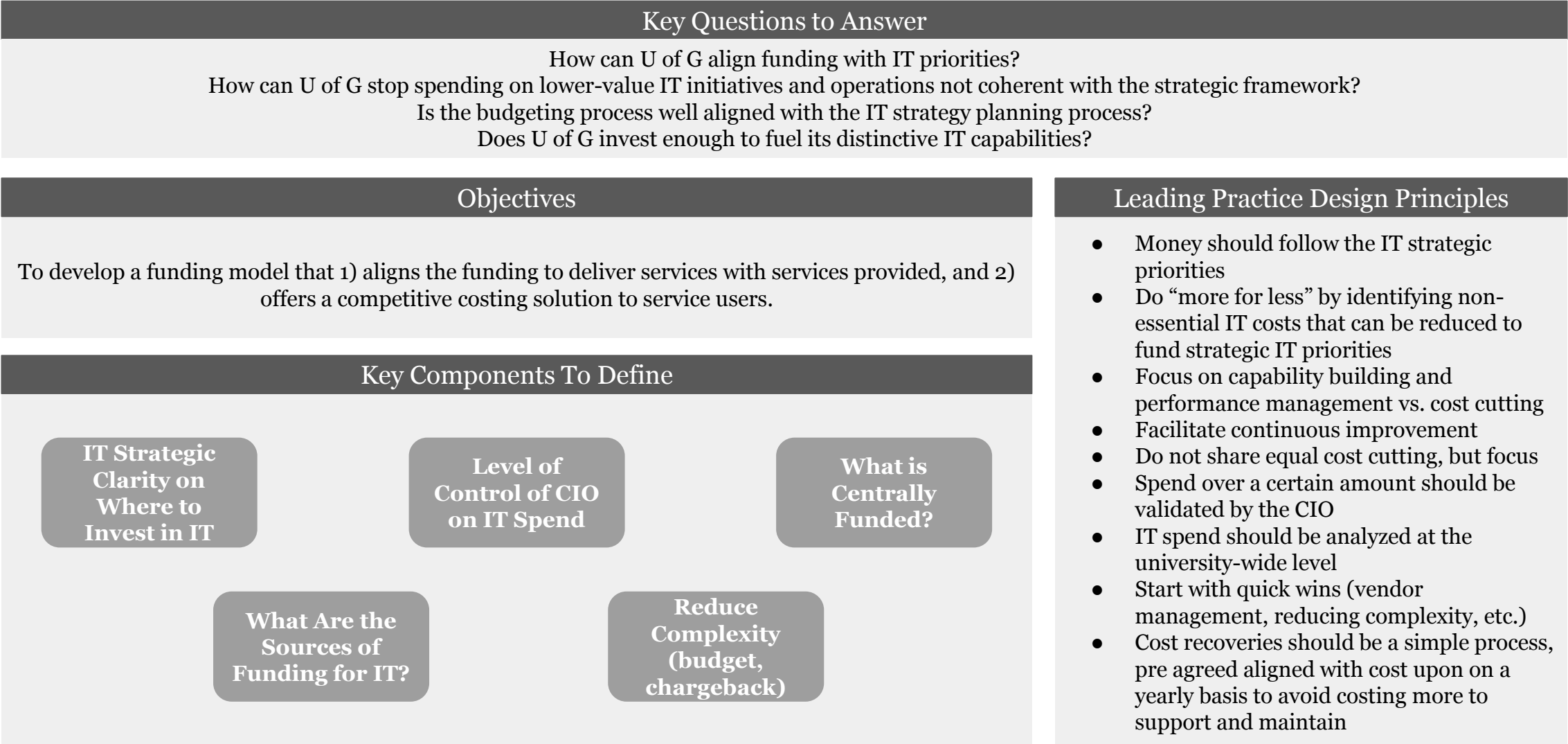
Key Components To Define

- **IT Strategic Clarity on Where to Invest in IT**
- **Level of Control of CIO on IT Spend**
- **What is Centrally Funded?**
- **What Are the Sources of Funding for IT?**
- **Reduce Complexity (budget, chargeback)**

