CALGARY ON THE PRECIPICE

Learning Our Way Forward

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Research Report

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A study of this complexity requires an interdisciplinary team of connected and committed scholars. We would like to thank these people for their investment and continued support as we continue the conversation on Calgary becoming a LearningCITY[1]:

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[1] This report is the first outcome of the LearningCITY Project. This project is exploring how a city-wide learning system could be re-envisioned to deliver on the priorities defined in Calgary's economic strategy.

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EXECUTIVE SUMMARY

For 40 years, economic, social, and cultural factors such as advanced technology and globalization have changed how cities compete to attract new citizens. A city's proximity to natural resources is no longer the driver of its competitive advantage. Instead, a city's ability to attract, develop and retain talent (the people who will live and work there) is the greatest predictor of social, and economic prosperity. That means how cities grow and develop their talent pool is crucial. Today's workplaces demand that people have the capacity to live with uncertainty, adapt to new roles and learn new skills quickly. These skills transcend industries and professions. If there were such a thing as a defining competency, it would be adaptability.

Adaptable people can adjust to the dynamic context of the world today. Adaptability can be reactive, like how many are learning to live in a new reality during the COVID-19 pandemic. However, adaptability can also be proactive and intentional, characterized by anticipating change and planning our response in advance. In this study, we explore the attributes of adaptive people and how they underpin adaptive organizations, systems, and cities.

"Imagine a city of people who view disruption as opportunity. Imagine a population whose talent and skills continuously evolve."

Imagine a city of people who view disruption as opportunity. Imagine a population whose talent and skills continuously evolve. Imagine a Calgary that attracts investment and talent from across the globe because it's known as a

city that learns its way forward. We don't believe the question is if this city is the Calgary of the future. Rather, our focus is on how we will realize our potential and whether the speed of change will be fast enough to navigate the precipice we're standing on.

At the root of adaptation is learning. So to become a city that adapts, Calgary must become a city that can learn faster and better than others. How do we transform Calgary into a "LearningCITY"? We have to start by changing the learning system.

We argue that how we choose to learn will define Calgary's future social and economic prosperity. Yet the ability for today's learning system to transform to meet emerging demands remains widely debated, because education is one of the most change-resistant institutions in society. Education is also threaded through society, not just in kindergarten to grade 12 and accredited educational institutes, but it's also in employers, professional associations, business ecosystems and in the hands of individual learners. The ways people learn, in short, are incredibly complex. That means there's enormous potential to effect wider change by evolving our learning system.

How can Calgary's learning system be optimized to drive social and economic prosperity in the face of accelerating uncertainty? To answer this question we conducted a multi-disciplinary study into the nature of adaptability and the learning system. **This first report reviews the results of this two-phased study**. Based on the outcome, we propose establishing a LearningCITY Task Force guided by the following five pillars:

1. **Transition to an open learning system:** To become a LearningCITY,

Calgary must transition from the traditional closed learning system, which is defined by isolated learning experiences like the path from kindergarten to postsecondary to professional development, into an open, lifelong personalized learning system where people are empowered by and accountable for their own continuous development.

2. **Transition to purpose-based learning:** A LearningCITY needs a learning system that prioritizes empowerment and autonomy for the learner. The learner's development pathway – their route through the learning system – becomes a personalized climbing wall instead of a predictable ladder. At its core, this open learning system aims to support the development of adaptable people, so the system itself must be adaptable.

3. **Commit to universal experiential learning:** An empowered learner learns through a variety of mediums and experiences. Today, many of these learning experiences aren't hands-on. Therefore, as part of an open learning system, we recommend that Calgary becomes the first city in North America to adopt a universal experiential learning system incorporating a minimum of 450 experiential learning hours for undergraduates prior to graduation.

4. **Develop enabling competencies:** An individual who has a strong foundation of enabling competencies (skills that are useful no matter the context, like communication or citizenship) will be more adaptive than someone whose learning is anchored in domain-specific competencies (skills that serve them in a particular role or context, like welding or cooking). We propose Calgary adopt a *unified community competency model*

that promotes development of skillsets that contribute to a person's ability to adapt. This approach will transcend industries, roles, and professions, creating a unique competitive advantage for our city.

5. **Invest in city-level structural capital:** An efficient, city-wide open learning system requires high-level coordination between many stakeholders. For this to happen, all partners in the learning system will need to ensure processes to advance collaboration and shared learning.
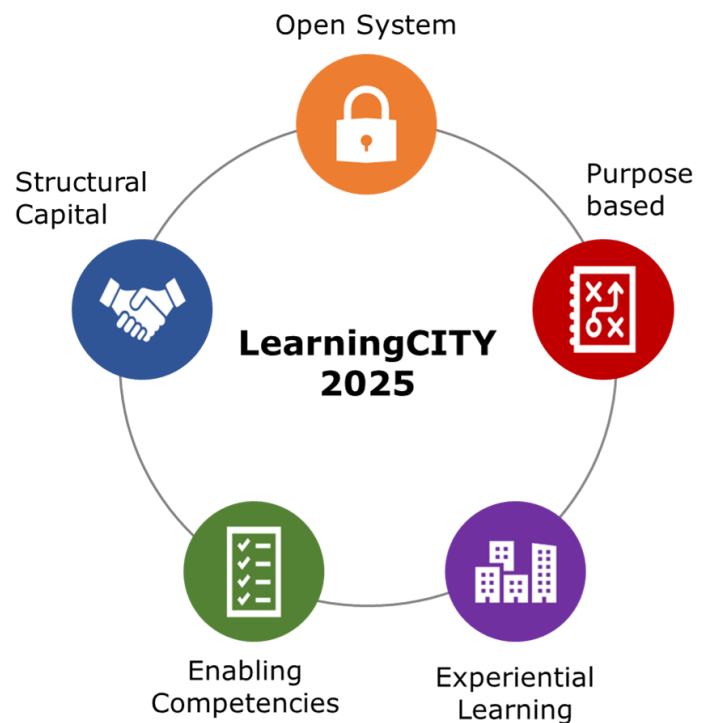
For additional details on these pillars, refer to the report, *Calgary on the Precipice: The Path to LearningCITY 2025* available **HERE**.

INTRODUCTION

SETTING THE STAGE

Necessity is the mother of taking chances.

— *Mark Twain*

In June 2018, Calgary City Council unanimously approved a new economic strategy for the city, facilitated by Calgary Economic Development. Titled *Calgary in the New Economy* (2018), this strategy called for a strategic diversification of the economy. The call for Calgary to diversify and adapt is not new; it has been debated for almost a half-century, with little evidence of fundamental change (e.g., Morgan, 2019). In its past attempts at diversity, the Government of Alberta took equity positions in financial institutions, meat packers and technology companies. Indeed, Calgary was briefly a global leader in wireless technology in the 1980s. The questions about *why* we should adapt, or *what* we should become have been debated endlessly. However, the more fundamental question remains – *how* does Calgary adapt?

Calgary in the New Economy confronts the *how* question head on and finds a clear answer: Calgary only adapts when its population adapts. A central pillar of the economic development strategy in the report focuses on education, and more specifically on the evolution of the learning system required to prepare Calgarians for the new dynamic economy. This new economy requires Calgarians (the city's "talent") to adapt quickly to emerging opportunities and challenges. In a constantly evolving labour market, learning must be continuous, because the skills organizations need from their talent are not fixed. To further develop the concept of a new learning system, a broad range of community partners, facilitated by Calgary Economic Development, established the **LearningCITY Project** with a mandate to explore how a city-wide learning system could be re-envisioned to deliver on the priorities defined in Calgary's economic strategy. This discussion paper is the first output of the LearningCITY Project.

Then COVID-19 changed everything.

> *"Calgary's economy requires talent to adapt quickly to emerging opportunities and challenges. In a constantly evolving labour market, learning must be continuous."*

In Calgary, the economic and social impact of the pandemic is amplified by the simultaneous collapse of global oil prices. Mary Moran and Sandip Lalli, the Presidents of Calgary Economic

Development and the Calgary Chamber of Commerce respectively, argue that going back to the way things were pre-pandemic is no longer an option. As they state: "long-term recovery and a future with opportunities for our children will depend on the creativity, grit and determination of entrepreneurial Calgarians and the innovative thinkers in our economy" (Moran & Lalli, 2020).

> *"Long-term recovery and a future with opportunities for our children will depend on the creativity, grit and determination of entrepreneurial Calgarians and the innovative thinkers in our economy."*

The pandemic has magnified some fundamental weaknesses of our current learning system. These include a dependency on traditional in-classroom learning models, the digital divide highlighted by exploding demand for student and educator access to computers and internet bandwidth, the lack of digital curriculum-sharing across institutions, educator inexperience with the complexity of online learning, employee comfort with digital tools, and so forth.

