Change Management and Technology – A Case of GenAI in Higher Education

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"Teachers are talking about ChatGPT as either a dangerous medicine with amazing side effects or an amazing medicine with dangerous side effects." —"@VicariousLee. Stanford faculty weigh in on #ChatGPT's shake-up in education https://t.co/Xx774 bzeWm #edtech #edchat #gpt3 #ai https://t.co/dz4MEQD3XH" (Tlili et al., 2023).

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Abstract

In the digital age, with the evolution of GenAI, change has become more rapid and multi-dimensional. Promoting the success of technology-related change initiatives has become an area to explore. Change management has been management-oriented, lacking holistic, interdisciplinary research and an understanding of technology and data, which has prevented it from being successfully applied to complex AI-related changes in organizations.

The purpose of this doctoral research was to explore methods to enhance the success of technology-related change. To answer the central research question, *how do methods enhance technology-related change success,* this research conducted a literature review of traditional change management frameworks, as well as an analysis of the complex inter-relations among (external) environment, organization, and technology, and links among various components, such as goal setting vs. technology. The researcher also conducted twenty interviews with executives, managers, and staff who worked in change and IT/IM capacities at a Canadian university. The findings from the interviews generated three themes: change success and failure factors, change challenges across different roles, and changes in education regarding ChatGPT. These findings helped fill gaps in the literature, link to Social Construction of Technology (SCOT) and Sensemaking theories, answer research questions, identify reasons for change failure, develop strategies to target ChatGPT in higher education, and enhance the success of ChatGPT change management implementation. The methods to enhance technology-related change success focused on understanding the new change phenomenon that GenAI brings and sensemaking, focusing on the people and understanding components. Future research should aim to rethink the relations between academic research and industrial practices to enhance a timely, holistic, and renewed understanding of GenAI and changes in an interdisciplinary and holistic manner. Graphs, concept maps, and tables have been developed to visualize the complexity of change, success and failure factors, and the gaps in understanding GenAI-induced changes.

Keywords: change management, GenAI, technology, organization, higher education

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Chapter 1. Introduction

In the digital age, technology has become an inseparable part of an organization's operations. Compared with the era before the widespread use of digital technologies, change has become more rapid and multidimensional. In the case of generative AI (GenAI), rapid development has occurred across many areas, such as text generation and information retrieval (Yeadon et al., 2023). One recent technological innovation, ChatGPT, has demonstrated technical maturity in conducting human-like conversations and activities, with technical impacts that result in profound, fast-growing social changes and various organizational responses (Siegle, 2023). Amid the large-scale changes technology brings, promoting the success of technology-related change initiatives becomes an area for exploration.

However, change projects, especially those related to technology, are often perceived as having a high failure rate (Nohria & Beer, 2000). Failed technology-related change initiatives have devastating consequences, such as high costs, delayed schedules, system ineffectiveness, reliability problems, security vulnerabilities, and lost trust among stakeholders/shareholders and users (Randell, 2007). Such failures can make organizations hesitant to initiate changes, thereby diminishing the potential benefits of adopting new technology. Therefore, it is crucial to understand the nature of change failure to develop methods and tools to reduce change failure and promote success.

This chapter has six parts. The first part provides a high-level overview of the challenges in change and management in the digital age, with a focus on change failure. The second part discusses the success and failure criteria for technology-related change projects, including the three crucial factors in any project – people, process, and product - as well as the interactive relationships among the parts within these three factors. The third part provides a high-level introduction to emerging GenAI technologies that induce profound social change, with a focus on ChatGPT, which is further examined in part 3 of the literature review. With the foundation laid by the first three parts, the fourth part outlines the research's purpose: to explore the opportunities and challenges of GenAI in a university context, with a focus on change management. Then the fifth part lists the central and sub-research questions, which aim to ask the right questions to examine ways to enhance change success. Lastly, the sixth part discusses the delimitations and limitations of this research, including resetting boundaries to change current change management practices and generalizing the findings. The interchangeable use of ChatGPT, GenAI, and Copilot is unavoidable, as the research aims to understand the phenomenon of GenAI and change management, while using ChatGPT, the earliest GenAI tool, as a case study and mentioning Copilot as a later GenAI tool adopted by some universities. All fall into the category of disruptive technology, which disruptive nature and change will be further discussed in Chapter four and five.

Problems in Change and Management

Research on change, management, and technology is not new. Back in the 1940s, Kurt Lewin, considered the creator of social psychology, initiated theories of human behaviour during change processes and influenced the establishment of organizational change management (Goncalves & Campos, 2018). Following Lewin, many change management theories with different focuses have emerged. For example, Kotter (1995) focused on people and culture management, while McKinsey (2008) focused on interactive institutional factors. During the mid-1990s, change management expanded from focusing on human resources (HR) management during changes to broader change project management (Goncalves & Campos, 2018). In the social science field, the research history of change, organization, and technology is well established. For example, as early as 1748, in *An Enquiry Concerning Human Understanding*, David Hume described change as an induction from the past to understand experience and the possible future (Davis, 2010). To date, the core of Marxian theory remains useful for examining the impact of technology, markets, and organizations (Mortensen, 1979).

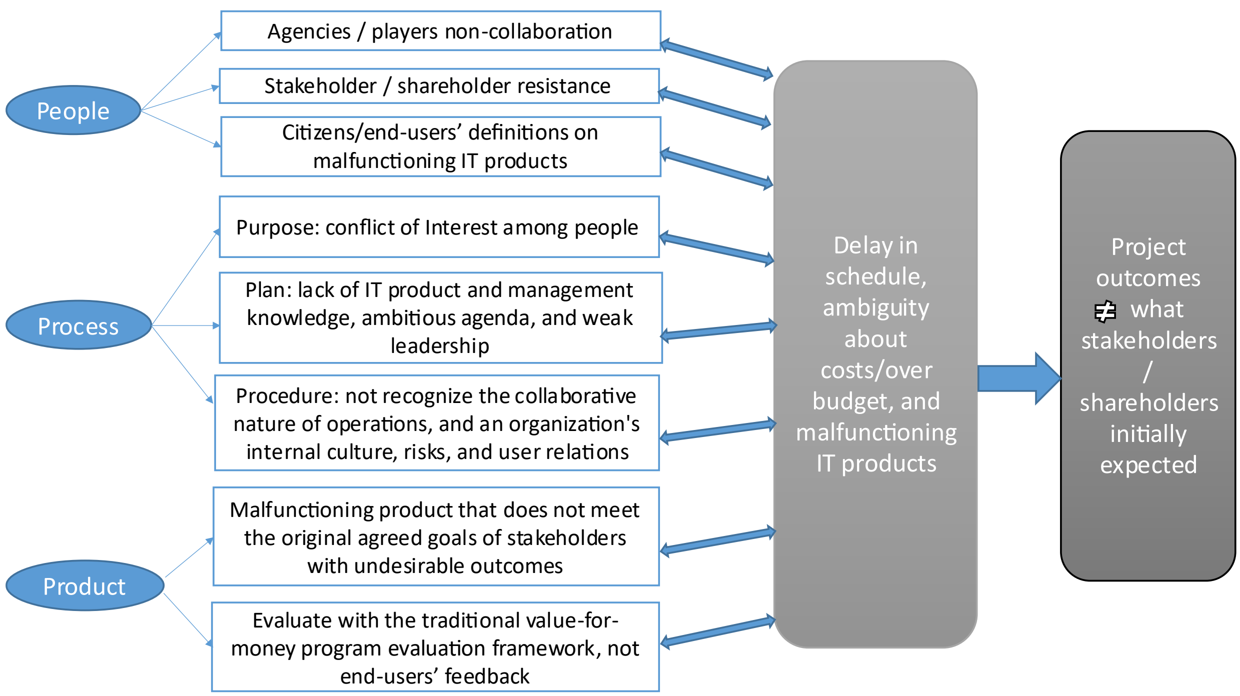
However, even with the long history of research and exploration, change initiatives relating to technologies often fail; for example, initiatives are abandoned, or outcomes are only partially achieved (Ewusi-Mensah & Przasnyski, 1991; Heeks, 2005). A 70% failure rate of change initiatives is a widely cited number in both academic works and professional reports – even though there have been arguments about how the 70% was measured, such an estimate and self-fulfilling prophecy have led to negative change management assumptions and motivations (Nohria & Beer, 2000; Barber, 2021). Considering the extensive history of change management and technology-related research, the widely cited high failure rate suggests significant gaps in current research and practice, especially in more complex technology-related change management in the digital age.

Technology-Related Change Project Success and Failure

Defining project success and failure is challenging, as different projects in various social environments and time periods may have significantly different standards of success or failure. In general, technology project success is defined as when most stakeholder groups have achieved their primary goals, and there are no significant undesirable outcomes of technical processes and products (Heeks, 2005). Such success can be achieved by adhering to project schedules, staying within budget, and delivering a fully functional final product as expected (Kelly, 2019).

In contrast to project success, a technology project failure is defined as the project outcomes not being what stakeholders initially expected (Kelly, 2019). There are two types of failure: total and partial. First, total failure indicates that initiatives are never implemented, or the entire initiative/project is abandoned after a significant investment (Heeks, 2005; Lammam et al., 2013). Second, more common than total failure, partial failure means that initiatives are not fully attained, come with significant undesirable outcomes, or both (Heeks, 2005). Any of these failures, such as Agconnex, the Agriculture and Agri-Food's attempt to build a fully integrated system for farmers, which resulted in a $14 million IT total project failure (Lammam et al., 2013) or the ALMRS system's partial project failure in the U.S., whose major software component failed to meet the Bureau of Land Management's needs and was not deployable (GAO, 2000), prevent a project from achieving success or positive impacts of changes through technology implementation.

Technology project success or failure is influenced by the interactions of the three factors – people, process, and product (Abdullah, et al., 2016; Kelly, 2019). Any interruptions in the people, process, and product stages can result in ripple effects and shape project failure (Kelly, 2019). Graph 1 below describes the complex relations among the three factors of technology-related projects.

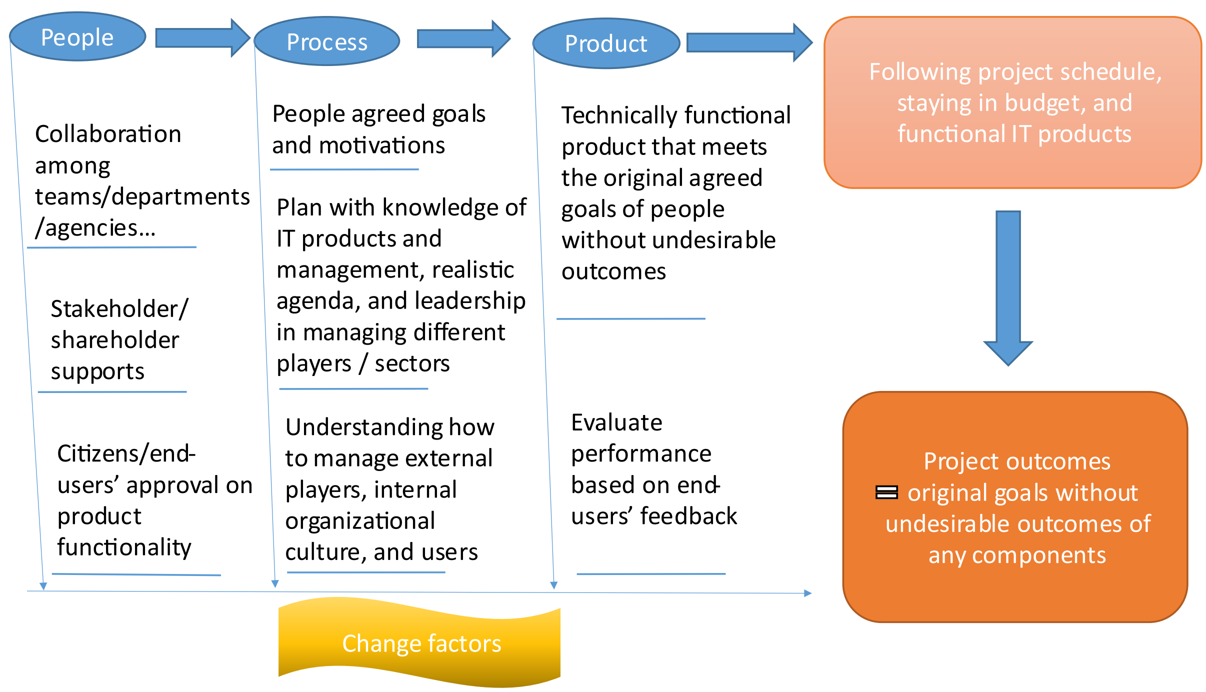


Graph 1. Technology-related Project Failure (Kelly, 2019)

To achieve project success, it is crucial to understand the meanings of people, processes, and products, as well as the interactive relationships among the various components of these three factors. First, people include multiple stakeholders, shareholders, managers, employees, end-users, customers, and citizens, whose composition depends on the type and scale of the project (Kelly, 2019). The quality of collaboration among various parties, stakeholder/shareholder support/resistance, end-users' comments on product functionality, and citizen perceptions of change all become crucial factors in determining the success or failure of technology-related projects (Kelly, 2019).

Second, the process in technology-related change is complex, which includes clarifying the purpose of technical product, receiving agreement of the purpose among most/all stakeholders/shareholders, identifying the desired features of the technology, developing a detailed and complete plan on how to purchase /manufacture/implement the product with the considerations of finance, deadline, evaluation, roles and responsibilities, etc., managing the change and technology implementation, and delivering a functioning final product with the approval of all people involved (Kelly, 2019). Third, the product and its related change, whether a technical product or a cultural shift that enhances technology values, must align with the common goals of stakeholders/shareholders by presenting quality information, ensuring relevance, accessibility, service quality, and error-free data (Alenezi et al., 2015; Kelly, 2019).

Technology-related project success requires collaboration among interrelated and ever-changing people, processes, and product factors (Kelly, 2019). For example, people's attitudes can change in response to an altered work environment, and technology can update rapidly, which in turn changes the process of technology use and implementation (Kelly, 2019). These factors make technology-related change projects complex, vulnerable to failure, and hard to succeed (Kelly, 2019). Therefore, to enhance success, each step in the project must meet milestones with the agreement of the various people involved and must have a sequential influence on the next steps (Kelly, 2019). Graph 2 below illustrates the collaborative effects of success in each step on achieving project success.



Graph 2. Technology-related Project Success Requirements (Kelly, 2019)

It is worth noting that project success and failure criteria have largely overlooked socially constructed change factors. This is partly because socially constructed theory grounds change at the macro level, focusing on technical changes in society (Bijker, 2009). Graph 2 focuses on change factors in organizations that contribute to success. Using GenAI as an example, Graph 2 illustrates how an organization can adopt GenAI in its operations. In contrast, the socially constructed theory examines how GenAI's construction and function interact with society and its people. This research draws on Bijker's (2009) Social Construction of Technology (SCOT) framework, which is more explicitly discussed in Chapter 2, Part 5: Theoretical Perspectives.

Emerging Technology and Artificial Intelligence

New technologies, especially GenAI, are bringing tremendous change to society and everyone's life at a rapid pace. GenAI-enabled computer systems exhibit human-level intelligence, understanding, reflection, and response (Buck et al., 2022; Pimlott, 2019). More than a single technology, GenAI is a collection of various technologies that support various tasks with specific processes and support, including the most-studied machine learning, natural language processing (NLP), and rule-based expert systems (Abbasgholizadeh et al., 2021; Davenport & Kalakota, 2019). ChatGPT and Copilot are two types of GenAI tools.

Chat Generative Pre-Trained Transformer (ChatGPT) is a large language model (LLM) – a machine learning system with advanced NLP capabilities, in-context learning that autonomously learns from a massive data set of text, and reinforcement learning from human feedback as well as their relationship – can produce sophisticated writing and interact with users conversationally (Sardana et al., 2023; Van Dis et al., 2023; Wu et al., 2023; Zhu et al., 2023). Introduced in November 2022, ChatGPT has the ability to respond to queries, acknowledge errors and misinterpretations, and challenge counterfactual and hypothetical scenarios (Sardana et al., 2023). Nevertheless, far from a perfect LLM revolution, ChatGPT exhibits numerous flaws in information quality and accuracy. For example, when it comes to technical knowledge, such as in health, ChatGPT can provide incorrect information that does not align with credible literature (Van Dis et al., 2023). The cost of development, including the hardware resources required to handle large volumes of data and the carbon emissions from millions of users every day, is quite high (Wu et al., 2023). For example, it costs about USD 12 million to train the basic large model GPT-3 (Wu et al., 2023). Therefore, many questions arise about the negative consequences of ChatGPT becoming the go-to GenAI for people trying to understand or accomplish anything.

Due to controversies surrounding ChatGPT and its impact on academic learning and teaching, Part 3 of the following Literature Review focuses on ChatGPT's positive, negative, and mixed responses in higher education.

Purpose of the Research and Methodological Approach

The purpose of this research is to understand why technology-related change management often fails and identify methods to enhance change success. To achieve this, the research explored the opportunities and challenges associated with ChatGPT, particularly regarding change management in a university context. The case study was conducted at a university in Canada. The case study aimed to explore: 1) to understand the views of executives, managers, and staff members regarding the changes brought by new technologies, especially ChatGPT, and 2) to identify the gaps between existing change theories, frameworks, and practices and higher education's responses to ChatGPT and new technologies in general. A policy review helped clarify the current coverage of ChatGPT policies and guidelines across 22 universities in Canada.

Through the literature review and case study, this research adopted a holistic approach, drawing on multiple data sources and crossing disciplines, to address the stated research questions. First, the literature review examined the current knowledge and research in change management in both management and social science fields, as well as the current understanding of ChatGPT. The literature review also examined gaps in the current literature and two theoretical perspectives to help fill them. Second, the data collected from the case study provided insight into higher education and the views of key individuals involved in change projects, filling gaps in the literature and offering real-life, practical insights into changes and successes.

The findings not only enabled the presentation of a renewed technology-related change management strategy, incorporating a holistic understanding of existing frameworks and new knowledge gained from data collection, but also fundamentally altered the thinking process of managing changes when facing new technologies, such as ChatGPT. In this way, changing the success criteria has been tailored to meet the needs and realities of an organization, and technology adoption and usage become a socially constructive process. The strategy from this research serves as a guiding principle for thinking, understanding, and applying changes and technologies, rather than restricting innovation and portability in the change process. Such findings are applicable and valuable to the field of education, which strives to achieve successful change management in digital transformation projects.

Research Questions

The central research question is "*how do methods enhance technology-related change success*". Three sub-questions aim to gather the necessary data in order to answer the central research question.

a. Why do change initiatives often fail in new technology adoption and usage?
b. What management approaches are currently applied to leverage ChatGPT's adoption success in higher education?
c. What strategies are available to leverage change processes connected to technology adoption, especially GenAI, within organizations?

Delimitations and Limitations

This research has reset the boundaries in an interdisciplinary fashion and demonstrated the bigger picture holistically. Such a big picture requires multidisciplinary and interdisciplinary thinking across management, social science, and technical fields. The literature review and case study reflect such multidisciplinary and interdisciplinary thinking. At the same time, an in-depth understanding of the nature of digital tools, organizations, and society, especially in the context of GenAI, is required to connect the various change factors and foster holistic thinking.

The delimitation, in the form of boundary resetting, fundamentally changes the current understanding and practice of change management. It should be noted that, as discussed in

Chapter 2, Part 1, change management has been developed from the theories of social psychology and human behaviour (Goncalves & Campos, 2018). Traditional change management in the management field emphasizes external factors and internal processes, such as stakeholder engagement and interventions (Avila & Garcés, 2017; Hayes & Hyde, 1998, as cited in Hayes, 2010; Hayes, 2010; Mogogole & Jokonya, 2018). In the social science field, as identified in Chapter 2, Part 5, leading theories, such as the Social Construction of Technology (SCOT) and the Socio-Technical (Systems) Theory/Framework (STT), focus on the big picture of social and technical sides of changes (Bijker, 2009; Davis et al., 2014). Yet in practice, as identified in Chapter 2, Part 4 Gaps in the Literature, traditional change methods, such as staff layoffs and employing consultants, are still widely applied to achieve organizational culture change relating to technology (Nohria & Beer, 2000). These two disciplines do not automatically connect with each other's focuses and practices.

In the digital age, organizations have increasingly focused on the practical application of how technologies could fit into their operations, so new technology adoption can better initiate and drive operational changes (Nohria & Beer, 2000). However, responses to complex technical change initiatives and processes often included 1) additional layers of technical solutions to change management frameworks or 2) additional change management practices to technical applications. Such responses only added existing theories on top of each other without rethinking the new change requirements. For example, software configuration management (SCM) uses the traceability feature to improve understanding of various components of software artifacts, such as requirements and design, to integrate knowledge elements to realize the design of complex software, and to support system evolution and change management in software development (Mohan et al., 2008). Such a connection between change management and technology has been forceful, lacks an interdisciplinary theoretical foundation, and may be a poor fit for real-world applications. Therefore, it is crucial to establish the relationships among environmental/human considerations, organizational changes, and understanding of technology. By connecting change, management, and technology, and by identifying and implementing the key missing factors and links in current knowledge and practices, this research has drawn on different theories and frameworks, extracted distinctive features, and identified gaps in change and technology. Based on the case study data, the research has developed a renewed change management strategy in Chapter 5 that is more applicable to real-world contexts and GenAI, resilient to digital change factors, and suitable for digital transformation projects in the educational field.

The limitation of the research is the ongoing application of the findings in an ever-changing, evolving digital world, which makes success more challenging to achieve and measure and failure more likely due to increasing complexity. One noticeable example is the change of technology and terminology in only a few years. This research started with ChatGPT, the earliest and most widely used GenAI tool, to understand the phenomenon of GenAI. Copilot came later and was mentioned as a tool like ChatGPT. GenAI refers to a variety of tools and the phenomenon of using them. There is an interchangeability among ChatGPT, Copilot, and GenAI because the tools influence the phenomenon, and the phenomenon shapes the tools. This is not a limitation meant to confuse people, but a reflection that change comes quickly in the digital age.

There is an inherent limitation of case studies: generalization. Since every organization is different and there are many variables even within a specific environment, generalizing the findings from a case study can have a limited impact (Stake, 1995). Therefore, it is a crucial first step to examine a single technology, ChatGPT, in a more controlled environment (education in this case) and develop a renewed strategy in order to be generalized based on various needs in different settings.

Chapter 2. Literature Review

This chapter presents a literature review of the relationships among change, management, and technology. Over the years, the field of change management has undergone significant developments in standards, processes, codes of ethics, and professional knowledge (Goncalves & Campos, 2018). In the digital age, the innovative application of technology has continued to bring large-scale changes to social functions, organizational operations, and human behaviours, as seen in the case of GenAI. Therefore, there is a need to systematically examine existing knowledge on change, management, and technology across disciplines to achieve a holistic understanding of the interrelationships among change factors and their gaps.

The following literature review includes five parts: 1) examining traditional change management in the management field with the "to know, to do, and to do more" category; 2) a literature review of change and management in the social science field that examines the relations among (external) environment, organization, and technology; 3) a review of ChatGPT's technical aspects and controversies in education; 4) gaps in the current literature regarding the understanding of change effects of new technology; and 5) theories of Social Construction of Technology (SCOT) and Sensemaking that apply the socially constructed changes thinking in technology adoption and usage, as well as the habit of making sense in every aspect of change from the social environment to people's behaviours.

Part 1. Traditional Change Management in the Management Field

There are many change management frameworks and theories. To present traditional change management frameworks concisely, this section extracted and synthesized the key steps from representative frameworks, such as Lewin, ADKAR, and Hove et al., into the categories "to know, to do, and to do more". The following sections include a brief overview of the history and issues of traditional change management research, an explanation of key frameworks such as Lewin's, a justification for using the "to know, to do, and to do more" category, and details for each category. A concept map was created to illustrate traditional change management components.

Overview

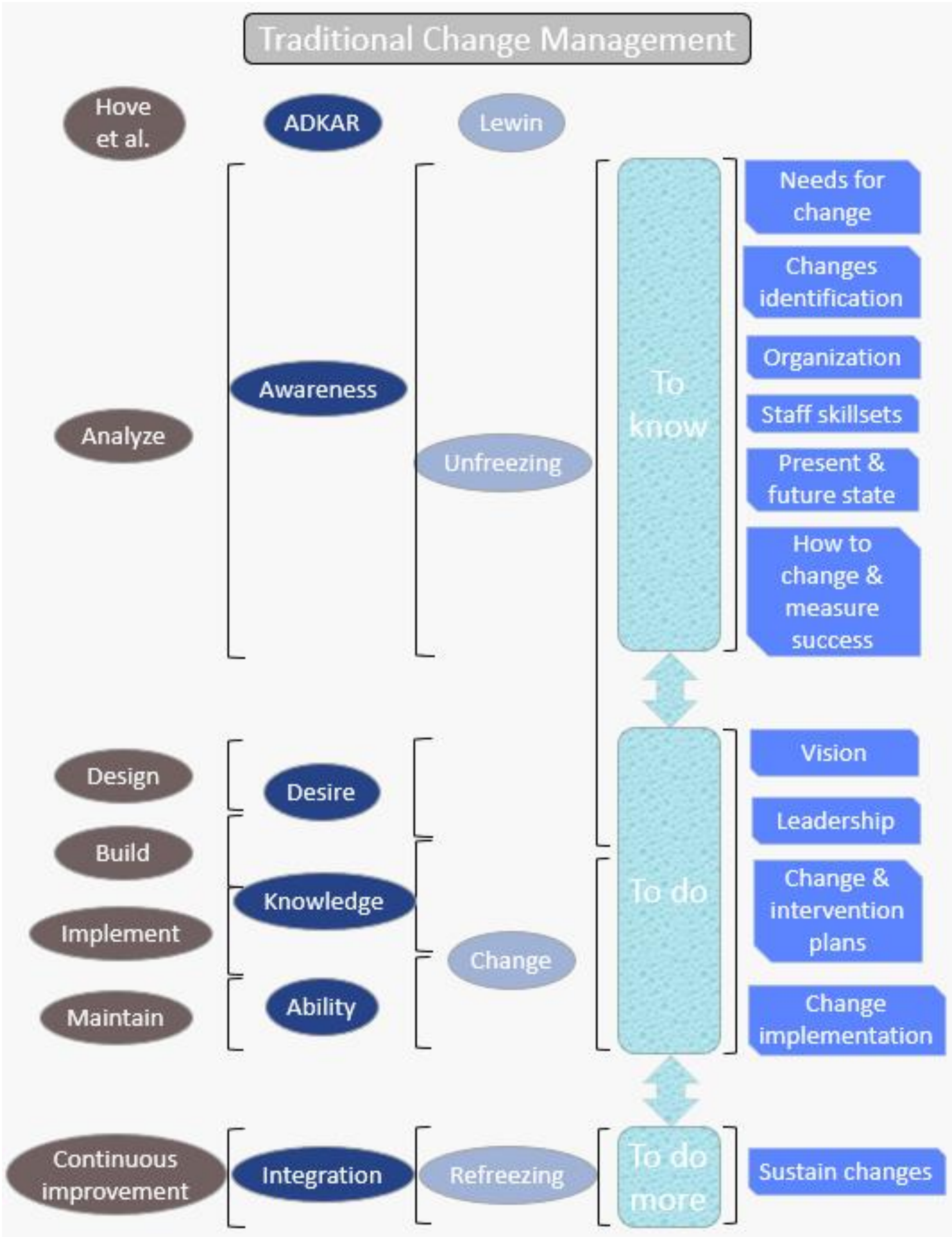
Change management is not a new concept. Back in the 1940s, Kurt Lewin, the creator of social psychology, initiated the theories of human behaviour during change processes and influenced the establishment of organizational change management (Goncalves & Campos, 2018). After Lewin, new theories and frameworks were built regularly in specialized areas that have branched out from change management, such as business models for sustainability (BMfS)

(Long et al., 2018) and business process management (BPM) change management (Hove et al., 2015).

Change management has encompassed a wide range of frameworks and theories. At the same time, the frameworks, which had different wording and graphs, shared many similarities (Almoaber & Amyot, 2021). Almoaber and Amyot (2021) identified Lewin's classic change management framework, "unfreezing, change, and refreezing," as offering a basic structure for other frameworks created by Bullock and Batten, ADKAR®, Lippitt, and Kotter. This research confirmed that three newer frameworks, Hayes, Hove et al., and Wilberg et al., also fall under Lewin's existing framework.

Instead of reviewing change management literature using Lewin's structure, a simplified "to know, to do, and to do more" category was utilized in order to synthesize key change management requirements from the literature with a focus on similarities across theories and frameworks. This category had four advantages. First, it considered the ever-changing nature of technology and the need to constantly prepare for changes, so refreezing after changes in Lewin's framework was no longer applicable. Second, Lewin's unfreezing included the planning phase of changes, which was more about preparing for the action phase (Almoaber & Amyot, 2021). The proposed category specified that planning was at the to-do stage, clarifying the nature of planning (thinking and doing) for technology-related change projects. Third, this category illustrated interactive, non-linear components of change management that differ from Lewin's sequential, linear framework. Fourth, the category used the ultimate plain language (know and do), which is more comprehensible than Lewin's framework. Such a comprehensive category, original to this research, enabled people across job roles in an organization to relate to and understand the change framework.

Concept Map 1 below illustrates the application of the "to know, to do, and to do more" category and its relationship to three sample traditional change management frameworks: Lewin, ADKAR, and Hove et al. The following three sections provide details on the components within the "to know, to do, and to do more" category, extracted from various change management literature in the field of management.



Concept Map 1. Traditional Change Management under "To Know, To Do, and To Do More"

To Know

There are six components in the "to know" category, including recognizing and understanding the need for change; identifying changes; and understanding the organization, the skillsets of the staff, the present state and the future state, and how to implement changes and measure success.

The literature has identified external factors as the force behind changes (Avila & Garcés, 2017; Hayes & Hyde, 1998, as cited in Hayes, 2010; Mogogole & Jokonya, 2018). Sample external forces included external markets, customer requirements, and political shifts in government policy (Jayatilleke & Lai, 2018). The change process and management started with recognizing and understanding the need for change (Hayes & Hyde, 1998, as cited in Hayes, 2010; Prosci, 2021). Then it was necessary to identify changes, the cause and the nature of the changes, and change requests (Hove et al., 2015; Jayatilleke & Lai, 2018; Long et al., 2018). Understanding needs and identifying changes could benefit the entire change process, including setting objectives, creating a transparent process, adding value to actions, avoiding distortion from reality, and better facilitating the adjustment during the change process and after changes are complete (Goncalves & Campos, 2018; Jayatilleke & Lai, 2018). Although these benefits did not reduce the level of difficulty in the change process, they prepared organizations with potential responses and adjustments (Goncalves & Campos, 2018).

It is vitally important to understand the organization holistically, from the approval mechanism to the roles of individuals in the change processes (Long et al., 2018). A sample to-know list included the culture of the organization, the (technical) skillsets of the staff, the processes in different areas (marketing, HR…), the relations between authorities, and the strategies for staying competitive (McKinsey, 2008). All these were interconnected. For example, organizational culture could stimulate or repress staff's innovative behaviours and change orientations (McKinsey, 2008; Mogogole & Jokonya, 2018).

A review of the present state (what it is) and the identification of the future state (what it should be) was crucial (Goncalves & Campos, 2018; Hayes & Hyde, 1998, as cited in Hayes, 2010; Weisbord, 1976). This was a key step in gathering information about the present state through various ways, such as interviews, observations, and questionnaires (Hayes, 2010). Then, a change management method and approaches should be established and documented (Hove et al., 2015). Having the knowledge of how to change and the ability to implement changes were key to achieving designed changes and reaching the future state (Prosci, 2021). To measure success, an organization needed to consider whether its vision of change can become a reality both internally and externally (Mogogole & Jokonya, 2018).

To Do

There are four components in the "to do" category: create a vision and communicate it, determine leadership roles, plan for change, plan interventions for potential issues, and implement changes.

Based on the knowledge the organization accumulated during the "to know" step, the next step was to create and communicate a vision to empower others to act on it (Almoaber & Amyot, 2021; Kotter, 1995). A vision is guidance for action, so it must be built on understanding every aspect of the organization, its people, and change. This vision could be considered a shared value or goal among stakeholders in the organization (McKinsey, 2008). A clear and well-communicated vision could be a critical success factor for sustainable change (Long et al., 2018).

The next step involved determining people relations, particularly in leadership roles, stakeholder engagement, people transitions, and communications (Hayes, 2010). Leadership, as a proactive function that foresees, oversees, and influences change, played a crucial role in navigating complex organizational dynamics and influencing changes from top management to staff (Dawson, 1994; Hayes, 2010; Long et al., 2018; Mogogole & Jokonya, 2018). Key actions for the leadership role included establishing a sense of urgency of the need for change, creating short-term wins, facilitating learning, institutionalizing new approaches, and expanding boundaries that changes bring (Almoaber & Amyot, 2021; Bögel et al., 2019; Hayes, 2010; Kotter, 1995). Stakeholders needed to be willing to support the change and participate in the change process (Prosci, 2021). Therefore, the leadership role needed to form a for-change partnership with motivated stakeholders, inspire others to get involved, and win the change (objectives) buy-in from stakeholders (Almoaber & Amyot, 2021; Goncalves & Campos, 2018; Hayes, 2010; Kotter, 1995). A lack of leadership was very likely to result in change management failure (Long et al., 2018).

Then it was time for organizations to plan for change (Hayes & Hyde, 1998, as cited in Hayes, 2010; Hayes, 2010). Such change plans could include a detailed work plan outlining who was doing what, a motivation and feedback loop for continuous improvement, and/or an economic/organizational strategy that focuses on results, competitive advantage, and stakeholder interests (Hayes, 2010; Hove et al., 2015). Such planning should focus on long-term outcomes, with consideration of cross-functional and agile management (Bögel et al., 2019).