Leading Practice Design Principles

- Money should follow the IT strategic priorities
- Do "more for less" by identifying non-essential IT costs that can be reduced to fund strategic IT priorities
- Focus on capability building and performance management vs. cost cutting
- Facilitate continuous improvement
- Do not share equal cost cutting, but focus
- Spend over a certain amount should be validated by the CIO
- IT spend should be analyzed at the university-wide level
- Start with quick wins (vendor management, reducing complexity, etc.)
- Cost recoveries should be a simple process, pre agreed aligned with cost upon on a yearly basis to avoid costing more to support and maintain

7.3 - IT Funding Actions Recommended

1. Align IT Governance and Budget

Ensure budget for IT is based on IT priorities defined by the governance structure and IT Strategy.

There is also a need to improve the use of data to manage IT as a business across the University in making proper governance decisions and setting realistic budgets. The University should use the data collection methodology used in this project as a starting point to manage IT costs (labour and non labour) and continuously improve it (e.g. rules to standardize IT spending classification).

2. Review Existing Funding

Review funding model to identify opportunities to centrally fund enterprise initiatives (e.g. desktops) and applicable policies where appropriate to drive standardization and controls.

Explore establishing Service Level Agreements (SLA) or Memorandums of Understanding (MOU) for IT services to provide transparency on service level expectations and associated costs, which provides an opportunity to increase / decrease services as required for specific functions (e.g. increase helpdesk support times to meet demand).

There is also an opportunity to review and potentially simplify cost recovery process to ensure the associated administrative costs are limited.

3. Policy around Major IT Purchases

Part of the IT governance agenda should be to establish policies, procedures, and controls related to IT financial management, including purchases of IT assets.

For example, major IT purchases should require CIO approval to ensure standard are being met.

U of G should define thresholds for what "major" means for them moving forward (either by $ and/or risk), and what the process will be to facilitate approvals in a controlled, yet efficient manner.

8.1 - Data

Improve **access to institutional data** through data standards, clear roles and responsibilities on data ownership, and tools to analyze, visualize, and report on the data from a variety of sources.

Supporting Observations

- Departments and colleges consistently expressed desire for better access to institutional data (e.g. HR, Finance, Students, etc.). A common complaint heard in most interviews included: "we can't access data" and even if we can, "we can't use it"
- There is no official source of truth for every core system; people are using whatever data they can find
- There is a lack of clarity on custodians / owners of data or processes for requesting access to data
- There is a lack of ability for stakeholders to access data without intervention from system owners (e.g. HR, Finance, etc.)
- There is a lack of university-wide tools and expertise in data and analytics

Peers' Lessons

Lack of data to support decision making can become the first driver to get rid of custom/aging applications from the IT environment (well before risk, costs or support).

Importance

- There is a strong desire for better, easier, more comprehensive data (including related management of data risks) - identified as a key factor informing the need for more strategic and integrated approach to IT
- Data maturity would allow the U of G Strategic Framework to be translated into metrics
- OVC is a good example where implementing a BI solution was a necessity. It allowed them to start making data driven decisions; for example, doing program costing allowed OVC to identify actionable savings and efficiency opportunities
- Many "pockets" of IT in research are trying to solve important problems using data (Biodiversity, Food Institute, etc.). There is an opportunity to pull expertise together and define a data strategy for U of G - driving innovation and differentiating the University

8.2 - Data Scope

Key Questions to Answer

How do we become more strategic, efficient, and collaborative when it comes to data and analytics?
How can faculty and staff access core system data to make better business decisions, better use of University resources, and drive efficiencies?

Objectives

To provide access to institutional data with standards, clear roles and responsibilities on data ownership/stewardship, and tools to analyze, visualize, and report on the data from a variety of sources.