Moran and Lalli contend that there is only one path forward – and it is together. As they state, the city's new reality "…will require a new level of alignment, leadership, and trust from all orders of government, businesses, educators and social-welfare organizations to resolve the simultaneous challenges. It is the way we will forge our path forward" (Moran & Lalli, 2020). Thus, this report asserts that

reinventing Calgary must begin by reinventing how we learn. Only when every Calgarian possesses a capacity to not only continuously learn and adapt, but to embrace our new reality, will our city and every citizen step back from the precipice and chart a new path to the future.

UNCERTAINTY AND THE FUTURE OF OUR CITY

"The ability to learn faster than your competitors may be the only sustainable competitive advantage."

– Peter Senge (1990)

For most of human history, a city's competitive advantage was defined by its proximity to scarce natural resources ranging from lumber and iron ore to access to navigable waterways (Glaeser & Gottlieb, 2006). For the past two hundred years, these natural advantages contributed to the growth of global cities through commodity extraction or manufacturing centres. Over the past four decades, the competitive advantage of many cities – driven by economic, social and cultural factors, such as advanced technology and globalization – has transitioned from proximity to natural resources, to their ability to attract and mobilize human capital (Diamandis & Kotler, 2012; Luksha et al.,2018).[2] Today, a city's capacity to develop, acquire and retain high-valued talent underpins much of its economic and social prosperity (World Economic Forum, 2020).

Accelerating social and economic disruption, and the resulting uncertainty, has redefined the nature of high-valued talent (Conference Board, 2019; Finch & Levallet, 2020). Research demonstrates

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[2] Herein, we used human capital as a synonym to high-valued talent and defines competencies as capital, similar to other forms of capital (e.g., financial capital, social capital). Human capital can be viewed at the level of an individual, institution (e.g., organization or ecosystem) or city.

that the adaptive capacity of individuals has emerged as a critical competency for employers (Conference Board, 2019). The World Economic Forum (2018) forecasts that by 2022, 75 million jobs will be displaced across the leading 20 economies, while 133 million new jobs will be created in nascent sectors. It is estimated that 50 per cent of employees globally will need to be reskilled or upskilled between 2018 and 2022 (World Economic Forum, 2018). Not surprisingly, 91 per cent of human resource decision-makers view an employee's ability to adapt as a critical competency (Right Management, N.D.).

> **"The ability for today's learning system to transform to meet emerging demands remains widely debated, as education remains one of the most change resistant institutions of society."**

As a city, Calgary is arguably at the forefront of this disruption (Ribeiro & Khatoon, 2019). The oil and gas sector, representing more than a quarter (27.9 per cent) of Alberta's gross domestic product (Government of Alberta, 2017) is experiencing significant structural disruption. Moreover, the 2015-16 recession led to a 7.4 per cent drop in the Alberta provincial gross domestic product and the largest number of job losses since the early 1980s (Parkinson, 2018). Not surprisingly, Calgary Economic Development (2019b) has called for a strategic diversification of the economy. One implication of this disruption is the prospect that up to half of the jobs performed by Calgarians today could be at risk of automation over the next 20 years (Calgary Economic Development, 2019b). As early evidence of this diversification, Cutean and McLaughlin (2019) report that

with the expansion of fields such as artificial intelligence and data science, total employment in key digital roles is forecasted to surpass 77,000 in Alberta by 2023, doubling the employment growth rate of all other sectors.

Yet, Calgary's deep roots in the oil and gas sector means that only about 25 per cent of Calgary's technical expertise is comprised of software engineers and data scientists – compared with 50 to 62 per cent in Ottawa, Vancouver, Montreal, and Toronto (Pike, 2019). Further, in a recent survey of global oil and gas CEOs, 68 per cent of the leaders were concerned about talent availability to support their company's digital transformation strategies (PwC, 2019). In fact, 88 per cent of the Canadian CEOs held this concern. While Canadian oil and gas CEOs thought that educational institutions could best close this talent gap, global CEOs were not willing to wait for government and education to deliver new talent, instead seeing "significant retraining and internal upskilling as the priorities" in their organizations (PwC, 2019).

Over thirty years ago, Peter Senge argued that an organization's "ability to learn faster than your competitors may be the only sustainable competitive advantage" (De Geus, 1988, p. 71). We contend that how we choose to learn will define Calgary's future social and economic prosperity. Yet, the ability for today's learning system to transform to meet emerging demands remains widely debated, as education remains one of the most change resistant institutions of society (Luksha et al.,2018; Stanford, 2019). One challenge is the structural barriers to system-wide agility created by the fragmented nature of the current learning system. Moreover, there remains a contentious debate of the comparative value of foundational vs. vocational knowledge and their competencies (Urban & Johal, 2020). Recognizing this, groups

such as the Business/Higher Education Roundtable (Sado, Cannon & Jenkins 2017, p. 1) argue that Canada "needs a fresh approach to meeting the challenges that exist at the intersection of business, education and employment." [3] In response, herein, we leverage rich multidisciplinary literature, and the results of two studies, to explore the following question:

> **"How can Calgary's learning system be optimized to drive social and economic prosperity in the face of accelerating uncertainty?"**

This report is structured as follows: First, we explore this research question through a multidisciplinary literature review. We next explore the mechanisms to aggregate adaptive capacity at the city-level. The output of this literature review is an integrated model of a LearningCITY and associated propositions. These propositions are explored in two qualitative studies. The first reports on the results of a large stakeholder workshop including employers, educators, administrators, and policymakers. The second analyzes a sample of competency models to examine the alternate approaches to competency development. In the final section, we consider the results of these two studies and present a series of comprehensive recommendations to stimulate dialogue

and debate about the future of Calgary's learning ecosystem.

CONCEPTUAL DEVELOPMENT

The measure of intelligence is the ability to change.

– Albert Einstein

LEARNING CITIES AND HUMAN CAPITAL

As far back as 1987, the U.S. Army War College introduced four dimensions to define emerging challenges facing military decision-making in a multilateral world. The four dimensions were volatility, uncertainty, complexity, and ambiguity (U.S. Army Heritage and Education Center, n.d.).[4] Together, these four dimensions reflect an exponential amplification of decision-making complexity and risk (Millar, Groth & Mahon, 2018). At the heart of this is an exponential increase in the number of variables influencing a decision and a similar level of potential outcomes resulting from any decision.

The volatility, uncertainty, complexity, and ambiguity facing cities has been the topic of multidisciplinary research for many years (e.g., Boschma, 2015; Florida, 2010; Jacobs, 1961). In the Calgary context, the volatility and uncertainty of the oil and gas sector has sustained an almost 50-year debate as to *why* Calgary should diversify (e.g., Morgan, 2019). Moreover, predicting *what* Calgary should diversify into (e.g., artificial intelligence, robotics, or

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[3] Today, 68 per cent of Canadians between the ages of 25 and 64 completed postsecondary education; Canada is the most educated country in the world, 24 per cent above the Organisation for Economic Co-operation and Development average (OECD, n.d.). Yet, Canada scores relatively poorly on the

OECD scales in areas related to adult literacy, numeracy, and problem-solving skills (OECD, n.d.).

[4] Volatility, uncertainty, complexity and ambiguity is commonly referred to as VUCA.

renewables) is merely a prediction, somewhat flawed in today's rapidly changing and uncertain world. Rather, we hypothesize a more fundamental question: *how* does Calgary develop the capacity to adapt? This question focuses on the *process* of change, and our collective ability to adapt to compete in the new economy.

Decades of research demonstrate that high levels of human capital are the anchor of a city's capacity to adapt (Glaeser, 2003; 2010; Mathur, 1999; Welch, 1970). For example, Glaeser and Saiz (2003) use 30 years of data to explore how human capital impacts a city's adaptive capacity when faced with a declining industrial base. These scholars reveal that human capital contributes to increasing economic resiliency. Other studies provide evidence that a geographic concentration of human capital accelerates the adoption of new knowledge through efficient information diffusion, spillover, shared learning, experimentation, and increased social embeddedness (Bathelt, Malmberg & Maskell, 2004; Florida, Mellander & Stolarick, 2008).

"Decades of research demonstrate that high levels of human capital are the anchor of a city's capacity to adapt."