Organizations should also plan interventions for potential issues before and during implementation (Hayes & Hyde, 1998, as cited in Hayes, 2010). The intervention focused on human factors, as people could be the source of driving forces (change supporters) or restraining forces (change opponents) in the change process (Hayes, 2010; Goncalves & Campos, 2018; Lewin, 1951). For example, people may become change opponents due to the current change process or uncertainties about the future state after change (Hayes, 2010; Kotter, 1995). Sample intervention activities during implementation included smoothing the change process, facilitating empathic communications, encouraging creativity, managing stakeholders' conflicts, stress, and motivation, redistributing tasks among experts and staff, and tackling issues in technology, human, and strategy (Goncalves & Campos, 2018; Hayes, 2010). Therefore, effective interventions could be crucial in maintaining stakeholder engagement during implementation for change management success.

To Do More

Changes needed to be sustained (Hayes & Hyde, 1998, as cited in Hayes, 2010; Prosci, 2021), which was developed from Lewin's refreezing thinking. This included monitoring and reviewing the implementation and adoption of changes (methods/processes) by other areas (Hayes, 2010).

In other words, while implementing changes and after the implementation, organizations needed to continue research on sound learning, application, and performance management, training, re-engineering business processes, and initiating or continuing interventions (Hayes & Hyde, 1998, as cited in Hayes, 2010; Hayes, 2010; Prosci, 2021). Products and services could only bring value to an organization if people used them properly (Goncalves & Campos, 2018). Therefore, lean thinking needed to be applied to efficient value creation and receiving (Hayes, 2010).

Moreover, organizations needed to be prepared for continuous innovation (Long et al., 2018) and the ripple effects of changes in different areas (Avila & Garcés, 2017). One ripple effect example was that new approaches in operations can result in corporate culture change (Kotter, 1995). This point was further examined and developed in the next part.

Part 2. Connect Environment, Organization, and Technology

The literature review in Part 1 on traditional change management was far from adequate. This was because traditional change management did not adequately consider the complexity of changes regarding technology, which was more explicitly discussed in this part. In the digital age, the nature and direction of changes were no longer straightforward. For example, in the traditional change management frameworks, the start of the changes was usually recognizing the need for change, but the need for change did not mean that the change was suitable for the organization, nor did it bring positive benefits, just like the need for a piece of technology did not mean that the technology was suitable or bring change success. However, traditional change management had not broken through Lewin's classic framework to adapt to the rapid, multi-directional changes of the digital age.

To address the inadequacy of traditional change management research, this part examined the literature on change, management, and technology in the social science field. This was because the social science literature recognized the importance of the environment, organizational culture, people, operational processes, and technology. For example, Socio-Technical Theory (STT) provided six change components in the course of holistic thinking - goals, building/infrastructure, people, process/procedures, culture, and technology, as well as their inter-connected natures within an organizational system and external environment, such as financial/economic circumstances, stakeholders, and regulatory frameworks (Challenger & Clegg, 2011; Davis et al., 2014). The above six components have been frequently mentioned in the literature with different wordings and in various contexts. During the review of the literature and the synthesis process, this research developed three main pillars of change: (external) environment, organization (including physical assets, goals and objectives, culture, people, and operational process), and technology. The overview section below explains the definitions of environment, organization, and technology in the context of this research. More specifically, this section and its sub-sections provide a detailed analysis of the complex relations among environment, organization, and technology.

Overview – What are Environment, Organization, and Technology

To better understand Concept Map 2. Interactions among Change Components: This section examines the definitions of environment, organization, and technology as change components. Environment refers to external forces (conditions, needs…) that could influence an organization's actions, such as managing IT innovation (King, 1994). Sources of such external forces included the economy, the market, financial institutions (such as banks and equity markets), government authorities (that develop regulation, policies, and legal frameworks…), international agencies (such as the United Nations and the World Bank and the International Monetary Fund), professional associations (such as scientific and technical societies), research-oriented higher education institutions, trend-setting and multi-national corporations, labour organizations (such as the unions), and religious institutions (King, 1994; Scott, 1987).

Regarding organization, there were three aspects summarized from the literature review: physical assets, people, and soft assets. The physical assets were visible, which could include the physical space (building, infrastructure…) and assets (office equipment…). Soft assets were typically less visible than physical assets, including organizational culture, goals, objectives, operations, and procedures. People in an organization served as the link between physical and soft assets, assigning meanings to both. For example, the presence of staff made physical assets useful for organizational operations. The work of people in an organization created operational goals and processes and forms organizational culture.

The concept of organization has changed over time. For example, as a fundamental construct of organization theory, organizational size has experienced dramatic changes in measurement in the past 70 years (Davis, 2010). Today's organizational size included sales, assets, real properties, number of employees, and market capitalization (Davis, 2010; Mortensen, 1979). In the digital age, organizations' physical space and layout have also changed with the usage of technologies (Challenger & Clegg, 2011). The key components of an organization were identified as physical assets, goals and objectives, culture, people, and operational processes.

Regarding technology, there were two sides: the technical and the non-technical sides. Since changes were rarely one-dimensional, technology-induced changes often led to interactive relationships among technical modifications, the socioeconomic factors of the environment, and organizational changes (Erickson, 1994; Robey et al., 2013). Such interactive relations reflected the action and reaction between technologies and the organizational/environmental factors. For example, when technologies brought revolutionary changes to organizations and society, the need for new organizational and social orders resulted in further changes and upgrades of technologies (Stachowicz et al., 2021). Therefore, research on technology and changes has focused on two sides of technology – the technical requirements and the social/organizational/user considerations.

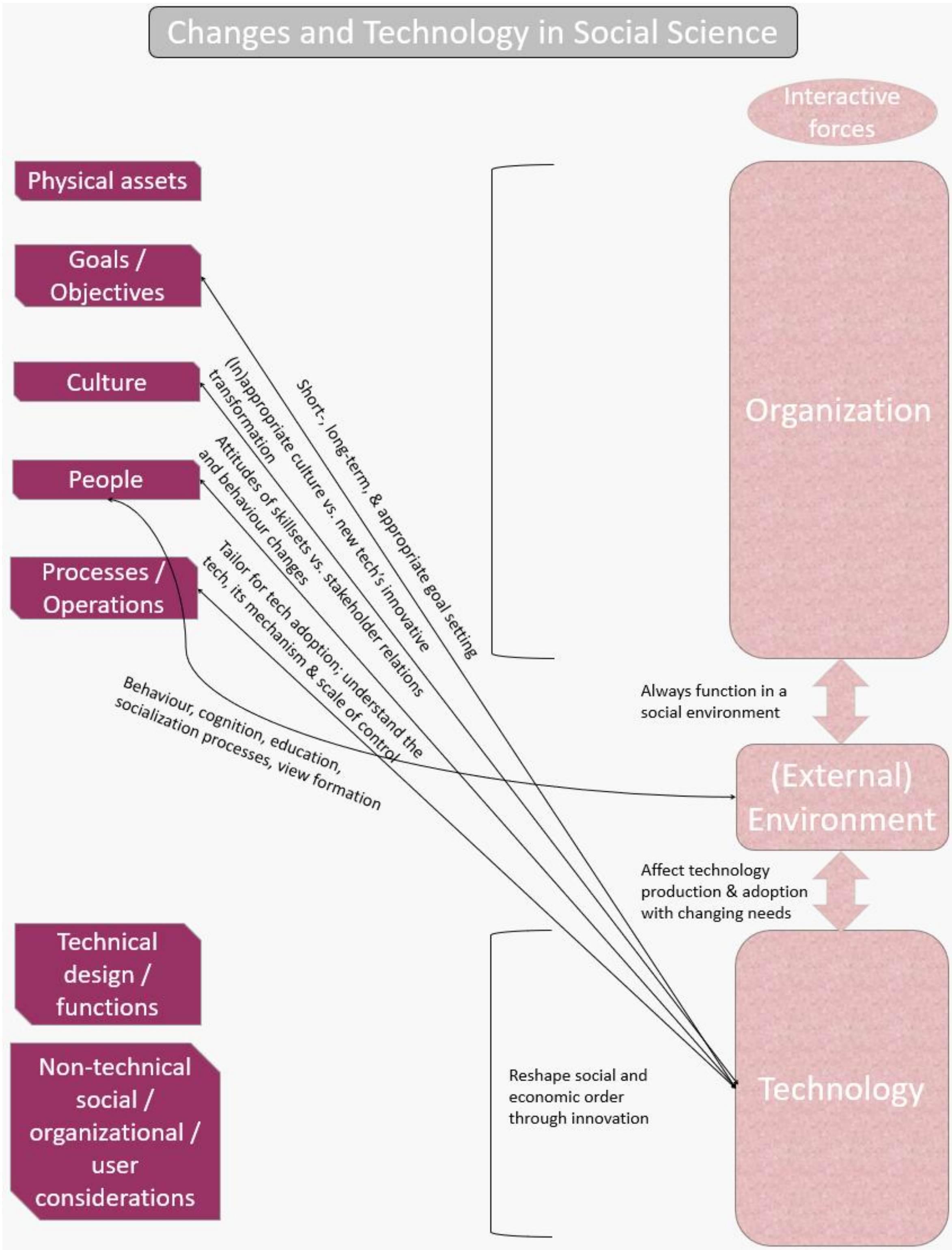
The first side was the technical requirements, which referred to the scientific design and functions of technologies. From a technical perspective, technology could only generate value if it had functioning systems that could be used by products and services (Rosenbloom & Christense, 1994). To ensure technology functioning, scientific design and functions needed to include sound design principles, sub-systems congruent with the basic system design, the match between local and central design process, strategic use of experimentations, the recognition of differences in systems, information retrievability, boundaries between systems (but not hinder information exchange and learning), variance control with the system, minimum complexity and maximum ease of use, and optimum conditions to enable users to regulate their activities (Imanghaliyeva et al., 2019). To help achieve technical optimism, a list of technology-related determinants included system complexity and application, unique features, novelty and superiority in new features, compatibility with other technologies, progressiveness and feasibility for the organization, licensing (a fee for rights, knowledge, and commitment from technology provider and receiver to form an agreement for a period of time), and joint venture of research and development (long term technological activities with shared costs and reduced risks) (Cheng, 2018). In this sense, functionality and usefulness were essential to fulfill the technical requirements during changes. An understanding of the characteristics of technology, technical adoption in organizations, and ways to achieve technical success was critical to change success.

Technology was not an isolated design exercise; therefore, the second aspect of technology involved linking to non-technical components. Technology was closely linked to an organization, its goals, and the people/users, so the technical parts, such as system design, were equally important as the integration between technology and organization/goals/people (Challenger & Clegg, 2011). Therefore, systems should always be designed with an understanding of why they were needed, as well as the considerations of human activities in technical adoption and usage, the political and social constraints, and continuous re-evaluation (Imanghaliyeva et al., 2019).

Interactions among Environment, Organization, and Technology

Environment, organization, and technology interact and influence each other. For example, technology redefined workers' qualifications to enable mass production, while automation led to upgrades and higher demands for qualifications (Mortensen, 1979). The case of digital publishing also demonstrated the interactions among the external environment, the organization, and technology. The availability of low-cost technologies for electronic reproduction and distribution created demand in the market (external environment) to adopt such technologies (Van Der Wurff, 2002). The reduced cost lowered barriers to new businesses/organizations entering the market and contributed to vertical disintegration along the information value chain of publishing (Van Der Wurff, 2002). Yet the information market was still under the control of traditional publishers in the wake of new technology adoption (Van Der Wurff, 2002). Two tiers of publishing – traditional and digital – existed, and the arguments on the digital divide and knowledge-seeking behaviour emerged. The COVID-19 pandemic has been an unexpected external factor that has forced organizations to adopt digital publishing and abandon traditional publishing. Technology advances and costs fluctuate with the new environmental factors and organizational operations. At the same time, new competition among traditional publishers, new publishers, and new technologies could result in new variables in the market and affect the information industry and market performance in general (Van Der Wurff, 2002).

To understand how environment, organizations, and technology function as a system, it was necessary to examine the interactions among the three pillars, the main pillars and the sub-pillars (the environment's effects on organization, environment and technology, and organization (goal setting, organizational culture, people, as well as process/operations) and technology. The complex relations have been visualized in Concept Map 2 – Interactions among Change Components, to demonstrate the close links and interactions among the change components. Such links also highlighted the vulnerability of the entire change system, as the failure of one interaction could trigger a ripple effect across other components and cause the system to collapse. Therefore, understanding such complex links was an essential step towards understanding why specific change initiatives fail.



Concept Map 2. Interactions among Change Components

1. Environment Affects Organization

An organization could not exist without its external environment. Given that an organization always functions within a social environment, elements of regulatory frameworks, stakeholders, end-users, and the financial environment can influence organizations' decisions, such as which goals to pursue and which metrics to use (Davis et al., 2014). Unexpected events in the external environment, such as war, could drastically change the existing behaviours and activities of an organization (King, 1994). For example, the Second World War highlighted the importance of technical innovations in weapon upgrades (radar, jet aviation, and nuclear power) (King, 1994).

In particular, the environment affected an organization by influencing its people through education and socialization processes in the formation of views, rewarding acceptable social activities with resources, and depriving access to resources for unacceptable activities (King, 1994). For example, regulations functioned as direct or indirect interventions in individual/organizational behaviours (King, 1994). Subsidies from government or other institutions were utilized to support an organization's innovation efforts, but they also influenced the development of key activities, including hiring practices, technology investments, individual adoption of innovation, and educational initiatives (King, 1994).

To demonstrate the effects of the environment on an organization, one study investigated how climate change activists' actions (external environment), such as witnessing congressional hearings and protesting, influence organizations' responses (Hiatt, 2015). Using data on U.S. petroleum companies from 1982 to 2010, the findings showed that changes were inevitable, interrelated, and tended to follow each other's directions (Hiatt, 2015). External politics and activities could cause changes in internal politics within the organization, which further resulted in alternative adoption of internal practices (Hiatt, 2015). Therefore, external political actions could form a different environment and could change an organization's internal politics and operational processes (Hiatt, 2015). In the case of ChatGPT, a study examined the Arabic environment within Muslim culture, religion, and social systems (Mohideen, 2024). It proposed the utilization of GenAI's language learning features to navigate the complexity of Arabic for non-Arabic speakers and enhance learning (Mohideen, 2024). In an age when AI technologies have become mature enough to influence social functions, organizations need to consider the overall social environment, accept the technical trends, and develop tailored organizational responses to facilitate the integration of technology into operations and management.

2. Environment and Technology

The external environment affected the production and adoption of technology. Early research on technological changes often related to knowledge development (Rosenbloom & Christense, 1994). In the digital age, one of the biggest challenges was to design, control, and evolve new adaptable social-technical ecosystems in a changing environment (El-Haouzi & Valette, 2021). This was because technological approaches needed to consider many uncertainties from both the environment and the organizations (Ewusi-mensah, 1981; Song, 2005). In other words, an organization needed to have perceptions of its goals and objectives under various circumstances, its capacities to respond to constraints and contingencies from the external environment, the information flow between the organization and its external environment, and the environment's effects on the organization's performance (Ewusi-mensah, 1981).

The case of real-life competitions over disk drives demonstrated the relationship between the environment and technological development. In the 1970s-80s, different product needs (desktop and laptop) determined the ever-changing demands for disk drive sizes (3.5-inch and 5.25-inch; 5 Mb, 10 Mb, and 20 Mb) (Rosenbloom & Christense, 1994). The changing needs affected companies' production cycles, market shares, and survival (Rosenbloom & Christensen, 1994). Along with improving the performance of disk drives, the changes in demand continued; for example, companies needed to detect, understand, and respond to the needs of the new 2.5-inch drive (Rosenbloom & Christense, 1994).

In the digital age, technology has played an increasingly important role in reshaping the environment. It has become crucial to understand how technological innovation could bring the reformation of the social and economic order rapidly and drastically (Rosenbloom & Christense, 1994). For example, social media has fundamentally changed the way people communicate as well as their information-creating and seeking behaviours (Kelly, 2017). With the increasing application of AI, this research aimed to identify the types of opportunities and issues, as well as the scale of impacts, that had yet to be fully explored and studied.

3. Organization and Technology

The interplay between organization and technology introduced interactive forces that influence the direction of strategies and productions. The adoption of technology could cause changes in organizational structure and control (Thompson et al., 1989). In general, change theories have identified that the change process needs to overcome difficulties, including persistent structures and oppositions, while technology could be used for persistence or transformation (Robey & Boudreau, 1999). For large organizations with multi-level management, technical changes could produce significant social and organizational changes at many levels (Tapia & Maitland, 2009).

One debatable area in organizational actions regarding the usefulness of technology was how to measure technology performance relative to an organization's traditional performance metrics. The arguments contained 1) There have been many variables in performance (profits, return on assets, market returns, or rate of any kind) and one single factor could not determine good or bad in a complex technical area, so using only numbers/scores to measure results could be misleading; 2) the control variables of past performance has been difficult to measure under a new leadership/technology, which could not be responsible for past performance; 3) measurement should focus on practical applications, not the contribution to theories (Davis, 2010).

This section provided details on the relations and interactions between organizations and technology. Four key parts of an organization, goals/objectives, culture, people, and processes/operations, have been discussed along with technology. In the technology and people section, the influence of people on technology adoption and the impact of technology on people are discussed separately.

3.1 Goal Setting and Technology

Goal setting has been an art and a science. In the digital age, there have been more interactions among organizations, resulting in increasingly blurred boundaries in goal setting among organizations with shared geography, legal authority, services, products, and functions (King, 1994). This section focuses on understanding what goal setting was, including the types of goals, the apparent and actual goals, and the (in)appropriate goal setting.

Goals can be short-term and long-term. Short-term goals can lead to quick actions and rapid influence within organizations, even though organizations themselves do not change quickly with the achievement of short-term goals (King, 1994). Long-term goals were different from short-term goals. For example, to achieve long-term goals, innovative changes often needed long-term planning, asking the questions of what changes were essential, when and how changes could happen, and what unpredictable future changes were expected (King, 1994).

It was crucial to understand what goal setting was and how it related to the realities and needs of organizations. For example, in for-profit organizations, the goal of technical adoption was to promote production efficiency (King, 1994). However, in not-for-profit and public organizations, the goal could be producing public goods while maintaining the legitimacy of the technology adoption process, such as accountability when using public funds (King, 1994). Regarding technology, it was vital to understand the apparent and actual goals. For example, even though it seemed that some East Asian countries aimed to access product innovations from the U.S. and Europe, the real goal was to apply more advanced manufacturing and management processes (King, 1994). The failure to distinguish the apparent and actual goals resulted in challenges from the more advanced products of East Asian countries to the traditional markets in the U.S. and Europe (King, 1994). Therefore, in the course of technological innovation, the roles and relations of producers and users, the real goals of production and use, and the politics behind pure technical innovation should be explicitly understood (King, 1994).

Goals must be appropriate for technology adoption and usage in an organization. Without a holistic consideration of all aspects, an organization might set an inappropriate goal that does not meet its needs and realities (Challenger & Clegg, 2011). It was also likely that an organization would try to reach the goal under various pressures and even start projects for the sake of being on time before it was safe to do so (Challenger & Clegg, 2011). This could result in a whole project's collapse in the end (Challenger & Clegg, 2011).

The case of the Phoenix Pay System in the Canadian federal government provided a convincing example of the devastating consequences of inappropriate goal setting. In the case of

Phoenix, goal setting was based on sheer political will to just have a piece of payroll technology in place, so Phoenix was launched despite the flawed stakeholder engagement, a system design that did not meet the needs of the complex government HR system, and the concerns from various experts on the risks and defects of the system (Kelly, 2019). All of these resulted in a malfunctioning pay system that has seriously affected the pay of thousands of public servants to this day (Kelly, 2019).

3.2 Organizational Culture and Technology

The importance of organizational culture has been widely recognized in the literature. A few examples of culture include management style, the mindset of managers and staff, and organizational behaviour (Carley, 1995; Challenger & Clegg, 2011). Culture has been a complex area, as different components constantly interact with each other and affect multiple courses of action and roles (Carley, 1995). This section examined how organizational culture affects technology adoption and how technology transforms organizations.

Culture could affect how an organization adopts and uses technology. For example, suppose the organizational culture promoted sound knowledge management. In that case, such a culture was likely reflected in budgeting and long-term planning that pushed for the adoption of an expert system to ensure knowledge storage, easy access for non-experts to retrieve information, reward knowledge-seeking behaviour when solving problems, and organizational memory (Song, 2005). On the contrary, if the organizational culture were only to learn what it needed, it might have a knowledge management system that could retrieve specialized knowledge from different sources, but it would not enhance knowledge management at the organizational level (Song, 2005).

At the same time, inappropriate culture, such as resistance to acknowledging wrongs and learning from mistakes, could result in operational and management disasters (Challenger & Clegg, 2011). For example, a culture lacking a systems-wide risk management perspective could result in the absence of contingency plans in crisis, poor command of a situation, and the lack of communication among key players who could control the situation (Challenger & Clegg, 2011). Such organizational culture could be expanded to organizational politics on the (fragmented) perception and management of technology, power dynamics and interests among stakeholders, and the clinging to traditions and the rejection of new tools (Robey & Boudreau, 1999). For instance, instead of using technology to enhance patient care, the costs of new IT systems in healthcare have been subject to financial control, accountability around resource management, and arguments about clinical freedom to practice medicine (Robey & Boudreau, 1999).

There have been suggestions that organizational culture directed technology adoption, user behaviour, and technical supplies, not the other way around, such as in the case that a learning-oriented organization could have a research and development budget and/or rewards to encourage IT-related knowledge application initiatives, but the usage of new technology was unlikely to create a new culture, at least not in a short period (Song, 2005). From common sense, technological innovation often brings new technology that pioneers an organization’s transformation (Rosenbloom & Christense, 1994). Issues arising from changes could necessitate a balance between changes and orders, persuading people of the future states that changes would bring and their importance to society, and committing to analyze the changes and make necessary adjustments (King, 1994).

3.3 Processes/Operations and Technology

Traditional business processes in organizations have often been applied directly to manage technology, but this approach often leads to issues due to the unique requirements of technological design and potential misalignments between technical and business processes. This section presents two business processes and identifies the problems that arose when applying them to manage technology processes in adoption and usage.

Business process has been a well-researched area. Mintzberg (1979) classic managerial actions – work coordination, mutual adjustment (informal communication), and direct supervision (one agent responsible for the work of others) – provided a basic framework for managing the operations in an organization as well as the technologies (El-Haouzi & Valette, 2021). Similarly, STT drew on classic business processes, such as vertical and horizontal integration, to propose three integration types for managing technology-related changes. These integrations were 1) vertical integration of hierarchical sub-systems that was supported by a well-thought integration policy to achieve the strategic goals of the organization; 2) horizontal integration through the corporations with other organizations to build a digital supply chain with common goals within regulatory frameworks; and 3) end-to-end engineering integration that added value to all stages of the product and service lifecycle with customers requirements as the centre of the map of the entire process (Sony & Naik, 2020).

There have been fundamental flaws in adopting traditional business processes to manage technologies. In the case of Mintzberg's business process framework, it could not be assumed that technology flow and people-oriented business flow were similar and comparable. At first glance, Mintzberg's framework appeared unable to address the question of standardization in ethics and human-machine relations concerning technology adoption, usage, and management (El-Haouzi & Valette, 2021). For example, what defined ethical rules, how ethical rules could be integrated into a design approach and manufacturing control, how the performance of control was assessed regarding ethics, and what were the obstacles in establishing and interacting with the environment (El-Haouzi & Valette, 2021)?

The problem lay deep in the misunderstanding of the nature of technology and the different requirements of technology-related processes compared with traditional business processes. Technology was not an object to be passively managed. As a matter of fact, technology could exert greater control within an organization than humans, through its control over data and specific processes, such as moving business operations from manual to computer control (Thompson et al., 1989). At the same time, the direct supervision relationship remained, with humans performing the controlling roles and making higher-level decisions (El-Haouzi & Valette, 2021). However, in contrast, technology performed low-level tasks in unoptimized situations and solved basic problems (El-Haouzi & Valette, 2021). However, due to the many variables in technology adoption and management, mutual adjustment is considered more suitable for addressing the instability of the technical environment and enabling collaboration between humans and machines (El-Haouzi & Valette, 2021). Therefore, understanding the nature of technology, its control mechanisms, and the scale of control has been vital for measuring the proportion of technical controls and recognizing changes and impacts within an organization (Thompson et al., 1989).

3.4 People and Technology

The relationship between technology and people in an organization has been extensively researched and discussed in the literature, as this section discusses. On the one hand, stakeholders' understandings and decisions affected the adoption and usage of technologies in an organization, managerial responses, and system usefulness. On the other hand, the implementation of new technologies could change stakeholders' engagement methods, skillsets, and behaviours (van Rijmenam & Logue, 2021). Such actions and reactions between technology and people could be complex and abstract, as this section discussed from two perspectives: how people's attitudes and skills influenced technology adoption and use, and how technology affected people in an organization through stakeholder relations, skillset demands, and behavioural changes.

3.4.1 People influence technology

In an organization, people's effects on technology stem from managers' attitudes and understanding, as well as their technical skill sets. Management's attitudes and knowledge about technology influenced the success and failure of technology-related change processes. For example, missing leadership could have devastating effects on an organization, such as not recognizing problems and the need for preparations, failing to manage daily operations and respond to crises, missing communication with key stakeholders and/or subject experts, and lacking empowerment to staff and end-users (Challenger & Clegg, 2011).

The skillsets of experts directly influenced the usability and design quality of technology. To design systems that met both technical requirements and human considerations, the technical team needed a diverse range of skills and perspectives across disciplines (Imanghaliyeva et al., 2019). For example, decision-aid IT leveraged expertise in applicable knowledge and IT design to produce comprehensive reports with charts and graphs, thereby enhancing knowledge transfer and processing for users (Song, 2005). No system came without risks. Therefore, addressing risks was an important aspect of IS project management throughout the system development life cycle, including the highest risks in change structure failure, relatively high risks of completing tasks and engaging stakeholders, and the least frequent technology risks, which were hard to recognize until the testing and implementation stages (Yu et al., 2013).

3.3.2 Technology Affects People

Changes in technology always come with changes in managerial structures, skill sets, and people's views toward organizational operations and management (Mortensen, 1979). For example, a qualitative study used STT as the theoretical basis and generated two findings about technology-related changes: 1) decentralizing and dividing operational tasks were important factors in increasing the success rate of job autonomy, and 2) reducing repetitive jobs was a task at the organizational level, not just about individual tasks (Vermeerbergen et al., 2016, 2021). This section examined how technology affects people in an organization through stakeholder relations, skill set demand, and behavioural changes.

The relationships among stakeholders in an organization changed as technologies were adopted. STT emphasized that while upper-level managers were often motivated by changes, IT implementations affected middle managers and staff most (Tapia & Maitland, 2009). Hence, motivations from upper management could receive mixed responses from staff, such as negativity and resistance (Tapia & Maitland, 2009). In the face of increasing technical and organizational complexity, coordination among various stakeholders was crucial for technology acceptability, ethics, and control of manufacturing design (El-Haouzi & Valette, 2021). Such coordination could help address issues such as emerging behaviours, blurred lines between legal responsibilities, fear of automation and job loss, and difficulties in system comprehension that lead to instability and a lack of resilience (El-Haouzi & Valette, 2021).

Technology requires new and diverse skill sets. This was necessary, as in an increasingly integrated digital time, multi-functionalism required people to process interdisciplinary knowledge and skills, achieve coordination among people and technology with minimized risks when pursuing improvement opportunities, have a certain level of flexibility in professional roles, and still have clear alignment between tasks and responsibilities (El-Haouzi & Valette, 2021; Imanghaliyeva et al., 2019). At the same time, innovation in an organization requires innovative people, regardless of their education or organizational rank (King, 1994). Therefore, knowledge deployment activities should include all managers and staff to brainstorm stimulated innovative ideas (King, 1994).

Behavioural changes accompanied technology adoption within an organization. This was because advanced technology affects people's cognitive processes of change and available information in an organization, from knowledge retrieval to decision-making (van Rijmenam & Logue, 2021). Although involving employees in the technology adoption and organizational change process was crucial, a qualitative study in a health maintenance organization revealed that institutional ideology and professionalism, rather than management's influence on technology, determine employees' acceptance or resistance to new technologies (Prasad & Prasad, 1994). People's attitudes towards new technology could vary, so ensuring staff's commitment to change, addressing change concerns, and helping comprehension of change and the process could enable staff to adapt to changes and ensure the effective implementation and usage of new technical systems (Chaudhry, 2018). In another case of retail banks, technology-induced e-commerce has changed the interaction between bank employees and customers (Blount et al., 2005). Hence, people management and customer service needed to evolve with the sophistication of e-commerce to enable retail banks to achieve a competitive advantage (Blount et al., 2005). A study found that age (15-30) played a vital role in customers' choice to use social media, such as Facebook, to interact with their banks (Durkin et al., 2015). Therefore, the extent to which future social media engagement would grow in the banking business is a question to be answered (Durkin et al., 2015).

Part 3. The Case of a Specific Technology – GenAI/ChatGPT in Higher Education

GenAI, particularly ChatGPT's capacity to replicate human interactions and language use, marks a significant milestone in the application of natural language in AI. There is no doubt that ChatGPT, as a disruptive innovation, has sparked excitement, controversy, uncertainty, and concern (Sardana et al., 2023; Van Dis et al., 2023; Wu et al., 2023; Zhu et al., 2023). In this case, the questions have not been about whether but about how ChatGPT affects different industries and what types of changes it would bring. However, it has been debated how the disruption applies across sectors, the exact directions of change, and the ripple effects, as the literature employs many ambiguous terms, including "might," "unclear," "opinions," "likely," and "potential." For example, AI was likely to revolutionize publishing and research practices (Van Dis et al., 2023). ChatGPT might redefine the boundaries between phonies and originality in authorship (Sardana et al., 2023). In response to the application of ChatGPT, different domains yielded different responses. For example, in publishing, some journals have prohibited AI-generated text and images, while others require that the use of AI tools be disclosed in the methods section (Sardana et al., 2023). In academic research, there have been advocates for developing rules for accountability distinctions, including author contributions and patents (Van Dis et al., 2023). Some voices cautioned against understanding the limitations of ChatGPT to avoid pitfalls, which echoed the statement of the American Chemical Society to disqualify ChatGPT from authorship (Zhu et al., 2023). At the same time, it was understandable that it was still too early to determine the impacts of ChatGPT, especially without the specific contexts of its application across different sectors.

This research focused on GenAI in higher education for two reasons. First, understanding the changes that ChatGPT has brought is particularly important, as these changes were no longer mere technical adjustments but could have ripple and long-term effects on learning and teaching for the next generation. Second, to date, the education sector has been among the most affected domains, as ChatGPT could directly alter current teaching and learning methods. The educational field was also the first to apply chatbot technology to education (Kerneža, 2023). At the same time, the literature has raised concerns about how ChatGPT affects learning and teaching, and some have called for new rules and regulations to enhance academic integrity.

After a review of academic literature and industry white papers, this section examined ChatGPT in three aspects: 1) the positive sides in its technology, teaching, and new businesses, 2) the negative sides in its information quality and reliability, and 3) the mixed responses with concerns about academic integrity.

The Positive

The positive sides of ChatGPT have been reflected in its technical maturity, opportunities for teaching, and business opportunities. First, the technical maturity of ChatGPT enabled it to produce academic essays, draft research papers, polish language in formal writing, summarize literature, develop and create works (poems, stories…), perform statistical analysis, and write computer codes, with quality that resembled human-written works (Sardana et al., 2023; Siegle, 2023; Tlili et al., 2023; Van Dis et al., 2023; Zhu et al., 2023). Using comprehensive language, ChatGPT could increase the likelihood of educational success by providing teachers and students with basic knowledge across subjects (Tlili et al., 2023). For example, based on his classic hit show M*A*S*H, Alan Alda used ChatGPT to write an original script, which quality allowed him to podcast it (Siegle, 2023). Compared with previous versions of the GPT-3 software, one remarkable improvement of ChatGPT was its enablement of continuous and somewhat interactive discussion in natural language between humans and ChatGPT (Perkins, 2023). Therefore, the literature has advocated proactive policy formulation to target ChatGPT in curriculum, training, and instruction to enhance adaptability and flexibility (Balahadia et al., 2025).

Second, the rapid advancement of technologies, such as ChatGPT or GenAI in general, brought transformative change to education (Kerneža, 2023; Jang & Choi, 2025). The possibilities in a classroom setting were unlimited, such as tailored self-directed and inquiry-based learning, development of teaching/learning materials, process-oriented teaching assessment, research, and administrative work (Jang & Choi, 2025). Several studies have attempted to understand the various changes that ChatGPT has brought to teaching. A literature review examined 44 articles to identify the changes ChatGPT brought to educators and students, including 24/7 support, explanations of complex concepts, personalized feedback, despite inaccuracies, misuse, and bias (Crompton & Burke, 2024). Back in 2021, Okonkwo and Ade-Ibijola analyzed 53 articles and found that chatbot technology was used mainly in teaching and learning (66%), compared with other areas in education (assessment, administration…) (Kerneža, 2023). A study aimed to identify teachers' skills when using ChatGPT to prepare curriculum (Kerneža, 2023). The study required fifty-five third-year students in the elementary education program to self-evaluate the required skills when using ChatGPT to write a lesson plan (Kerneža, 2023). An evaluator examined the students' communication with ChatGPT and their prepared lesson plan (Kerneža, 2023). The comparison between the students' and the evaluator's evaluations concluded that the students tended to overestimate their required skills to interpret ChatGPT content, which could lead to inaccurate assessment of their skills and hinder future development when working with ChatGPT (Kerneža, 2023). For science teaching, ChatGPT could catalyze educators to model responsible use of ChatGPT, set clear learning expectations, and promote critical thinking as a learning priority, not to mention performing tasks, such as designing quizzes and editing research narratives (Cooper, 2023). For example, a qualitative study interviewed physics teachers and found that students could benefit from ChatGPT's detailed explanations of processes/theories/solutions, logical formula development, law quoting accompanied by solving each problem, immediate feedback, and interactive query and answer with specific examples (Jang & Choi, 2025). Therefore, for educators, ChatGPT provided an opportunity to facilitate learning, especially for gifted students, regarding using AI to generate more advanced content, achieve personalized learning, enhance technical and problem-solving skills, collaborate with others, and conduct their own research (Siegle, 2023).