Key Components To Define

Data Classification	Data Governance	Data Operating Model

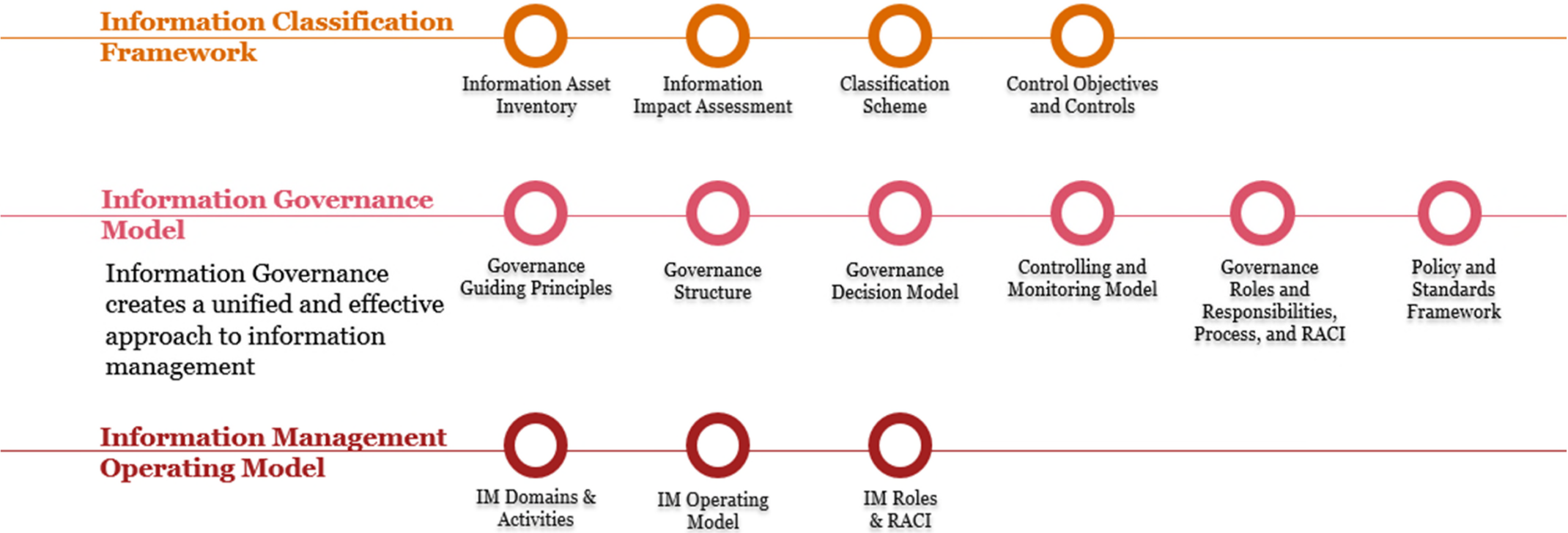| Pilot	Identify Analytic Talent	Collaborate (HR, Registrar, Finance, IT and Data)	Continuous Improvement

Leading Practice Design Principles

- **Ensure strong data governance**, including strict guidelines for data ownership, quality, and accuracy
- **Identify opportunities** to draw improved insights from existing data, making use of emerging low-cost IT solutions
- **Assess existing technology limitations and skills gaps** within the business to determine the appropriate IT investments
- **Engage in business process reengineering** using new insights from data
- **Use successful pilot projects** to demonstrate potential and gain buy-in
- **Maintain a closed-loop learning environment** based on data-driven decision making
- **Support analytics initiatives** through balanced resource allocation (technology, people, and funding)

8.3 - Data - Information Management (IM) Framework[1]

The framework is designed to balance value, cost and risk, while addressing the business issues of information quality management, cost effectiveness, security/risks, as well as regulatory compliance. The key components of the IM Framework including within each chapter are shown below:

Information Classification Framework
- Information Asset Inventory
- Information Impact Assessment
- Classification Scheme
- Control Objectives and Controls

Information Governance Model

Information Governance creates a unified and effective approach to information management
- Governance Guiding Principles
- Governance Structure
- Governance Decision Model
- Controlling and Monitoring Model
- Governance Roles and Responsibilities, Process, and RACI
- Policy and Standards Framework

Information Management Operating Model
- IM Domains & Activities
- IM Operating Model
- IM Roles & RACI

(1) PwC Approach to Information Management - Information Classification - June 2016

8.4 - Data Actions Recommended

1. Establish data classification, governance, and operating model

Data classification should provide a standardized method of handling all data assets across the University.