Moreover, researchers examined the underlying nature of a LearningCITY through a variety of perspectives. For example, scholars in community development (Florida, 2010; Glaeser, 2003), planning (Innes & Booher, 1999), economics (Boschma, 2015), management (Senge, 1990) and education (Fullan & Loubser, 1972) study themes associated with adaptive capacity at a system level
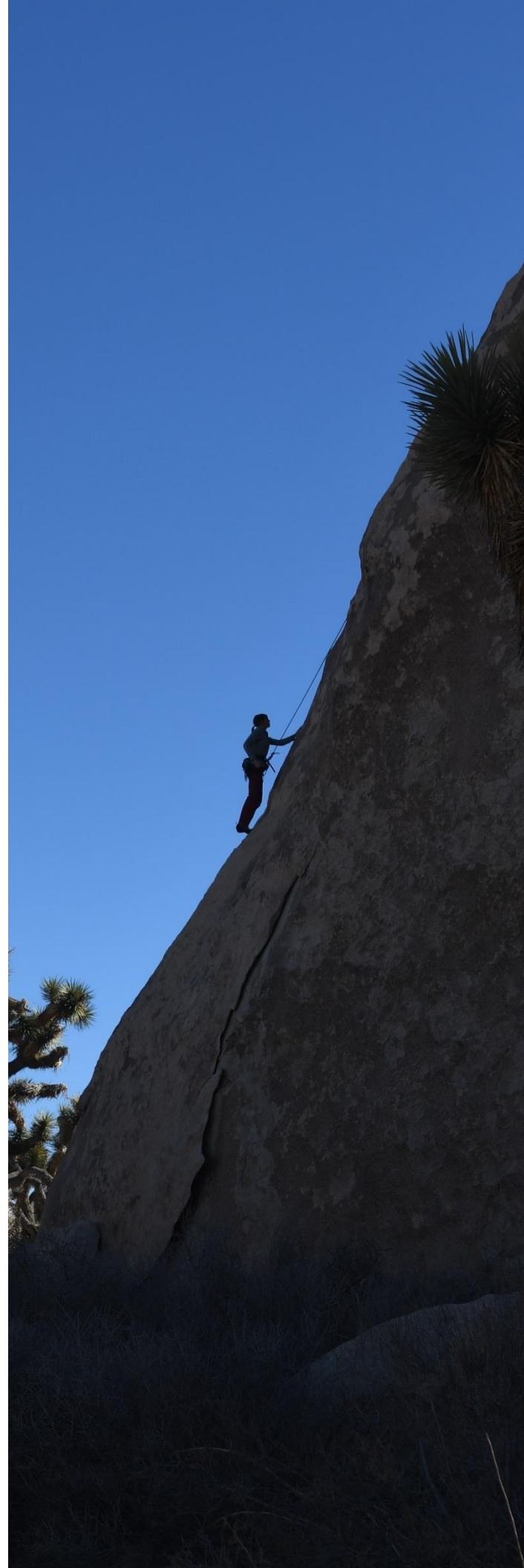
(e.g., economic systems, education systems, community systems).[5] In contrast, Teece, Pisano and Shuen (1997) explore dynamic capabilities at the level of the organization. Finally, scholars in psychology (Kidd & Davidson, 2007; Savickas, 1997), entrepreneurship (McGrath & MacMillan, 2000), and education (Kolb & Kolb, 2005) study the factors that contribute to the adaptive capacity of the individual, being at the foundation of both the organizations and the system in which they reside. While adaptive capacity is studied extensively, limited research synthesizes this work into a broader conceptual model of how a city can develop a systematic adaptive capacity.

The behavioral theory of the firm contends that organizational activities can be explained through reductionism, that is, the explanatory power of individuals (e.g., employees, decision-makers) (Barney & Felin, 2013). This is echoed by community development researchers who mapped a "spiraling-up" influence of individuals and institutions (e.g., organizations, ecosystems) on regional systems (Emery & Flora, 2006).[6] Thus, *adaptive capacity* is the ability for an individual or institution to anticipate systematic changes and proactively reconfigure existing resources, or acquire new resources, to maintain a competitive advantage (Rudolph, Lavigne

& Zacher, 2017; Staber & Sydow, 2002). Whereas *resiliency* presumes dominance of the external environment over the individual or institution, adaptive capacity posits that the individual or institution maintains agency.[7] Our initial frame is geographic agglomeration, meaning we view a LearningCITY as the aggregation of adaptive individuals and adaptive institutions. In the following section, we consider three levels of adaptive capacity: *adaptive individuals*, *adaptive institutions* (organizations and ecosystems) and *learning cities*.[8]

> *"Adaptive capacity is the ability for an individual or institution to anticipate systematic changes and proactively reconfigure existing resources, or acquire new resources, to maintain a competitive advantage."*

ADAPTIVE INDIVIDUALS

A city's adaptive capacity is anchored in the ability for its labour force to meet increasingly dynamic demands for new competencies (Glaeser & Saiz, 2003). Moreover, increasing labour uncertainty forces individuals to rigorously maintain currency within their field or pivot to new

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[5] Complex adaptive systems theory emerged as a multidisciplinary field of study exploring the adaptive nature of systems across a range of disciplinary contexts including computer science, ecology, and social sciences. For additional reading on complex adaptive systems, refer to Miller and Page (2009).

[6] The definition of "institution" in institutional theory is highly debated. Scott (1995) defines it as a relatively stable social structure with normative and regulative dimensions. In the context of this study, we narrow this definition to encompass organizations and ecosystems. We also acknowledge that institutions are sometimes understood as government institutions.

[7] Resiliency is a highly debated construct across multiple disciplines. For additional information, refer to Martin (2012).

[8] We adopt the term *LearningCITY* to describe the aggregation of adaptive individuals and adaptive institutions at the level of a city. In recent years in community planning literature, *adaptive capacity* is periodically used to describe a city's preparation for, or resiliency from, natural disasters (e.g., Hess, McDowell, & Luber, 2012). This context is outside of the scope of this study.

fields (Bimrose & Barnes, 2011). Adaptive individuals manifest themselves through career adaptability, facilitated by the ability of individuals to successfully combine personal competencies with career uncertainty.

The construct of *career adaptability* is foundational to career construction theory (Savickas, 1997) in that individuals can successfully accept and proactively navigate professional uncertainty (Savickas & Porfeli, 2012). Career adaptability incorporates for inter-related dimensions, concern, control, curiosity, and confidence (Hirschi, Herrmann, & Keller. 2015). In building this capacity, individuals can anticipate and proactively assume responsibility for the development of their competencies (Savickas & Porfeli, 2012). Career adaptability includes embracing uncertainty, continuous learning, and reinvention (Rudolph, Lavigne & Zacher, 2017). This ability to adapt professionally is a core competency of a dynamic 21st century labour force (Conference Board, 2019).

The construct of adaptive individuals is anchored in integrated dynamic capabilities (Finch & Levallet, 2020). Borrowing from the employability literature and the dynamic capabilities perspective in strategic management research, Finch and Levallet (2020) suggest an individual's integrated dynamic capability is anchored in their capacity to acquire, reconfigure, or release three resource clusters: *input* resources, *development* resources and *competency* resources. Individuals must not only possess the raw input resources (such as personality and cognition), but also development resources (education and experience) and evidence of outputs (competencies). As a result, resources cannot be considered in isolation as they are interdependent and complementary components that enable an individual to develop an adaptive capacity.

The development and refinement of resources is an iterative and nonlinear process, incorporating feedback loops between each of the resource clusters (Finch & Levallet, 2020). Building on the work of Finch and Levallet, Table-1 explores the relationship between input, development and competency resources and adaptive individuals. Refer to Appendix -2 for the associated model.

Table-1: Developing adaptive individuals (extended from Finch & Levallet, 2020)

Resource	Scope	Role in Adaptive Talent
Input Resources		
Personality	o Incorporates intrinsic personality including emotional stability, *openness to experience*, extraversion, agreeableness, and *conscientiousness.* o Perceived as relatively stable but has the potential to be refined and developed (McCrae & Costa, 1997; Mount, Barrick, Scullen, & Rounds, 2005).	o Two personality attributes frame an individual's adaptive capacity: o *Conscientiousness*, including dimensions such as dependability, organization, and being goal-driven relates to employability (Schmidt & Hunter, 1998). o *Openness to experience* includes dimensions such as intellectual curiosity, imagination, creativity, and independence; as well as the capacity to embraces new ideas, creativity, intellectual curiosity, and problem solving (Mussel, Winter, Gelleri & Schuler. 2011). Also recognizes that a proactive personality and extraversion contribute to adaptive capacity (Fuller, 2009).
Cognition and Meta-Cognition	o Cognitive resources incorporate critical thinking competencies, decision making, problem solving, reasoning, ability to learn from previous situations and the competency to self-evaluate one's cognitive abilities to do any of the previously listed cognitive tasks. o Includes meta-cognitive self-reflection (thinking about, and critically evaluating, one's own thought processes – strengths and weaknesses) and personal meta-cognition knowledge.	o Cognition and meta-cognition provide a foundational anchor that frames an individual's adaptive capacity. o Is strongly linked to employability across a variety of occupations and contexts (Stiwne & Jungert, 2010). o These relate to career confidence and are critical for a sense of control over one's career (Coetzee & Harry, 2014). o Contributes to self-reflection and an entrepreneurial, or proactive, mindset (Haynie & Shepherd, 2009) which may predispose certain individuals to be more adaptive to uncertainty.