Third, due to ChatGPT's marketing potential, various organizations have been developing in-house GenAI capabilities, creating significant business opportunities for GenAI/ChatGPT. For example, more companies followed OpenAI's lead to build their own ChatGPT-like products (Wu et al., 2023). For example, Microsoft integrated ChatGPT with its search engine, Bing, to improve the quality of search results (Wu et al., 2023). SenseTime also developed its own SenseChat robot, which generated visual materials, such as 3D content, figures, and videos (Wu et al., 2023). Therefore, there were many possibilities to explore the opportunities and issues of ChatGPT, which provided a perfect example of technology-related change and management for this research.

The Negative

The negative side was ChatGPT's information quality and reliability. In general, the weaknesses of ChatGPT include dependence on the learners' knowledge of the subject to provide targeted questions and probes, inconsistency in responses to the same question, inherent limitations of its learning algorithms to generate entirely novel solutions to problems, and language restraints among different languages (Jang & Choi, 2025).

Specifically, as the original content provider, ChatGPT created errors, presented misleading information, fabricated references for specific information, and presented false information when the data in the field was limited (Lancaster, 2023; Tlili et al., 2023; Zhu et al., 2023). ChatGPT could not provide functional responses in more specialized topics, either (Tlili et al., 2023). Moreover, ChatGPT could be contradictory to the extent that it provided opposite answers to the exact same questions (Lancaster, 2023; Stojanov, 2023). For example, when three educators initiated a new conversation with ChatGPT, asked the same question from the same location within the same university network, and received three different responses, ChatGPT demonstrated that it could not be relied upon when seeking information (Tlili et al., 2023). More concerning, users might not always detect the inconsistency from ChatGPT, so they could have the false fulfillment of receiving the "truth" (Stojanov, 2023). This was particularly dangerous when ChatGPT might be used to write fake news stories, spread conspiracy theories, and generate ethically questionable responses (Lancaster, 2023). Therefore, the quality and limitations of information/knowledge generated by ChatGPT, as well as its reliability, have become a major concern (Tlili et al., 2023).

The following case provided an example of the questionable information quality and reliability of ChatGPT. One case study showed that when asking ChatGPT a basic physics question on acceleration at the highest point in the air, ChatGPT could provide correct answers to the least complex part and avoid common human mistakes (Gregorcic & Pendrill, 2023).

However, for the rest of the responses, ChatGPT provided incorrect answers and contradicts itself (Gregorcic & Pendrill, 2023). When the researchers began engaging ChatGPT, like a human student, in the hope that dialogues could help it recognize its mistakes and learn from them, ChatGPT began to provide longer, more contradictory answers (Gregorcic & Pendrill, 2023). At last, ChatGPT began to judge if the researchers' statements were correct, while still mixing correct and incorrect statements in its responses (Gregorcic & Pendrill, 2023). This proved to be the case for multiple-choice questions as well (Gregorcic & Pendrill, 2023). This research concluded that ChatGPT was not sophisticated enough to generate the right answers, think logically, or solve problems (Gregorcic & Pendrill, 2023). The positive point was that educators could receive help from ChatGPT to better recognize the thinking behind students' wrong answers and interpret problematic argumentation (Gregorcic & Pendrill, 2023). However, if users did not trust the potentially fake and plausible information from ChatGPT, it would difficult to engage users to start with (Tlili et al., 2023).

Mixed Responses in Higher Education

There was no doubt that GenAI catalyzed a new learning and teaching culture in higher education (Christ-Brendemühl, 2025). The literature mainly focused on the debate over disruptive potential and ethical dilemmas (Christ-Brendemühl, 2025). Christ-Brendemühl (2025) analyzed the content of 67 German universities' guidelines on GenAI. This study found that a majority of university guidelines explicitly permitted university lecturers and students to engage with GenAI because it was important to build AI literacy and prepare students for changing demands in the workforce. Noticeably, 56.7% of university guidelines recognized that the opportunities and transformative impact of GenAI on teaching and research outweighed the risks. In addition, the results of a workshop with 25 faculty members highlighted the need for AI-related skills and for early training in students' curricula. The recommendation proposed using AI to solve academic or administrative tasks, to gain insights into its applicability and limitations. Similarly, Bobula (2024) also emphasized digital literacy, staff training, and policy development to enhance institutional readiness for the changes that ChatGPT brought to higher education.

At the same time, GenAI was not explicitly designed for academic users, yet its ability to generate academic text has sparked debates about academic integrity when students use ChatGPT (Lancaster, 2023). It was a particularly challenging area in higher education, where students could inappropriately use ChatGPT to do their work instead of putting in their own effort. The functions of ChatGPT posed a threat to academic integrity through plagiarism, as students might create entire essays, reports, or assignments without citing sources. This was particularly concerning when universities lacked tools to accurately distinguish between student-generated content and ChatGPT-produced content (Perkins, 2023). ChatGPT could also impede the learning curve for new knowledge, such as writing programming code (Zhu et al., 2023). In other words, due to ChatGPT's technical advancements, students could use it to complete schoolwork without putting in learning efforts. Therefore, universities were concerned about students' dependence and plagiarism by asking ChatGPT to do schoolwork, conduct research, or write exams (Siegle, 2023).

Higher education institutions have taken distinguished actions and exercised caution in their responses to GenAI. For example, the University of Hong Kong and the Chinese University of Hong Kong prohibited the use of ChatGPT when it first emerged in higher education, but these universities now permit its use with specific guidelines on academic integrity (Huang et al., 2024). McDonald et al. (2024) examined documents from 116 US universities, including policies and procedures, and found that 63% of universities encouraged the use of GenAI. 41% provided detailed guidance for the use of GenAI in the classroom. 56% offered sample syllabi, and 50% provided sample GenAI curriculum and activities that would help instructors integrate and leverage GenAI in their classroom. Most guidance for activities focused on writing, but also mentioned code and STEM-related activities. Regarding ethics, 52% institutions mentioned a range of topics, including Diversity, Equity, and Inclusion. A review of policies and guidelines in Canadian universities aligned with the findings from American universities, which were discussed in detail in Chapter 4, Theme 4.

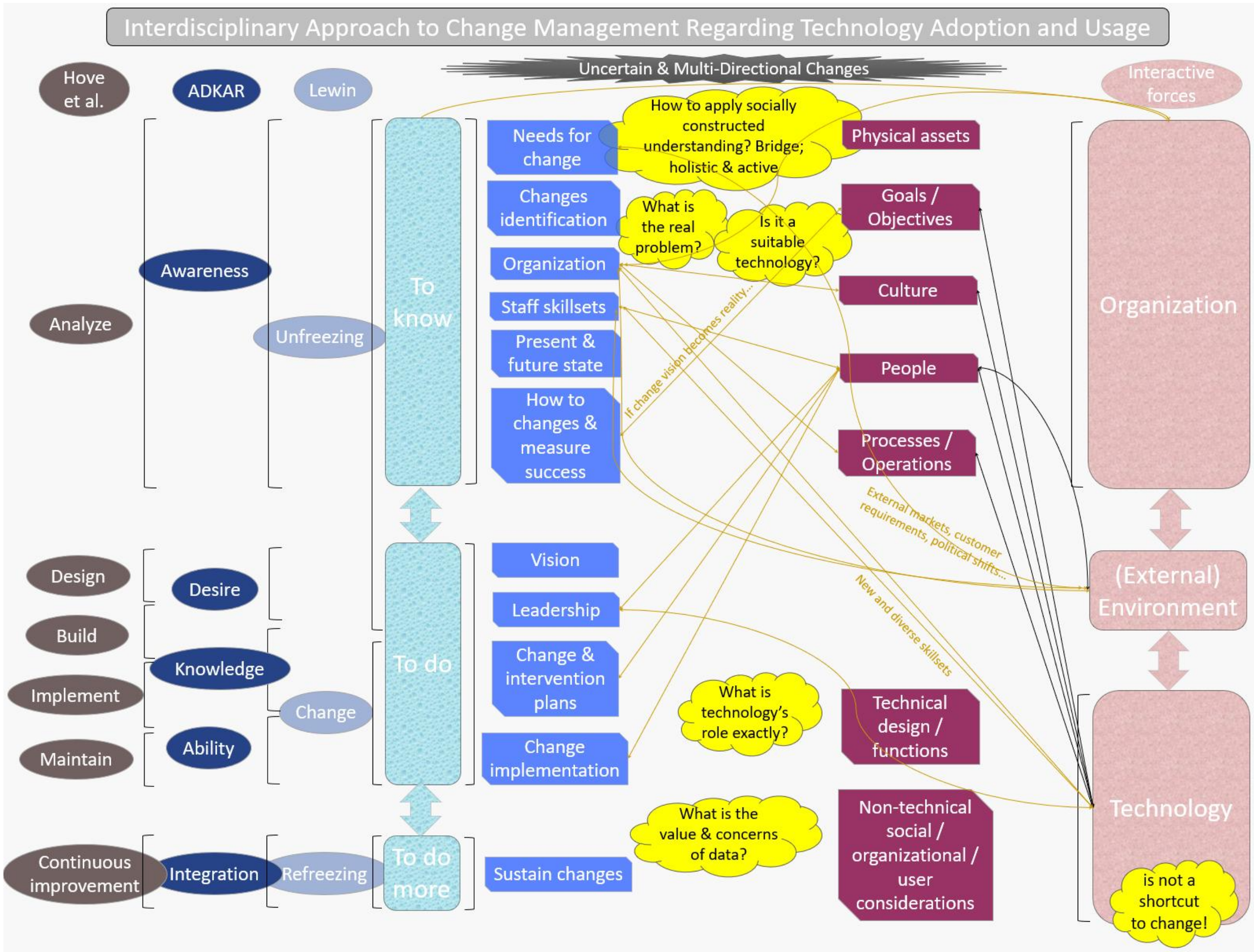
Recommendations for higher education institutions (HEIs) included setting clear boundaries for appropriate use of ChatGPT, monitoring students' use with an emphasis on responsible use, encouraging critical thinking to detect ChatGPT's inaccuracies, and providing guidance on using AI effectively (Siegle, 2023). Concerns about plagiarism, academic misconduct, and threats to academic integrity, as well as how educators can detect the use of ChatGPT on homework, have prompted discussions of academic integrity policies and penalties for plagiarism and academic misconduct (Perkins, 2023). Therefore, there was a call for academic policy and regulation on whether using AI tools as a starting point for schoolwork constituted academic misconduct (Perkins, 2023).

The industry white papers, in particular, took an innovative thinking approach that went deeper than the advantages and limitations of GenAI. The Georgia Tech Center for 21st Century Universities (C21U) white paper emphasized the need to rethink and re-evaluate the concept of authentic and personalized assessment to determine content validity (what to measure) and construct validity (assessment approach) (Lee & Soylu, 2023). Next Level Lab at Harvard Graduate School of Education proposed "intelligence augmentation" (IA), in which AI and humans engaged in a complementary partnership so that the human-and-AI team's overall performance was greater than the sum of individual capacities (Dede et al., 2021). In such an AI-to-IA model, human judgment and ethical decision-making became more essential than ever in order not to entirely rely on automation and information generated by GenAI (Dede et al., 2021). The Generative AI in Education: Opportunities, Challenges and Future Directions in Asia and the Pacific project formed the CRAFT framework – culture, rules, access, familiarity, and trust (Liu & Bates, 2025). Specifically, the white paper identified that culture represented the deepest challenges and the most significant opportunities regarding implementing changes, GenAI acceptance, and adoption (Liu & Bates, 2025). In this sense, rules must extend beyond cultural and regulatory restrictions to enable changes with practical guidelines and consideration of digital divide-related access issues (Liu & Bates, 2025). Familiarity related to digital literacy, including AI capabilities, limitations, and ethical implications, directly led to trust or not (Liu & Bates, 2025).

Most recently, various opinion pieces have been published regarding GenAI and the future of higher education. One article, "AI is Destroying the University and Learning Itself," pointed out the real problem of education: "We are approaching educational bankruptcy: degrees without learning, teaching without understanding, institutions without purpose" (Purser, 2025). While cheating has always existed, the view of modern education as a dating service and a chance to party, according to Conservative economist Tyler Cowen, signalled the death of universities' intellectual mission and a shift toward consumption and transactions (Purser, 2025). Instead of addressing the underlying problems in education, universities, such as San Francisco State University, began issuing layoff threats and outsourcing education by charging premium prices for a chatbot that students had already been able to use for free (Purser, 2025). Articles, such as "S'adapter à un monde invivable n'est pas une option" and "Questionnaire MESR « Intelligence Artificielle et Enseignement »: quelques réponses," shared a similar sentiment of seeking the real problem in enabling critical thinking and transforming education instead of passive acceptance, as well as the lack of desire to understand AI first before sacrificing education sovereignty to private companies (L'équipe de rédaction d'Academia, 2025). Such opinions align with the core advocacy of this research regarding a holistic understanding of technology and its root problems in non-technical domains, before diving into solutions driven by political, environmental, and organizational misunderstandings. Chapter 5. Discussion, Concept Map 5. Renewed Change Management Strategy in the Age of GenAI illustrated the essence of understanding the real problem.

Part 4. Gaps in the Literature

Based on the literature review of 1) the well-known traditional change management frameworks in the management field, and 2) the interactions among environment, organization, and technology from the social science perspective, two key gaps have been identified – the inconsistencies in perceptions of technology's role in change, as well as the understanding and incorporation of social construction in change projects. Concept Map 3 below combined Concept Map 1 (traditional change management) and 2 (social science) and showed where the gaps were in change management. The orange arrows represented the links among the various change factors. The obvious links had no explanations, such as people driving changes and intervention plans. Some explanations have been inserted to explain the relations better.



Concept Map 3. Gaps in Change Management in the Management and Social Science Fields

Inconsistent Perceptions and Understanding of Technology in Changes

As with change management, the discussion of technology and change has a long history. Along with the emergence of information technologies (IT) in the 80s and 90s, literature began to focus on information system implementations and IT-enabled changes (Benjamin & Levinson, 1993; Doll, 1985; Markus & Keil, 1994). More frameworks focused on technology have been added to the many change management theories. For example, the Requirements Change Management (RCM) framework, aligned with the trend of technology involvement in change management processes, focuses on the complex engineering process (Akbar et al., 2018; Jayatilleke & Lai, 2018). However, the literature still shows divided views towards technologies, including opportunities, limited impact, additional complexities, and uncertainties. In the case of GenAI, such divided views have led to a lack of a holistic understanding of the technology's use and potential, resulting in assumptions about the worst-case scenario of decreased academic integrity and calls for regulation.

Such divided perceptions of technology could make it challenging to position technology in changes, from the fundamental question "What is / why this technology" to the consideration "What can go wrong with this technology," then to the essential question "What can this technology achieve". Therefore, such inconsistent perceptions could be dangerous, as it was challenging to promote technology-related change success without first positioning the role of technology accurately. Moreover, there was a severe lack of discussion of data when discussing technology, which posed immediate and long-term threats to understanding changes in technology adoption and use. The following four sub-sections demonstrate the four change gaps and questions when the perceptions and understanding of technology were inconsistent.

What is the Role of Technology in Changes

Technology has often been mentioned in change scenarios, but there was no unified understanding of what technology was in change: was it an opportunity to enhance change, with limited impact on change projects, adding complexity to already complicated change processes, or was it simply uncertain? Some literature viewed technology as an opportunity and presented an optimistic outlook. Kotter (1980) identified that technology could be a tool for organizations to collect information and enhance communication, which could affect human behaviour toward driving or restraining change (Hayes, 2010). Tanriverdi and Lim (2017) found that technology could push a firm to recognize the complexity of its environment, respond to that complexity through change, and increase its chances of survival (Vial, 2019). For example, the application of blockchain could complement or substitute the traditionally centralized institutions (Vial, 2019). Such optimization towards technologies could be valuable when finding solutions and supporting change management decision-making and change deliveries (Ruiz et al., 2018).

Some literature suggested that technology had a limited impact on change management, meaning that introducing technologies into the change process did not fundamentally alter the traditional change management framework. For example, human factors remained crucial in engineering change management projects (Wilberg et al., 2015). Without sufficient attention to human factors, projects could still experience difficulties in meeting deadlines, losing control over costs, sacrificing scope and quality, missing strategic goals, and losing value for the change investment (Goncalves & Campos, 2018). The quality of leadership and decision-making remained a determining factor in the success or failure of technology-related change initiatives (Brown et al., 2016). In other words, sound leadership remained a prerequisite for successful change. In contrast, unsound leadership could directly lead to change failure, even with the adoption and use of technology in the change process. In this sense, the ripple effects of changes in the IT areas did not differ from other non-technical changes (Avila & Garcés, 2017).

Much literature recognized that rapid technological development added complexity to change management for technology adoption and use. The emergence of artificial intelligence (AI), software that enables the sharing economy, and social media adds complexities to traditional change management for organizations and industries in general (Avila & Garcés, 2017; Bögel et al., 2019). In the digital age, more factors drive change, making it more constant, unpredictable, less certain, and less manageable (Jayatilleke & Lai, 2018; Mogogole & Jokonya, 2018; Ruiz et al., 2018; Vial, 2019). Technical factors, which relate to customer needs, global competition, and government policies, complicate the nature of change requirements (Jayatilleke & Lai, 2018). For example, the alignment of IT and business needs inherited IT structures, and past success/failure of information systems can affect the change success of new systems (Mogogole & Jokonya, 2018), as the learning from these considerations can contribute to change success and the ignorance of those can create a useless IT system in an organization. Additionally, there are more representatives in the technology fields, such as IT project managers (Mogogole & Jokonya, 2018). Moreover, the window for successful change narrows significantly (Ruiz et al., 2018). As a result, changes become more integrated, as sustainability requires coordinated change in technology, management systems, and organizational culture (Bögel et al., 2019). In this way, understanding the technology, such as the essential criteria for adoption and system enablement, becomes increasingly important (Karahanna et al., 1999).

Much of the literature acknowledged uncertainties in technology's role in change management, including the scale of technical impacts and the relationships between change and technology. The uncertainties regarding the role of technology could affect the choice of technology, which has become an underperforming factor in addressing functional needs, technical requirements, and process modelling capabilities (Hove et al., 2015). For example, if adopting technology was determined as an internal change process in a passive manner (Avila & Garcés, 2017), technologies were not used to respond to changes in the digital transformation process (Vial, 2019). It was also uncertain to what extent technology changed business processes and operations (Goncalves & Campos, 2018; Mogogole & Jokonya, 2018). In other words, changes could be moderate, such as shifts in organizational practices from bureaucratic to more adaptive and cost-efficient (Hayes, 2010); or disruptive, such as broken power structures and knowledge hierarchies, which could meet resistance (Goncalves & Campos, 2018). Therefore, uncertainties are reflected in the possibilities that changes can be big or small, change processes and activities could be top-down or bottom-up, technology could be a part of changes or an issue to be resolved through change management, and exploring new technical changes could be a trade-off of using current technical resources (Bögel et al., 2019; Bygstad & Øvrelid, 2021; Vial, 2019).

Is Regulation a Sound Approach in the Case of GenAI

The divided perceptions of technology, as discussed in the previous section, resulted in questionable responses to the debatable change effects of new technologies. In the case of ChatGPT in education, there have been calls for academic policies to regulate its use, but there have been gaps in holistically examining AI tools in learning, the potential real problems in the education system, and the broader environmental and social impacts of ChatGPT on education. In light of newer literature advocating for the policy/regulation support to engage GenAI in teaching and learning (Christ-Brendemühl, 2025), it would be dangerous to use regulation to suppress ChatGPT, which could only cover the real problem in the current educational system.

It should be no news that students use AI tools to improve their schoolwork, such as developing a writing style, managing references, and correcting grammar (Perkins, 2023). For example, Automated Paraphrasing Tools (APTs) could paraphrase texts with different wordings (Perkins, 2023). Just like ChatGPT, the tool was far from perfect, but the focus on students using the tool to make writing less like original text and the assertion of academic dishonesty and paraphrasing plagiarism (Perkins, 2023) could be premature and diminish the potential positive changes that APTs and other AI tools could bring. Therefore, there was a need to evaluate new tools available to students and create clear guidelines to facilitate responsible usage (Perkins, 2023) without assumptions about the usage, advantages, and disadvantages of new technologies. In the case of ChatGPT, when asking ChatGPT to generate five paragraphs on how academic integrity policies needed to be adjusted for students using the latest technologies, ChatGPT returned a fluent output with falsified references and inaccurate information (Perkins, 2023). Minor editing and small adjustments of references (Perkins, 2023) were insufficient – students must invest considerable effort to detect and correct ChatGPT, which could require more learning and knowledge application than working without it. In this sense, ChatGPT could serve as a starting point for learning, and educators should focus on helping students use ChatGPT to enhance learning instead of suppressing it through regulation (Lancaster, 2023; Stojanov, 2023). In this sense, a holistic understanding of ChatGPT was needed. Otherwise, regulations could take a one-size-fits-all approach, despite differences between intended and actual technology use.

The presence of GenAI tools in higher education is unavoidable, suggesting that higher education may need to adapt to technological advancements and explore ways to enhance learning through AI. For example, teachers needed to rethink new teaching philosophies and methods (Tlili et al., 2023). It was also possible that students had no intention to attempt to cheat by using ChatGPT, but to improve academic performance by submitting more polished works (Lancaster, 2023). However, there was a gap in assessing such a possibility. Instead, the literature solely focused on the potential adverse effects of ChatGPT, such as the threat to the fidelity of drafting short essays in Physics using ChatGPT (Yeadon et al., 2023). Based on these assumptions, the literature has called for academic regulations and policies to address plagiarism and academic misconduct that AI tools, such as ChatGPT, could cause.

The changes in GenAI in education have had profound environmental and social impacts, beyond the micro-lens of academic performance. For example, suppose ChatGPT was perceived as the ultimate knowledge authority and a single source of truth (Cooper, 2023). In that case, the risk of insufficient qualifications in utilizing evidence to challenge copyright infringement necessitates higher education to position ChatGPT within a broader social context, whose scope extends beyond academic integrity and regulations (Cooper, 2023). Moreover, given the significance of education in society, the use of ChatGPT could alter the current educational structure, including by facilitating discipline-specific interventions (Lancaster, 2023). Yet the current recognition of ChatGPT in education has not been linked to the broader social environment beyond the campus.

It was unclear if regulating in terms of suppressing usage was a sound approach in the case of ChatGPT. Given that ChatGPT was still a relatively new phenomenon in the educational field, the discussion of how ChatGPT could tempt students to use it to write papers without doing their work and lead to a decrease in academic integrity (Perkins, 2023) seemed to be premature without achieving a holistic understanding of the cost-benefits of ChatGPT and possible enablers of strategic usage. Yet one thing was clear – ChatGPT and other text-generation tools were here to stay, so the domain of education must embrace and be ready for the change rather than ban it out of fear of change (Lancaster, 2023). Therefore, the gaps in the current literature - holistically examining AI tools in learning, the possible real problems of the education system, and the larger environmental and social impact of ChatGPT related to education – need to be filled before considering regulations or other measures to promote responsible usage of ChatGPT in higher education.

How to Determine Technology Suitability and the Real Problems

Research on the relations among technology, ethics, and suitability in the social science field has continued since the 1970s (Schramm, 1977). However, in practice, change failures often occurred because the chosen technologies did not align with the organizational culture or effectively address problems, particularly when the root causes were not correctly identified. In other words, needing change, as determined by traditional change management as the main change driver, did not necessarily mean that a piece of technology or a technical solution was a suitable change channel or guaranteed positive change results. The disconnection between technology and change management is also confusing. For example, due to unclear role and responsibility assignments in technology, IT change projects could be mistaken for the IT department's responsibilities (Goncalves & Campos, 2018). The discussions on why, what, and how technology-related changes occur were limited to business stakeholders, who might lack expertise in technology, rather than including technical experts (Goncalves & Campos, 2018). Moreover, there was no right way when using the wrong methods to solve the wrong problem (Malik, 2022). In other words, sometimes the path towards change success was to realize that the so-called problem was not the real problem (Malik, 2022). Therefore, it was crucial to understand the real problem rather than its symptoms or misconceptions. Otherwise, a change failure could occur when using an unsuitable piece of technology to tackle the wrong problems.

Technology suitability meant the choice of technology must target the underlying issues that drive the apparent need for change. In the traditional change management framework, identifying and solving problems are aimed at facilitating people and knowledge during the change process (Weisbord, 1976). However, when initiating changes through adopting technologies, the apparent symptoms and problems might not present the real issues that clients were concerned about (Hayes, 2010). For example, a client's problem identification and requirements of technical applications could be about what the clients perceived, but they could be different from a software developer's problem identification and vision that reflected the hidden problems that the clients did not perceive (Jayatilleke & Lai, 2018). The real issues could relate to other less visible problems and needed to be addressed at the start of the change process (Hayes, 2010). For example, even though blockchain could increase efficiency and security for e-voting, e-voting required high levels of both privacy and verifiability, which happened to be a key trade-off of blockchain (Wüst & Gervais, 2018). The inability to address less visible problems rendered blockchain unsuitable for e-voting, despite numerous studies in the literature advocating its potential benefits. It was very dangerous to assume that technology was a shortcut to change everything without considering whether the technology was a suitable choice to initiate or support changes (Porter & Heppelmann, 2014). Therefore, understanding the hidden problems and choosing suitable technologies / technical solutions were crucial, or projects would fail when applying the perfect change process to the wrong problem.

What is the Value and Concerns of Data

Technology and data have been inseparable and equally crucial parts of any technical product because all types of technologies generate data through human usage. Discussing technology without mentioning data was impractical. Yet data was ubiquitous, and its amount and complexity presented an increasing cross-boundary trend in the age of big data (Russell et al., 2017). In fact, one significant side effect of technology was big data, an understudied area in technology adoption. Just like an all-you-can-eat buffet did not promote good dietary practices, big data created practical issues in data access and research practices, with complex implications that have gone beyond the theoretical discussion of data management practices (Davis, 2010). Facing endless data repositories, which increased in size by the minute, accessing and retrieving useful data became a difficult task (Davis, 2010).

Yet, change management frameworks were limited to a cognitive map linking organizational change goals to societal values (Weisbord, 1976). If a technology choice focused on the business drivers and change enablers (Hove et al., 2015), rather than the data produced through technology adoption and usage, there could be a disagreement on what success was between traditional change management and technology-related change management. Research on human information interaction (HII) helped clarify how humans create and use information/data through technologies (Russell et al., 2017). Regarding data analysis and value creation, low data quality and the lack of cleaning, management, and preservation strategies could impair an organization's ability to extract value from data. More concerning, if data fell into the wrong hands, such as in a cyberattack, the adverse effects on the organization could be devastating, including lost client trust, legal challenges, and national security concerns. Therefore, greater focus on data creation, flow, and management has been urgently needed in the context of technology-related change management and practices.

How to Apply Socially Constructed Understanding to Technology-Related Changes

The social science field has provided a relatively holistic understanding of the relations among environment, organization, and technology. However, the current change management research lacks an understanding of the relations between technology and society in a socially constructive manner. In this way, change and technology have often been managed passively at the micro-organizational level, not actively transforming with large-scale social impacts. To bridge this gap, socially constructed technology-related change is needed to achieve a holistic understanding of change factors, to bridge the management and social science fields in managing change, and to practice active transformation at the social (macro) level.

A socially constructed understanding required applying a holistic understanding of the (external) environment, organization, and technology to the actions of managing change, with consideration of specific social realities and ripple effects. However, research on technology-related change management has been fragmented, with many specialized areas ranging from traditional change management to social science fields. In other words, the research publications have been empirical and have focused on developing new change management frameworks across different technical areas. For example, an agile approach was used to manage software requirements and changes during the development process (Lloyd et al., 2017), which assumed that change success could occur in a specialized area with a specific approach at a particular stage, without considering the broader change environment. The study of the psychology of human-computer interfaces began in the 1980s, but it focused on human behaviour and cognitive psychology in technical environments (Card et al., 2017), rather than a more holistic approach to interactions between society and technology. Even though literature recognized that change management should be an integrated process in practice throughout the change life cycle (Hove et al., 2015), as change happened at the individual/people, organizational/structural, and system/technical levels as a whole (Beer, 1980; Long et al., 2018), managing changes was still restrained as technical processes at the organizational level without expanding to the socially constructed understanding and practices.

The bridge between change management practices in the management field and the holistic understanding of managing change in the social science field should be a prerequisite for establishing socially constructed thinking and its applications. Currently, change responses have been more passive than active, such as organizations needed to prepare for changes according to external forces, such as the change of market, despite the long history of research and the multi-disciplinary nature of change and management (Jayatilleke & Lai, 2018), but the needs for changes did not mean the change was in the right direction and benefits the organization in the short- and long-run. In the social science field, change management has been understanding-oriented, encompassing a holistic understanding of change, organization, and technology. However, these understandings have been missing from change management practices in the field of management. Therefore, theoretical knowledge of managing change and the complexities of ripple effects among change components from the social sciences needs to be applied to action-oriented, traditional change management in the management field. This would help achieve a combination of understanding before action and actions based on understanding.

Holistic understanding-based actions led to active transformation. Currently, research has been conducted to update existing structures and tools to better respond to changes and improve performance, but the methods have been more passive adjustments than active transformations. There has been a severe lack of active transformation to establish a culture of change, identify and target potential problems instead of merely fixing problems, actively mobilize organizational components to adjust to the ever-changing environment and technology, apply suitable technology as transforming forces instead of mere tools to support organizational functions, and learn from mistakes. In the digital age, changes occurred rapidly to the point that theories alone could not explain or predict them (King, 1994). Therefore, active transformation, alongside technological evolution, is needed to replace the current passive responses to rapid, unpredictable change. Only then, managing changes could become more socially constructed, which benefits big-picture thinking in organizations and the macro-level of society.

Part 5. Theoretical Perspectives

Theory had no agreed-upon and clear-cut definition (Mortensen, 1979). The purpose of a good theory should help enhance understanding of a phenomenon, not to describe factors or predict usual responses (Rosenbloom & Christense, 1994). In the case of change management, both management and social science fields have provided abundant change management frameworks and theories with distinct focuses. As demonstrated in the past sections in this chapter, the management field was action-oriented in change initiation and implementation, while the social science field was theory-oriented in examining the complex relations among society, organization, and technology. The gaps in the literature revealed a lack of connection between the two fields and a need for a deeper understanding of key change components, including the real problem, technology, and data. Theoretical perspectives need to be applied to fill gaps and provide theoretical support for this research to continue.

This research adopted two theoretical lenses – Bijker (1995, 2009)'s Social Construction of Technology (SCOT) and Weick (1979, 1995)'s sensemaking – to expand the scope of change management at the macro-social level while focusing on the details of change and people's relations at the micro level. The two theories were selected from among many others for two reasons. First, as identified in the last part, the current change management studies have been mostly fragmented and have lacked a socially constructed understanding of technology, environment, and organizations. SCOT and Sensemaking provided relatively holistic considerations of many aspects of change. Second, specifically, SCOT enabled the expansion of technology-related change management to the level of social construction. Sensemaking made sense of the complex interactions within organizations in various situations. Therefore, the two theories aligned with the holistic thinking guideline of this research, whereas other theories did not. The following two sections provide details on each theory and its applications.

Social Construction of Technology

The social science field has provided a rich resource of theories on change, technology, and management. One leading theory is the Social Construction of Technology (SCOT). Bijker's (2009) SCOT focused on the study of technical change in society and provided a theory of the development of technology and its relation to society and various aggregated factors, such as politics in technological culture. First used by Berger and Luckmann in 1966, social construction focused on the sociological aspect of reality, such as knowledge, gender, law, class, and artifacts (Bijker, 2009). Against the thinking that technological determinism (technological development was one-dimensional and free from social and political interventions), SCOT argued that technology was a high-level socially shaped aggregation of many single artifacts of social events and connections (Bijker, 2009).

To use SCOT as a problem-solving research tool, three steps should be followed (Bijker, 2009). The first step was the "sociological deconstruction of an artifact to demonstrate its interpretive flexibility," which involved identifying the relevant social groups and assessing interpretive flexibility (Bijker, 2009). This step led to the understanding of how the users perceived and described the technical artifact (Bijker, 2009). Technology should be designed flexibly to reflect users' expectations and feedback (Bijker, 2009).

The second step concerned the "description of the artifact's social construction," which required researchers to weigh users' expectations and determine the dominant designs (Bijker, 2009). The end result was stabilization of the final product, which marked the closure of the design process (Bijker, 2009).

The third step was about the "explanation of this construction process in terms of the technological frames of relevant social groups" to communicate the final product to the users, such as why a social construction process followed one way instead of the other way (Bijker, 2009). This step was crucial for shaping users' thinking and behaviour with respect to the final technical artifact (Bijker, 2009). Based on users' needs, technical requirements, social functions, and ongoing changes, sensemaking became crucial for understanding each step of the changes and their ongoing impacts, as discussed in the next section. Bijker had a signature example of creating a bicycle to demonstrate SCOT and the three steps of problem-solving (Bijker, 1995, 2009). To help comprehension, this research visualized SCOT in Appendix A: "SCOT – How to Build a Bicycle".

The application of SCOT has been broad, regarding 1) generating technical ideals to solve social problems, 2) linking different technical and non-technical disciplines instead of simply investigating empirical technical cases, 3) exploring different layers of technical and social problems, 4) providing an entry point to ethical analysis of technology but without a conceptual framework for in-depth analysis, and 5) exploring political dimensions relating to technology (Bijker, 2009). In this way, SCOT has provided the theoretical foundation for thinking holistically about the relations of technology, society, and change.