Data governance should address the following**:**
- Clear ownership and stewardship of the data
- Clear processes on how the data is shared
- Quality standard of the data
- Who has access to the data
- Authoritative sources of the data

A robust **data operating model** facilitates efficient use of information capabilities, assets, and resources and helps position the right people, process, data, and technology components to deliver on the data mandate.

There is an opportunity for research and academics to have a committee with third parties to discuss architecture, design, data principles for Internet of Things (IoT) etc.

2. Pilot analytics using existing expertise

It will take some time to create a blueprint of the IT environment to understand what data exists across the institution and how applications are sharing data between each other.

In the meantime, U of G can start an agile data analytics pilot with one core system such as HR using expertise and tools from OVC. For example:
1. Choose a question to answer with data such as "how many FTEs are in my department?"
2. Build a simple report of FTEs per college / departmental units and their roles (IT, Finance, etc.)
3. Validate the result - review FTE definition
4. Continue refining and improving

As maturity increases around the systems and dashboards, begin establishing data governance and sharing data with the right stakeholders. From there, begin cleaning up the data and slowly add more systems to the mix.

9.1 - Communication

9 - Communication

Foster an **open and collaborative IT environment** for departments to learn about common needs, current projects underway, leading practices, and emerging technologies.

Supporting Observations

- There is a strong appreciation among all of those engaged in U of G's review project about the importance of IT to the future of the University, and a willingness to work together across colleges and departments to achieve a common goal
- There is an appetite for information sharing between colleges and departments (e.g. simply sharing the list of projects)
- Some forums exist today, but they are not exhaustive. Effective communication requires going to meetings rather than having a free flow of information or published information

Peers' Lessons

Institutional IT should be transparent on initiatives - fostering conversation about common needs across the organization - to present IT as a partner.

Importance

- Better collaboration and communication between IT providers can help avoid duplication and work together on shared needs
- Examples of information U of G could start sharing in a more accessible manner are IT needs, projects, applications and contracts

"Transparency is important. It comes through communication and speaking in terms of common needs across the organization and between levels". "Data is an asset that should be shared".
"Sharing project information aligns and informs people across the University."
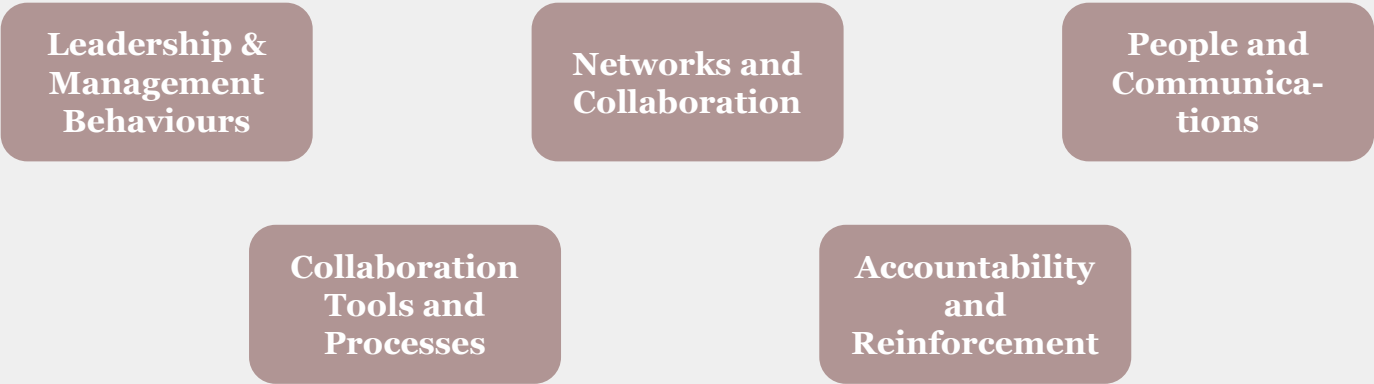
9.2 - Communication Scope

Key Questions to Answer

How do we share information more seamlessly across the IT community at U of G?
How do we motivate staff to share and collaborate across departmental boundaries on IT needs?