Development Resources		
Education	o Education encompasses both accredited and non-accredited training that contribute to the development of cognitive and personality resources. This incorporates all delivery forms from formal education to vocational training to self-directed learning (e.g., reading).	o Education provides foundation to develop enabling competencies that anchor an individual's adaptive capacity (Fink, 2013; Kolb & Kolb, 2005).
Experience	o Experiences are professional (e.g., paid), volunteer (e.g., not compensated work) and contextual (e.g., personal experiences, such as travel) (Dacre Pool and Sewell, 2007).	o Experience provides capacity to learn and adapt through reflection and experimentation (Kolb & Kolb, 2005). o Experience activities are more closely related to developing domain-specific competencies (Bills, 2003). o Experience can have both positive and negative impacts on adaptive capacity. Experience in a risk-averse culture may condition an individual to act in a manner that mitigates future risk (Öhman & Mineka, 2001).
Competency Resources		
Enabling Competencies (ECs)	o ECs (also referred to as meta-skills, human-skills, soft-skills and transferable-skills) ability to incorporate the knowledge, skills, attitudes, values, and behaviors required to deliver analytical thinking, interpersonal, foundational literacies; and professional enabling competencies (Conference Board, 2019; Finch, Nadeau & O'Reilly, 2013).	o ECs are not contextual and therefore more stable and perceived to transcend labour market uncertainty. o Specific ECs are linked to supporting an individual's adaptive capacity. These include contextual agility (Pignault & Houssemand, 2016), creativity (Kilgour & Koslow, 2009), curiosity (Bower & Konwerski, 2017), emotional intelligence (Coetzee & Harry, 2014), growth mindset (Burnette et al., 2019), perseverance (Reed & Jeremiah, 2017), confidence (Koen et al., 2010), professional identity (Ibarra, 2013), reflection (Kolb & Kolb, 2005), and vision (Senge, 1990).
Domain-Specific Competencies (DSCs)	o DSCs incorporate the knowledge, skills, attitudes, values, and behaviors required to complete specific tasks associated with a role (e.g., accounting, welding) and/or a sector (e.g., energy, sport).	o DSCs are highly contextual and possess a shorter lifespan than ECs (Gawad, Allen, & Fowler 2019; Zhang, Ryan, Prybutok, & Kappelman, 2012). In general, their contextual nature limits their adaptive value. For example, accounting DSCs provide potential to adapt within accounting but offer limited value to pivot into a new role outside of accounting.

In sum, we contend that developing adaptive individuals is anchored in the systematic development of enabling competencies, by leveraging input, development, and competency resources. Based on this, we define the following proposition:

> **Proposition 1 (P1): Enabling competencies are the foundation of an individual's adaptive capacity.**

ADAPTIVE INSTITUTIONS

Herein, we define adaptive institutions as the adaptive capacity embedded in organizations or ecosystems. Adaptive organizations incorporate the ability for an organization to anticipate change and reconfigure existing resources or acquire new resources to maintain a sustainable competitive advantage (Staber & Sydow, 2002). Organizations evolve in response to internal and environmental discontinuities (Tushman & Romanelli, 1985). Organizations and their executive leadership have a degree of choice as to the strategy they adopt for a given scenario. In the context of volatile and 'hostile' conditions (e.g., COVID-19), organizations that adopt organic (i.e., adaptive, flexible) structures, along with entrepreneurial and visionary orientations tend to perform better (e.g., Colvin & Slevin, 1989). In addition, adaptive capacity is rooted in the systematic processes used by the organization to identify direct and indirect signals of risk and opportunity (Day & Schoemaker, 2019).

Culturally, adaptive organizations are dynamic and embody a culture of experimentation and a state of continuous learning and reinvention (Chakravarthy, 1982; Senge, 1990; Staber, & Sydow, 2002). Two streams of organizational literature exemplify this: organizational learning, and dynamic capabilities. The organizational learning research field suggests that for any organization to possess a sustainable competitive advantage it must first and foremost be designed as a learning organization (Senge, 1990).

Learning organizations are rooted in five disciplines (Senge, 1990): (1) personal mastery, (2) mental models, (3) a shared vision, (4) team learning, and (5) systems thinking that integrates the other four disciplines. A learning organization is "skilled at creating, acquiring and transferring knowledge, and at modifying

its behaviour to reflect new knowledge and insights" (Garvin, 1993, p. 7). Therefore, a learning organization not only acquires new knowledge, but also has the capacity to modify its behaviour based on this new knowledge, and develops an absorptive capacity, or the "ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends" (Cohen & Levinthal, 1990, p. 128).

> *"Adaptive organizations are dynamic and embody a culture of experimentation and a state of continuous learning and reinvention."*

Similarly, the dynamic capabilities perspective suggests that to succeed during times of uncertainty, an organization should develop dynamic capabilities "to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments" (Teece et al., 1997, p. 517). To develop such capabilities, organizations leverage organizational processes, notably learning mechanisms (Zollo & Winter, 2002).

Aligned with the individual competencies discussed in the previous section, organizations become able to (1) sense and shape opportunities and threats (e.g., input resources such as creativity and curiosity), (2) seize these opportunities (e.g., competency resources), and (3) enhance competitiveness through reconfiguring resources (e.g., analytical competencies; Teece, 2007). For example, adaptive organizations sense market dynamics and use revenues from an existing profitable, but declining business,

to fund expansion into new business lines (Gilbert, 2017). For example, Netflix transitioning from a mail order DVD business to the leader in entertainment streaming and content reflects the organization's ability to evolve its dynamic capabilities in the face of environmental changes (Pisano, 2015).

In contrast with organizations, an ecosystem is a form of inter-organizational collaboration facilitating accelerated learning and innovation (Williamson & De Meyer, 2012). In a business context, an ecosystem reflects a formal or informal network of stakeholders (e.g., producers, distributors, consumers, suppliers, competitors) that collaborate to create, scale and serve markets beyond the capacity of a single organization or a traditional sector (Deloitte, 2015). Ecosystems blur industry boundaries and can eventually replace them (Atluri et al., 2017). In general, business ecosystems are developed because the problems to be addressed are too complex for any one organization to tackle alone, necessitating the collaboration of multiple partners.

Complementary knowledge assets become important in business ecosystems (Alstyne, Parker & Choudary, 2016). Enabled by increased connections across specialized areas, ecosystems leverage shared knowledge to develop new, co-created solutions and business models. Ecosystem structures may take different forms. For example, they may be controlled by a single entity (e.g., Apple App Store), or they may be collaborative (e.g., open source software development ecosystems, multi-party research collaborations) (Jacobides, Cennamo & Gawer, 2018). This type of open, collaborative ecosystem may transcend the profit, non-profit, and public sectors. For example, ecosystems often exist to support entrepreneurs through networking, professional development, mentoring and financing.

However, what owned or open ecosystems have in common is the goal of maximizing the ecosystem value (as opposed to value accruing exclusively to individual members) (Alstyne et al., 2016), regardless of how "value" is defined. As a result, ecosystems evolve and adapt as their resource needs or goals evolve and adapt over time (Williamson & De Meyer, 2012). For this reason, clear governance mechanisms are essential to ensure that as ecosystems evolve, the value continues to accrue to the shared goals of the ecosystem (Williamson & Meyer, 2012). Based on this, we define the following proposition:

> *Proposition 2 (P2): Adaptive individuals are the foundation of adaptive organizations and ecosystems.*

TRANSFORMING INTO A CITY THAT LEARNS

A LearningCITY demands the systematic aggregation of the adaptive capacity embedded in individuals and institutions (organizations or ecosystems). Therefore, it is essential to explore the mechanisms that enable adaptive individuals and institutions to aggregate to become a LearningCITY. Aggregation mechanisms are studied extensively by multidisciplinary scholars (Coleman, 1988; De Pablos, 2004; Nahapiet & Ghoshal, 1998). These aggregation mechanisms are processes through which activities and behaviours of lower level actors (e.g., individuals, institutions) combine at higher level outcomes (Barney & Felin, 2013; Foss, 2011). Aggregation mechanisms are

complex and incorporate the culture, structures, processes and routines (e.g., social capital, relational capital, cognitive capital, structural capital) that enable the value of the individual or institutions to be maximized for the benefit of the aggregated entity (e.g., a city) (Boisot, 2002).