Sensemaking

Weick's (1979, 1995) sensemaking was more than a theory – it built on Weick's organizational psychology and human interactions. It emphasized the potential to understand what was happening during change (Schwandt, 2021). It was a provocative thinking process for organizations to understand complex relations between human actions and organizational management, asking pragmatic questions, including "Is that plausible and what are we missing?"

and how to manage unexpected situations (Schwandt, 2021). Weick's advocacy for people in change was more than environmental reactors – through keen observations, they could choose actions, create situations and new variations, and enact their environment (Schwandt, 2021).

The Organizational Sensemaking Theory was intended to make sense of less-known situations to better predict and respond to unexpected events (Weick, 1995). This was because organizations were not structured in a self-evident manner, with complex people relations and control mechanisms, so changes could take on various meanings, and collective activities were difficult to achieve (Weick, 1979). For example, one myth concerned planning, which most people considered a crucial first step towards practical action. On the contrary, plans in a firm served more symbolic and advertising functions to attract investors, since they presented the best image of an organization without the realistic challenges and possible failures (Cohen & March, 1974; Weick, 1979). Internally, plans were also used to gauge people's attitudes toward the changes and to make necessary adjustments for the following steps (Cohen & March, 1974; Weick, 1979). In this way, plans became a pretext for activities rather than for forecasting future-oriented changes (Cohen & March, 1974; Weick, 1979).

Weick's (1979) basic sensemaking model focused on understanding the relationships among social processes, organizational rules, staff behaviours, and interpretations of changes. In 1995, sensemaking was systematically expanded to a broader audience of change agents and managers (Schwandt, 2021). Weick (1995) proposed seven parts for sensemaking in an organization, 1) grounded in identity construction, (2) retrospective, (3) enactive of a sensible environment, (4) social, (5) ongoing, (6) focused on and by extracted cues, and (7) driven by plausibility rather than accuracy (Weick, 1995).

The first part, grounded in identity construction, involved understanding people's views of themselves and others, their perspectives on their surroundings, and their identity in the social environment. Such understanding came from human interactions, keen observation and critical analysis of behaviours, and an in-depth understanding of people's identities in society (Schwandt, 2021; Weick, 1995). The second part, retrospective, indicated an interactive process of actions and reflections (Weick, 1995). The third part, enactive of a sensible environment, meant being aware of the socially constructed environment in its current and historical states when making decisions and sense-making (Weick, 1995). The fourth part, social, meant to pay attention to all clues of social contract in people's conversations, interactions, activities, (mis)conceptions, and shared meanings/values during the sensemaking process (Schwandt, 2021; Weick, 1995). The fifth part, ongoing, addressed the nature of sensemaking's constancy, which had no start or end but was a constant state of thinking (Schwandt, 2021; Weick, 1995). It was also essential to recognize the ongoing interruptions caused by human emotions, unexpected situations, and changes in relationships among people (Weick, 1995). The sixth part, focusing on and by extracted cues, meant avoiding effortless sensemaking through easy cues or simple conclusions, noticing sound and less obvious cues, continuing to update existing senses, and striving towards the ultimate goals (Weick, 1995). The seventh and last part, driven by plausibility rather than accuracy, emphasized that, rather than accuracy, sensemaking should be plausible, coherent, reasonable, socially acceptable, and credible (Weick, 1995). To summarize, sensemaking presented a holistic, continuous, and non-linear process of understanding people's behaviours and social identities, acting plausibly and credibly, reflecting on the actions, relating to past experiences and current situations, making sense of the action and the environment, noticing new clues in the social environment, acting again, rethinking, making different sense… to achieve the common goals in a socially constructed environment (Weick, 1995).

Weick's sensemaking has been widely applied across fields, including understanding organizations and the science of organizing, changing conversations within organizations, the art of improvisation, and the in-depth analysis of what people say and what they mean (Gioia, 2006). In particular, sensemaking was applied to understanding the social environment and cues in different situations, analyzing the complex thinking process and interactions of people, and making sense of the complex components of change and people's interactions (Weick, 1995). Such emphasis on understanding has been beneficial for making sense of each step of change, including the role and function of technology, the real problems it addresses, and the social environment it affects. The literature also guided this research toward a more holistic, interactive approach to the various change components and sensemaking.

Chapter 3. Methodology

Research Design and Rationale

This research employed a case study method to investigate the integration of ChatGPT into university change management processes. This was a suitable approach, as ChatGPT has introduced new phenomena in university teaching and learning, yet little research has analyzed it holistically and identified key aspects. A case study grounded in a holistic, big-picture approach, aligned with theoretical grounding in understanding technology through a socially constructed view and makes sense of its various components (Bijker, 2009; Weick, 1979, 1995).

To understand activities within specific circumstances, a case study examines the complexity of a case or phenomenon, such as an event, process, or institution, in an empirical manner (Merriam, 1988; Stake, 1995; Yin, 2009). The case should be relevant to an integrated system that needs improvement, such as functional operations and rational purposes (Stake, 1995). Multiple cases could be selected to draw a single set of conclusions across different cases (Yin, 2009). In the context of change management in this research, the case selection within the higher education setting enabled an in-depth analysis of current understanding of ChatGPT, potential responses to its adoption and usage, and limitations in understanding and responding to new technology. Change management principles and theories of SCOT and sensemaking have been applied throughout the case study of ChatGPT.

This research is a single-case study, focusing on the specific instance of ChatGPT in higher education (Swanborn, 2010). A case study requires multiple sources of evidence and data (Yin, 2009). Therefore, this research collected data from two sources: interviews and policy document reviews. The two data sources complement each other – the interview data were collected from a single university to examine the phenomenon of ChatGPT in depth, while policy documents provide a broader picture of responses to ChatGPT in higher education.

Role of the Researcher

In general, the researcher should ensure data security, the privacy of the interviewees, the quality of data analysis and findings presentation, and the ethical use of organizations' information throughout the research. The researcher needed to manage the research project with detailed planning and follow the timeline for each research stage.

The role of a case researcher included advocate, evaluator, and interpreter (Stake, 1995), and the researcher's role shifted during different stages. At the data collection stage, the researcher's role was to keep a comprehensive record, filter and interpret the data that was meaningful to the research, and prepare the data for further analysis and the generation of findings (Stake, 1995). At the data analysis stage, the researcher's role was to derive meaning from the data through converging concepts, interpreting sentences/numbers, detecting patterns and recurring regularities, synthesizing information, and developing theories (Merriam, 1988; Stake, 1995).

This researcher was an insider to the organization under study, in this case, a university student. It was often advantageous to be an insider within the organization in which this research would be conducted. Being an insider gives the researcher the advantage of becoming part of daily operations and observing decision-making processes. The risk was that the researcher could develop close connections with the participants/the organization and form bias. Such bias could influence the researcher's interpretations of the research data (Creswell, 2018). To guard against such bias, a research journal was kept throughout the research process.

Data Collection Procedures

As mentioned earlier, a case study requires multiple sources of evidence and data (Yin, 2009). This research collected data from two sources: interviews and policy document review.

First, interviews were conducted to gather data on the change management process, success and failure factors, and the different job functions of executives (decision-makers), managers (change adopters), and staff members (users of new technology). The interviewee selection followed three criteria. Interviewees 1) were currently working in a university in Canada; 2) had worked with technology-related change projects; 3) had stories and insights on change project success and failure. There were no restrictions on specific job roles/tasks, faculties, or universities. The interview guide was divided into two parts: nine questions for all participants and two questions tailored to each job function. The interview guide is in Appendix B.

The research has received ethics approval. Using a solicitation letter to encourage interview participation, the researcher recruited and conducted interviews at a Canadian university for a year, until November 2024. The interviewees were recruited through three channels: 1) emails sent to identified potential interviewees, if they are listed on the departmental websites. 2) emails sent to departmental general mailboxes, if there is no information on the IT staff on the internet. 3) snowball sampling by asking interviewees to forward research information to colleagues and staff members. The response rate to emails is high among executives and managers, while staff members are mostly recruited with snowball sampling. The 20 interviewees were deemed sufficient because they yielded a representative sample and provided rich, diverse professional experiences, the details of which are included in the next chapters. The recruitment was terminated when the interviewees' responses began to overlap and showed detectable patterns.

All interviewees reviewed the consent form and gave consent before the interviews. The researcher conducted 20 semi-structured interviews, including eight executives, five managers, and seven staff members. The interviewees had 10-30 years of experience in IT-related roles and a variety of career paths. All executives had experience in managing IT needs, overseeing technology governance and technical/policy strategies, and interacting with university leadership to adopt solutions. All managers had experience in leading and managing IT services, operations, and implementation. All staff members had worked in supporting roles in IT (change) projects, such as serving as a liaison between learning and teaching, adapting applications and solutions in education and research, and reporting. A demographic table of the 20 interviewees was included in Appendix C.

Second, the policy document review included AI-related policies, guidelines, and frameworks of 22 major Canadian universities. There were two steps in the search. First, Maclean's (2025) survey ranked the top 50 Canadian universities. To gather a representative sample, this research only examined the first 30 universities. The researcher further adjusted the list based on provincial coverage. Therefore, Toronto Metropolitan University (formerly Ryerson University), Wilfrid Laurier University, Concordia University, and Sherbrooke University were excluded due to the overrepresentation of universities from Ontario and Quebec. The University of New Brunswick was included to reflect the inclusion of the province. The complete list of included universities was as follows:

1. University of Toronto
2. University of British Columbia
3. McGill University
4. University of Waterloo
5. McMaster University
6. Université de Montréal
7. Queen's University
8. Simon Fraser University
9. University of Alberta
10. Western University
11. University of Calgary
12. Université Laval
13. York University
14. Dalhousie University
15. University of Victoria
16. University of Ottawa
17. University of Guelph
18. Carleton University
19. University of Manitoba
20. Memorial University
21. University of Saskatchewan
22. University of New Brunswick

The second Google search included the university's name and the GenAI policy. The results usually included various GenAI policies and guidelines in different schools within the university. The detailed findings are in Chapter 4, Theme 4.

Data Analysis Procedures

The data being collected were qualitative. To analyze qualitative data, a combined inductive and deductive approach has been applied using open, axial, and selective coding (Krueger et al., 2014; Strauss & Corbin, 1990, as cited in Orlikowski, 1993). The coding was conducted manually.

First, open coding focused on content analysis and enables the researcher to extract knowledge and categorize data into initial themes and concepts (Agar, 1980, as cited in Orlikowski, 1993; Creswell, 2002). In this way, knowledge was generated by making sense of the data, not from pre-existing theories (Agar, 1980, as cited in Orlikowski, 1993; Stake, 1995).

Second, axial coding was applied to centre one open coding category and relates other categories to it (Krueger et al., 2014). Such other categories include factors that influence the core phenomenon and the actions taken in response to it in the case study (Krueger et al., 2014). This allowed the researcher to identify recurring themes, common categories, and associated concepts (Orlikowski, 1993).

Third, selective coding was the final phase, which enabled the researcher to write reflections and discussions based on the interrelationships among the categories developed through axial coding (Creswell, 2002). During this phase, the researcher developed theories from the categories and their interrelationships (Creswell, 2002, as cited in Krueger et al., 2014). Quality findings were generated through organized research notes, attention to detail, and constant review at each coding stage.

Validity Strategies

To achieve internal validity in the collected data, the findings must match the reality (Merriam, 1988). Therefore, the researcher needed to ensure the faithful recording and analysis of data.

For this research, the following strategies were employed to ensure data validity. First, the researcher kept a research journal to record details during the study, which helped guard against researcher bias. Second, the researcher analyzed the data as soon as it was collected (Merriam, 1988), as fresh memory could correct inaccurate records. Third, for interview data, live recording and faithful transcription could present accurate data. The researcher needed to deliver mistake-free transcripts and records and leave detailed descriptions of the data collection setting, environment, and experience to increase the trustworthiness of findings (Creswell, 2018). Fourth, if some of the interviewees wished to review their interview transcriptions, their corrections, feedback, and additional comments helped improve data accuracy (Merriam, 1988).

Ethical Considerations

Ethics approval from the University of Ottawa was obtained in November 2023, prior to data collection. This research followed the ethics rules. For example, a consent form was developed. The researcher presented the consent form to each potential participant and explained the contents. After potential participants signed the consent form or provided verbal consent, as captured on recordings, they could still withdraw at any time without negative consequences. Because of the nature of a case study, there were additional ethical considerations in data anonymity and transparency.

Data anonymity could present a challenge in a case study, especially when the organizations were small, and managers and staff were familiar with each other’s speaking habits, thinking processes, and opinions. To mitigate the risk of identifying interviewees, the researcher could not discuss the interview experience with anyone. Real names or the university could never be used to protect participants' identities.

Data transparency could be an issue. Participants from a university might hesitate to disclose personal experiences unique to the university that reveal their struggles or failures in achieving project success. In this way, useful data for the research was considered classified information by the organization. Therefore, the researcher emphasized the anonymity of individuals and universities, the data coding process that retained only aggregate data to safeguard individual identity, the confidentiality of responses, and the benefits of the research for improving change success in higher education in the age of GenAI.

Chapter 4. Findings – Change Success, Failure, Challenges, and ChatGPT in Higher Education

The central research question has been "*how do methods enhance technology-related change success?"* Three sub-questions have been developed to gather the necessary data to answer the central research question.

a. Why do change initiatives often fail in new technology adoption and usage?
b. What management approaches are currently applied to leverage ChatGPT's adoption success in higher education?
c. What strategies are available to leverage change processes connected to technology adoption, especially GenAI within organizations?

Based on the analysis of the interview data from 20 participants, the following three themes were developed: 1) change success and failure factors and gaps; 2) change challenges in executives, managers, and staff members; and 3) changes in education regarding ChatGPT. Theme four was based on the AI policy/guideline review of 22 Canadian universities. Direct quotes were used in each theme.

The findings from this chapter were compared with the literature review, the gaps identified in the literature, and existing theoretical frameworks to answer the research and sub-research questions in Chapter 5.

Theme 1: Change Success and Failure Factors and Gaps

The first five questions in the interview guide were designed to understand the change success and failure factors, examples, gaps, and possible improvements. The questions were as follows.

- What are the gaps, if any, between what you expected and what you see/experience during technology-related change projects?
- Could you give me an example of the most successful technology-related change projects that you have been a part of?
- What is change success and failure regarding technology, in your opinion?
- Why do you think that technology-related change projects fail? With an example?
- What can you do differently to make the change project successful? With the previous example?

1.What is Success and Successful Cases of Technology Change Projects?

Interviewees acknowledged that changes were evolving, and so was the standard for success. After all, “a project is measured by what it brings” (Interviewee 7, Manager).

The two examples below demonstrate the differences in success metrics between a traditional and a technology change project. In the first example, interviewee 2, a manager, provided a more traditional example of change success, encompassing goal setting, process, people management, and outcome. An organization had a clear goal of outsourcing IT globally in the early 2000s. The organization took it slow and spent two years processing the change with maximum transparency. Most importantly, it guaranteed employees’ positions for at least 2 years after the outsourcing was completed, giving them time to plan and ensure a smooth transition for the organization. In technology-related change management, changes encompassed not only hardware and software updates but also input from business and research partners to decide which new equipment to buy and to establish long-term relationships among partners. Therefore, treating change as a business has become more relevant in technology-related changes.

“They were very transparent about it, so we never felt, at least I didn't feel, that anything was being hidden from us and in that sense, when the outsourcing finally took place. It was almost as simple as handing in our employee badges from the outsourcer, and nothing else changed in the beginning.” (Interviewee 2, Manager)

In the second example, interviewee 16, a manager, presented a case to illustrate integrated efforts in technology-related change management. A university implemented ERP PeopleSoft to replace a legacy homegrown student information system. It was a $1 million project over 13 years. It was one of the most significant technical projects in the region at the time and the foundation of today’s student information system. It was a collaboration with a consulting company to ensure all applications were part of the ecosystem and integrated into the new PeopleSoft implementation. In addition to integrations, implementation, and technical reporting, a university with a central IT department and separate IT departments across faculties would require additional effort to integrate multiple systems. Such changes were complex, challenging, and rewarding.

“It touched all of the ecosystem of application that we had across campus and delivered solutions as well.” (Interviewee 16, Manager)

The interviewees primarily discussed the success of technology-related change management in three key areas: people, process, and outcomes.

1.1 People

A change could be successful if stakeholders were on board and had no complaints. This statement had two parts. The first part was about stakeholders on the board. According to interviewee 20, an executive, this was not about people agreeing with the change, but about whether a change practitioner could shift the perceptions of as many people as possible regarding it. Achieving this required an in-depth understanding, including stakeholders' understanding of the changes, why they were being adopted, what the change practitioner and the organization were doing, what the changes brought in their context, and the benefits (such as revenue and performance improvements). Such understanding made stakeholders more interested in the change and less likely to resist.

"It is not that people agree with your change because, like I said before, not everyone is going to agree. The change success is whether you are able to change the perception of as many people as you can who are targeted for this project." (Interviewee 20, Executive)

The second part was about no complaints. According to interviewee 18, a manager, change was also considered a success if users adopted the changes without complaint, as evidenced by positive feedback through phone calls and online reviews. Therefore, training or other methods to enable users to realize the maximum value of change were key to minimizing complaints. Interviewee 6, a staff member, pointed out that technology had enabled high-quality audio recording. However, students needed to know how to use it and how to create a high-quality recording. Therefore, high-quality training allowed stakeholders to appreciate the benefits of the new technology, not just by clicking the recording button.

"We succeed if we don't get phone call complaints." (Interviewee 18, Manager)

"They can get a chance to touch and create high-quality audio recordings and come back maybe with personal interest – that is the most rewarding." (Interviewee 6, Staff)

An executive, a manager, and two staff members identified the same example to demonstrate the success of getting stakeholders on board without complaint. The pandemic catalyzed the application of remote labs and desktops, enabling students to access labs from anywhere, rather than having to visit a physical space to use the software. From MS to Virtual Machine (VM) ware backend – a holistic solution to manage data centres and present them to clients anywhere to connect from a machine – universities were not licensed, were not ready for the costs, had issues managing students' access from different faculties, needed to collaborate among faculties and from top down, needed several technology/architectural reviews with varying groups of stakeholder, had security concerns… Although plans were in place to transition to virtual, there was no time for detailed planning; instead, the team adapted, and the transition was a success. Now the changes become the norm. Students use it, and no faculty member finds the need to go back to the pre-pandemic state.

"We had to integrate a special VMware Horizon agent on each one of those machines, which would communicate with the gateway servers that would present those machines to our student population. We had to inform professors of this new tool and service. It was about four to five months, during which I had numerous late meetings, technology reviews, and architectural reviews with various members of the campus community." (Interviewee 8, Manager)

"Understand how the change impacts an individual's role and what it means to them in terms of this change. This is not about technology but about people." (Interviewee 4, Executive)

1.2 Process

The successful process might not be as apparent as the successful outcome, as interviewees identified that people noticed what they got but not how they got it. However, success at each step of the process is crucial to the overall success of the change project. In other words, managing the process in different realities is vital for providing people with what they want and ensuring they use the technology as intended. In this sense, managing changes up front involves bringing in the right players, implementing a rigorous project management process, adhering to best practices, and hiring an external firm to guide the necessary steps to ensure success. Sometimes, it is necessary to modify an organization's business processes to align with its technical requirements. This is not easy, even though it is a crucial element of success. Below are three examples of how organizations manage successful change processes.

Interviewee 4, an executive, experienced a large-scale change within an organization that affected many aspects, ranging from facilities to research and from finance to HR administration. Such a significant change also affected many people who used this system. Aiming at the positive changes outlined in the strategic plan, the organization took 3-4 years to implement the new solutions. This involved adopting detailed change management approaches to prepare for disruptions, develop communication and training plans, and engage various stakeholders to address increasing complexity. When organizations are ready in each stage of the change process, change success becomes possible.

“There has to be some connection between what we communicate and the realities of how people live through the change.” (Interviewee 4, Executive)

Interviewee 19, a manager, offered several examples to demonstrate the importance of integrating various components in the change process. Moving a university’s existing on-premises email system to MS365 online involved more than just transitioning to an online platform; it also integrated with new features like Teams, OneDrive, and Work/Excel Online. To facilitate understanding of the change, the communication team shared a compelling story through various channels, including a change plan, training sessions, staff meetings, informal discussions, Q&A sessions, social media announcements, and coffee breaks. This change process enabled people to appreciate the new services, access data remotely from anywhere, and have a single entry point for the email system for both students and staff. The transition from Novell to MS Active Directory took a similar approach, helping people understand the necessity of changes, such as using a 6-digit code for authentication. The communication team not only stated that the change was an industrial standard but also demonstrated the harms of not making the change, such as children accessing one’s bank account when research data was lost due to the legacy system.

“Success often depends on how bad the situation was before. The worst situation is that ‘before’ was easier, and people have to accept a new thing, which doesn't meet their full expectation, right?” (Interviewee 19, Manager)

Following agile thinking, interviewee 14, an executive, identified successful components in an ongoing case that has been transforming advancement at a university. The process made sense in theory, including clear roles and responsibilities. However, the product, Microsoft PowerPoint, a dashboard system integrated with Microsoft Reporting Services, was difficult to use, and its expansion was expensive. Rather than continuing the process that led to change failure, the university took 9 years to develop an alternative solution, utilizing an open-source approach, a standard database, and distinct front-end and back-end components. The result was that the new solution made the process easier for fundraisers to engage users. Data was securely exchanged outside the email system. Such a process change might seem time-consuming and costly, but it ultimately led to success.

"There's contextual help everywhere. Interfaced with the CRM, users can view the progress of their requests. On the back end, the service providers can manage everything, allowing the requester and provider to communicate with each other directly within the interface. Then we can exchange data securely without having to use e-mail or liquid files, which is a real pain." (Interviewee 14, Executive)

1.3 Outcome

Outcome is a broad word. According to the interviewees, successful outcomes of technology-related change management were reflected in three areas – governance, change effects, and technical usability.

Governance is crucial in the change management process. An executive identified that traditional project management components, such as on-time and on-budget delivery, still applied to technology-related change management. A manager identified two key points of success: implementing changes with proper approval and validation levels and having the flexibility to roll back if necessary. Such an implementation should also have been adopted across the board where the technology was applicable, according to a staff member.

"Change success would be an implementation with the proper levels of approval and validation." (Interviewee 8, Manager)

Change effects were reflected in the comparison between the pre-and post-changes in business objective alignment and value-adding. An executive jokingly mentioned that success often depends on how bad the situation was before the changes. First, interviewee 16, a manager, pointed out that it was fundamental to ensure the technology aligned with and met business objectives in the change plan. For example, PeopleSoft's implementation aligned with the business goal of providing a better system for students. Such business objectives vary, such as improving services, supporting functions, improving user experience, reducing workload, processing tasks more efficiently, and worth the money and staff time, but the bottom line was to deliver what was expected in a reasonable and tempered manner, as agreed among interviews of all levels (executive, manager, and staff). A staff member offered the example of redesigning a university's key-and-card management system. The change project involved many steps and had a complex workflow, but the outcome was a significant improvement – the delivery time for access cards and keys went from 3-4 weeks to a few days or next-day delivery. The staff required less time to process requests, eliminating duplicates and manual data entry. The quality of data improved with the elimination of errors, such as typos. For users, especially students and professors, the process became simpler and more efficient with quicker deliveries. Even though no solution was perfect, this solution aligned technology with business objectives.

"Success is really about aligning with the business goals. Every technology project has a business objective, right, like cost savings or increasing customer experience. So if you're not meeting those, then surely it's not a very, you know, a success." (Interviewee 16, Manager)

Second, as agreed among all levels of interviewees, while it was ideal that change and technology brought new value and benefited the organization, it was considered a success if the change put in place a piece of new technology which was better and more efficient as promised; for example, better security and user experience… compared to what the organization had before. Moreover, the results of user adaptation and new technology are needed to deliver the right impact on the community and make a difference, not just look good on paper. For example, an e-award project successfully managed the full grant cycle to centralize research management. "It reflected the reality of the researchers' work environment, so no one hated it." (Interviewee 5, Staff). A co-op system took five years to implement and cost five times more than planned, but it met its goal by matching co-op students with opportunities. A student academic accommodation service gave back to the community and provided more effective aid to students. The Ventus was still in use and has been scaled to other universities.

The multi-factor authentication (MFA) system provided a good example, as identified by two executives and a staff member. Security-related changes have gone a long way from the days when calendars were shared publicly, and people knew with whom a professor had a meeting. Over the years, small changes have been implemented through ongoing communication with stakeholders. It was a change in perceptions for both professors and students, as communication helped them understand that security was not a barrier to easy access. It was an exercise in understanding stakeholders' capacity to absorb change through listening to their complaints, questions, and debates. Strategizing was necessary after understanding their capacity, which involved identifying the most critical changes to implement, focusing on the most challenging ones, and spreading these changes over several years rather than just one. In the case of MFA, it did not provide absolute security. Moreover, it could not make everyone happy, just like policies. Therefore, it was crucial to recognize MFA as a demographic shift, ensuring that a minority of negative comments could not undermine the change. However, without needing to understand the technology behind it, users found it easy to learn and use, and IT's communications were relatively straightforward, helping users catch up. Moreover, the process was gradual. One university brought only first-year students in the first wave of adoption. Over a period of 1-2 years, all students were gradually brought into the change, and the feedback was generally positive. When it came to specific stakeholders, such as clinicians, it was not just about user adoption but also about politics. Agreements and other negotiations were in place to defuse technical liabilities.

"You can't get everyone on your side, but you can do a great job of doing everything you can to increase your chances of success." (Interviewee 20, Executive)

Third, technical usability referred to the ease with which people use new technology, as noted by an executive. For instance, students and researchers could utilize the new system to monitor their grant proposals and financials. Building on this, a staff member noted that technology must stay current to maintain usability. This meant the technology needed to be adaptable, up to date, and responsive to users' needs throughout its lifespan.

"I think success is staying current." (Interviewee 12, Staff)

2. What is Failure?

Just as with success, interviewees noted that failure was difficult to define due to various metrics. For example, interviewee 11, a staff member, cited an instance in which managers initiated a change to a good platform that had no middlemen and made clients happy by responding to feedback efficiently. Therefore, it was a form of failure to fix something that was working fine, such as a stable stack or a good team. In other words, changing for the sake of change without a good reason, analysis, or oversight could bring nothing but failure.

"Failure is subjective, so it is hard to define". (Interviewee 20, Executive)

"If it isn't broken, don't fix it…they try to do the change, but the change was to do what change couldn't do." (Interviewee 11, Staff)

The interviewees identified technology-related change management failures in four areas: planning, people, processes, and outcomes.

First, a change failure could be rooted as early as the planning stage. According to executives, treating change as a one-time deal led to long-term governance issues, including hardware maintenance and ongoing licensing costs, which were important for large projects. External factors, such as one's limited career, as well as political and funding changes, also affected the willingness and ability to engage in long-term planning. For managers and staff, this lack of long-term planning made them feel that some changes were insincere or unhelpful. In other words, change for the sake of change could not be well planned, which was why change projects were often managed in a waterfall without re-evaluation at each stage or staying on top of things.

"Remember the path of technology, it is not a one-time thing but a life cycle. Sustain, or it will cost and bring the business down." (Interviewee 13, Executive)

Second, similar to change success, people played a crucial role in change failure. An executive pointed out that if a group of stakeholders, who happened to be the most impacted by the change and technology, were not made aware of the technology, the change failure became inevitable. A staff member also pointed out that if people did not use the new technology or did not or could not use it properly, it was also a change failure.

“I think failure is the inability to ensure that the population you're targeting, the people who are impacted the most with your technology project or your change project, are not acutely aware of what you're trying to do.” (Interviewee 20, Executive)

Third, when changes were not properly communicated, processes were not followed, and technology was not adequately tested, failure occurred, according to a manager. For example, a small change, such as an email function, did not require massive change management. However, if someone changed something without documenting or broadcasting it, email might stop working, so small changes could lead to significant failures in organizational processes and operations.

“Changes shouldn't just creep up on people and impact their systems without giving some heads up. So a failure to me would be any change that has not been properly communicated or tested, and no rollback plan has been provided.” (Interviewee 8, Manager)

Fourth, the outcomes revealed a clear distinction between success and failure, categorized as no impact, minimal value, and significant negative impact. For staff members, if a new system showed only visual changes and did not meaningfully improve employees’ day-to-day work, it was a change failure. In other words, if the change brought little value and, in particular, was not proportional to the amount of money and resources invested, it was a change failure. For instance, an organization might spend a significant amount of money to address a minor or cosmetic issue in a technology, potentially leading to more substantial operational problems. Most gravely, interviewee 2, a manager, pointed out that there could be massive negative impacts on an organization, including employee dissatisfaction, stress, a decrease in profit, and interference with shareholder value, which led to the failure to meet any change objective or need, improve anything, or bring business value or a usable technology.

“Failure would be the opposite of what would be a massive impact to the organization and everything from employee satisfaction to failing to meet any of the objectives in the project.” (Interviewee 2, Manager)

3. Why do Technology-Related Changes Fail?

With an understanding of how executives, managers, and staff members defined the success and failure of technology-related changes, the next step was to investigate why these changes often fail. The short answer was that it depends. Executives pointed out that it depended on whom to ask and on the definition of failure. For example, users might think that failing to deliver what needs to be delivered could be a failure. However, for executives, not knowing or not being clear about the needs or what to deliver to start with was a failure. Then the mismatch between what was planned to deliver and what the users wanted became a definite failure.

“Failure is very subjective to the individual that experiences the change…we could have deployed MFA to 60,000 people, but five people in executive positions might have had a bad experience...was it really a piece of crap? Failure is very much based on perception.” (Interviewee 20, Executive)

The previous section explained the definition of failure from the interviewees' perspective. One crucial point was that failure was perceived differently across environments. For example, cancelling certain parts during piloting was not a failure but a quit. However, different sectors might respond differently when unsure how to address quitting. The private sector was quicker to realize when to move away from a failure by quitting. The public sector was more challenging due to its funding structure, so instead of quitting, stalling could lead to failure. Therefore, the sooner an organization realized and admitted "failure," the sooner it could put controls in place for the project. The cost of learning would be minimized to enable the identification of risks that cause failure, according to an executive.

The interviewees identified four areas of mismanagement that could cause failure: planning, people, process, and outcome.

3.1 Planning

Planning was the first step in justifying and initiating a change, so the failure of planning was the root cause of the failure. It was vital for technology-related change management because it was hard to go back and fix the technology if it was not set up right. Two types of planning could result in failure: lack of planning and improper planning.

Lack of planning stemmed from two reasons: being too comfortable with the current state or being too competitive to change it. First, when an organization was comfortable with its current profits and performance, it often lacked a plan for the future, such as hiring new talent or a strategic vision. Therefore, when the future arrived abruptly, massive mismanagement could occur if the existing structure could not keep pace with changes. This was what happened to Nortel, a Canadian telecommunications company, as a staff member pointed out. Second, competitions forced people to keep up, so an organization might sometimes feel rushed to change. In such situations, people wanted action instead of excessive planning, according to a staff member. For example, an executive noted that a university rushed to unload old licenses for SharePoint online and needed to access new permits. Such a rush resulted in the sacrifice of a data life cycle plan and information management processes, including information structure, file naming conventions, and metadata schemas. Therefore, the lack of planning resulted in inadequate preparation for the necessary arrangements and considerations.

"It took like a couple of months – they jumped into the project without defining the needs, and the thing turned out to be a nightmare that lasted years and years." (Interviewee 7, Manager)

No proper planning could cause a variety of issues, such as planning not aligning with business perspectives or bringing value to the organization, according to a manager. There were two reasons for the lack of proper planning: a misunderstanding of the relationship between technology and change, and environmental constraints.

Misunderstandings could occur across various planning areas, including the need to replace outdated technology, the context in which it is used, persuading people of the necessity for change, risk assessment, and identifying gaps between expected value and actual outcomes. The principle was that technology-related changes could not be implemented in the IT bubble without being tied to the business process and operations. After all, no matter whether it was a small or transformational project, IT was no longer by itself but related to the business and other sides. According to an executive, failing to understand the technology requirements and the effort involved could lead to failure. In the world of technology acquisitions, there was a need for due diligence to test and so forth. Inadequate due diligence could result in being stuck with a product that did not perform. If in doubt, the change project must stop and start looking for another product, or spending more time on a failed project could result in the loss of key, irreplaceable talent. Therefore, being overly optimistic and overcommitting without considering the technical due diligence could miss key checks on a data system and cause integration delays, as in the case of Workday.

"In the world of product acquisition, if purchasing is not done as thoroughly as it needs to be, nor is the review of the product, nor the due diligence testing and so forth, I mean, if it's inadequate, you can get stuck with a product that just is not gonna perform." (Interviewee 14, Executive)

Environmental restraints included resource constraints, organizational hierarchy, and organizational ecosystem. First, both the executive and staff agreed that organizations always face resource challenges, such as the lack of people, visibility, governance of solutions, and new systems. In particular, there were never enough resources assigned for change projects because, as an organizational culture, the funding allocated was always below what was needed. For example, if a change project required one million dollars, it was often asked for half that amount, fearing it would not get approved. Second, organizational hierarchy determined that changes often come from management. Suppose there was no proper engagement from the leadership. In that case, changes could be imposed on lower parts of the hierarchy, such as the development team, without considering the consequences of change. The technical staff's understanding of the technical mechanism of change might differ from management's objectives for change. Staff might choose to leave the teams, not in fear of the changes, but because they could not deliver a functioning stack to meet the objective of institutional change. Third, an organizational ecosystem had variables that did not favour changes. As an executive pointed out, changes for more efficient processes when adopting technologies can push the organization back to the status quo. Moreover, hiring the wrong people, a change of interest, and changes in budget, political environment, vendor, and technology itself could happen at any time during a change project. The longer the project was, the riskier it became due to changes in the ecosystem.