Objectives

To build a culture of openness and transparency in IT across the institution and establish mechanisms for departments and colleges to share and collaborate on common IT needs.

Key Components To Define - Creating a Knowledge Sharing Culture

Leadership & Management Behaviours

Networks and Collaboration

People and Communica-tions

Collaboration Tools and Processes

Accountability and Reinforcement

Leading Practice Design Principles

• **Build a communication plan** -Tailor the communication to be the right message, to the right people, at the right time

• **Use multiple channels** - Reach a broad audience and reinforce message through multiple mediums (e.g. meetings, conferences, newsletters, portals, etc.)

• **Lead by example** - Management should champion attitudes and behaviours of a knowledge sharing organization

• **Make it part of performance plans** - Knowledge sharing should be a base expectation for staff

9.3 - Communication Framework - Components of a Knowledge Sharing Culture[1]

Leadership and management
- *Leadership* (knowledge on agenda, sponsored, supported among leadership)
- *Vision* (knowledge included in strategy/business plans)
- *Role modelling* (good knowledge sharing behaviours)
- *Recruitment* (the right people/knowledge sharers)
- *Retention* (keeping good knowledge sharers)

Accountability and reinforcement
- *Accountability* (consequences for not contributing/sharing)
- *Performance management* (Knowledge included in objectives)
- *Personal responsibility* (taking ownership of knowledge and contributing)
- *Recognition* (informal team meetings, formally at appraisal)

Networks and collaboration
- *Relationships* (good working relationships which facilitate effective knowledge sharing)
- *Networks* (efficient/effective knowledge networks)
- *Communities* (of Interest, Practice – efficient/effective)
- *Mavens (key connectors)* in networks (connecting others, sharing as a matter of course)
- *Collaboration* (project/team/X-LoS sharing - accessing wide pool of experts)

Knowledge (sharing) culture
[environment, (e.g. physically sitting together) personality, diverse, dynamic, evolving, innovation, self- identifying, evident (look & feel)]

Infrastructure and business processes
- *Learning/coaching* (on the job sharing, reflection, dialogue)
- *Knowledge roles* (sponsor, champions, advocates)
- *Embedded in business processes* (consistently applied e.g. content gathering, lessons learnt)
- *Application/re-use* (tech makes sharing easy, using what we already have)
- *Education & awareness/ training* (e.g. On tools/technologies, behaviours/expectations)
- *Research* (research what we have already before starting jobs/re-use)

People and communications
- *Behaviours* (collaborating, sharing, contributing, accessing, team work, consultative, reflective, sharing ideas/innovating)
- *Challenge* (asking, challenge whether team are effectively sharing knowledge)
- *Expectations* (that people bring/deliver insights, share)
- *Communication* (recognising importance of knowledge, valuing contributions)
- *Valued* (recognising contributions)

(1) PwC Factsheet 2016 - How to grow the collective expertise of a group - Improve your knowledge sharing culture

9.4 - Peer University Communication

University of Toronto - Centre for Teaching Support & Innovation (CTSI)[1,2]

The CTSI is a good example of a collaborative university body, as it collaborates and communicates with the institution's community in a variety of ways to deliver educational technologies. CSTI:

- Produces an annual report for the greater UofT IT community which communicates its initiatives across the University

- Has a focus on creating partnerships throughout the University's community to support university-wide initiatives in teaching, learning and technology

- CTSI contains a unit for Academic & Collaborative Technologies (ACT) which provides faculty support for organization-wide supported technologies to understand and serve faculties' IT needs. ACT uses partnerships (CIO's office, central IT org) to integrate and streamline implementation of technologies across the organization.