For example, the construct of social capital emerged from its sociological foundation to explore the creation of network and community-based value as an aggregation of individuals (Coleman, 1988; Lin, 2017; Putnam, 2001). Social capital is a by-product of human relations, producing incremental value to both the individual and the collective (Coleman, 1988). A distinct dimension of social capital is that it does not consider self-interest and social interest as mutually exclusive. Rather, the pursuit of self-interest is a significant driver for the pursuit of social relations, and, in turn, the institutions formed to support these relations (Hutchinson & Vidal, 2004; Shaw & Martin, 2000). Yet, the benefits of social capital are measured in the context of collective value (Coleman, 1988).

Social capital is usually considered as a multidimensional construct, with relational, cognitive, and structural capital constituting its key facets (Nahapiet & Ghoshal, 1998). Relational capital examines the relational bonds that link individuals (that accrue to become collective value), cognitive capital on the resources for shared interpretation, meaning, and structural capital to resources for patterns of connection among actors (e.g., individuals, organizations) (Nahapiet & Ghoshal, 1998).

In this study, we focus on structural capital as it incorporates the tangible and intangible processes and structures that facilitate the bonding of both individuals and institutions. At an institutional level, structural capital is most commonly defined as the value of an organization when the

employees have gone home (De Pablos, 2004). Therefore, it includes the processes and structures that enable the effective leveraging of other forms of capital, such as human capital or physical capital that generates incremental value. Structural capital may include dimensions such as intellectual property, culture, and knowledge management systems, and processes (Aminu & Mahmood, 2015). Limited research is available regarding structural capital at a city level. Callaghan and Colton (2008) defines public structural capital as including both tangible and intangible assets from roads and libraries to social services and education. Herein, we define structural capital as the tangible and intangible processes and infrastructure that facilitate the effective collaboration and alignment of individuals and institutions within a city.

> *"Structural capital...includes the processes and structures that enable the effective leveraging of other forms of capital, such as human capital or physical capital that generates incremental value."*

Therefore, our focus is on the aggregation mechanisms that enable the adaptive capacity of individuals and institutions to scale to a city level. Below, we explore three mechanisms critical to scaling adaptive individuals and adaptive institutions to become learning cities.

MECHANISM 1: KNOWLEDGE DIFFUSION

Knowledge is both tacit and explicit (Nonaka, 1991). Tacit knowledge refers to experiential knowledge that cannot be easily transferred while explicit knowledge can be coded (Alavi & Leidner, 2001). Knowledge incorporates information, competencies and beliefs that enable individuals to extract meaning from an

observation (von Krogh, Roos, & Slocum 1994). Scholars suggest knowledge is embedded in a context and experience (Bourdieu, 1977; Levina & Vaast, 2006). A proactive view of knowledge contends the institutions define new problems and generate new knowledge to solve them (Nonaka, 1994). Thus, learning occurs when knowledge is shared and converted into new practice.

An example of a knowledge diffusion mechanism that has emerged in the last two decades is open innovation (Chesbrough, 2006). Traditional innovation processes focus on controlling the innovation process, i.e., the exploration of new knowledge and exploitation of existing knowledge in a closed loop (e.g., limited to employees within an organization), which allowed a company to retain ownership of and control over knowledge and intellectual property (IP). However, traditional innovation has limited access to knowledge from external sources and therefore an organization is challenged to effectively tackle the most complex problems (Chesbrough, 2006).

In contrast, open innovation encourages the development of partnerships and the leveraging of complementary knowledge for innovation from individuals and organizations across ecosystems (Van Der Duin et al., 2007). This is to say, organizations seldom innovate in isolation, but rather invest in the structural capital required to open their innovation processes to others, becoming empowered to collaborate and co-create (Chesbrough 2006; 2011).

In this cyclical interaction model, an organization transitions from being a linear controller of knowledge to becoming a dynamic broker of knowledge across an ecosystem, supporting interconnected processes. For example, organizations invest to develop the structural capital to enable system partners to develop and distribute products and services, and

facilitate interaction with users, commercial organizations, and their customers. These platforms encourage both competition and collaboration within the ecosystem. The benefits of open innovation include increased value creation, access to external resources and capabilities (Grimpe & Hussinger, 2014), speed, agility, reduced cost and the ability to exponentially increase and diversify the people engaged in the design, development and delivery of new products and services, which tend to outweigh the downside associated with open platforms (e.g., IP ownership, new competitive threats).

The adoption of open innovation by cities is essential to facilitate the aggregation of knowledge and experience from adaptive individuals and institutions on the city level. We contend that enhanced knowledge diffusion across learning system partners, including accredited institutions (kindergarten to postsecondary), other educational providers, employers, professional associations, and government, are instrumental to developing a LearningCITY.

"The adoption of open innovation by cities is essential to facilitate the aggregation of knowledge and experience from adaptive individuals and institutions on the city level."

An example of a specific mechanism to facilitate learning system knowledge diffusion is experiential learning (EL). Educational theorists view learning as a holistic process that incorporates all lived experiences (Dewey, 1923; Fink, 2013; Kolb & Kolb, 2005). A central element to experiential learning is not simply the

experience, but rather the process of reflecting about the experience and how to make meaning from it (Kolb & Kolb, 2005). As a holistic pedagogy, Kolb (1984) asserts that transformational learning is an intersection of concrete experience and abstract conceptualization. Thus, reflection is critical to transform experience into deeper learning through conscious evaluation of an experience (Kolb, 2005).

Scholars (Schwartz, Bransford & Sears, 2005; Von Esch & Kavanagh, 2017) explore the construct of adaptive expertise in contrast to routine expertise. Adaptive expertise is the capacity for an individual to adjust to new problems or contexts. This expertise requires the intersection of new subject matter content with practice-based learning design to yield the integrated knowledge of an adaptive expert who can be simultaneously innovative and efficient.

Experiential learning bridges conceptual learning with experiences in the form of internships, apprenticeships, live case studies, field schools entrepreneurship, and community-engaged research (CEWL Canada, 2019). EL enhances student engagement (CEWL Canada, 2019), increasing situational cognition (Coll et al., 2011) and the rate of employment pre- and post-graduation (Billett, 2011). This combination of knowledge acquisition and applied learning experience yields the expertise required for new economy careers.

MECHANISM 2: BOUNDARY SPANNERS

The next aggregation mechanism we consider is *boundary spanners*. Scholars (Boxenbaum & Battilana, 2005; Brannen & Thomas, 2010; DeFillippi & Ornstein, 2003) identify that while cognitive-cultural understandings shape beliefs and logics, some individuals (and organizations through them) possess the capacity to push beyond their current boundaries (Brannen & Thomas, 2010). A boundary is a demarcation at the edge of a sphere of

collective human activity (Hsiao, Tsai, & Lee, 2012). However, these boundaries are bridged by cognitive, relational, attitudinal, and behavioral differences (Barner-Rasmussen, Ehrnrooth, Koveshnikov, & Mäkelä, 2014). Deemed *boundary spanners*, these individuals and organizations can facilitate the aggregation of a city's adaptive capacity by finding linkages so that new and novel external knowledge is translated and diffused (Carlile, 2004) and then recognized and valued (Schotter, Mudambi, Doz, & Gaur, 2017). An example of a boundary spanner is the notion of a 'dealmaker'. These individuals are investors with valuable social capital within regional economies that mediate relationships, making connections and facilitating firm formation and growth (Feldman & Zoller 2012).

Thus, boundary spanning plays an essential role in sharing knowledge within a system because when knowledge is novel, individuals or institutions may lack the capabilities to recognize and value that new knowledge. Boundary spanners can be viewed as contributing to institutional (organization or ecosystem) absorptive capacity because they provide a necessary mechanism for the porous boundaries needed to connect the organization to other players in the ecosystem (Volberda, 1996). As such, the absorptive capacity literature recognizes boundary spanners as an important mechanism to diffuse knowledge across both organizations and ecosystems (Volberda et al., 2010).

"Boundary spanners are individuals and institutions that overcome barriers to link or aggregate resources, knowledge, and practices in novel ways to accelerate or expand a city's adaptive capacity."