"Sometimes change can be forced by the outside. We don't have control necessarily over those changes." (Interviewee 3, Staff)

3.2 People

People were the determining factor in the success or failure of technology-related changes, as failure often lay with the people, not the technical aspects, which were easier to rectify. Moreover, people's perceptions and expectations could be different when measuring success and failure. Using the example of MFA again, some users saw it as a failure because it added layers to open low-risk applications at the individual level, while organizations saw it as a success because it was a sound security practice. This section examined three gaps that could lead to change failure: affected stakeholders were unaware of the changes, did not engage users from the beginning, and did not identify the proper stakeholders.

"You can't please everyone." (Interviewee 20, Executive)

People needed to be on board. Stakeholder engagement and awareness were key. There were three types of stakeholders in the change process: people affected by the changes, users, and subject experts. First, in general, people affected by the change should be aware of it. According to an executive, there was a general lack of engagement to make sure that people affected by the change were aware of it. One email from the technical team was far from enough to inform of changes because even minor changes, such as a telephone line, could affect various stakeholders. Therefore, it was crucial to involve and consult the teams that would be affected by changes to ensure a thorough understanding of all implications.

"It's not necessarily a technological breakdown. It's a communication breakdown if there's a change being implemented and they're not properly communicating the potential impact to the stakeholders; there is a huge possibility for failure and negative impact to an organization." (Interviewee 8, Manager)

Second, all three levels of interviewees have acknowledged the importance of integrating users from the beginning of the change process. When users were not involved in the design process, consequences could include failing to ask for users' opinions, not engaging users in subsequent development, application, or release stages, insufficient user experience testing, solutions that did not meet actual needs, and technology losing momentum. It happens more than people think. For example, at a university, the virtual desktop replaced the labs without consulting the faculty. Therefore, when the virtual desktop was released, faculty were not aware of a whole bunch of requirements. The change needed was not met because no one talked to the users in the faculty first, and tried to make sense of the change project. The bottom line was that users must be on board. If not, the ripple effects included unhappy employees who harboured negative feelings towards the new applications and felt undervalued, resulting in reduced productivity.

"A misguided plan without involving the users will not get anyone anywhere." (Interviewee 7, Manager)

Third, the lack of engagement could be due to the failure to identify the proper stakeholders to engage. For example, an executive noted that while IT might be considered an expert in the technical field, its mindset differed significantly from that of the broader organization population. When the real subject experts on the business side were not identified and engaged, it could result in a misunderstanding of the changing scope and risks, so that the whole project could miss the mark.

"When changes are not well planned or set up, change is for the sake of changing. Value the needs in a day and jump to projects, and the nightmare of failure can last for years." (Interviewee 3, Staff)

3.3 Process

The process of implementing technology-related changes included many steps. Failure in communication and implementation could directly lead to change failure, which was discussed in detail below.

Relevant to the previous section on stakeholder engagement, communication was not merely about informing about changes but about ensuring in-depth engagement and understanding. For example, relevant stakeholders needed to understand the impacts of the change, as initiating changes without proper consideration could lead to failure or massive negative consequences. However, it was hard to manage because of the many moving parts, according to a manager. An organization might lack the correct documents for its legacy systems, making it difficult to measure and communicate the change impact accurately. A customized change process could also miss stakeholder analysis and user impact analysis. An example was that in the Cloud, an organization did not manage the entire system. If Microsoft made a change without adequate communication, it would have a massive impact, even though the organization did not initiate the change. Furthermore, such externally induced changes could trigger an internal change, as an adaptive/corrective measure, to ensure the system functions again for the university. Therefore, changing management protocols within an organization was not enough. Communications must extend to the external service providers who delivered services to the organization.

"I think that's tough to manage an IT because there are so many moving parts, not all of those parts are correctly documented, especially if you're talking about legacy systems. And even with that technology, much of our current technology is based on cloud systems that we don't entirely manage." (Interviewee 8, Manager)

Implementation could fail in various forms. A manager pointed out that in real life, there was never enough time to go through all the project details, unlike what the textbook teaches. Therefore, there was a need to cut corners to go through processes faster. At the same time, a prolonged transition could be a failure to implement changes in a timely manner and implement outdated technology by the time of change completion, according to a staff member. Flexibility during implementation also determined if the change was flexible enough for future improvements. The order also mattered. Implementing changes first and then explaining the changes and impacts to people afterwards, according to an executive, was managing fires by not recognizing or measuring the impacts immediately/correctly and running the risk of reversing the change.

"In school, you learn the whole 360 aspect of what a project should go through. In real life, there's often not enough time, and we always try to cut corners, skip parts of it, and try to find ways to make it work without following all the best practices because we try to go faster, but it doesn't always go faster. Something smaller projects can be handled differently if the appetite is there." (Interviewee 7, Manager)

3.4 Outcome

As discussed earlier, failure was primarily a matter of perception. A change failure could happen when expectations are not met, so the failure can be that the change promised too much to start with, or the outcome was doomed. In technology-related changes, malfunctioning technical products were the leading cause of change failure. For example, a staff member provided an example of backend systems that could not communicate with other systems, often due to a lack of Application Programming Interface (API) access or poor API implementation. In a university, the lack of a centralized system to retrieve information about students, employees, and others results in many applications duplicating the information in their databases or relying on daily Comma-Separated Values (CSV) file imports. This could be avoided if APIs were utilized correctly. This lack of integration and communication between systems created inefficiencies and hindered project success.

"A big failure, in my view, is when backend systems can't communicate with other systems, often due to a lack of API access or poor API implementation. A clear example is the lack of a centralized system for retrieving names of students, employees, or others. Many applications end up duplicating this information in their databases or rely on daily CSV file imports, which could be avoided if APIs were properly utilized. This lack of integration and communication between systems creates inefficiencies and hampers the success of projects." (Interviewee 17, Staff)

4. Gaps between Change Success and Failure

After discussing what success and failure were, as well as why technology-related change projects often failed, this section discusses the gaps between change success and failure to transition to the next section on what to do to make change initiatives successful.

Just as failure is subjective, "it depends" (Interviewee 16, Manager) also applied to the gap between success and failure in change. The size of an organization mattered. In large organizations, such as a university, the environment could be dynamic. It required a lot of effort to connect organizational factors (reviews…) and technical requirements (accounting, licensing, maintenance…). In small companies, changes were still challenging, but initiatives had a better chance to succeed because of fewer organizational dynamics.

While it is almost impossible to change the size and dynamics of an organization, it was essential to recognize gaps in planning, people, processes, and outcomes.

4.1 Planning – Gaps between Wants and Cans

It is common sense that one cannot always achieve what one wants. Nevertheless, human emotions and organizational/social factors could blur the distance between wants and cans, which was discussed in this section.

First, human emotions counted. When expecting a technical tool to be more exciting and beneficial than real or right, objectives could become unrealistic or unrealizable. There were various reasons for such a disconnection with reality. To start with, a manager pointed out that when decision-makers did not understand how technology worked and, more importantly, could misestimate what was needed to align and standardize technology across the organization, including employee competencies. A staff member provided an example of managers wanting to switch to a different stack, but the team was unable to achieve this, despite the managers paying for staff training. Such forced changes may not occur at the end, when employees leave, nor will the goal of cost reduction be realized when the organization must hire others to work on the existing stack. Therefore, expectations needed to align with what can be done over time,

“It is not like buying a TV for a home.” (Interviewee 6, Staff)

Humans have always been disappointed by the differences between what they expected technology to bring and what it actually delivered, even though the technology sometimes met their needs and fulfilled its intended purpose. Communication was always the key, according to an executive. When communication lacked transparency, and the change process must continue once it started, people could be underprepared for difficulties and potential disruption to the entire organizational ecosystem. After all, executives noticed that people perceived things differently and tended to make their perceptions the realities. In particular, IT professionals and users thought differently, spoke different languages, and expected different outcomes. Users might not always fully understand the technical approaches of IT. Without adequate communication, it was impossible to understand the difference between the expectations of people implementing the change and the experiences of people throughout the change. To make things worse, when things went wrong from what was expected, management tended to say everything was OK without owning the problems in the whole change cycle. This could result in lost trust, which did not end with the change. Therefore, it was crucial to communicate, even over-communicate, understand the users’ perspectives and expectations and be truthful about challenges to avoid trust being broken.

“A new application is not the end because people always want more.” (Interviewee 19, Executive)

Second, organizational and social factors were more difficult to manage than technical aspects. There was no surprise that money was always a factor in any project. An executive noted that insufficient funding could restrict the scope of a change project and hinder the development of a new solution. A staff member pointed out that, aside from financial constraints, cost-effectiveness was key for technology-related changes because both changes and technology cost a lot of money. Another executive gave the example that operating technology costs not only hardware installation but also delivering a solution and maintaining it, which proved more costly than expected in the long run. It was like a contractor building a new house was not the end. The new owners would renovate, buy furniture, and upgrade periodically, so there were always new costs. Even though a university did not develop the technology, the ongoing support for a technology change project and the technology itself required resources.

"Implementing the change is one thing. Sustaining the change always needs more people and work than expected". (Interviewee 19, Executive)

4.2 People - Knowledge Gaps, User Experience, and Resistance

The gaps in the people aspect coincided with the factors identified as success and failure factors in people. All three levels of interviewees acknowledge that the people factor played a role in the change process. It was not always about the technology, so we could not focus solely on technology and updates to achieve our change goals. After all, technology was more static than the failing part, and the perfect product did not always have user usage. If people were not on board to use the new technology/solution, it would be of no use, even if it were appropriately implemented. The lack of communication between what was promised and what the solution delivers also created gaps in communication and explanations. Sometimes it could take years for people to use a piece of technology. Therefore, we could not simply focus on the technology, put the project in place, get the server up, move all the data onto it, and tell everyone it is done. This section focuses on three aspects relating to people: knowledge gap, user experience, and resistance.

First, there was sometimes a knowledge gap among staff. According to an executive, it was not always about the lack of resources but the knowledge of the available resources, such as the new versions or features in technology. Sometimes there was a lack of staff who had the required knowledge and training to facilitate change. Therefore, relying on other experts, especially in the AI field, could help fill the knowledge gap.

"Some of the changes that always seem to come back to us, especially in this day and age, are not just the lack of resources, which resources are always a challenge, but it's the knowledge that the resources you have, if it's a totally new technology or if it's just a new version or new features." (Interviewee 1, Executive)

Second, user experience counted. Staff and executives noted that while there was considerable discussion about the importance of user experience, it often failed to translate into practical project applications. In a technology-related change project, it was required to know the audience and stay on top of things and their environment. Regarding the environment, business analysts often did not understand the environment that users were in, their industry, or the subset of the industry (for example, public relations or philanthropy). A manager noted that difficulties in user adoption were not always about resistance, but rather about bad timing in the users' environment. For instance, the summer might appear to be an ideal time for change projects, as students are not on campus. However, faculties often used this period for house-cleaning, which did not necessarily mean they had more time available during the summer months.

Regarding knowledge, clients often lacked familiarity with specific changes and technical terminology, particularly in the context of Workday, an enterprise resource management software designed to organize HR, finance, and other related functions. It has been a challenge in change management because it was unclear what the real, concrete realities of the users were and how users could be integrated. Only with clear information was a leap of faith possible for those affected by the changes, such as professors and students. Therefore, organizations needed to bring users in and equip them with training and resources, rather than just telling them about the changes.

"The users should be brought in, not to be told." (Interviewee 5, Staff)

Third, changes would not please everyone, so there would always be resistance. Executives and managers noted that, although communication enabled quicker adoption, people's diverse expectations could make it challenging to realize them in reality. This was particularly true in large-scale transformation projects involving a diverse user base, encompassing several thousand employees and half a million students. Professors were particularly resistant to changes, such as those related to security, due to varying levels of knowledge and mindsets. Therefore, it was impossible to account for everyone's needs and meet various expectations. At the same time, the fear of resistance could lead to prioritizing user needs over identifying the real problems, the organization's objectives, and the goals. What users wanted and their proposed solutions were sometimes not what they needed. Therefore, it was crucial to always aim at giving a properly fitted solution through goal assessment of different projects and stakeholder environment/user experience analysis, not simply what people asked for.

"The other thing that we notice too is that professors, like the academic group, are very resistant to change, very resistant to anything that is security-based." (Interviewee 18, Manager)

4.3 Ideal Process and Actual Process

It is not an exaggeration to say that if changes followed an ideal process from planning to communication and from technical testing to implementation completion, change success would increase tremendously. However, this seldom happened in reality.

The ideal process was that things went very easily, but the reality was much more complicated, as an executive pointed out. This tied back to the people factor – there was always someone to complicate even the super small change. Certain stakeholder groups were not receptive to an agile system that helped absorb changes. For instance, professors aimed to educate students more effectively, but their openness to understanding technical innovation was not always evident, making the process of change in the professor cycle more complicated than it needed to be.

Technology changes always came with process changes. A staff member pointed out that even though going agile was supposed to come with technology-related change projects, old practices, such as in-person meetings, were still used as if the project were a waterfall. Such misalignment reflected a deeper level of misunderstanding of technology-related change management. For example, when management wanted Agile to measure how much code the staff pushed, they required staff to commit code to a Git repository. This resulted in more meetings and a drop in output by half. More than a waste of resources, the more important question was what the ownership of change processes should be like. Was it designed to fix the real problem or just the symptoms through opening tickets? Applying traditional change processes was likely to mask real issues unless there were continuous efforts to understand and address them. It was not like if the ticket was closed, all was good. In other words, tasks were completed, but this did not necessarily mean the application was functioning correctly or achieving its change objectives. Opening another ticket would not fix the problem.

"But we were, you know, more into meetings and more agile, but in the end our output was half…So when like agile, sometimes it's just you're filling in tickets, it's more like my ticket is done." (Interviewee 11, Staff)

In an organization where IT was centrally managed, change processes could be complex. For example, in a university, the central IT used an endpoint application to manage servers. However, each faculty also managed more than 800 endpoints. When central IT initiated a change to its endpoints, it could not implement the change across all faculties due to licensing concerns. The situation turned out to be that there was no permission for the faculties who adopted this change. To make things worse, the change was not user-friendly, so some chose to use the old one. The failure of change processes led to the failure of the entire change.

"And the problem that we ran into was when they brought it out, we were excited to try using it. They wanted us to use it, but they didn't give us half the capabilities we needed, as they reserved many things for themselves. So it became very difficult to use it for anything. Then we were kind of stuck using the old system for some things and then struggling to try and use the new system, but then realizing that we couldn't use it because we didn't have the permission that we needed." (Interviewee 10, Staff)

4.4 Outcome – Technical and Continuous Management

Regarding the people factor, there was often insufficient support to encourage people to adopt and use technologies, such as demos, documentation, and training, as well as collecting champion/user feedback after testing. However, the sheer focus on the people side did not realize technical optimism. The interviewees provided information on three gaps in outcomes: cost-benefit, technical functionality, and continuous management of technology.

First, even though it was not strictly a technical failure when cost and benefit were not balanced in technical-related changes, the project was hardly a success. An executive pointed out that this happened when applying big technologies to solve minor organizational problems, resulting in low returns for high investments. This also happened, as a staff member pointed out, when it took an extra long time to deliver a project. By the time the system became fully operational, new technologies or requirements might already be in place, rendering the initial implementation outdated or overly complex.

"The centralized system is trying to be prudent about what they give out, but that ends up restricting the usefulness of the tool for the people using it." (Interviewee 10, Staff)

Second, technical features were not the sole determinant of change success, but functionality was necessary to provide basic technical functionality. An executive offered this example: if there were flaws in the basics, such as username and password setup, they needed to be addressed before discussing change management, not only on the organizational side but also on the vendor side. Yet IT was very solution-focused, so organizations and vendors did not ask why technical flaws existed, what was missing, or what risks were causing negativity, especially when different stakeholder groups, teams, and priorities were involved. These should be addressed early before planning, designing, and analyzing changes.

"Technology is not the failing part. Often the gap is what's comes around it. And that's when I mean change management. So example could be you have a wonderful product, it does A to Z, but the user doesn't know how to use it. They don't even have the username and password and so on and so forth." (Interviewee 9, Executive)

A staff member noticed that the gap in outcomes appeared as expected key functionalities were not included in the final delivery, and, in some cases, they never got implemented. "When a project relies on third-party vendors to provide critical features, organizations may not have the final decision power to have the exact tools needed. This dependency can be a significant challenge in keeping pace with organizations' evolving demands." (Interviewee 17, Staff)

Third, managing technology was not a one-time thing but required long-term management and scaling. This was because technology changed over time. Staff members argued that failing to use and manage new technologies properly was akin to starting without finishing, resulting in a waste of time and money. Moreover, without keeping pace with technological changes, organizations risk reverting to the same ideas over time and failing to fully explore newly acquired technologies. Suppose an organization could not continuously manage its existing and evolving technology. In that case, scaling and making changes across a large number of users, such as half a million students at a university, would be more difficult. This resulted in small user groups, such as 1% of the students each semester, being engaged to learn and use the new technology, which was a diminishing return on investment.

"We do a little bit of guesswork on what we think that we could manage in terms of adopting." (Interviewee 6, Staff)

5. What to do to Make Technical-Related Change a Success?

5.1 Planning – Understand Lifecycle, Requirements, Effects on People, and Failure

It was common sense to know that the chance of failure was much higher if the change and its requirements were not well understood. What to understand was that technology-related change management differed from traditional change management. Therefore, to reduce the rate of change failure, the fundamental step in planning at every stage was to understand how technology-related change management differed in terms of lifecycle, requirements, effects on people, and failure.

First, the project lifecycle was different in technology-related change management. To start with, planning needed to be well in advance, including data lifecycle and licensing. This ties back to the point of integrating the user from the beginning of the process and understanding the technology, according to interviewee 5, a staff member, not just data gathering or consulting. This included developing a continuous communication plan rather than a one-time effort. According to an executive, such a communication plan included coordinating with stakeholders, assessing the change's impacts on them, and understanding and building relationships with the communities that the change serves.

“It's not just people who make all the announcements and send the communications. It’s really what I would call a trainer slash coach who can write user documentation and write all the context-wise help on pieces of technology.” (Interviewee 14, Executive)

Then, some executives recognized that the path of technology change was not a one-time thing but a lifecycle to be sustained. If not sustained, it would cost more than initially planned, and continuous financial surprises might bring the organization down. If not maintained or supported, a functioning technical project would decline and fade. Moreover, without understanding the need to sustain beyond a fixed lifecycle, today’s success could become tomorrow’s failure if the system's functionality and how to fix it are not documented after a successful implementation. Therefore, it was vital to treat technology-related change projects as an evolution rather than a one-time project.

Such a need for sustainability required the move from project to product management. Unlike traditional project management, moving a technology-related change project could not have a set timeline or a set budget. Attention needed to be shifted to the technology product itself, including what to plan and design, how to run on time, and what to deliver. Otherwise, a perfect change management practice could lead to a project failure if an organization does not adopt a product management lifecycle.

“In a product lifecycle, products will decrease in value after coming out, if there is no continuous improvement. Changing the mindset from project to product management is crucial to distinguish between success and failure.” (Interviewee 9, Executive)

Second, technology-related change management required a more in-depth understanding of the real problem, business needs, and process change. After all, according to a staff member, what was the point of changing and investing all the time and money if no one used the technology? Therefore, business analysis was required to determine needs. However, there was less time and attention to the real problem identification and business analysis at the executive level, as an executive acknowledged. The staff had more time and a better understanding of what mattered and what was relevant when monitoring their performance. Still, executives had no time to engage in conversations with staff. Therefore, solutions often came from many possibilities that did not address real problems or needs.

In this sense, planning needed to be built on a better understanding, such as when to move on from an aging technology. An executive recognized that change projects were usually underestimated in terms of timeline and budget, so more guidance on what to plan was needed. Take one at a time and be realistic, or an organization could not fulfill what it aimed to do. A staff member observed that it was particularly important to keep the scope in check. An organization might start small but add up to many people's requests for the change. It was one thing to satisfy stakeholders, but it did not mean adding too many requests that an organization could not fulfill.

"People say, can you add this, this, and this, and you try to satisfy them. But trying to add too much stuff…it just doesn't work well." (Interviewee 10, Staff)

As executives pointed out, there was also a need to understand the process changes required for technology-related change management. On the one hand, agile must replace waterfall to ensure validation and consultation with users during development, thereby enabling users to understand the solutions. For example, when building a new medical building, it was necessary to consider how to gather a diverse community of users and researchers and collect technical requirements. The 30-60-90 methodology should also be applied (from 30% accuracy of the requirements to 60%, then, hopefully, to 90% through continuous consultation and revalidation of the requirements and solutions throughout the implementation). That was how to evolve the process to translate requirements into technology adoption.

"But even in a waterfall where we gather the requirements at the beginning, we have a tendency to do requirements, do development, and then whoops, here goes a solution. But we totally skipped consulting back with the users and validating during development." (Interviewee 4, Executive)

On the other hand, technology-related changes required a decentralized leadership model. In universities, each faculty and department/school had different rules and processes, so it was difficult to deploy institution-wide solutions. In other words, automation was impossible when people tried to manage their small systems manually, which could be hundreds of systems (some can be duplicates). Therefore, attempting to create one-size-fits-all solutions and automation when business processes differed significantly within an organization was a recipe for project failure.

"They'll try to have a one size fit all solution. OK. And then it'll go through the initial approvals, the project for its adoption will be approved, and then once it's pushed out, people start complaining and saying, well, it's not that it doesn't do this, it doesn't do that." (Interviewee 8, Manager)

Third, it was important to understand the effects on many people with different views on changes. A staff member noted that when a change affected 100 people, there was a chance that 10 would not buy in. The resistance was manageable. How about a couple of thousand people? In addition to understanding the source of resistance to provide targeted training and meet specific needs and expectations, taking small steps could be one approach. In other words, it was worth trying to simplify things, take small increments, see small improvements, and make multiple preparations for bigger changes. From small changes to big ones, it was progress, just like one could not jump from a manual car to a Tesla with only a screen and no handles or buttons. Therefore, an organization should adopt a customized change management process based on stakeholder analysis and user impact, as the traditional triangle in project management – budget, time, and goal – was not flexible enough to manage technology-related change projects, which was agreed upon by managers and executives. The change management process needed to be flexible enough to accommodate concerns and knowledge from various stakeholders.

"Technology is a double-edged sword. Just like in the case of AI, implementation can make people worry about their current state, such as losing jobs. Need a fine line to balance different perceptions." (Interviewee 9, Executive)

Fourth, there was a need to change the understanding of failure. Both executives and staff recognized that there should be no fear of taking risks or admitting failure, as there was much to learn. It was just like bouncing back and forth between experiences with partners and shaping ideas in a sport. For example, in a transformation project for a university's website, the goal was to leverage cloud technology to reduce costs and improve service and security. The university also owned applications and data, even though other parties managed them. However, the failure was that no one cared. People only needed a running website, so all success was a failure because it did not address user needs and demands. In this case, the need was not to focus on the successful components but to think about failure differently, understand why it occurs, and conduct analysis to improve and align what we wanted with what we got.

"They changed the whole platform for the website, like issue with taxonomy. There's issue with the syndication of content and I'm seeing the problem and for me it's like crystal clear. The problem is when I'm talking to the application manager, I feel the person is not understanding the problem and then the person is driving a change and then like oh I gotta solution. (Interviewee 11, Staff)

In the age of GenAI, failure reflected in preparing for disruptions in technology-related change management. According to executives, this included identifying risks in order to prepare teams and stakeholders for disruptions. Risk management needed to be based on thinking things through, or it would create a lot of risks itself. During COVID, even though there was not much time to think things through, a university should at least know the basics of digitizing vaccination records, such as how many shots were considered acceptable. For a university, the failure was not as big a scandal as ArriveCan, but it was not a success due to wasted resources, an unclear technology purpose, and dubious value to stakeholders. After all, technology was not a shiny new toy that could be tossed away after a few days.

"No change can go without risks." (Interviewee 4, Executive)

5.2 People

People were the centre of any change management, especially technology-related change management. To transform from change failure to success, a high level of stakeholder engagement, teamwork, and satisfaction was required.

Stakeholder engagement

Three components enhanced stakeholder engagement: knowledge, perception, and bottom-up communication.

The first component involved having the knowledge to identify and connect stakeholders and understand change requirements. A staff member suggested becoming knowledgeable enough to communicate with people. For example, a university needed to know students, since undergraduate, master's, and PhD students had different technological understanding and maturity. Therefore, technology changes needed to be appropriately implemented based on different users. Such knowledge could help identify all the right stakeholders and engage them early.

"So you have to really, you know, tailor what you're going to work with the given audience that you have. So there's a big difference between an undergraduate student, a master's student, and a PhD student. They have different levels." (Interviewee 12, Staff)

Gaining knowledge of stakeholder requirements took time, so there was a need to give subject experts sufficient time to consult, as an executive cautioned. Knowledge of change team formation was also crucial. A manager emphasized the importance of having a trained project manager who could lead a successful project, noting that a manager's role was not limited to project management and that having the right staff assigned to the project was crucial. A staff member pointed out that a small but diverse team with different perspectives and backgrounds could help with making sound decisions. Groupthink needed to be avoided so that due attention could be given if only one person in the team saw the real problem.

"I can do smaller projects, but I don't have the training to do project management and all that stuff. So having, you know, a really good project manager helps make these projects successful." (Interviewee 18, Manager)

How to gain knowledge was key. Using a remote system shared by a staff member as an example, each faculty member needed to set up a server for students to use. Each faculty member had someone to train, but in the meantime, the staff had to wait and struggle. More challenging, training was not provided at the time of implementation and did not align precisely with what the system was designed to do. The result was that if one followed the training videos, the instructions would not work in the system. Therefore, there was considerable confusion and self-doubt. The training became a waste of time. It would be better to have a few people representing the faculties and Central IT to set up the infrastructure together and make the implementation and training smoother. However, there was a lack of support and clear roles and responsibilities.

“The application wasn't quite in place, so we had to wait until after that to do it, and there were still people who hadn't done it yet, and they're having trouble doing it. So there was a lot of duplication of effort, and people were struggling. Why was this not working? The training was not the same as they were actually implementing or were able to implement.” (Interviewee 10, Staff)

The second component was to change perceptions. The change team needed to have the knowledge and skill sets to rationalize the change and solution to make clients understand the problem and solution. A staff member used the example of changing entire websites and the problems with taxonomy, such as content syndication. Suppose the person hired and/or the manager had only colourful visions, rather than the technical knowledge or understanding of the technical components. In that case, the problem could not be solved, and the change would fail.

Perception change was difficult because people always believed in certain things, including both truth and non-truth as sides of the equation, and the vast grey area in between. Understanding how to change the perception of the target audience was key to the success of technology-related change. This was not about making everyone agree with the change. Even if they disagreed, they understood the change and accepted it. An executive again used the MFA example. The change management team applied change management practices very early and focused on influencing perceptions and interactions regarding the change. The team visited each faculty to inform people about the change. There were also drop-in workshops to engage people. The team was understaffed at the time, so some corner-cutting was necessary. However, early engagement helped change perceptions, which could not have happened if users had only been asked to register after MFA was implemented.

“What is common across everything is perception.” (Interviewee 20, Executive)

The third component was early, simple, and bottom-up communication, agreed upon by all three levels of interviewees. Early communication was essential for sending messages about change and building a strong network with a clear voice to explain the change. For example, a three-year change plan could not be communicated at its two-year mark. The dialogue must happen early. Simple communication was about finding the sweet spot between too much and too little communication, so people did not unsubscribe or forget about it. It was a sustainable way to communicate according to stakeholders’ needs for information and make them interested and integrated in the change projects.

“Users, money…find simple ways to communicate.” (Interviewee 5, Staff)

Bottom-up communication involved engaging with people who owned or were part of the change and influencing their perspectives. Changing ambassadors/champions' roles could bridge communication gaps, help stakeholders understand the changes, influence facility changes, defend changes to persuade people to accept them, identify who the resisters are, and offer benefits to the resisters to reduce resistance. Therefore, organizations needed to identify all stakeholders, conduct analysis, and consult the ambassadors/champions on solutions, considering specific user needs related to technical requirements, infrastructure, barriers, security, and limitations.

Clients should be the ones who drive change, not managers. Therefore, bottom-up communication could involve clients early in order to make them understand the change, become part of the project, and make decisions together. Clients, like other stakeholders in the change process, needed to take every opportunity during the planning stage, such as joining a committee or a workgroup, to plan and manage the change impact. When stakeholders had opportunities to participate in change planning, it would help guarantee success.

"Relations is multi-aspect understanding." (Interviewee 15, Executive)

However, professional authority and hierarchy could make organizations lose sight. A top-down approach accompanied by zero consultation led to a lack of understanding of the requirements at the start, incorrect assumptions, and more rework in the future. Therefore, communication needed to be bottom-up, as if forming a partnership with clients, not about top-down military orders.

"Keep in mind that stakeholder/user's experience through this change and being able to pivot in and adjust quickly is an essential part of the change management process. It is absolutely about people." (Interviewee 4, Executive)

Teamwork

Teamwork was necessary, as no one could do everything on their own. Staff members noted that the success of change relies on working effectively with partners in a team. Working with young technologists was recommended because they could bring innovative ideas and create more impact. In the case of Apple connecting the internet and music, the iPod revolutionized the way humans connect with music, completely transforming the music industry. Team satisfaction was also essential. If an employee working on a stack, intranet, or extranet…left because these were not technically sound, then it was a failure. A small team (maximum of five people) made it easier to ensure the change success. Large teams often lose project ownership when team members only understand individual components and cannot integrate them effectively. In the case of Workday, users were affected, but no one took care of them. HR, IT, and Workday were busy offloading the fixes to someone else without getting back to users to find out whether they thought the problems were solved or the changes were good.

Such teamwork included getting key users involved during the development and implementation stages. Simply testing which part of the technology was working or not was not enough. Users needed to say what was working but not working the way they wanted it to work.

"No lone wolf is possible these days." (Interviewee 12, Staff)

Satisfaction

Stakeholders' satisfaction not only made the change outcome but also the process a success. Such satisfaction was shared by both employees and users. First, employees with good ideas and skills should receive appreciation, as a staff member observed. Nurturing such employees and creating the right environment for change could enable innovative and interesting changes. Therefore, matching the capabilities of such employees, providing necessary training rather than focusing only on user training, and having these employees in place to support solutions and enable crucial support during the change process.

"If you don't have team satisfaction, you're gonna have a lot of like rollover, and this is a sign of a failure." (Interviewee 11, Staff)

Second, change should be team and user-oriented. More than getting teams on board and taking employees' knowledge and views into consideration, client/user satisfaction was important. As a staff member put it, users were the centre of everything, so users' sides should be the first and foremost. Therefore, the change process needed to start with the users and work backward to explain to them how the technology worked, rather than a top-down or rollercoaster approach. In the long run, the success of change depended on whether users liked it, not on whether executives liked initiating it.

"The user is the center of everything that we do." (Interviewee 12, Staff)

5.3 Process

Understanding that the process of technology-related change management was different from traditional change management was key, as discussed in the section "understanding". Agile needed to replace waterfall, as emphasized by interviewee 13, an executive. More importantly, there should be controls in place to identify risks of failure and inform better decision-making. It was no longer practical to rely on an ideal-world Gantt chart and project plan. There was a need for time to adjust when one realized something was off. The change process needed constant evolution from various perspectives.

One example shared by interviewee 7, a manager, demonstrated the challenges in process change. An organization had some new but not mature ideas from the CIO to move forward. Even in an agile environment, there was a lot of documentation, including developing a project charter, identifying audiences, defining needs, costs, and resources, and obtaining approval. There were about 200 documents. It was a heavy documentation process, not just on phases and roadmaps, but on all the steps and pieces to work on. It took too much energy and time to document, rather than to move projects forward. It was costly, so simplifying processes and more clearly defining agile were required.

"You spend too much energy documenting everything and not enough doing. And then you're trying to hit the metrics of showing that your project will be done on time, on budget, that you're addressing all the needs and just focus on that…Everyone seems to be doing overtime just to be able to produce documentation to show that the project is doing well, and it's hard to find the time to get the project moving." (Interviewee 7, Manager)

5.4 Outcome, Performance, and Technology

The outcomes of technology-related changes needed to be measured in more than one way, which was agreed upon by executives and managers. The principle was that the technology must function as originally planned to meet its intended goal. To achieve this, end users needed to be engaged early.

For technology-related change initiatives, technology must function effectively and meet its objectives to be considered successful. In plain language, the technology had no bugs. Moreover, people knew how to use it, so the technology did the job that people needed it to do. To achieve this, organizations should test before production whenever it is cost-effective. For example, testing firewall rules impacted by different network sources ensures agents communicate and avoid unfavourable changes. Therefore, if possible, test all automated processes within the organization to verify that they integrate successfully and meet the initial requirements, as well as any success criteria necessary for the change project.

To achieve technical performance and success, end users (clients or employees) needed to be involved in gathering the right metrics to measure success, as agreed upon by interviewees at all levels. Technically, staff members suggested focusing on creating more open systems with accessible APIs. This would allow easier access to information and enable multiple parties to expand or interact with the system. In the case of a university, it might be possible to make it mandatory that any system implemented must provide API access to its data. At the same time, any system should be required to utilize these APIs instead of duplicating data or relying on outdated file-based systems, such as CSV imports. This approach would streamline processes, reduce errors, and improve efficiency across all applications. In general, to increase the chances of success, it might not be a good idea to be an early adopter of new technology; therefore, opting for a technology that has been proven effective over time could be a viable option.

"In the case of a university, I would push for making it mandatory that any system implemented must provide API access to its data." (Interview 17, Staff)

Theme 2: Change Challenges in Executives, Managers, and Staff Members

The interview guide included two questions for each interviewee type: executives (decision-makers), managers (adopters), and staff members (users of the new technologies). The responses to the question "Was your role/function consulted when guidelines on Generative AI and Academic Integrity came out this academic year?" were analyzed. The findings were presented by role.