- CTSI - has an "Academic Toolbox Renewal Project", where the goal is to move the University from having disconnected technologies to an "Education technology ecosystem" - connecting education technology tools from different sources. For example, as faculty adopt new tools, the tools are adopted into the Toolbox and integrated with other educational technology tools.

(1) http://teaching.utoronto.ca/about-ctsi/annual-reports/
(2) http://toolboxrenewal.utoronto.ca/

9.5 - Communication Actions Recommended

1. Improve Communication and Information Sharing on IT Across the University

Develop a communication plan for IT that considers the following communication aspects:
- Regularly publish the status of all IT projects across the University
- Collaboration between colleges/ divisions as well as the broader University environment
- Regularly meet to communicate needs, current initiatives, and lessons learned
- Host IT awards for exemplary IT projects to 1) communicate projects and best practices across the University 2) create a supportive community that showcases and acknowledges talent
- Share inventories of applications
- ShareIT contracts to leverage communities of scale
- Conduct regular workshops with facilitators so that others understand the needs and challenges of IT
- Conduct vendor consultations
- Research and communicate the "art of possible" with IT
- Communicate with international institutions to avoid group think

10.1 - Risk and Compliance

10 - Risk and Compliance

Improve U of G's IT risk profile through better visibility and mitigation of cyber security threats at a university-wide level, ensuring regulatory compliance (e.g. AODA) and implementing IT Disaster Recovery in alignment with the Emergency Management initiative.

Supporting Observations

- Significant progress has been made within CCS to improve the institution's information security posture
- The security program and policies are currently focused on CCS-managed IT environment. As a result, there is a lack of visibility of the security posture and risks across the institution
- There is a lack of formal IT security policies
- There is no institutional-wide Disaster Recovery (DR) plan or capabilities in place, with the exception of a reciprocal agreement for backup services with York University
- While progress has been made on the main web site, the University currently has ~4,000 smaller web pages that are not compliant to Accessibility for Ontarians with Disability Act (AODA)
- There is a lack of institution-wide policies or forums to manage IT risks and compliance to regulations

Peers' Lessons
Security is a key investment area of focus for all universities we talked to. Security creates a platform to harmonize the IT environment (e.g. desktops and servers) if enforced by policy.

Importance

- Risk and compliance is about reducing risk for U of G and requires the right policies, controls, and resources to be successful
- A security breach or non-compliance to regulations can have a significant reputational, financial and operational impact to the University if not managed properly
- In case of a disaster, U of G could face a significant challenge getting some core systems back online

"Security and compliance need to be enforced by all stakeholders."

10.2 - IT Risk & Compliance Actions Recommended

1. Manage security risk at university level	2. Remediate non-compliance with AODA requirements	3. Disaster Recovery (DR)
- Align the institution's security strategy and the IT Strategy - Expand mandate of the CIO to be responsible for security institution-wide (e.g. faculty, staff, and students) - Gain visibility into security practices across departments through documentation review, interviews, etc. - Conduct threat and risk assessment and develop mitigation plans - Empower university security to enforce standardization across the institution	- Complete an assessment of the business risk of non-compliant websites - Develop a transition plan for non-compliant websites - Leverage IT governance to enforce the decommission of non-compliant websites, where appropriate	- As part of the IT strategy, develop an infrastructure strategy to determine how to leverage Cloud and to balance the cost and risk of the University's infrastructure (including consideration for DR) - Develop a business case for DR at a university level - Define with the IT governance what level of risk vs. cost the University is willing to take around DR - Align DR planning with University's emergency management initiative

11.1 - Innovation

11 - Innovation

Establish an IT-enabled **innovation** function to experiment with emerging technologies that will advance academic or research goals and differentiate the University.