Previous research on knowledge transfer demonstrates that tacit knowledge cannot be seen as a given commodity that can be packaged, rather it must be recreated in social practice (Tsoukas, 2009) and is thus inseparable from organizations and individuals (Björkman, Barner-Rasmussen, & Li, 2004). It is for this reason that Carlile (2004) understands boundary spanning as a transfer, translation, and transformation process. Borrowing from educational theory, Roberts and Beamish (2017) developed the idea of boundary spanning as the process of creating scaffolding around new knowledge (Kokkonen, 2014), so that it can be recognized, understood, and valued by people who are unfamiliar with the context in which it was originally created (Lecusay, Rossen, & Cole, 2008). Thus, from a city perspective, boundary spanners are individuals and institutions that overcome barriers to link or aggregate resources, knowledge, and practices in novel ways to accelerate or expand a city's adaptive capacity.

This may include economic development agencies, chambers of commerce, ecosystem facilitators or multi-sectoral purpose-driven social innovation collaboration (e.g.,10 Year Plan to End Homelessness). For example, in Nashville, there are 39 fully integrated boundary spanning organizations (e.g., Music City Music Council) who share a collaborative goal of growing the Nashville music sector (Bernard et al., 2012). Another example is

StriveTogether, an American non-profit that bridges parents, educators, civic leaders, and local employers to drive enhanced community learning outcomes (StriveTogether, n.d.). Finally, *Pathways in Technology Early College High Schools* (P-TECH) was established to accelerate technical competencies by bridging educators, policymakers, and industry partners. Today, P-TECH encompasses 18 countries, 200 schools and 100,000 students (IBM, n.d.).

MECHANISM 3: SHARED VISION

The final aggregation mechanism we consider is *shared vision* (Pearce & Ensley, 2004). Senge (1990 p. 192) defines a shared vision as simply a picture of "what do we want to create?" A true shared vision is not a top-down endeavour. Rather, it is an aggregation of "personal visions" that is owned by a collective, such as an organization or city. Senge (1990) suggests that a critical component of this ownership is the freedom for individuals or institutions to participate. Because a shared vision is an aggregation of personal visions, it is not coercive. As a result when individuals and institutions choose to participate, this ownership creates an intrinsic motivation to deliver on a shared vision. We contend, this shared vision is a critical aggregation mechanism for a LearningCITY. This shared vision becomes the anchored purpose for adaptive individuals and adaptive institutions to prioritize the allocation of resources to deliver on the shared vision.

In the context of this study, we propose that a *Unified Community Competency Model* ("competency model") could become a mechanism to operationalize a shared vision of a LearningCITY. Competency models have proven to be effective aggregation mechanisms that align and prioritize the required competencies across individuals and institutions. Competency models were introduced at different levels including organizations (e.g., UNESCO), roles (e.g., accounting) or regions (e.g., European Union; Singapore). These models provide guidance for the classification of competencies and associated levels in specific roles (Lane & Griffith, 2017). Models support the creation of a common vocabulary (Braham & Tobin, 2020). In addition, they often include consistent classifications and measures to enable policymakers, employers, and individuals to assess the current state of human capital and guide the allocation of scarce development resources (e.g., education

and training) (Rothwell, 2002). The role of a competency model is central to second study.

Based on this we define our third proposition:

> *Proposition 3 (P3): A LearningCITY is founded on adaptive individuals, organizations, and ecosystems through aggregation mechanisms, such as knowledge diffusion, boundary spanners and shared vision.*

In summary, we propose that a LearningCITY is the aggregation of adaptive individuals (P1), adaptive organizations, and adaptive ecosystems (P2) into a LearningCITY (P3). Refer to Figure-1.
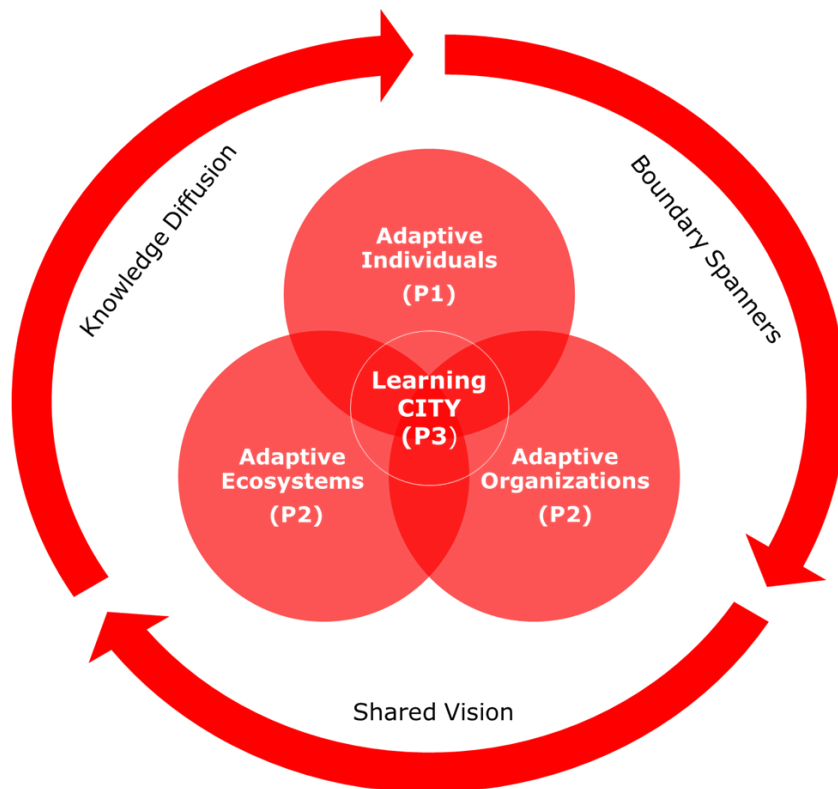

Figure-1: A systemic view of a LearningCITY

RESEARCH STUDIES

To explore the three propositions, we conduct a sequential multi-methods study using qualitative methods (Creswell, 2009). The first phase of this study engaged 110 community stakeholders in a three-hour learning system stakeholder workshop. The second phase of this study built on the findings from the literature review and workshop to develop and explore the role of enabling competences in existing professional and industry competency models.

PHASE 1: STAKEHOLDER WORKSHOP

PHASE 1: SAMPLE

The workshop used purposeful sampling to ensure a mix of talent development stakeholders: (1) educators (from accredited institutions); (2) educators (from non-accredited institutions); (3) employers; and (4) other stakeholders (including policymakers, funders, and professional associations). In addition to stratifying the sample by system stakeholder role, the sample was also stratified by secondary variables to ensure diversity. For example, employers were stratified by industry sector, company size and the individual participant's role. Appendix-3 provides a definition of each stakeholder group, their stratification variables, and the percentage of participants from each group.

PHASE 1: METHODS

For the stakeholder workshop, we developed a semi-structured agenda to guide the three-hour session. This format was chosen to provide enough structure to explore the propositions, while maximizing objectivity and ensuring spontaneous reflection on the issues. To ensure the agenda was not leading, it was not explicitly linked to the defined propositions, rather, it was designed to explore participants' perceptions on two broader questions:

Key Questions for Participants

1. *What are the factors influencing the development of talent today and in the future?*

2. *What are the implications of these factors on a city's learning system?*

The first step was to establish curated working groups of eight individuals, each incorporating a diverse mix of system stakeholders. Each working group was assigned a facilitator who led the exercises. In addition, a scribe was assigned to each group who was responsible for taking comprehensive notes of the discussion. The agenda considered the two questions independently and sequentially. For each question, individuals were asked to record factors on individual pieces of paper. No discussion was permitted during this exercise to ensure that their contribution was not influenced by the broader group.

Once participants completed the exercise, they were asked to post their individual factors on a flip chart. All participants were asked to collaborate to cluster the factors into major themes. From this exercise, a series of consolidated themes emerged. The participants of each group then discussed and provided examples of each theme from their personal experience. This led to a robust facilitated discussion among participants at each table. Following this exercise participants were encouraged to circulate throughout the room to review other workgroup's outcomes.

"Alberta has one of the highest performing education systems in the world and we must build on this by adopting a more holistic view of learning."

Following the workshop, this post-it note exercise from each work group was first coded by the lead researcher (as suggested by Strauss & Corbin, 1990). Following this, the scribes' notes from each table were transcribed by the lead researcher. The second stage of the analysis process involved the synthesis and consolidation of themes between the work groups. To mitigate risk of content loss during the reduction process, a separate document was maintained of all content removed during the analysis. The document was then reviewed to ensure no critical content was lost during the reduction process. The composite themes that emerged are discussed below.