Executives, the Decision-Makers

The questions for executives aim to understand the enablers and challenges in making technology adoption decisions, regardless of the organization's readiness. The third question is the same for all interviewees, but it is designed to determine whether executives are consulted on

GenAI guidelines, how they are consulted, and their views on regulating. The questions are as follows.

- What makes you decide on a piece of new technology for your organization's change initiative? (Prompt: technical features, organizational needs, budget…)
- What is change management like, if the technology always exists, such as ChatGPT, and brings changes despite whether higher education is ready or not?
- (For all roles) Was your role/function consulted when guidelines on Generative AI and Academic Integrity came out this academic year?

All eight executives shared their experiences and insights. The findings for each question were presented in the following three sections: factors affecting decisions on new technology, responses to disruptive technologies, and consultations of executives about GenAI guidelines.

1. Factors Affecting Decisions on New Technology

The first question aimed to identify the enablers and concerns for executives to consider when deciding on new technologies during the change process. The enabler was business needs and value. The three concerns are money, understanding of complexity, and powerlessness.

1.1 Enablers – Business Needs and Value

Business needs and value were the primary drivers in executives' decisions about adopting a new technology for an organization's change initiative. It was not always easy to determine business needs and perceived value. There were two parts to the thinking process of understanding needs: evidence and strategy. First, there needed to be a genuine need, either short-term (higher priority and more operational) or long-term, so market scan and research, market solutions analysis, gap analysis, evaluation of existing technology, and the considerations of various aspects, such as budget and decision-making process, were required to determine whether the need is genuine. Key questions included whether it was an actual acquisition of a technical piece or an upgrade to enable a feature module. Second, the change needed to align with the organization's strategic plan, including the case for change/transformation and IT investment (evaluated by a governance committee in higher education).

"There has to be a genuine need. And then there's a process for market research, budgeting, and decision. So it's complicated, I would say." (Interviewee 14, Executive)

There must be a value that overthrows budget and costing constraints. The value was based on business-first value vs dollar value. This was tied to understanding business needs and the mindfulness of the cost of technical ownership throughout the life of the change. Key questions to ask included the technology's benefits to the organization (e.g., replacing technical debt, complying with new regulations), which project terms met the requirements, the gaps, and the financial aspects. It should be noted that, although the value was about case-by-case analysis, the big picture of the value chain and sustainability needed to be crystal clear. For example, what was the return on investment? Could the technology cycle in other areas? How was the government fund leveraged, if applicable?

"So make sure that there is value gained back, and then we need to really weigh the value gained against the dollar, which is what we often refer to, like you know the cost of ownership, the return on investment…" (Interviewee 9, Executive)

1.2 Concerns – Money, Understanding of Complexity, and Powerlessness

These three concerns affected executives' decisions about technology adoption: money, understanding of complexity, and powerlessness.

First, money determined options. Lack of funding or budget always affected an organization's ability to implement new technologies, maintain the existing systems, and hire qualified talent with decent pay. However, the budget was also a fixed number before the change projects started, and the change team decided what to do. When certain products were beyond their financial means, especially given the long-term cost of ownership and benefits, organizations needed to find workarounds without additional funding or other non-IT solutions to initiate changes.

"Lack of funding also means lack of access to a skilled workforce." (Interviewee 1, Executive)

Second, the change process was complicated, so a lack of understanding of this complexity could lead to misunderstandings about what to look for, where to start, the real problem, the need to change the business process, and the impact afterwards, before initiating changes. Sometimes, people could confuse the necessary steps for change. For example, people could choose technology before understanding the solutions and then write requirements. Organizations might also ask vendors to change solutions before recognizing their own business processes. In this way, technology and solutions became separated when organizations asked these key change-related questions about business needs and requirements, enterprise architecture needs, existing components in the tech ecosystem, and the alignment between new requirements and architectural principles. Other key factors to consider included terms and conditions, vendor ease of use, adoption of newer technology, and data ownership. Among these, enterprise architecture, security, and organizational alignment were critical.

"Made incorrect assumptions about Access and security configurations… that created a whole series of rework that we had to do at the end, rather than really understanding the requirements of the beginning." (Interviewee 4, Executive)

Third, powerlessness was reflected in the lack of decision-making power. For example, some decision-makers did not make decisions on technology or new products. They were like forensic investigators, who went where the evidence led them. Such powerlessness often led organizations to prioritize technologies over examining their needs and current state, and then work backwards to determine the appropriate technologies. In other words, the sound practice was to capture business requirements and then evaluate technology based on those requirements. When executives faced various vendors trying to sell something, they would only gain power when they were part of the decision-making conversation in organizations.

"It's a bit like a forensic investigator: I think a true technology leader needs to go where the evidence leads them, right? Because I feel that if you're picking technology, you're putting the cart in front of the horse, so to speak. You need to understand what the business is looking to accomplish." (Interviewee 20, Executive)

Such powerlessness was also reflected in the lack of a voice in process changes and red tape, especially in the public sector. In a university, a faculty could not do the right things because of the layers of approval processes outside the faculty's control. It was never a one-person/faculty thing, as projects required a structured format, such as multiple committees, to justify them to the governor and senate. For example, when a university tried to implement an experimental learning tool, it took more than a year to secure internal funding, by which time it was too late for quicker, more effective change adoption. More than the funding process, the bidding competition through public announcement (a request for proposal process), the selection process in procurement for acquisition, the contract negotiation (either a custom application or a software as a service application subscription), and other environmental and organizational factors made it take an impossibly long time to reach a decision. At the same time, timing was everything, and the right timing made stars align in the change process. Therefore, overly complex processes could result in delays and missed timing, which could reduce the chances of successful change.

"Depending on the cost, go through various competitive processes because we are a public-funded institution, so we need to follow the procurement process, which is for the acquisition of products, like if we get into contracts with companies that offer either a custom application or a software as a service application subscription model." (Interviewee 13, Executive)

2. Responses to Disruptive Technologies

The second question focused on organizational responses to disruptive technologies, such as ChatGPT, and whether they were not ready for the changes. When this situation occurred, executives mentioned two steps of response: admitting the difficulties of managing and stepping back to gain understanding.

It was an essential first step to recognize that GenAI, including ChatGPT, was a disruptor, and organizations were not ready to manage such changes. For example, students would use ChatGPT no matter what the universities did. Using ChatGPT without doing the work was a possibility. Therefore, organizations recognized the need for change but struggled to determine the direction of change and the user ecosystem, and could not master many angles. For example, even though a university controlled the governance side, policymaking could not keep pace with the evolving landscape of AI. There were also no success stories from other organizations because the disruption affected everyone at the same time. Organizations could refer to what they have done when facing changes that reinvented the wheel in the past 25 years, such as the Web in 2000, Google in 2004, and the iPhone in 2007. Just like ChatGPT, no one was confident in saying they did not know about it, whether they used it or not.

"The genie is out of the box." (Interviewee 20, Executive)

After organizations acknowledged they had lost control, they needed to develop plans to improve understanding and define next steps. The essence was to stay ahead of technology usage by utilizing existing tools. For example, by pushing from the top down, a university could adopt MS Copilot to ensure better data security than with ChatGPT. This fell under the existing tools, such as getting a licensing agreement, establishing guidelines, and providing training to help users build new habits. This was not just applicable to higher education but to organizations in other areas.

“Be aware of data security and then learn how to use it, practice with it…it’s the future.” (Interviewee 19, Executive)

The second stage involved adjusting expectations when organizations were unable to control and regulate new technologies. For example, the enterprise resource planning (URP) system in a university was managed by the vendor. Therefore, the vendor changed some features twice a year. The university sent notifications beforehand and explained how to use the new features. It did not matter if the users liked it or not, or felt ready or not. The university had no control over change management. The same applies to MS Teams, whose cloud suite was constantly evolving. This was challenging because proper and effective change management required people to facilitate change. If the provider was not adequately resourced for change management, users could not keep up. An organization could not simply make announcements. It needed to facilitate training and coaching, provide user support, and dedicate HR and change management to support change and processes, rather than leaving these responsibilities to users. After all, if an organization could not control change, it could at least control the numbers, values, and notifications of change rapidly.

“Like it or not, ready or not, it is out of our control.” (Interviewee 13, Executive)

To respond to such a loss of control, organizations needed to be agile and open, and asked the fundamental question: what were the business objectives and needs, as well as the areas that AI could affect? This was not a technical fix, but a people fix. For example, there was a need for more research with AI experts to identify pain points and explore potential solutions or concepts. However, it was not easy to make decisions when people were already using generative AI. Therefore, a couple of steps needed to be applied: 1) step back to continue measuring and understanding user experience and study the outcomes; 2) define and apply a governance framework and provide more directions on how it will be used. If an organization decided to stop using it until it understood further, the question to ask was: what was the benefit of losing time and opportunities? There was no blanket approach. After weighing all the options and deciding on adoption, an organization needed to customize its approach to change management, regardless of whether it was a planned project or a disruptive one.

“We go as we learn.” (Interviewee 20, Executive)

Therefore, it was essential to understand that generative AI was a challenge to privacy and security. In a university setting, data integrity was directly related to institutional reputation. Therefore, visions and guidelines on data management and usage needed to be in line with the university's integrity and reputation. It was also a force that brought efficiency and effectiveness. At the same time, it was worth remembering that certain sectors, especially higher education, were poorly equipped to keep up with and leverage new technology.

“It's a balance. It's Ying and Yang. It’s a force, right? Because one tool like this particular tool is to bring efficiency and effectiveness in our human life day to day. And then on the other hand, we want to make sure that our university's integrity, our data, our reputation is protected.” (Interviewee 9, Executive)

3. Consultations of Executives about GenAI Guidelines

The third question sought to determine whether each role was consulted during the development of guidelines on Generative AI and Academic Integrity in higher education, and to gather their perspectives on regulating GenAI. Of the eight executives, all of them were involved in different capacities, such as sitting on different committees and working groups to exchange information and knowledge with experts from various domains (security, privacy, ethics, infrastructure/solution/integration architects…), designating a representative to consult industry experts and communities of technologies to define a governance structure to manage GenAI, giving high-level recommendations, answering surveys,

“I would assume the university is trying to put in place policy and procedure.” (Interviewee 1, Executive)

However, getting involved did not mean being consulted. If consultations took place, they were mostly informal and high-level. Some executives were not expected to be consulted. Executives shared their views about what higher education should do about GenAI. The executives recognized that GenAI would continue to advance, and people would use it regardless, making it fruitless to try to implement guidelines to prevent students from using AI or block its usage on campus. This was because GenAI was useful in saving time, such as summarizing big documents, emails, or notes and initiating thoughts to trigger ideas on how to approach strategies.

“The university is too big to understand roles and responsibilities.” (Interviewee 15, Executive)

Therefore, suggestions for policy/guideline development included being agile, continuing to learn and advance until going a level deeper than the current understanding, adopting a user-based approach and leveraging solutions to give a better experience for students, professors, and staff, not restraining usage, working with experts in bigger groups and make collective efforts, meeting people’s various expectations (such as creating an easy button to improve user experience.), being cautious about sensitive information and data security, knowing when to use it (writing an email without sensitive information).

One executive suggested referring to examples of how technology companies ran their business and EU rules. For example, the pressure of AI policy in higher education should be similar to how Apple ran its app stores with clear rules and measures. EU digital guidance is required to provide consumers with choices within different ecosystems.

"We are trying to put all regulations from different faculties. Be careful, the data might not be private. The data in generative AI can be used to train the model, reinsert it in the pool, and show up somewhere else. Therefore, we can't take students' reports directly to AI. We need to be diligent on records (students, HR…) and make sure to be secure." (Interviewee 19, Executive)

Some executives shared their concerns regarding GenAI. Interviewee 14, an executive, expressed disappointment with Copilot, citing that its features were not comparable to ChatGPT – "what if no one wants to use the solution because other solutions are better"? Interviewee 15, another executive as cited earlier, also expressed concern about the feasibility of consultation, given the university's size, which made it difficult to navigate roles and responsibilities. Moreover, the distinguished roles of IT and Deans in each faculty could make collaboration difficult. IT tended to bring people together. As units within a university, faculties tended to create a vacuum within their bubble, and Deans tended to make their faculties function their way. While IT policies were in place and faculties could not ignore them, a policy on AI was not in place. Until universities came up with some standards and a formal policy, faculties would develop their own guidelines without consulting central IT, believing it was part of their academic freedom.

Managers, the Change Adopters

The questions for managers aimed to understand the reactions and strategies when facing difficulties in changes during the technology adoption process. The third question was the same for all interviewees, but it was designed to find out if managers were consulted for GenAI guidelines, how, and their views about regulating. The questions were as follows.

- Have you experienced a situation in which you find a piece of technical product unsuitable for your organization's change initiative?
- How do you manage the implementation of technology/change, if you have any concerns about the change initiative?
- (For all roles) Was your role/function consulted when guidelines on Generative AI and Academic Integrity came out this academic year?

There were seven responses (five managers and two executives who answered the manager's two questions because they had done work in the managers' capacities recently). The findings for each question were presented in the following three sections: misalignment between technology and change, managing concerns, and consultations of managers about GenAI guidelines.

1. Misalignment between Technology and Change

The first question sought to understand managers' experiences when they encountered a misalignment between technology and change initiatives. The response was that everyone had some experience. For instance, the metaverse could help IKEA determine if furniture fits in a living room, but it might not be suitable for higher education in certain types of teaching, particularly when universities could not justify the cost of licenses. The underlying issues surrounding such experiences were tied to misunderstandings about the alignment between technology, change needs, and consequences.

To start with, change solutions did not always align with clear needs after thinking things through. Organizations develop solutions because someone else uses them, rather than understanding the needs before evaluating and implementing a solution. For example, from a solution architect lens, why did an organization have both Teams and Zoom with overlapping capabilities? It was not sound practice to buy both, but one needed to identify the focus and the leverage of the technologies. Interviewee 2, a manager, used the example of Blackberry in the 90s. At the time, top management required employees only to keep either a laptop or a BlackBerry. The consideration was that an employee only needed one for mobile computing, and the cost was high to keep both. It demonstrated a lack of understanding of basic technical functions and business needs, including that the two devices have different functions, and one could not type a report on a BlackBerry. Such a change did not make sense because productivity would drop more than the savings on devices. It was just like today, when employers denied employees remote work equipment to force them to work in the office, under the guise of change, disregarding the possibility of reduced productivity.

"What we call today mobile computing allowed the narrow view that you don't need two devices. Doing it with one didn't make any sense, which goes back to my earlier comments where you don't understand the business, because typing a report on a BlackBerry keyboard as opposed to a laptop keyboard is not the same thing." (Interviewee 2, Manager)

Following unclear needs identification, processes and operations could further worsen such unsuitability. First, insufficient consultation could lead to unexpected consequences at a later time. For example, the MS team was a one-size-fits-all solution during the pandemic. However, it was not a good fit for some faculties, such as medicine. The right parties in large organizations should have been involved, even when rapid adoption was necessary, or when the cost of fixing the issue or adopting alternative technology would be prohibitively high later. Second, process complexity could hinder the detection of technical suitability for a change. Normally, there should be an architecture review before any change management in an organization. The problem was more on the project management side. An organization started a project, assembled stakeholders, got a project sponsor, and moved forward. Then it was not going to work because of the cost, vendor changes, or bureaucratic layers at a university. One project was abandoned one-third into implementation because it failed the security screening. The real reason was the back-and-forth with vendors and the misalignment between their product standards and the organization's standards. Third, old processes did not support new technologies. Some organizations still use manual processes for financial transactions. Technology, such as a new ERP system, could not solve all the problems because several processes were still outside the system, including filling out forms. After spending millions on a financial system, the organization could not even use it end-to-end because of inaction on procedural changes.

"You've got to fill out this form and then do this form, but they're not in the system. So I'm like, well, we spent millions to put in a financial system, and we're not even using it end-to-end." (Interviewee 18, Manager)

2. Managing Concerns

The second question aimed to understand how managers manage concerns in implementing technology/change. Managers had ways in such situations – voice concerns, communicate, and do their best when there was no choice but to go ahead. First, managers had limited authority, so concerns could only go either laterally to co-workers or horizontally to bosses. The latter could sometimes prompt executives to re-evaluate changes or even halt them. Proof needed to be research-based and beyond a reasonable doubt. For example, questions regarding virtual reality could include who the vendors were and what lessons were learned. Consultants and other institutions/universities could provide information before making recommendations. The gap analysis, particularly the security evaluation, helped determine how different pieces fit/do not fit the gaps in an organization, such as failing to meet security needs. Second, similar to other situations, communication was key. Clients who use the technology daily should be part of the decision-making process, not surprised by it. Third, sometimes there was not enough time for in-depth analysis, products were overly complicated, or decision-makers did not want to listen to concerns, so the first level of implementation started regardless. In this case, managers had no choice but to follow through on decisions to avoid getting into trouble. Therefore, they needed to do their best to make the change a success. Managers should focus on the positive aspects of the change, bridge the gaps, reassure people that they are there to help, and develop solutions to meet their needs. Suppose there was room to adjust the changes to suit the institution. In that case, managers should make such adjustments within their power to ensure a smooth transition, minimize negative impact on clients, and apply lessons learned to future projects.

"The problem with selecting a product is sometimes these products are very complicated, and there's just not enough time to go into in-depth research on every single product that you're reviewing. Even if you've got it narrowed down to the top three, there's not enough time to go into in-depth analysis on all three of those top three. So, when you get to the implementation, if the first part of the implementation involves a really in-depth analysis, you will usually have a list of concerns already. That's where you would identify them." (Interviewee 14, Manager)

3. Consultations of Managers about GenAI Guidelines

The third question aimed to find out if each role was consulted when guidelines on GenAI and academic integrity were developed in higher education. Of the five managers, none were consulted, despite some being experts in AI and change. One manager was asked about ChatGPT, but was not a part of any panel or committee. Some universities currently lack the resources to address GenAI regulations.

If the managers were consulted, they would give suggestions, including developing policies from central IT to reflect the direction of the university as a whole, needing a cohesive approach in communications and advising, aligning across institution and community, consulting with faculties and professors, partnering with experts in the field, following industrial and government directions, preventing plagiarism, ensuring quality and inclusiveness, preventing malicious intents towards marginalized groups, focusing on the learning side with ChatGPT and evolving,

"Communicating and coming up with guidelines or policies for our community. So right now, there's a lot being published out there, but there is no alignment across institutions. So yeah, I think we would benefit from alignment across institutions, and that would bring more clarity to our community and what we can do, what we can do, where we're going." (Interviewee 16, Manager)

Staff Member, the Technology Users

The questions for staff members aimed to assess the level of engagement with users and the support they receive during changes. The third question was the same for all interviewees, but it was designed to find out whether staff members were consulted on GenAI guidelines, how, and their views on regulating. The questions were as follows.

- When coming to technology-related change initiatives, how often are you consulted? (Prompt: technology usability, potential problems…)
- What support do you receive during technology-related changes (Prompt: user testing, training…)?
- (For all roles) Was your role/function consulted when guidelines on Generative AI and Academic Integrity came out this academic year?

There were eight responses (seven staff members and one executive, who also answered the two questions for staff members because executives were once staff members). The findings for each question were presented in the following three sections: frequency of consulting, support to staff during changes, and consultations with staff about GenAI guidelines.

1. Frequency of Consulting

The first question aimed to determine how often staff members were consulted regarding technology-related change initiatives. Most responses were no and never. Three were included in the discussions or consulted for the job specialty. For those who were not consulted at all, no meant no one asked users/nontechnical experts or non-managers about technologies. Most of the time, managers made decisions that could lead to poor results if they were not technical and relied on staff who were not consulted. One staff member mentioned that a university had different levels. Central IT did not often consult IT staff from the faculties, and it was even less so nowadays. A common trust between IT and the faculty needed to be built.

“Faculties have difficulties implementing when everything is decided for them without user implementations in tech changes.” (Interviewee 3, Staff)

Of those consulted, the format was passive, not a real formal consultation that required participants to be proactive. The format was very top-down, such as surveys in the central IT but not in the faculties. It was easier to consult in smaller teams because ownership was clearer when taking initiatives to fix issues. Topics included security, student usage, user communications, the business side of change, planning, and strategy. In the case of Workday, user feedback was not integrated into the technology, so consultation did not give users a voice.

“I don’t work for people. I work with people…people are experts in their fields, so they're gonna bring things forward that I may not be knowledgeable about, but I can fit what my knowledge is with theirs and then boom, we have a solution.” (Interviewee 12, Staff)

2. Support to Staff during Changes

The second question aimed to learn about support for staff during changes. Other than two staff members who said no, the rest received some form of support, mainly in the form of training, except for one, who said guidelines. Training differed across change initiatives, and one had to be proactive to pursue them. They were mostly online, such as through LinkedIn. However, such training was usually short, quick, and surface-level, and did not target users' needs. One staff member suggested that there should be a liaison, a designated person to receive training and serve as a point of communication with the central IT. Otherwise, everyone got a week of training, but they often forgot everything if they did not use the system for a few months afterward. This could also foster a culture where team members supported each other, rather than focusing on who benefited the most from the training and turn training into toxic competitiveness.

“As far as the training goes, it's possibly better to have somebody dedicate who's been trained, who's able to help you all the time, rather than receiving everybody receiving a week of training and then maybe not using the system for a few months and then forgetting everything that they were trained on.” (Interviewee 10, Staff)

With less-organized training, staff members turned to Google and YouTube, learned independently, evaluated technical products, and supported each other as a group through MS Teams. The positive side was that such isolation from change processes and supports gave staff members the freedom to train themselves in various subjects. Such training did not need to be project-related, but learning more about AI and cloud computing could help make better recommendations for areas for change, such as data management. Staff members also became accountable for implementing their own changes to adapt to technologies.

"People send you that Google can do this, and YouTube can do this, and zoom can do this." (Interviewee 12, Staff)

3. Consultations of Staff about GenAI Guidelines

The third question sought to determine whether each role was consulted during the development of guidelines on generative AI and academic integrity in higher education. None of the staff members was consulted. The closest to a consultation was when one person participated in a large, intimidating group of over 200 people. One staff member noted that the organization might assume the older generation of technology users did not understand new products, such as ChatGPT.

"Make sure whatever is written in the policies and regulations is enforced. Like the speed limit: you can't just have the 50km signs without enforcing it." (Interviewee 3, Staff)

The advice that staff members gave included understanding and balancing. First, understanding was a perpetual theme throughout this research. One person pointed out that ChatGPT was just one of the many tools in the history of technology evolution. It was more creative and efficient, enabling a shortcut to learn, than HTML, whose impact in the 90s was equivalent to GenAI today. Yet ChatGPT was just a tool. One person mentioned that AI was a broad area. Organizations needed to evaluate how it applied to various tasks, such as MS Office work, report generation, and help and support functions. Given that it was not just one area of focus, a more inclusive approach might be needed.

Second, balance was about finding a sound way to engage users. Everyone would need to be aware of ChatGPT, but professors might not want to dig into it. Therefore, the balance needed to shift to the professor group to help it determine how to address ChatGPT. The balance also meant that a smaller focus group needed to be established. Big groups only triggered big debates, which was not an inviting channel for staff members to participate. Such a group needed to bring together different roles and their specific needs for an AI tool. Tailoring AI tools to particular tasks and roles would ensure efficiency and relevance for the people using them. There was no one-size-fits-all solution, maybe except for general functions like summarizing, translating, or correcting. At-level meetings could help gather staff feedback, or people might not feel comfortable answering questions from senior managers. Balance also shifted to focusing on how AI impacts the end user, rather than trying multiple things to see what sticks.

"If I had been consulted, I would have suggested bringing together different panels of people to develop a plan that addresses the unique needs of various roles." (Interviewee 17, Staff)

Theme 3. Changes in Education Regarding ChatGPT

The questions aimed to understand executives, managers, and staff's views of ChatGPT and their perceived potential to change directions in higher education. The questions were as follows.

- What do you think of the changes that ChatGPT bring to higher education? (Prompt: teaching, learning, student usage…)
- What is the potential change direction that your university will take regarding ChatGPT, in your opinion? (Prompt: policy, regulation, usage…)

All 20 interviewees answered the questions. The findings for each question have been presented in the following two sections – ChatGPT changes to higher education and university changes direction.

1.ChatGPT Changes to Higher Education

There is no doubt that ChatGPT has brought irreversible changes to higher education and would be shaping the future regardless. One manager mentioned that s/he had no experience with ChatGPT because the university has adopted Copilot. In general, most responses recognized the beneficial changes and the detrimental aspects. To break these responses down, there were three views about ChatGPT/Copilot/GenAI in higher education: optimistic, passive, and observant.

1.1 Optimistic

The optimistic views focused on the positive changes that ChatGPT can bring. Such positivity emphasizes ChatGPT's usefulness, its enablement of teaching and learning in higher education, and efficiency.

First, regarding usefulness, interviewees acknowledged that ChatGPT/Copilot provided a helping hand in many areas, including 1) preparing presentations, summaries, creation of documents, and slides; 2) fast translating from English to French (37 pages in 10 seconds) with 90% accuracy and only missing some cultural reference between institution and organization; 3) reducing redundant tasks, such as checking spelling, grammar, and tone when editing an email and publishing after validating scripts; 4) helping people structure ideas, translate, and do initial research, risk assessment, and cost-benefit analysis; 5) making a big difference in project management and software development with the assistance of people aspects and audience map. An executive noted that the future looked bright with AI, but higher education was only just beginning to scratch the surface. There was enormous potential to make teaching, learning, research, and administrative tasks more efficient with fewer resources.

“I use ChatGPT to translate everyday from English to French, 90% perfect. It may miss the cultural reference. For example, use institution, not organization, but ChatGPT doesn’t pick on that.” (Interviewee 5, Staff)

Second, a university was about education, so it needed to embrace any tools that helped students learn. This has not been a new concept. For decades, professors have used virtual teaching assistant tools to explain concepts, answer students' questions, and save time. Interviewees have identified key learning enablers, aiming to think from the students’ perspectives. ChatGPT could effectively filter out noise, so students did not need to spend hours searching for answers within answers on Google. Instead, students could learn more efficiently, have time for creative thinking, and become better at critically evaluating the qualities of answers.

“AI tools like ChatGPT are revolutionary. It changes everything. It will have a profound impact on higher education, particularly in teaching and learning.” (Interviewee 17, Staff)

Third, ChatGPT was efficient at providing relatively quality answers, especially in the technical field. For example, it took one-quarter of the time to code, compared with humans. It could also respond instantly 24/7. Most importantly, the explanations suited students’ educational levels, ages, environments, and emotions. This level of customization led to a more efficient and effective learning process. In this way, AI tools like ChatGPT could target students’ needs to conceptualize complex subjects, clarify difficult concepts, and provide immediate feedback and explanations.

“AI will be able to respond instantly, at any time of day, with explanations that are perfectly suited to the student’s educational level, age, disabilities, and intelligence. This level of customization could lead to a more efficient and effective learning process, making it almost symbiotic between the student and the AI.” (Interviewee 17, Staff)

1.2 Passive

The passive views focused on ChatGPT’s adverse effects on learning and the consequences of cheating and reputation loss in higher education. One staff member pointed out that universities and professors were doing too much for students, which could make students stop thinking for themselves. For example, Engineering students should be able to create specific solutions independently, rather than relying on AI. It's similar to teaching children how to eat, rather than spoon-feeding them all the time. What if AI were down? We could not rely too much on technology without first understanding its failures. After all, ChatGPT was not reliable enough to give first-rate text validation or summarization.

“Teach a person to fish, not fish for the person.” (Interviewee 3, Staff)

When students relied entirely on GenAI rather than as a supplement, they might get answers directly from it. More than stopping thinking by themselves, it was cheating. Moreover, a professor needed to teach students to learn on their own, rather than relying on ChatGPT or GenAI in general to build courses. While it might be acceptable for individuals or enterprises to use ChatGPT for information or problem-solving, this approach should not be applied to education. This was because universities' reputations would suffer if students used ChatGPT to cheat or if professors relied on it to prepare classes. When universities allowed ChatGPT to bridge learning and teaching with less money, capacity, and resources, educational institutions are no longer just elite.

"AI is an amazing tool and I hope to see it evolving, like keep the error rate going down." (Interviewee 11, Staff)

1.3 Observant

The third view, observant, received the most responses among all interviewees. Being observant, interviewees were cautious about taking sides on the technical features of GenAI. Instead, interviewees preferred to understand GenAI's impacts beyond its surface-level technical use and its hidden impact on higher education. Such observations included acknowledging its irreversible impact, recognizing the real issues in higher education, and experiencing uncertainty.

GenAI has made an irreversible impact, so arguing about it is pointless; it's better to acknowledge it and plan for the next steps. The current zest of GenAI was alarming, according to a staff member. The 40 licenses offered by one university were taken within 2 minutes because the demand was so high. Moreover, people were using GenAI regardless. An executive pointed out that programmers already use GenAI for projects. It was not super sophisticated, but it could help point programmers in the right direction to solve problems better than Google could do. However, this was not a new phenomenon. Google made a similar revolutionary change and irreversible impact in the last century, too. Back then, users needed almost no training to navigate Google, just as they do now when interacting with GenAI.

Admitting Irreversible Impact

By acknowledging the irreversible impact, the next steps were to mitigate ungrounded fear, explore value-adding solutions, and enhance the detection of wrongdoings. First, it is necessary to reduce the ungrounded fear and examine GenAI rationally. An executive mentioned the fear that AI would become students' crutches, but the fact was that AI only became as good as the data it had. Human data would never be perfect, so the fear that AI would be too good and that students would stop learning by themselves was unfounded. Moreover, even though it was unlikely that AI would replace professors entirely, as a staff member pointed out, it would eventually take over many aspects of education. However, AI could not replace the physical and interpersonal interactions in human teaching and learning.

"Academia is afraid that it will be used as a crutch by students." (Interviewee 19, Executive)

Second, after eliminating ungrounded fear, it was necessary to consider various ways to add value with AI. More than facilitating communications among people, AI could adapt itself to the targeted audience, using the right words, demonstrations, and mechanisms to create a personalized teaching and learning experience. For students, ChatGPT provided detailed explanations of why they made mistakes. Such personalized tutoring and adaptive learning paths would help guide students on their educational journey, with implications that go beyond task assistance. Therefore, traditional training methods for staff to use new technology, such as interfaces, were no longer applicable. It was crucial to explore the value of AI to a new level. One staff member proposed to generate a rules-based ChatGPT to produce publicly available materials, such as news and bios. Executives proposed 1) to create easy buttons to request ChatGPT to complete admin tasks, such as drafting proposals and letters of introduction; 2) to feed data to ask for data analysis on trends; and 3) to catalyze changes in organizational functions/positions/roles. This was not about job loss, such as answering phones, but being replaced unless we embraced changes and evolved with them.

"Understanding that universities can't push back against AI but embrace it". (Interviewee 20, Executive)

Third, wrongdoing always came with value-adding potential. AI made detecting wrongdoings extremely difficult because students could effectively generate almost anything from ChatGPT, thereby avoiding professors from detecting them, possibly not a master's thesis, but materials from an early stage of education. Therefore, detecting plagiarism should no longer focus solely on copy-and-paste, but should also explore the possibility of detecting changes in style and patterns using AI.

"ChatGPT brings a fundamental crisis to higher education, and it is not necessarily a bad thing." (Interviewee 20, Executive)

Real Issues in Higher Education

As discussed in the last section, there was no turning back from AI or avoiding using it. At the same time, AI could be an opportunity to help identify the real problems in education under the apparent concerns, which the status quo has covered up for years.

First, issues in education should never be black-and-white. The real problem was the lack of desire to fully understand technologies, how to use them properly and to detect the darker side of the technologies. This applied to every technology, including email, MS Office, and the Internet, which were essential to any administration. Using the internet as an example, we did everything online, but it did not mean all the answers were reliable. It was the same for ChatGPT. Interviewee 7, a manager pointed out that AI could answer, but it did not mean it was the correct answer, just like asking someone a question and assuming everything the person said is a fact. At the same time, the licensing price of ChatGPT/Copilot has increased to $150 each for individuals at the enterprise level. Universities were also uncertain about how to regulate their usage, particularly in creative work/arts, as a staff member noted.

"You ask AI something and it gives you an answer. It doesn't mean it's right." (Interviewee 7, Manager)

Second, the real issue in teaching and learning was not about technology but about the fear of what was real and what was not, and how to facilitate fundamental cultural change. It was never the case that students used a tool solely for cheating, but there were always students who took shortcuts and committed plagiarism long before the internet was introduced. Therefore, plagiarism was not the real issue; instead, professors were uncertain about what constituted original work from students, what was created in an artificial environment, and what was considered stolen in the traditional sense of plagiarism.

This meant professors needed to rethink their teaching methods, grading processes, and re-evaluation of students' work. They must also guide students in using and leveraging GenAI, while being mindful of its implications and how to foster improvement. It was no secret that students used it daily, and professors keeping silent in fear of losing their jobs was groundless. Therefore, professors needed to start seriously thinking in four areas – 1) how to encourage transparent usage of ChatGPT to encourage learning and achieve better learning outcomes; 2) how to relate workplace requirements to use ChatGPT effectively and responsibly, such as people cannot use GenAI to produce a list of made-up court cases and hand to the judge; 3) how to communicate better, so there is always a need for talking to a real human in an AI world; 4) how to measure successful learning, create hands-on practices, and care about students' experience; and 5) have an voice in the management, governance, and policy implementation of AI to help facilitate the delivery of education to students.

"Professors need to change. They are traditionally resistant to change, but they have to change their ways of teaching now." (Interviewee 20, Executive)

Third, data was a real and significant challenge. We did not yet understand the full potential of data in GenAI because we could not directly link data to actual individuals (sampling, training...). What was poured into AI training and solutions needed boundaries on the difference between personal and aggregate data. Moreover, we needed to know how AI used data regarding privacy (personal, financial, and health). Therefore, the real issue regarding AI data was that we did not have a standard yet because of many unknowns.