Supporting Observations	Importance
- Innovation is core to U of G's identity - IT-enabled innovation is becoming critical to Higher Education Institutions in both research and academics - There are pockets of innovation today across U of G leveraging emerging technology to drive student or research outcomes (e.g. OpenEd, Food Institute, Biodiversity) - Other colleges and divisions may benefit from applying similar innovations to modernize their services - The primary focus for IT investments has been running the operations and managing risks with some pockets of innovation. There is a desire and a need to further leveraging IT as a strategic asset for the University in addition to running the day-to-day	U of G is missing an opportunity: an IT-enabled innovation function (eg. common investments in connectivity, big data platforms, etc.). This could encompass innovating in other areas (e.g. academics and research) and operationalizing these new innovations once they become the norm

Peers' Lessons

There is often a clash of culture and capability between Academic/Teaching and IT. One solution is to create a "Hub" with co-located staff to work together on emerging technologies

11.2 - Innovation Scope

Key Questions to Answer

What mechanisms need to be in place to foster innovative IT at the departmental level?
How does U of G ensure its IT is innovative to attract Millennial talent?

Objectives

To establish the foundational technologies, structures, and partnerships to foster innovation across the institution at the departmental level

Leading Practice Design Principles

- **Research should be accessible** across the University to ensure the University remains innovative
- "**Walk before you run**" - ensure that the leading technologies and practices (eg financial, vendor management) are in place to support an innovative environment
- **External facing units** have **awareness and access** to new and emerging technology
- Leverage **partnerships internally and externally** to foster innovation and bring the right skills
- Dedicated teams, agile environment, proper governance

Key Components To Define

- What does innovation mean to the University of Guelph?
- What cultural pieces need to be in place to foster innovation and its sharing?
- Where can innovation be fostered within the organization?
- How departments across the University can leverage innovation?
- Who are potential partners?
- How can students be involved?

PwC

11.3 - Innovation Framework - Implementing New Technology[1]

1) Recognize Need for Change

- **Problems** e.g. competitive pressures, staff expectations, disruptive technologies
- **Opportunities** presented by emerging technologies, new skills, changing market dynamics, and leveraging investments

2) Ideate

What challenges and opportunities does the organization face? Which trends are worth considering, and their impact on the organization?

- Awareness, expertise, and understanding of the implications of emerging trends
- Brainstorm opportunities
- Build business case for change

3) Design

What user experience could unlock incredible value for the organization?

- Experience design
- Journey mapping
- User experience and user interface
- Concept and usability testing
- Prototyping and concept visualization
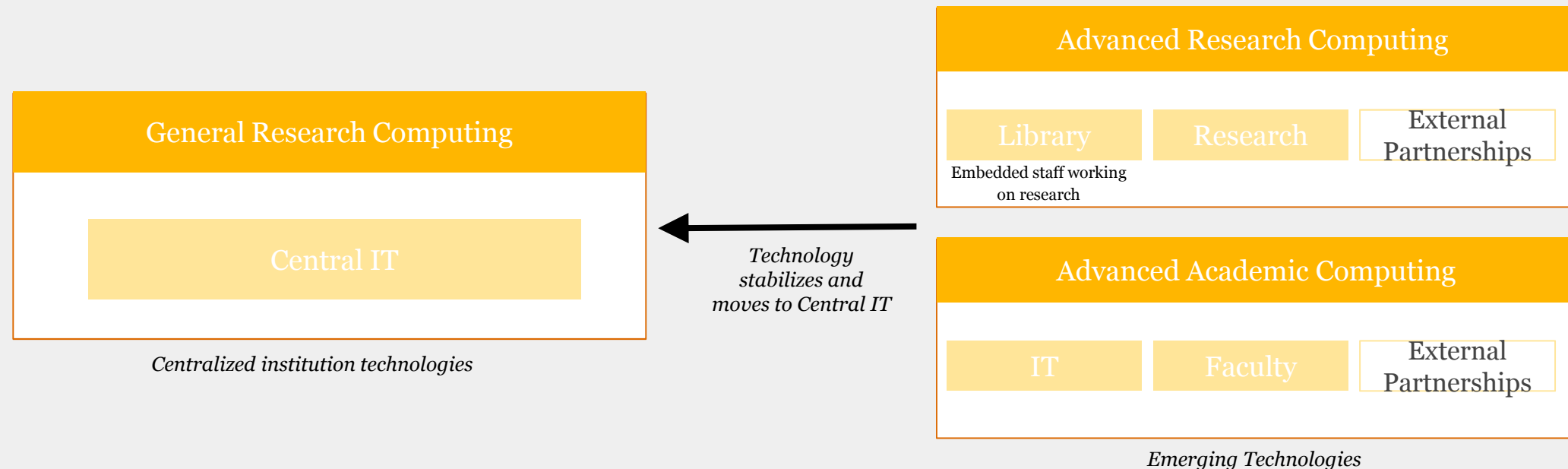
4) Execute