PHASE 1: RESULTS

Here we present the results from the thematic analysis.

Question 1: *What are the factors influencing the development of talent today and in the future?*

The future is a moving target: Driven by technology and social changes, the future demand for specific competencies is uncertain. Therefore, participants view that the value of talent today is anchored in the capacity to adapt into new roles, different contexts and acquire essential new competencies.

Shelf lives of domain-specific competencies are shortening: The shelf life of DSCs is shortening dramatically. Participants believe this is only accelerating. The result is ECs are emerging as foundational to dynamic learning systems.

Increasing diversity of learner profile: Learning can no longer be a life stage tied to a specific cohort of young adults: it is a lifestyle of lifelong learning. Therefore, the profile of learners will continue to diversify. This includes diversity of age, culture, professional backgrounds, and learning goals. Higher education and the entire learning system must adapt to reflect the unique personal learning needs of each individual. It is no longer a one-size-fits-all world.

Learning as an expense: Employee learning continues to be conceptualized as a cost, not an investment with meaningful return. This exposes funding for education and professional development to budgetary cycles. Partners in the learning system must demonstrate measurable value and pursue collaborative third-party funding.

Institutional inertia: The pace of societal change is in direct contradiction with the measured pace of the organizations at the heart of the learning system; from education, to government, to large corporations. Participants argued that there is not yet a deep sense of the emerging talent crisis facing the city.

A city level adaptive challenge: Participants contend that the accelerating uncertainty facing the city is not cyclical; rather it is structural, impacting individuals and institutions.

Adaptive capacity starts with the individual: Participants viewed the adaptive capacity of a city as rooted in the adaptive capacity of its citizens. Therefore, it is essential for the city to develop an intentional strategy to prioritize developing not only adaptive individuals, but also the associated mechanisms to enable these competencies to be aggregated at the level of the organization, ecosystem, and city.

Reframing learning: Alberta has one of the highest performing education systems in the world and we must build on this by adopting a more holistic view of learning. This includes accredited and non-accredited education partners, employers, professional associations/ accreditation. In this open model, participants viewed that learning would shift from a one-size-fits-all, to a co-created personalized learning model. This refocuses individuals and partners from delivering traditional learning to one that delivers dynamic personalized missions (missions that evolve over a lifetime, based on personal values and the broader societal dynamics). This dynamic learning model has a transformative impact on the entire learning system. Structural changes include: (1) transitioning from a linear to a looped model of education; (2) transitioning from a disciplinary "major" path to a dynamic mission model; and (3) integrating experience and education. This demands that educators, from all disciplines, possess both the academic training and applied experiences to bridge theory to career-oriented outcomes.

Interdependent competencies: To deliver city-level adaptive capacity, the learning system must balance the development of ECs and DSCs. Example ECs provided by participants include:

- Curiosity
- Communication skills
- Capacity to learn
- Creativity
- Growth mindset
- Emotional intelligence
- Perseverance
- Analytical thinking and Problem solving
- Collaboration/ Relationships
- Leadership
- Self-starter
- Organization skills

The second category are domain-specific competencies linked to a specific role or sector (e.g., accounting or welding). Participants acknowledged that DSCs possess a far shorter lifespan and therefore, the development of DSCs must be accelerated through partnerships between educational institutions and employers. In this model, the employer transitions from a mere consumer of talent to a co-creator of talent.

> *"Learning is no longer a sequential predictable "ladder", rather a non-linear "climbing wall." The climbing wall must encourage and support continual exploration, experimentation, and refinement."*

From ladder to climbing wall: Participants viewed learning as no longer a sequential predictable "ladder", rather a non-linear "climbing wall". The climbing wall must encourage and support continual exploration, experimentation, and refinement. The ability for ECs and DSCs to work together and scaffold in this climbing wall model is imperative. Therefore, a city's learning system must be designed to integrate diverse competency development pathways, including all forms of education (formal and informal) and experience (professional, volunteer, and contextual) resources. This must include an effective scaffolding of these credentials, so that these act as building blocks, rather than

isolated events. This change creates short-term gates for learners to consider.

Public education innovation: Public education must learn how to adapt and redefine itself in the context of declining public funding. These institutions and systems must increase their measurable value to their funders and identify innovative approaches to attract new funding to support talent development.

PHASE 1: SUMMARY

Two interrelated themes emerged from the Phase 1 data collection. The first theme is that accelerating uncertainty is a city-level challenge, requiring city-level solutions. The second theme is that a LearningCITY starts with citizens who possess the ECs that allow them to prosper in the face of uncertainty. Together these themes support our conceptualized systematic view of a city's adaptive capacity as an outcome of an aggregation of ECs from individuals to organizations to ecosystems. The results of Phase 1 framed a need to extend this study to explore the scope of societal demands for different ECs.

PHASE 2: ENABLING COMPETENCY DEMAND ANALYSIS

Based on the results of Phase 1, Phase 2 proceeds to explore the scope of demand for ECs across different professional fields and disciplines. To do so, we conduct a content analysis of a sample of global competency models to identify the different ECs identified across different models.

PHASE 2: METHODS

Following the method used by Miller, Wesley, and Williams (2012), a content analysis was completed of 15 competency models. The 15 models were selected to be representative across a broad range of disciplines and professional fields, including healthcare, management, finance, engineering, social work, and criminology (refer to Appendix-4). As identified by Braham and Tobin (2020), one of the major challenges facing researchers in the area of human capital is inconsistent definitions

and labels. Thus, defining a concise coding scheme is essential for completing an empirical content analysis (Lubisco, Birren, & Vooris, 2019). To do so, the research team developed an EC codebook to define coding procedures and the definitions for each variable (Wong, Kember, Chung & Yan, 1995). As a baseline, we used three models to support the initial framing of the EC codebook.

The first was *Alberta Education's competencies* (Government of Alberta, 2016). This model includes eight competency clusters: critical thinking, problem solving, managing information, creativity and innovation, communication, collaboration, cultural and global citizenship, and personal growth and well-being.

The second was the *Employment and Training Administration Competency Model Clearinghouse* (ETAM) developed by the United States (U.S.) federal government and industry partners. ETAM defines competencies in nine distinct tiers, with lower tiers serving as building blocks for the higher tiers. The lower tiers (defined as foundational competencies) include a range of transferable, professional, and academic competencies. As the tiers increase, the competencies become more specific to an industry and/or occupation.

Thirdly, we used Massachusetts Institute of Technology's (MIT, N.D.) *Human Skills Matrix*. This model incorporates 24 ECs clustered in four categories (thinking, interacting, managing ourselves and leading). The final element we considered at this stage was the enabling competencies that emerged from Phase 1. Refer to Appendix-5 for the mapping from this stage.

Following ETAM and Human Skills, the first level analysis was based on higher-order competency clusters (e.g., interpersonal competencies). The second level broke each down to specific competencies (e.g., verbal communications). The third level defined and tracked consistent keywords associated with each second level competency to ensure consistency and eliminate potential

double counting. The addition of keywords was iterative and refined through the coding process by the coders. Three researchers independently coded each competency model. In doing so, they decided whether the phrasing, word or sentence encapsulated the defined competency. If the coder judged that any portion of the model incorporated the competency, the competency was coded as present using a "1." Following the completion of coding all models, the researchers consolidated their codebooks. Each researcher then completed a second review based on the consolidated codebook. Refer to Appendix-6 for the definitions, literature support and full codebook to be tested in Phase 2.[9] Following the outcome of our literature review, competency model analysis and outcomes of Phase 1, we defined four clusters of ECs including *analytical* competencies, *interpersonal* competencies, *foundational* literacies, and *professional* enabling competencies. Refer to Figure-2 for the full list of ECs incorporated in this study.