"We can't allow AI to act on its own." (Interview 18, Manager)

Uncertainty

An executive noted that ChatGPT and GenAI were advancing rapidly across higher education and industry, which was alarming in many respects. There was a lot that we did not understand. A staff member also mentioned that ChatGPT was exciting, scary, and could be in many places. There were several uncertainties, including research, A staff member and a manager have voiced uncertainty about how much ChatGPT could contribute to original research because the algorithm could miss racialized people and bring bias. Moreover, a more urgent question was whether ChatGPT would take away individual creative processes. It depended. According to a staff member, this was not the case because we already used search aids, research aids, templates, and pre-existing structures, such as iMovie. So just let the technology do the job. However, the uncertainty came when ChatGPT wrote a film script. Who would take the credit? Who owned the content? How could individuals still be creative? There was no answer yet, so academic experts and researchers needed to lead the exploration and research to understand the disruption.

"ChatGPT is powerful. In education, it can go the opposite direction from what we expect from students." (Interviewee 3, Staff)

The way of teaching would change, but what the future holds presents a question. How good could teaching get with the help of GenAI? Could we use GenAI to build tools to enhance teaching? What is the increased capacity of integrating things to connect the dots? Is the basic programming language still being taught, or can GenAI do it quickly? How do professors teach students to detect wrong answers from ChatGPT and learn from finding the correct answers? Can ChatGPT help reduce errors in the news and teaching materials? The same goes for learning – the role of AI in student learning could evolve in ways we can't fully predict yet.

To understand these uncertainties, higher education has started discussions at various levels. The university has now created guidelines for students and professors, including how to handle AI and large language models. Open dialogue with students was key to creating the right environment, instead of being dazzled by vendors to move in the wrong direction or trying to push it back. Executives emphasized that GenAI was here to stay, so we must understand it, define it clearly, govern it effectively, and mitigate risks to ensure students can use it properly and enhance learning. After all, uncertainties could bring problems, but also a lot of opportunities.

"Just like Spider-Man, for a university, great power comes with great responsibility." (Interviewee 3, Staff)

2. ChatGPT and Universities' Change Directions

When changes were inevitable, higher education needed to embrace them. Even though not everyone would embrace them, higher education would not have a choice because the rest of the world has been using GenAI, as a staff member pointed out. It should be noted that change goals and needs differed between public institutions and private companies, where the primary consideration was reducing costs and streamlining processes. AI tools require management and governance in higher education, and various discussions on AI policies, regulations, and appropriate usage are underway. Although the direction was uncertain, interviewees expressed four possible directions: technical changes, strict policies, guidelines, and innovative thinking.

2.1 Technical Changes

It was natural to utilize technical advancements in response to the evolving landscape of AI. Some universities have been exploring ways to let ChatGPT write business proposals and reports in the background. Instead of ChatGPT, some universities used Copilot due to their existing contractual agreement with Microsoft. It ensured that data did not leave the universities; however, the technical limitations were disappointing compared to ChatGPT. Some universities have already implemented Copilot in MS Office applications or integrated it into MS Edge. Although there were many expectations, such as having Copilot tools for various roles (programmers, security…), the direction of technical changes remained unclear.

"In the future, we'll likely have Copilot tools for different staff roles, including programmers and security teams." (Interviewee 17, Staff)

2.2 Strict Policy

Policy has been a perpetual instrument in responding to changes in higher education. Some interviewees suggested that current policy/regulations actions should focus on rule-based changes (can use or cannot use), including 1) not using computers during exams or in the classroom in some (European) universities; 2) not allowing students to create homework or thesis with GenAI to prevent plagiarism, especially in life-or-death businesses, such as medicine; 3) network control, such as blocking ChatGPT on campus and may only allow Copilot; 4) creating strict punishing mechanism, such a disqualification, for offenders; 5) openness and better information management to avoid losing control of data.

Interviewees proposed that policy drafting needed to 1) engage the industrial partners to start pilot programs to understand AI platforms and concepts better in order to make concrete policies; 2) engage teaching and learning support to meet the needs across campus as a university-wide engagement instead of faculty-based initiatives; 3) require educators to understand AI, be skeptical, and be able to contribute to the detection of irresponsible ways of using of ChatGPT and changes in student evaluation in policies; and 4) strengthen the role of the ethics board to ensure genuine research proposals.

The problem with policy measures was how to administer them, as a manager pointed out. Academic integrity and its violation have always been present, and while some individuals took responsibility, others did not. Therefore, responsibility for administering the policy needed to be assigned. Another problem was the slow pace of policy change when "the next big thing" came, as a staff member mentioned, and the subsequent slow changes in administrative activities once the policy changed.

"Policy is important. It needs to be governed appropriately at different levels." (Interviewee 2, Manager)

2.3 Guideline

A guideline should guide a range of community audiences, including students, researchers, and employees. Therefore, an advisory committee with various representations, especially professors, should be formed, as a manager explained. Suggestions of the guideline stances focused on 1) recommendations on what to use (to search and as a muse) and what not to use (no copy and paste or plagiarism), just like teaching how to use the internet; 2) explanations on the discrepancies because people would not get the same answer with the same query; 3) clear guidance on how to use ChatGPT, how to ask questions, and how to reference it, without long sentences on data gap or theories or any confusions; 4) preserving cognitive and commutative skills without sacrifice essential intellectual abilities, such as using correct grammar, while quickening research processes. It should be noted that the guidelines and actual usage differed, as an executive pointed out. Moreover, technology moved too fast, so guidelines needed to be prepared for new understandings, expanded, and adapted to new disruptions continually.

"The AI tools are there already. Universities can't restrain or control the use of them. They can only recommend or guide on best practices." (Interviewee 13, Executive)

2.4 Innovative Thinking

The entire AI world has been causing changes, and ChatGPT has just been the tip of the iceberg. Exploring AI and related changes needed innovative thinking. One staff member mentioned that guidelines should focus on encouraging the usage of ChatGPT rather than limiting it. To enhance learning outcomes and quality, universities should encourage students to use ChatGPT in projects, thereby reducing coding errors, increasing work efficiency, and improving quality, which in turn frees staff's time for administrative work. For example, institutions should encourage 20% time for learning and using ChatGPT/Copilot to develop the first draft of code, summaries, or translations. Then staff members could go through it. This approach not only provided staff with a ready draft to work on but also reduced the fear of losing jobs to AI, as it helped them understand how AI would change job functions. After all, AI would assist people in their work tasks and eventually replace certain functions/positions altogether.

Change direction should not focus solely on the technical side, but also on the ripple effects, including ongoing costs, legal aspects, and data storage. Therefore, changing direction is needed to adopt a cost/record/system perspective for executives and management to make their environments and businesses more efficient for AI, or it would be costly (licensing, not salary reductions) in the long run. This was not about starting from scratch, but about improving processes and operations in a different world. Staff members needed to be involved in implementing changes and to consider practical challenges, including bilingualism and privacy. A manager emphasized that AI brought a significant shift in education, which had remained unchanged for far too long. It was time to move beyond small-scale thinking and ask the right questions, ensuring that higher education retains its focus on the big picture instead of compromising opportunities.

“There has to be a shift in education. Education has stayed the same for far too long. There has to be a shift. Something's gonna change. Kids don't learn the same way as I did in my own. You're gonna need to use AI to help you. Hopefully they will.” (Interviewee 18, Manager)

Theme 4. GenAI Policies and Guidelines in 22 Canadian Universities

Policies and guidelines from 22 Canadian universities were examined and analyzed. A summary of the key elements, summaries, and links of GenAI policies and guidelines in these universities was included in Appendix D.

1. University of Toronto
2. University of British Columbia
3. McGill University
4. University of Waterloo
5. McMaster University
6. Université de Montréal
7. Queen’s University
8. Simon Fraser University
9. University of Alberta
10. Western University
11. University of Calgary
12. Université Laval
13. York University
14. Dalhousie University
15. University of Victoria
16. University of Ottawa
17. University of Guelph
18. Carleton University
19. University of Manitoba
20. Memorial University
21. University of Saskatchewan
22. University of New Brunswick

This section had two parts. Given the similar foci and distinctive features across the 22 universities, the first part examined the commonalities among them. The second part focused on the distinguishing features and overall directions among these universities. This section used direct codes from each university.

“It no longer makes sense to state expectations to be 'NO GENAI USE' because the technology is now embedded in both new and pre-existing tools and increasingly difficult to avoid.” (University of Saskatchewan)

Common Focuses Across Universities

Academic integrity was a repeated theme and focus for all universities. Responsible, ethical, and secure usage was the core of policies and guidelines for students, instructors, and administrators. Moreover, there was a relatively high level of freedom for autonomy and discretion in terms of innovation and learning facilitation. Specifically, the common focus areas were listed below.

- Academic Integrity: Emphasis on citing GenAI tools, ensuring AI use does not constitute cheating and plagiarism, and treating unauthorized use as academic misconduct. Research ethics is especially important in graduate studies and thesis work.
  - "By failing to comply with the instructor's specific instructions that you not use generative AI tools in writing your term paper, you have knowingly used an unauthorized aid in preparing your assignment." (University of Toronto)
  - "Using AI tools to generate content for assignments and presenting it as one's own original work, as well as copying or paraphrasing the content produced by AI tools without proper citations and the instructor's consent, are both considered to be in violation of academic integrity." (Carleton University)
  - "It is an academic offence at Memorial University to submit work created through the unauthorized use of generative artificial intelligence (GAI) tools and present it as your own original work." (Memorial University)
- Transparency and Disclosure: Required disclosure of GenAI use in research, theses, and assignments.
  - "GenAI tools can have the potential to enrich learning, for example by supporting idea generation, studying, or writing – with proper acknowledgement." (University of British Columbia)
  - "Since norms regarding the use of generative AI technologies vary across academic disciplines, graduate students who plan to use generative AI tools in researching or writing, including the completion of the Qualifying Examination, must seek unambiguous approval for planned uses in advance from their advisor(s) and advisory committee. Approvals must be documented and adhere to departmental and/or field-specific policies where they exist." (University of Guelph)
  - "Using AI uncritically, or without acknowledgement can result in problems with research integrity." (University of New Brunswick)
- Ethical Use: Promotion of responsible and human-centred use of GenAI. Emphasis on fairness, bias mitigation, and responsible behaviour.
  - "Regularly delete stored AI conversations where possible to minimize data retention risks." (University of Waterloo)
  - "We recognize potential concerns associated with the use of GAITs, including potential biases in the algorithms and the possibility that GenAI might be used in ways that violate academic integrity principles and intellectual property rights.

Faculty and instructors are best positioned to make decisions about the use of GAITs in their courses." (University of Victoria)

- Instructor Autonomy: Instructors define whether GenAI is allowed and how GenAI can be used in their courses.
    - "Instructors must be explicit in course outlines about the expectations for use of generative AI tools and may set limits on their use in assessment tasks." (McGill University)
    - "You must clearly indicate on your course syllabus whether the use of generative artificial intelligence tools are acceptable, permitted in specific situations, or unacceptable in your courses. This sets clear expectations for your students." (Western University)
- Operational Use: Guidelines for administrative and institutional applications.
    - "AI tools have the potential to improve efficiency and enrich experiences in teaching, research, student life, and administration. However, these tools should be used with careful evaluation of their risks and alignment with core commitments as outlined in the university's strategic plans. AI systems often have limitations, including built-in biases and exclusion of certain types of knowledge." (University of Alberta)
    - "Tools to detect text or other outputs produced by GenAI are not reliable. False accusations can be devastating. No detection tool has been approved for use at the University of Saskatchewan. USask continues to monitor and assess detection strategies." (University of Saskatchewan)
- Privacy and Data Security: Caution against inputting sensitive data into GenAI tools.
    - "Research conducted using algorithmic systems may violate the University's regulations regarding research integrity (a subcategory of academic integrity; see 'Integrity in Research') in a variety of ways, such as if you do not know the character or provenance of the system's training data, whether the data was legally obtained, or how the data was modelled." (Queen's University)
    - "Do not share documents that contain sensitive or personal information, such as academic records, financial data, student results, and research data." (Université Laval)
- Tool Literacy: Provision of training and resources to improve GenAI literacy.
    - "GenAI literacy refers to understanding and effectively using GenAI tools and technologies. It does not mean you must adopt GenAI, but rather that your approach should be informed and in line with your own needs and values." (York University)
    - "As Generative Artificial Intelligence (GenAI) is rapidly transforming our daily lives, this guide is designed to help Dalhousie's students, staff, and faculty explore resources that go over how to effectively, efficiently, and responsibly, navigate GenAI in their work, teaching, learning, and research." (Dalhousie University)

Distinguishing Features

Even though there were similarities in AI policies and guidelines, Canadian universities showed different approaches, coverage, and directions regarding GenAI policies and guidelines.

- Different universities took different approaches to AI policies. For example, the University of Toronto integrated policies across research, teaching, and operations. The University of British Columbia broke down AI guidelines into principles, teaching and learning, and academic integrity. Some universities, such as the Université de Montréal and the University of Manitoba, gave faculty members the freedom to set their own guidelines.
    - “Les facultés et les unités/départements/écoles peuvent avoir des exigences ou des restrictions spécifiques concernant l’utilisation de l’IA générative qui vont plus loin que les présentes lignes directrices.” (Université de Montréal)
    - “Keep in mind that asking or requiring your students to access these tools is complicated by the fact that genAI tools have not been vetted by the University of Manitoba for privacy or security.” (University of Manitoba)
- There was various coverage in each university. For example, the University of Ottawa’s policy was one of the most detailed in Canada, addressing both technical and ethical dimensions of GenAI. It promoted a balanced approach to innovation and risk, with a strong emphasis on privacy, fairness, and institutional accountability. The University of Calgary had detailed rules for graduate students in research and writing.
    - “The University recognizes the need to define its risk tolerance for the use of AI. A balanced approach will be adopted, considering both the potential benefits and the associated risks. AI systems that could potentially affect safety, fundamental rights, or introduce significant ethical issues will be considered high risk.” (University of Ottawa)
    - “Students are expected to possess a comprehensive understanding of the GenAI tools employed in their research or writing process. This includes being able to critically evaluate the outputs generated by GenAI systems. This proficiency enables students to confidently defend and explain the results, interpretations, or conclusions derived from AI-generated content during academic assessments or scholarly discussions.” (University of Calgary)
- Different universities showed quite distinguished directions. For example, Queen's University took a prohibition-by-default approach, whereas the University of Guelph required written approval from a supervisor for the use of GenAI in graduate research. By contrast, the University of Calgary encouraged responsible and balanced use of AI as a supplement, rather than a replacement, by guiding graduate students to utilize GenAI for application writing. Some universities encouraged the use of Copilot as an institutionally supported tool for safeguards, such as at McMaster University and Université Laval.
    - “Delegating a task that you were supposed to perform to an algorithm is no different than delegating it to another person, so delegating a task that you were supposed to perform to an algorithmic system violates academic integrity.” (Queen’s University)

- “In graduate studies, GenAI technology should be used to enhance rather than replace human creativity and judgement.” (University of Calgary)
- “McMaster has an enterprise license for Microsoft Copilot which ensures that, when logged in using McMaster credentials, data used is not shared with either Microsoft or McMaster and confidential, personal or proprietary information can therefore be used.” (McMaster University)

Chapter 5. Discussion

The central research question is "*how do methods enhance technology-related change success?"* Three sub-questions aim to gather the necessary data to answer the central research question.

a. Why do change initiatives often fail in new technology adoption and usage?
b. What management approaches are currently applied to leverage ChatGPT's adoption success in higher education?
c. What strategies are available to leverage change processes connected to technology adoption, especially GenAI within organizations?

This research has answered the sub-research questions and, hence, the research question. The following sections discuss in detail how the interviews fill the gaps in the literature and answer each research question. The following sections are arranged as follows: 1) reasons of failure that connect the findings from the literature and the interviewees, 2) strategies to target ChatGPT in higher education, 3) ways of enhancing the success of ChatGPT change management implementation, 4) connection to theoretical perspectives – SCOT and Sensemaking, and 5) methods to enhance technology-related change success, which answers the central research question.

In general, all interviewees have found technology-related change management and its success and failure to be a complex issue. This is because it was difficult to measure success and failure, as identified in both the literature and the interview findings. According to a manager, change was multifaceted. It could depend on what the users thought, but it was challenging to get everyone on board and accumulate success when too many people were involved. Moreover, even though the changes met goals, such as users adopting the new technology, staff leaving positions during the change process could indicate the failure of the change management process. The following sections demonstrate what interviewees believe are the successes and failures of technology-related change management, why failures occur, the gaps between success and failure, and how to succeed. Table 1 below summarizes success, failure, gaps, and bridging success and failure across the areas of planning, people, process, and outcomes, as identified by the interviewees.

"It's multifaceted. It's user adoption to the new technology, improvement from a business process perspective, and customer experience improvement as well, right?" (Interviewee 16, Manager)

	Success	Failure	Gaps	Bridging

Planning	No mentioning	-Lack of planning -No proper planning	-Want vs can have	-Understand lifecycle, requirements, effects on people, and failure -Plan with understanding, far ahead, & ready for disruptions
People	-Onboard -No complaints	-Unaware of the changes -Users are not engaged at the beginning -Not identifying the proper stakeholders	-Knowledge -User experience -Resistance	-Stakeholder engagement -Teamwork -Satisfaction
Process	- Fit in various realities	-Failure in communication and implementation	-Ideal vs actual	-Understand
Outcome	-Governance -Change effects -Technical usability	-Perception: expectations are not met -No or massive negative impacts -Little value	-Cost-benefit -Technical functionality -Continuous management of tech	-Engage end users

Table 1. Success, failure, gaps, and bridging success and failure vs. planning, people, process, and outcomes.

Based on various data sources, including a literature review and interviews, it was concluded that success is a multifaceted assessment of change. Yet people hardly noticed success because reasonable solutions and impacts draw less attention than downsides and failures. Moreover, different success metrics led to varying definitions of success, such as quality of work, on budget, on time, putting theory into practice, business value added, good communication, a well-integrated product, and stable, capable, and available technical features. From an agile perspective, none of these traditional project management performance measurements were applicable for measuring success because changes had never been made. This section demonstrates how difficult it is to measure success and failure, as well as various strategies and methods identified from the interviews and policy/guideline reviews.

Reasons for Failure

This research has identified key failure factors from the literature, as demonstrated on the left side of Graph 1. The interviewees have agreed on these points, as shown on the right side of Graph 1. First, change failure was hard to define because of different social environments, times, and standards. Second, people, process, and product factors influenced the success or failure of technology projects, as illustrated in both Graph 1 and Table 1. Graph 3 combined the failure factors to demonstrate the connections between the literature and the interview results.

Graph 3. Connect the failure factors from the literature and the interviews

It should be noted that stakeholder resistance was not emphasized in the interviews. The reason might be that the research is framed within the scope of GenAI, which was disruptive, and no one could resist it. On the contrary, users have already been exposed to GenAI at various levels, without organizations initiating the traditional buy-in processes. This point has been more specifically discussed in the last section of this chapter.

Theme 2 Change challenges in executives, managers, and staff members from Chapter 4 have gathered unique views and challenges based on their roles as executives, managers, and staff. The findings explored the people component in the change process and the effects on the process and products/outcomes.

	Factors affecting decisions on new technology	Responses to disruptive technologies
Executives	Enablers: business needs and value. Concerns: money, understanding of complexity, and powerlessness.	Admit the difficulties of managing. Step back to try to understand.

	Misalignment between technology and change	Managing concerns
Managers	Misunderstandings of the alignment between technology, change needs, and consequences.	Voice concerns, communicate effectively, and do the best when there is no choice but to proceed.
	Frequency of consulting	Support for staff during changes
Staff	No or never. The format of consulting is passive.	Less structured training and guidelines.

Table 2. Change challenges in executives, managers, and staff members

Such challenges made the measurement of success difficult because GenAI was disruptive and interrupted the traditional structure and processes of change. This made understanding and communication more important, including alignment between GenAI and the current organizational structure and operations, staff support, and what success looked like for individual organizations when GenAI stayed, no matter how organizations planned to adapt to it.

Strategies to Target ChatGPT in Higher Education

The third part of Theme 2, concerning consultations on GenAI guidelines, and the third part of Theme 3, Which Addresses Changes in education related to ChatGPT, have compiled the actions and responses towards ChatGPT in universities. Theme 3 focused on the current policies and guidelines in 22 Canadian universities.

The findings from the interviews in Themes 2 and 3 aligned with the literature, which was still in the early stages of research. It should be noted that, although higher education provided a focus for both the literature review and the interviews, the literature review took a more general approach to GenAI and technologies in general. In contrast, the interviews conducted in universities demonstrate a more focused approach to higher education.

	Literature		Interviews
Positive	Technical maturity, opportunities for teaching, and business opportunities	Optimistic	Usefulness, enablement of teaching and learning in higher education, and efficiency.
Negative	Information quality and reliability	Passive	Adverse effects on learning and the consequences of cheating and reputation loss in higher education

Mixed	Disruptive potentials and ethical dilemma.	Observant	Admit its irreversible impact, understand the real issues in higher education, and feel uncertainty.
Responses	Depending on the domain. Establishing boundaries for the appropriate use of ChatGPT.	Responses	Executives were sitting in committees, and managers and staff were not being consulted.
Responses: GenAI Policies and Guidelines in 22 Canadian Universities			
Academic Integrity, Transparency and Disclosure, Ethical Use, Instructor Autonomy, Operational Use, Privacy and Data Security, Tool Literacy			

Table 3. Actions and responses towards ChatGPT in universities from the literature, the interviews, and the policy review

The findings indicated that while strategies to target ChatGPT in higher education existed, no specific strategy had been implemented yet. This is no surprise, as traditional planning for technology adoption is no longer applicable to GenAI, which arrives disruptively and lacks a lifecycle. In other words, it evolves faster than organizations can plan for, and users have already begun using it without requiring organizations to implement it. Therefore, to effectively manage changes like ChatGPT, traditional change management thinking must be revised to align with the new realities and requirements of technology and change.

Theme 4 included a review of GenAI policies or guidelines of 22 Canadian universities. While there were distinct characteristics of the GenAI policy direction at each university, the findings from these policies and guidelines showed two key trends: awareness and responsibility.

First, universities have been aware of the changes that GenAI brings and are getting ready for ongoing responses in their various capacities. Across the 22 universities, GenAI policies and guidelines demonstrated broad policy convergence with the consensus on foundational GenAI principles in higher education. Some universities have established task forces and training modules to better position themselves to adapt.

Second, universities have been aware of the complex responsibilities and requirements regarding GenAI. For example, regarding equity and access, some explored GenAI’s potential for inclusive learning. However, due to the nature of education and research, there has been no single standard to ensure absolute equity in the use of GenAI across various learning, teaching, and research purposes. At the same time, GenAI relates to other complex digital areas, including privacy and security. Therefore, responsibilities for ethical usage are tied to risk management, which involves mitigating risks by and for each user.

What was lacking in these policies and guidelines could be considered the next steps for higher education to better adapt to the new realities of teaching and learning collaboratively. One noticeable observation was that there was no unified framework in higher education, nor in each university. In other words, while coverage of GenAI policies and guidelines has been broad, there has been no collaboration among faculties within or across universities. Such a lack of cooperation could hinder the sharing of sound practices and the evaluation of impact in an aggregated manner. Therefore, while faculties developed tailored AI policies and guidelines to meet the needs of their distinguished domains, it was necessary to initiate national wide academic networks to move to more integrated policy making, interdisciplinary GenAI exploration, horizontal co-curricular programs by domains instead of by institutions, and sound practices and results sharing to evaluate impact and achieve ongoing learning and evolution to respond to the ever-changing nature of GenAI in the digital age.

Enhance the Success of ChatGPT Change Management Implementation

Facing such a disruptive technology, with no strategies and no way of planning in place, it seems unanswerable how to enhance the success of ChatGPT change management implementation. This section focuses on the gaps in the literature and on whether the interviews have filled them.

As discussed in Chapter 2, Part 4, Gaps in the Literature, the main gap identified in the literature was inconsistent perceptions and understanding of technological change. To be specific, the four gaps under the umbrella were

- No unified understanding of what technology is in change.
- The danger of simply using regulation to suppress ChatGPT and cover the real problems in the current educational system.
- Technologies do not fit into the organizational culture nor solve unidentified real problems.
- Data value, concerns, and complexity.

The interviewees have acknowledged all these gaps to various degrees. For the first gap, the need for understanding and its lack have been recurring themes in both the literature and the interviews. For example, in Chapter 2, Part 1, traditional change management recognized the importance of understanding the need for change and every aspect of the organization. The analysis of environment, organization, and technology in Chapter 2, Part 2, also included the necessity of understanding the goal, nature of technology, and the complex relations between people and technology.

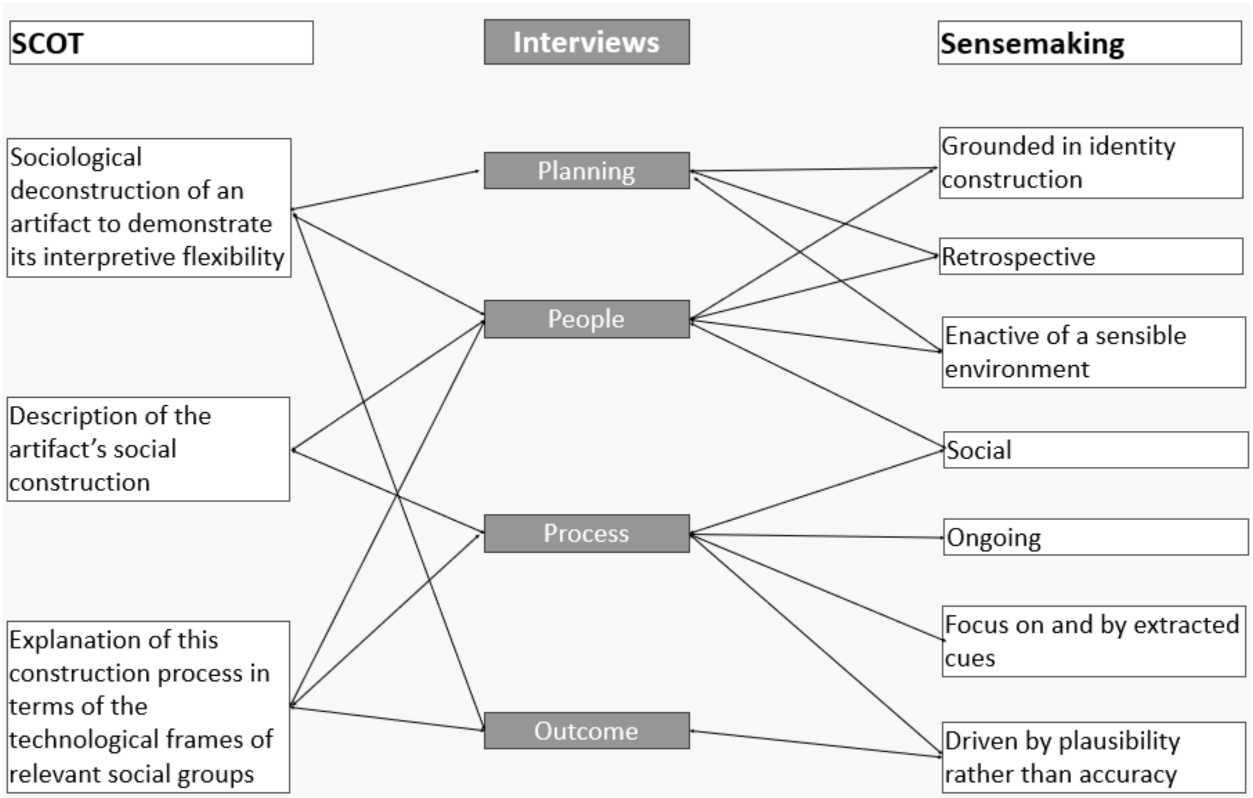
The interviews filled the gap at a certain level. The areas to understand about technology included technical requirements, lifecycle, effects on people, and the relation between technology and change, as identified in Chapter 4 Theme 1. For example, Chapter 4 Theme 1, 5.1, mentioned that understanding technology was not only about its sustainability but also about its requirements for process change within an organization. However, the interviews lacked a unified understanding of what technology was during the changes, despite the interviewees recognizing its importance. This was due to the unpredictable and ever-changing nature of variables in technology and change. Therefore, it was impossible to have a unified understanding of technology's role in change.

The second gap was extensively discussed in Chapter 4, Theme 3, 1.3 Observation regarding regulation on ChatGPT in universities. One danger the interviewees identified was the enforcement and governance of any regulation or policy. This was a valid concern, as ChatGPT has become a part of students' activities and outpaced the development of policy or regulation. Another concern about suppressing ChatGPT in higher education was that it might mask the real problems related to the third gap. Interviewees identified real problems, such as a lack of desire to understand technology and fear of facilitating fundamental cultural change in universities. Innovative thinking, such as encouraging the usage of ChatGPT, was mentioned in literature and interviews. However, this was related to the third gap regarding technology suitability for addressing real problems or changes. ChatGPT faced the same technical issue as past technologies – is it a suitable innovation for an organization? For example, in a government setting, when culture and process changes were difficult and close to impossible to meet the requests for change, could ChatGPT act as a catalyst or another doomed change failure when other change components are untouchable?

Such innovative thinking was relevant to data, the fourth gap in the literature. The interviewees recognized the issues around data in technology-related change management, including the need to plan data life cycles, metadata schemas, and data ownership, integrity, and management. Regarding GenAI, data security was the main reason that universities chose MS Copilot, though interviewees acknowledged that the function was not comparable to ChatGPT. In Theme 3, 1.3 Observants and 2. ChatGPT and University Change Directions, data became a separate topic regarding its demystification, challenges, and considerations.

Connection to Theoretical Perspectives – SCOT and Sensemaking

This research drew on SCOT and Sensemaking as theoretical support. Both theories and their relations to change and technologies were explicitly explained and discussed in Chapter 2, Part 5: Theoretical Perspectives. The findings from the interviews, categorized by planning, people, process, and outcome, corresponded with the three steps of SCOT and the seven parts of Sensemaking. However, there were key differences in emphasis between the interview findings and the theories. This section discusses the connections and disconnections between the interview findings and the theories of SCOT and Sensemaking. As below, Concept Map 4. Connection to SCOT and Sensemaking illustrates such connections at a high level.



Concept Map 4. Connection to SCOT and Sensemaking

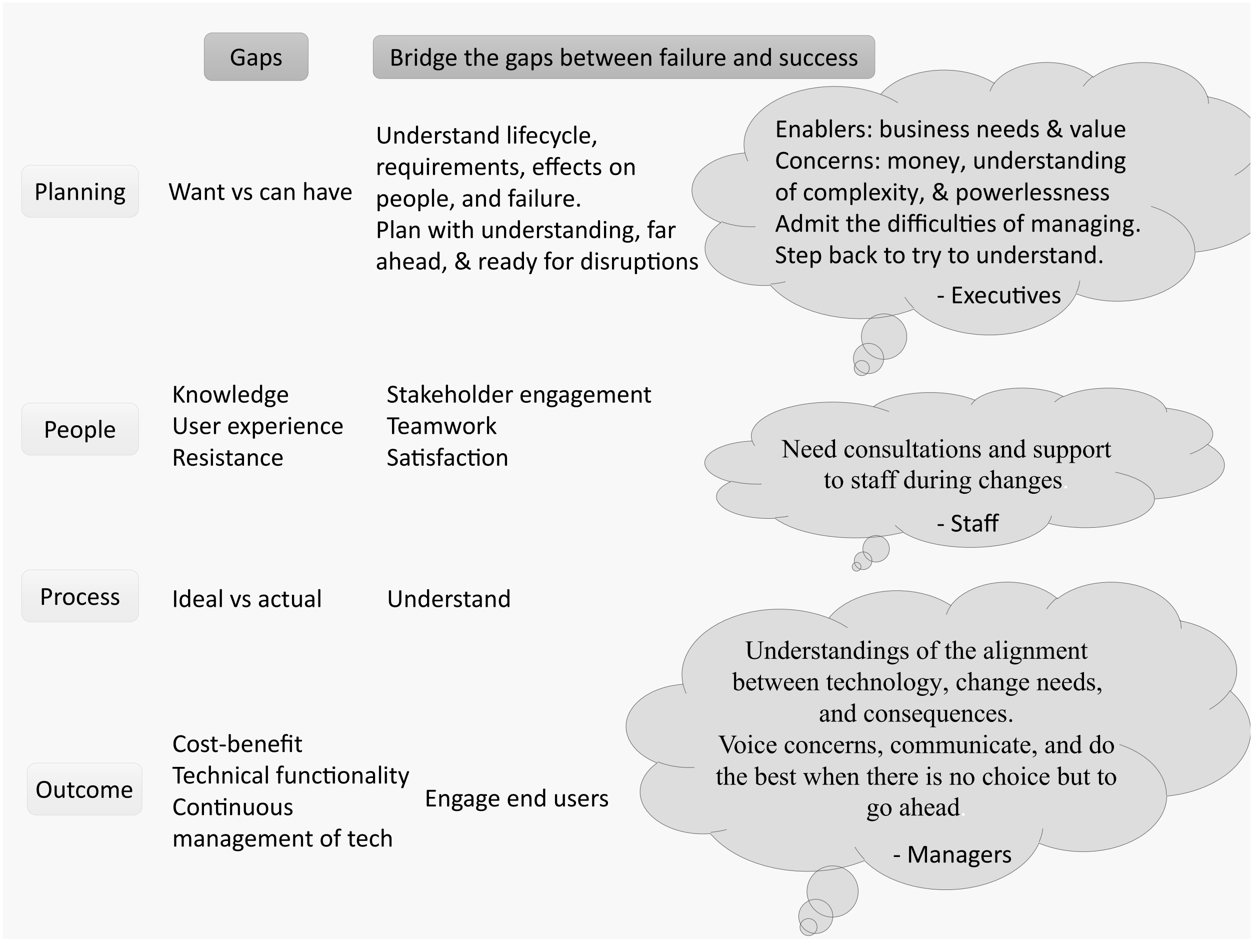
The similarities were reflected in the general alignment of the planning, people, process, and outcome aspects, as well as the recognition of the importance of people, as illustrated in Concept Map 4, Connect to SCOT and Sensemaking. First, the four pillars identified in the interviews, planning, people, process, and outcome, aligned with the components in SCOT and Sensemaking. Even though SCOT was a problem-solving research tool, the emphasis on the people component and the relationship with users in technology design and application corresponded to the interviewees' recognition of the importance of understanding user needs, stakeholder identification, and user engagement at an early stage. Based on the guideline of understanding, which larger-than-ever role in understanding technologies and their interactions with humans and organizations has been discussed in 1) Chapter 2, Literature Review, Part 5, Theoretical Perspectives, and illustrated in 2) Sensemaking is a multi-step process of observation, analysis, action, reaction, awareness, interaction with people, emotions, situations, and relationships. This corresponded to the interviewees' identification of complexity across the various components of the change process. Second, people have been the centre of everything, according to SCOT, Sensemaking, and interview findings. SCOT emphasized people's role at every step, from identifying users' needs to communicating the final product to them. Sensemaking was built on making sense of people before moving to any action. The interviewees have specifically discussed the people factors in technology-related change success, failure, and gaps. Therefore, it is reasonable to conclude that the theories align with holistic thinking, as evidenced by the findings of this research across planning, people, process, and outcomes, whereas the people component has been the most crucial part of the change process.