What do we need - internally or externally - to quickly show value?

- Governance and leadership
- Change management
- Approve
- Build vs. buy
- Develop vs. customize
- Deploy
- Train

11.4 - How UBC Incubates IT-Enabled Innovation in Academia and Research[1]

University of British Columbia

UBC has two types of research computing groups: General Research Computing (responsible for operations) and Advanced Research Computing (responsible for research and emerging technology).

Advanced Research Computing

| Library | Research | External Partnerships |

Embedded staff working on research

General Research Computing

Central IT

Centralized institution technologies

Technology stabilizes and moves to Central IT

Advanced Academic Computing

| IT | Faculty | External Partnerships |

Emerging Technologies

The Advanced Research Computing group is on the fringe of the organization to experiment and research new technologies. As the technology stabilizes, the management of the technology is moved to General Research Computing following a conveyor belt approach. There is a similar structure present for innovation in academics.

(1) Interviews with UBC CIO - not validated by CIO

11.5 - Innovation Actions Recommended

1. Explore Options for Innovation
1) Explore UBC's innovation model for implementation at U of G
2) Explore other possibilities for incorporating innovation in U of G   e.g. Involve students in technology development (e.g. hackathons, research, robotics competitions)
3) Outline the cultural change required to incorporate innovation across the University
4) Communicate the need and benefits to incorporating innovation across U of G to gain stakeholder buy-in
5) Determine how a model of innovation will be funded in a sustainable manner   e.g. Determine the percent of overall spend that should be devoted to innovation (vs. operational activities)

Next Steps for the University of Guelph

The incoming CIO will be responsible for leading many of the recommendations set out in the IT Review. However, the following actions are recommended to start immediately while the CIO is being recruited in order to maintain momentum.

1. CIO Recruitment

Initiate the process to hire a new CIO who will lead the execution of many of the recommendations identified in the IT Review. In addition, a transition plan is needed to determine who will initiate the recommendations while the CIO is recruited.

Next steps:
- Determine transition plan while new CIO is hired (i.e. confirm if it makes sense to hire an interim CIO, determine recruitment approach for interim CIO, determine support resources)
- Prepare job description for the new incoming CIO (IT priorities, attributes)
- Recruit, hire and on-board new CIO

2. IT Governance Framework

While a new CIO process is being recruited, there is an opportunity to start designing and implementing IT governance for U of G that will help create a positive environment for the CIO and support urgent decisions regarding applications. The IT governance framework will serve as a starting point for the new CIO, and will continue to evolve over time.

Next steps:
- Initiate project with dedicated resources to design and implement IT governance
- Establish a working group with representatives across the University
- Design IT governance framework (committees, membership, policies, etc.)
- Roll out the IT governance committees
- Pilot the IT governance with imminent decisions (e.g. core applications noted in item 3)

3. Imminent Application Decisions

Some decisions on core applications (e.g. HR and SIS) might not be able to wait for the foundation to be in place. Whether it's an update or a new system implementation, both decisions should be carefully thought through and both will have Cloud implications.

U of G should complete a study and business case for each applications in consideration of requirements, market offerings, and total cost of ownership to make informed decisions.

Next steps:
- Identify critical applications requiring replacement within the next 12 months
- Review and enhance decision framework
- Complete environmental scan for use of Cloud & related frameworks
- For each critical application:
  - Review business requirements
  - Review solution market
  - Assess options
  - Develop business case