The differences are reflected in agile thinking and the less socially constructed nature of new technologies. First, the interviewees identified the interconnected nature of all four pillars, so agile must be applied to move among them for the best change effect. Nevertheless, neither SCOT nor Sensemaking was agile. SCOT had a clear sequence of when and how people were involved in each change step. Even though Sensemaking presented a holistic, seemingly non-linear process for understanding people, the environment, and society in relation to technologies, it still positioned people as the foundation of a waterfall sequence of people, process, and product. However, according to the findings from the interviews, people engagement, ongoing consultation, and user feedback should be part of the holistic change process. Such integration was not integrated into the current change situation regarding GenAI and the theories of SCOT and Sensemaking. Second, technology became less socially constructed, especially in the case of GenAI. For example, the first step of SCOT referred to identifying the relevant social groups and interpreting flexibility. However, GenAI's emergence and destructive nature did not require user expectations or feedback in its initial technical design or application. In other words, the creation of technology was not strictly tied to its social expectations and functions, as with older technologies, such as the bicycle. Therefore, even though SCOT remained relevant on the micro level in organizational change management and technology adoption, the concept of social construction has shifted toward a less unified approach and more case-by-case analysis.

Methods to Enhance Technology-Related Change Success

Through a literature review, interviews, policy review, and connections to the theories, this research has addressed the sub-questions and thus answered the central research question: how do methods enhance the success of technology-related change*?* This section discusses connections and gaps among findings, with a focus on understanding that traditional change management theories and practices are outdated, though still relevant, and on the new realities of technology and GenAI. This section has also proposed a renewed method to change management in the age of disruptive technologies, such as GenAI.

First, even though many elements of traditional change management theories and frameworks remain relevant, the theories and practices themselves are no longer applicable to the new age of GenAI. For example, the interactions among the environment, organization, and technology will never cease. However, the pace and ever-changing nature of such interactions do not allow for systematic, linear thinking to know, to do, and to do more thinking and processes. Sustaining changes is no longer applicable because changes are constant with the evolving technologies. Second, Concept Map 5 below combines elements from Table 1, generated based on Theme 1 Change Success and Failure Factors, and Table 2, generated based on Theme 2 Change Challenges in Executives, Managers, and Staff Members. This concept map illustrates the methods identified by interviewees to enhance change success, focusing on key points raised by executives, managers, and staff. It should be noted that the executives' methods are primarily focused on planning, reflecting their decision-making role. Staff's methods are in the people area, which emphasizes their stakeholder roles. Managers, as the change adopters, focus on the process enablers and deliverables.

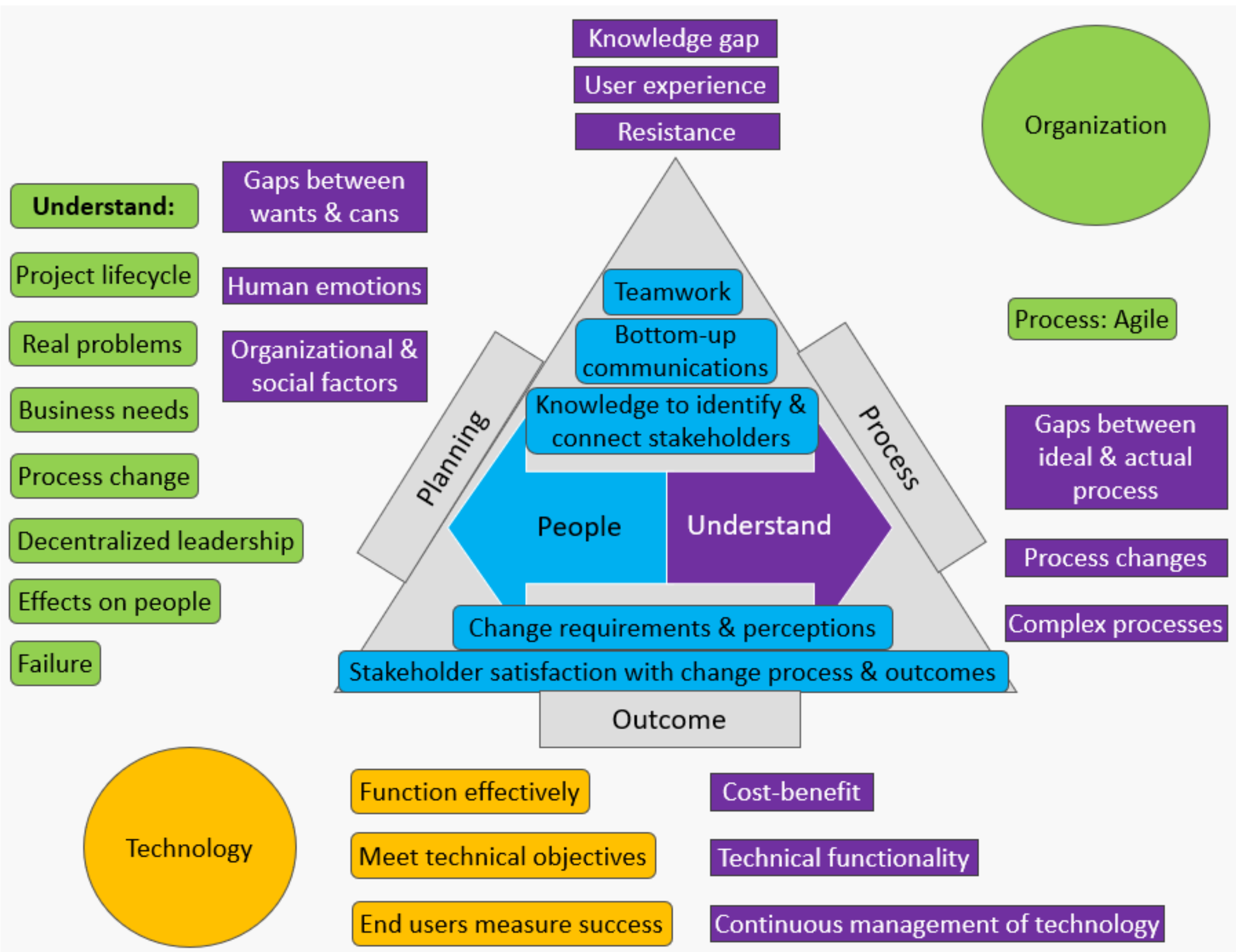


Concept Map 5. Enhance Technology-Related Change Success

"It is never the tech problem but the issues of creating workflows for business process changes based on data, such as in the case of the BI system usage." (Interviewee 14, Executive)

Third, regarding theories, most notably, the SCOT theory does not apply to GenAI in the same way it applies to traditional technologies. This is because some technologies are not designed with society and interest groups in mind. In other words, the aspect of social construction is not the same as traditional inventions, such as bicycles. Nevertheless, it does not mean that SCOT is no longer helpful. At the organizational level, SCOT would be crucial to facilitate technical thinking that solves organizational problems, as illustrated in Appendix A. However, the scale would not be at the societal level as in the past industrial revolutions. At the same time, applying sensemaking becomes a prerequisite to understanding the new reality of technology and GenAI. As interviewees pointed out, GenAI is here to stay. Organizations have no control over GenAI's existence and people's usage of it, so trying to suppress it will not work. However, organizations can decide whether to apply AI and at what scale, based on their reality, goal-setting to solve real problems, and stakeholders. Moreover, the ripple effects of GenAI-induced changes, such as process efficiency and data considerations, need to be considered alongside GenAI instead of separate change issues. Therefore, people factors have become increasingly crucial for understanding the multi-layered complexities and issues, the real and root problems underlying the apparent symptoms, and the emerging opportunities and obstacles in the adoption and use of GenAI.

Therefore, among all the factors identified, understanding and people have emerged as recurring themes. This is a valid point, as any misunderstanding of the planning process, the people in an organization, the process, or the expected outcome can lead to changes, missed targets, and failure. Based on the discussion in this chapter, as well as Chapter 4, Theme 1 4. Gaps between Change Success and Failure, and 5. What to do to Make Technical-Related Change a Success, the renewed methods in change management are as follows in Concept Map 5. Renewed Change Management Strategy in the Age of GenAI.



Concept Map 5. Renewed Change Management Strategy in the Age of GenAI

This concept map used colour codes to combine elements to understand and act on for success in the planning, people, process, and outcome aspects. There are overlaps, as to action is to understand actively. For example, to plan GenAI adoption, it first has to understand key elements, including the project lifecycle, process change, and effects on people, which inform the approach to succeeding in the people and process parts. Technical functionality needs to be understood and achieved.

The shapes also matter. The central piece is a triangle. Agile has been a repeated theme in this book, especially from the interview data. It is true that in the case of GenAI, being agile means considering all aspects of change holistically, understanding failure, being flexible in modifying based on user engagement, and continuously adapting, as technology will never cease to change. However, Agile is not as easy as a few two-way arrows indicate on a graph. Agile is time- and cost-consuming and often requires a change initiative in its own right across organizational operations, processes, and culture. Therefore, as shown in the triangle of planning, process, and outcome, moving among these components can be a rollercoaster, with climbing to the top of the triangle and free-falling as the reality in Agile. People and understanding within the triangle are like two hands, holding change and change management together. Organization and technology are round, which indicates their ever-changing nature and mobility throughout the change process. There are no arrows to indicate sequence, as all aspects can occur simultaneously, depending on the situation and the organizations involved.

Chapter 6. Conclusion, Limitations, and Future Research

This research has answered the main research question and the sub-questions, as discussed in Chapter 5 and illustrated in Graph 3, Tables 2 and 3, and Concept Map 5. The gaps in the literature have also been addressed in the interview. Through a literature review, theory examination, policy review, and interviews in higher education, this research has bridged traditional change management thinking and GenAI while addressing key issues in higher education amid many uncertain and unknown variables.

Nevertheless, there are three major limitations – unanswered questions, limited scope, and the pace of research. First, this extensive research has left more questions than answers about how to enhance change management success in the age of GenAI. This is due to the many unknowns about the ripple effects of the changes that GenAI brings and its rapid evolution. For example, the interviewees offered many insightful ideas and comments, but there was a lack of in-depth discussion. It is normal, considering the time restraints of one-hour interviews, the inherited complexities and unknowns about changes, and the scarcity of change success. This limitation not only presents a barrier to technology-related change management research, particularly in the context of GenAI, but also hinders the ability to learn from sound practices in diverse new situations and constraints. The death of the Artificial Intelligence and Data Act (AIDA), the AI legislation that did not pass the House of Commons (Attard-Frost, 2025), was an example of how the unknowns about AI hinder responses to change.

Second, although this research has connected various disciplines and bridged change management and GenAI, its scope remains limited. It is natural since no single research can cover every aspect. Nevertheless, two key elements are missing – the real problems in the power inequality and GenAI environment, as well as broader inclusion of interviewees. To start with, change management is a power play in political economy. AI further reflects the power inequality in data. For example, data scarcity is common in large domains controlled by a few stakeholders, such as agriculture and construction. Inappropriate data use, such as in grocery shopping, can target vulnerable consumers, such as a single mother who can only afford certain types of food at certain times of day. The broader AI environment, such as the current arms race reminiscent of the Star Wars arms race in the 80s, is linked to many political, economic, and international relations issues, but it is a separate subject that deserves its own PhD thesis. Therefore, even though this research advocates understanding the real problem, the real problem in the environment regarding political economy, democracy, and AI governance, rather than trusting technology in the micro sense of change management, cannot be included in this research due to scope restraints. Furthermore, this research interviewed people working in change and IT/IM. Students and professors have been excluded, who are a major stakeholder group in higher education. This is because of the focus on change management, and the staff members represent the user group in change management. It would be more complex to recruit students and professors, who are not traditionally included in the change process, even though they are among the most affected users in universities.

The third limitation is that the unprecedented pace of GenAI evolution outpaces research and publications (Wolak & Keffer, 2023). For example, at the beginning of this research, ChatGPT was the only GenAI that was widely known and used. During the research process, Microsoft began exploring the market, and now Copilot has become a corporate GenAI. This research could not include a broader examination of GenAI because some products did not exist when the research was planned. More unknowns become unavoidable if research cannot keep up with GenAI. In this way, the unknowns and uncertainties can continue to snowball without being answered promptly by traditional academic research. This is dangerous, as the blind pursuit of GenAI can lead to a scaling change failure in real life without timely research and publications. For example, the current G7 competition is a call for AI solutions to solve root-process and cultural problems in the federal public service, including high volumes of information and complex policies and regulations (Impact Canada, 2025). It is the first step towards failure to hope that technology can solve organizational problems without going through the necessary organizational process changes to enable technology adoption and use.

For future research, academia and industry need to form a new partnership for knowledge sharing, apply the findings from this research to practice, and further develop sound practices. Ongoing understanding and changes in understanding need to come from holistic thinking and lessons learned at a faster pace than conducting normal academic research. The traditional academic study of specific issues, which do not integrate interdisciplinary knowledge and ideas, is no longer applicable to the new realities of rapid evolution and the multifaceted ripple effects of GenAI. Research also needs to branch out into relevant fields, as identified in the limitations. Therefore, future research should not only be subject-oriented but also consider the shifts in culture within current academic research and its relations with industry.

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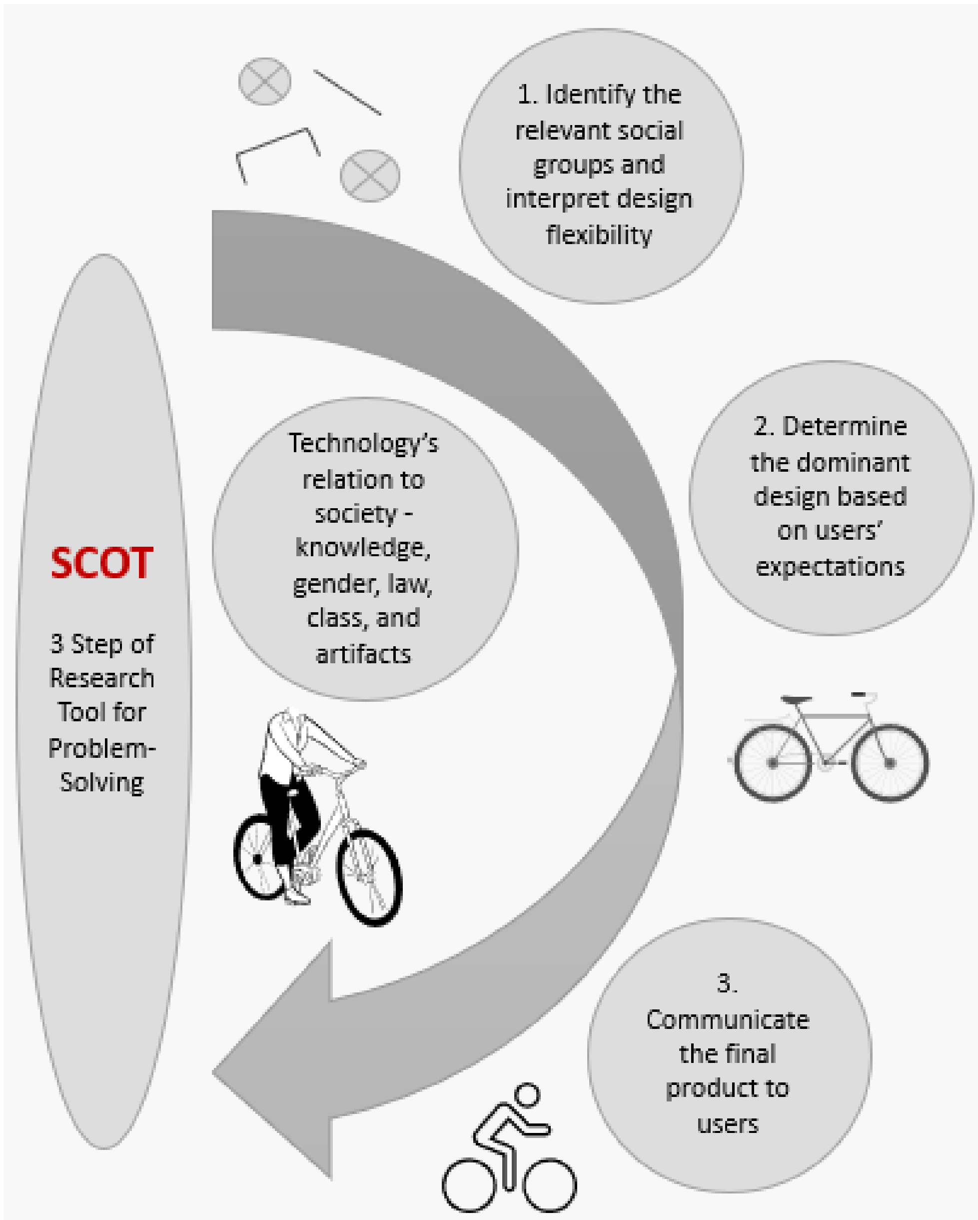
Appendix A. SCOT – How to Build a Bicycle



Appendix B. Interview Guide

Icebreaker questions for all interviewees:

Would you like to describe your role and work in the university?

Would you like to describe your career path that leads you to your current role?

For all interviewees:

What are the gaps, if any, between what you expected and what you see/experience during technology-related change projects?

Could you give me an example of the most successful technology-related change projects that you have been a part of?

What is change success and failure regarding technology, in your opinion?

Why do you think that technology-related change projects fail? With an example?

What can you do differently to make the change project successful? With the previous example?

What do you think of the changes that ChatGPT bring to higher education? (Prompt: teaching, learning, student usage…)

What is the potential change direction that your university will take regarding ChatGPT, in your opinion? (Prompt: policy, regulation, usage…)

For the 2-4 executives (the decision-makers):

What makes you decide on a piece of new technology for your organization's change initiative? (Prompt: technical features, organizational needs, budget…)

What is change management like, if the technology always exists, such as ChatGPT, and brings changes despite whether higher education is ready or not?

For the 6-10 middle-level managers (the adopters):

Have you experienced a situation in which you find a piece of technical product unsuitable for your organization's change initiative?

How do you manage the implementation of technology/change, if you have any concerns about the change initiative?

For the 10-16 staff members (the users of the new technologies):

When coming to technology-related change initiatives, how often are you consulted? (Prompt: technology usability, potential problems…)

What support do you receive during technology-related changes (Prompt: user testing, training…)?

Additional:

Was your role/function consulted when guidelines on Generative AI and Academic Integrity came out this academic year?

If you were consulted, what would you have suggested (differently)?

Appendix C. Demographic Table of the 20 Interviewees

This table includes high-level demographic information to maintain interviewees' anonymity. First, the table only includes the information that is not relatively unique to the interviewee. For example, if an executive was in the current role for only a year, the year spent working in the domain was included. Similarly, if a staff member has worked in the domain for more than 40 years, their years of experience would exceed 20 years in the university sector. Second, the table excludes traditionally accepted demographic information, such as gender and workplace department. In this way, the table does not help identify any interviewee, such as a female executive with one year of experience in the current role in faculty xxx, even though the university is not listed.

Interviewee #	**Rank**	**Years of Experience in the current role/domain/sector**	**Current role/domain/sector (university)**
1	Executive	>10 in the current role	IT needs and interaction with the leadership
2	Manager	>30 in the domain	IT services
3	Staff	>20 in the domain	IT systems
4	Executive	>20 in the domain	Technology development, governance, and change
5	Staff	>10 in the domain	IT support
6	Staff	>25 in the domain	Learning and teaching with technologies
7	Manager	>20 in the sector	IT project management and services
8	Manager	>20 in the sector	IT management and support
9	Executive	>15 in the domain	Architecture and project management
10	Staff	>30 in the domain	Programming and IT infrastructure
11	Staff	>10 in the domain	Programming and information management
12	Staff	>15 in the sector	Information management and technology application
13	Executive	>10 in the sector	Software and IT solutions
14	Executive	>20 in the domain	IT applications and advancement
15	Executive	>10 in the domain	Software architect and IT management
16	Manager	>10 in the sector	Technology implementation
17	Staff	>20 in the sector	Web applications and service streamlining
18	Manager	>15 in the current role	IT infrastructure and software/system implementation
19	Executive	>30 in the sector	IT strategy and governance
20	Executive	>20 in the domain	IT infrastructure and operations

Appendix D. Key Elements, Summaries, and Links to AI policies/guidelines of 22 Canadian Universities

University of Toronto	
Key Elements	Academic integrity, AI task force, teaching & learning, research & citation, security & ethics, responsible use, marketing & communications
Summary	Principles: Emphasizes safety, security, academic integrity, and responsible use. Developed a strategic vision for AI integration. Scope: Applies to students, faculty, and staff across all campuses. Focus Areas: Research enhancement, student success, and operational efficiency. Strategic integration of GenAI across research, teaching, and operations; evolving guidelines; co-curricular engagement.
Policy/Guideline Link (sample)	https://ai.utoronto.ca/guidelines/

University of British Columbia	
Key Elements & Coverage	Teaching & learning Advisory Subcommittee, graduate education, administrative use, academic integrity, ethical use, human interaction
Summary	Documents: Includes Principles for Use and Teaching & Learning (downloadable) Guidelines. Focus: Academic integrity, balancing AI with human interaction, and responsible and ethical use in teaching and learning. Audience: Faculty, staff, and students
Policy/Guideline Link (sample)	https://genai.ubc.ca/guidance/

McGill University	
Key Elements & Coverage	Digital standards, research, teaching & learning, graduate studies, tools
Summary	Tailored for graduate research. Focuses on research – ethical and transparent use of GenAI. Emphasizes transparency, authorship, ethical considerations, and responsible use. Acknowledges the limitations of GenAI tools and the importance of students to avoid overreliance, especially in scholarly writing and data interpretation.

Policy/Guideline Link (sample)	principles_on_generative_ai_in_teaching_and_learning_at_mcgill.pdf

University of Waterloo	
Key Elements & Coverage	General policy, responsible use, alignment with federal/provincial frameworks, and tool-specific guidance
Summary	Ethical and secure use of GenAI tools and detailed tool guidance. General Policy: Existing university policies apply to AI use. Responsible Use: Aligns with federal and provincial AI ethics frameworks. Key Principles: Fairness, accountability, transparency, security, and human-centric design. Tool Use: Cautions against using unlicensed GenAI tools with university data
Policy/Guideline Link (sample)	https://uwaterloo.ca/information-systems-technology/about/policies-standards-and-guidelines/guidance-artificial-intelligence-use

McMaster University	
Key Elements & Coverage	Teaching & learning, research, operational and responsible use, advisory committees, academic integrity, privacy, transparency,
Summary	Research: Emphasizes transparency, documentation, and ethical use during the whole research lifecycle—preparation, execution, and dissemination. Use of GenAI requires explicit approval in graduate research. Teaching & Learning: Task force established to guide AI integration in pedagogy. Encourages faculty to define GenAI expectations in syllabi. Encourages use of institutionally supported tools (e.g., Microsoft Copilot). Supporting innovation through institutional tools and faculty development.
Policy/Guideline Link (sample)	https://provost.mcmaster.ca/generative-artificial-intelligence-2/provisional-guidelines-on-the-use-of-generative-ai-in-research/

Université de Montréal	
Key Elements & Coverage	Applies to graduate students and supervisors, requires transparency and explicit approval for GenAI use in theses and research, warns against plagiarism and misuse of confidential data, and emphasizes academic integrity, data privacy, and intellectual property.
Summary	Rigorous and research-focused, the policy mandates full disclosure of GenAI use, encourages critical evaluation of AI-generated content,

	prohibits unauthorized use, and highlights the risks of bias, misinformation, and ethical breaches.
Policy/Guideline Link (sample)	Utilisation_IA_Memoire_et_these_Octobre2024.pdf

Queen's University	
Key Elements & Coverage	Prohibited by default, academic integrity, research ethics, and transparency
Summary	A cautious and ethics-driven approach, the default stance is prohibition unless explicitly permitted in course materials. Emphasizes academic integrity, contract cheating, research ethics, as well as the risks of misinformation, bias, and academic misconduct. Warns against overreliance on LLMs due to their unreliability and lack of transparency. Promotes responsible innovation through guiding principles.
Policy/Guideline Link (sample)	https://www.queensu.ca/politics/about/policy-use-artificial-intelligence

Simon Fraser University	
Key Elements & Coverage	Academic integrity, responsible use, and transparency
Summary	Slowly responding to AI, the university focuses more on strategy and guidelines than policy. Regarding students' use, expectations of not engaging in deception in academic work and resources on ChatGPT citation are provided. Regarding teaching, there are guidelines for both instructors and unit leaders.
Policy/Guideline Link (sample)	https://www.sfu.ca/students/enrolment-services/academic-integrity/using-generative-ai.html

University of Alberta	
Key Elements & Coverage	Emphasizes clarity, academic integrity, adaptability, training, and responsible use.
Summary	Supports a decentralized approach, empowering departments and instructors to set clear expectations, and fosters a culture of collaborative development and transparency around GenAI use between faculty and students.
Policy/Guideline Link (sample)	https://www.ualberta.ca/en/artificial-intelligence/index.html

Western University	
Key Elements & Coverage	Experiment responsibly, safely, and ethically with five principles: transparency, accountability, integrity, privacy, and inclusion.
Summary	Promotes responsible innovation with GenAI. It supports academic freedom while reinforcing institutional policies, academic integrity, and ethical standards. Encourages ethical and accountable use of GenAI across teaching, research, and administration. Instructors have autonomy in integrating AI into courses. Students must follow course-specific rules and act with honesty and transparency.
Policy/Guideline Link (sample)	https://ai.uwo.ca/Guidance/index.html

University of Calgary	
Key Elements & Coverage	Responsible use of GenAI in graduate studies, emphasis on enhancing human creativity (not replacing it), risks of overreliance, bias, and IP/privacy violations, and encourages transparency, accountability, and ethical use while maintaining academic integrity and research quality.
Summary	Focuses on ethical and effective use of GenAI in graduate research and writing, discourages overreliance on GenAI to preserve critical thinking and writing skills, promotes transparency, originality, and ethical considerations, warns against using GenAI detection tools due to reliability and privacy concerns, highlights the evolving nature of GenAI policy and the importance of program-specific guidance, and emphasizes transparency, authorship, privacy, and data security.
Policy/Guideline Link (sample)	https://grad.ucalgary.ca/current-students/important-resources-and-supports/graduate-ai-guidelines

Université Laval	
Key Elements & Coverage	Ethical, secure, and responsible GenAI use across teaching, research, and administration with structured guidance for integrating GenAI into all aspects of academic life.
Summary	Comprehensive and values-driven, the policy supports GenAI use while safeguarding privacy and academic standards. It emphasizes academic integrity, privacy, transparency, and IP protection. Laval also provides Microsoft Copilot access with institutional safeguards and tailored resources for students, faculty, and administrative staff.
Policy/Guideline Link (sample)	https://www.ulaval.ca/technologies-de-linformation/systemes-dintelligence-artificielle-generative

York University	
Key Elements & Coverage	Citation of Gen AI tools required, instructor discretion, student responsibility, and ethical use.
Summary	Flexible yet firm in upholding integrity, York promotes digital literacy through resources on GenAI bias, ethical awareness surrounding GenAI tools, and transparency. It emphasizes that GenAI use must be documented and cited. It empowers instructors to set boundaries and expects students to act transparently and responsibly in clarifying course-specific rules.
Policy/Guideline Link (sample)	https://www.yorku.ca/teachingandlearning/gen-ai/for-students/

Dalhousie University	
Key Elements & Coverage	Guiding principles for course delivery and academic integrity, as well as faculty-specific integration into syllabi and pedagogy.
Summary	Supports thoughtful integration of GenAI into teaching while maintaining academic standards, emphasizes faculty autonomy, ethical use, and ongoing adaptation to evolving technologies, and includes resources, webinars, and Q&A sessions.
Policy/Guideline Link (sample)	https://dal.ca.libguides.com/genai/dal

University of Victoria	
Key Elements & Coverage	Promotes thoughtful integration of GenAI, balancing innovation with academic integrity. Supports instructor autonomy, student education, and ethical use, while warning of GenAI's limitations.
Summary	Embraces responsible and ethical use of GenAI in teaching and research. Instructors decide whether GenAI is allowed in their courses; syllabus templates are provided. Students must cite GenAI use and include prompts if required. Does not allow GenAI for grading and discourages reliance on AI detection tools.
Policy/Guideline Link (sample)	https://teachanywhere.uvic.ca/academic-integrity/genai-position-statement/

University of Ottawa

Key Elements & Coverage	Security, privacy, fairness, transparency, accountability, reliability, risk assessment, data protection, and responsible use. Discourages entering confidential data into GenAI tools.
Summary	A comprehensive framework for evaluating and deploying AI tools focusing on secure and ethical use of GenAI, with a strong emphasis on data privacy, bias mitigation, accountability, and risk assessment. Encourages departments to define AI use in context-specific ways.
Policy/Guideline Link (sample)	https://www.uottawa.ca/about-us/information-technology/it-artificial-intelligence/Cybersecurity-AI-guidelines

University of Guelph	
Key Elements & Coverage	Research-focused, supports responsible use and accessibility, and bias awareness.
Summary	Detailed and research-focused, Guelph emphasizes accessibility, academic integrity, and disciplinary norms. It supports responsible use while requiring transparency and advisor oversight. Graduate students must obtain explicit approval for GenAI use and document the usage in research and writing. While acknowledging GenAI's potential to support accessibility and learning equity, it warns of bias and misuse of AI-generated content.
Policy/Guideline Link (sample)	https://graduatestudies.uoguelph.ca/generative-ai

Carleton University	
Key Elements & Coverage	Highly pedagogical, offering practical tools for instructors. Emphasizes transparency, academic integrity, authorship, ethical concerns, student support, and the evolving best practices for AI in education.
Summary	Encourages pedagogical innovation and thoughtful integration of GenAI into teaching and assessment. Encourages instructors to define AI expectations. Provides syllabus language, academic integrity examples, and ethical considerations. Discourages reliance on AI detection tools.
Policy/Guideline Link (sample)	https://carleton.ca/ai/instructors/academic-integrity/

University of Manitoba	
Key Elements & Coverage	Emphasizes instructor discretion, academic integrity, and privacy.

Summary	Cautionary and student-focused, the use of GenAI must be explicitly permitted by instructors. The university provides syllabus statements, assessment design tips, and practical tools for managing GenAI in coursework and assessments. It warns against the risks of privacy and bias and discourages the use of AI-detection tools due to concerns about reliability.
Policy/Guideline Link (sample)	https://umanitoba.ca/centre-advancement-teaching-learning/integrity/artificial-intelligence

Memorial University	
Key Elements & Coverage	Strict on academic misconduct and emphasizes transparency, privacy, and ethical responsibility. Encourages education on GenAI's risks and benefits and provides institutional support for responsible use.
Summary	Unauthorized GenAI use is an academic offence. Students must seek instructors' permission and cite AI-generated content. Memorial emphasizes data privacy, intellectual property, bias awareness, ethical use, and training.
Policy/Guideline Link (sample)	https://www.library.mun.ca/researchtools/guides/integrity/ai/

University of Saskatchewan	
Key Elements & Coverage	A robust, multi-layered approach to GenAI that emphasizes transparency, academic integrity, and ethical research practices. Students are expected to understand the risks of bias and IP violations and to use GenAI tools responsibly with proper disclosure.
Summary	Promoting transparency and ethical GenAI use in research and coursework, there is an emphasis on academic integrity, supervisor approval, and responsible tool use. Instructors define GenAI use in syllabi. Students must follow course-specific rules. Unauthorized use or failure to cite GenAI constitutes academic misconduct.
Policy/Guideline Link (sample)	https://academic-integrity.usask.ca/gen-ai.php

University of New Brunswick	
Key Elements & Coverage	Allows decentralized GenAI policy enforcement, supports ethical use in research, and maintains strict academic integrity standards.

Summary	A decentralized approach that allows instructors to decide whether GenAI tools are permitted in their courses. It maintains a strict stance on academic integrity regarding GenAI-related misconduct, including plagiarism and cheating. Encourages AI literacy and responsible integration into academic workflows by offering resources for ethical AI use in research and publishing contexts, including grant writing and peer review.
Policy/Guideline Link (sample)	https://lib.unb.ca/guides/artificial-intelligence-ai-graduate-students-and-researchers