Analytical Competencies

Analytical Thinking
Contextual Agility
Creativity
Curiosity
Perseverance
Problem Solving
Reflection
System Thinking
Taking Initiative
Time Management

Interpersonal Competencies

Collaboration
Conflict Resolution
Effective Listening
Emotional Intelligence
Influence
Integrity
Relationship Curation

Foundational Literacies

Civic Literacy
Financial Literacy
Numeracy
Technology Literacy
Verbal Communication
Written Communication

Professional Competencies

Define Workplace Goals
Resource Management
Inspire & Lead Others
Professional Identity

Figure-2: Four cluster model of enabling competencies

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[9] The list of ECs incorporated in this study must be refined through additional research and community consultation.
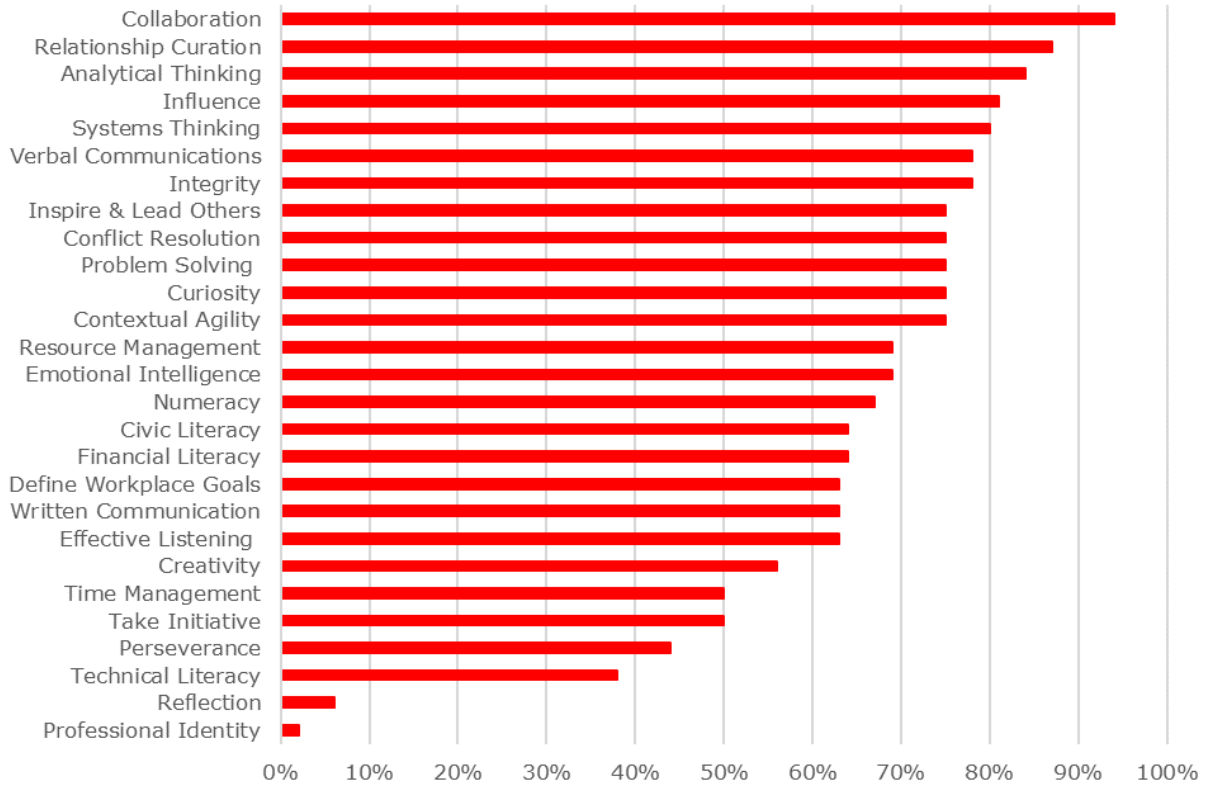
PHASE 2: RESULTS

Figure-3: Enabling competencies coding results (individual-level)
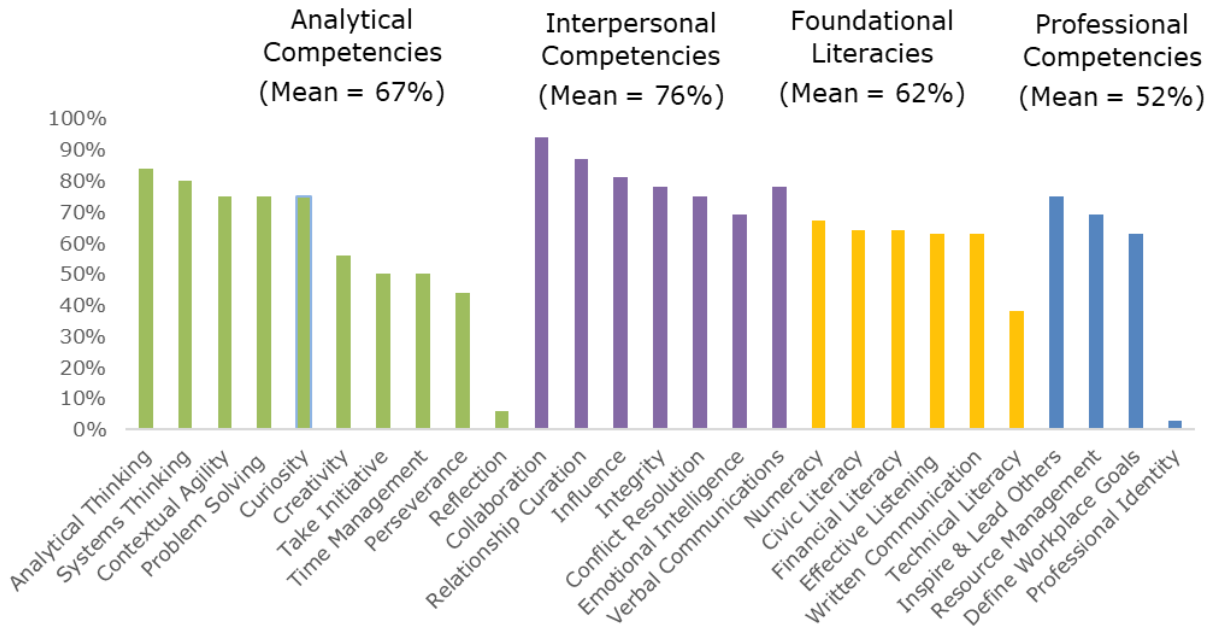

Figure-4: Enabling competencies coding results (cluster-level)

As reported in Figures-3 and 4, the overwhelming majority of the ECs embedded in this study have widespread support across the diverse range of 15 competency models. The interpersonal competencies cluster had the broadest support with a mean competency score of 76 per cent [10]; followed by analytical competencies (67 per cent); foundational literacies (62 per cent); and professional enabling competencies (52 per cent). This finding provides support for the proposition that ECs are foundational, providing an individual the capacity to adapt to different roles and contexts. The implication of these findings will now be considered.

SUMMARY OF RESULTS

This study has presented a perspective on how Calgary develops a learning capacity to adapt to compete in the new economy. This perspective is rooted in the evolution of the learning system to foster a set of enabling competencies across the population. This learning system must be built on a shared vision that developing a LearningCITY is anchored in developing adaptive people. This type of change mandates collective action at the city, ecosystem, employer, and individual level.

If this change is successful, Calgary stands to take control of its future and its remarkable comeback. If this change fails, Calgary may forever be at the whim of market forces, dancing to the tune of the globalized economy.

Herein, we defined and tested three propositions. Table-2 reviews the results framed by the three propositions and their associated implications.

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[10] This is the percentage that the specific competencies in a cluster were included in the 15 competency models.

Table-2: Conclusion and Implications

Proposition	Conclusion	Implications
Proposition 1: Enabling competencies are the foundation of an individual's adaptive capacity.	***Enabling competencies:*** This study found a strong consensus on the foundational role of ECs in the development of talent and individual adaptive capacity. ***Lack of intentionality:*** Our findings suggest there is limited sustained focus on the intentional scaffolding and development of ECs over an individual's lifetime. Moreover, the current fragmented learning system assigns limited accountability for the development of ECs. The implication is a labour force of increasingly static talent.	***Structural implication:*** The increasing foundational role of ECs will have a significant structural impact on a learning system that has an increasingly DSC focus. ***Accountability:*** These structural implications will lead to increasing demands on measurement and evidence of ECs. ***Competency model:*** To maximize efficiencies and ensure alignment, the city must define a unified competency model. This model will frame the priority learning outcomes for the learning system.
Proposition 2: Adaptive individuals are the foundation of adaptive organizations and ecosystems.	***Adaptive people:*** The results offer strong support that adaptive individuals are the foundation of adaptive organizations and ecosystems. ***Aggregation:*** This study highlights the importance of embedding intentional mechanisms to facilitate the effective aggregation of adaptive individuals into organizations and ecosystems.	***Learner Role:*** The role of the learner must fundamentally change from a passive consumer of learning to an active designer of learning based on their unique goals and mission. This has cascading implications on the entire learning system from classrooms to employers. ***From ladder to climbing wall:*** The adaptive and agile need for continuous learning will shift the model from a linear, predictable ladder to an explorative climbing wall with multiple pathways to a learner's destination. ***From consumer to co-creator:*** Employers can no longer play the role of a passive consumer of talent; they must transform into active co-creators of this talent as part of a systematic open learning system. This new role must involve a commitment supporting universal EL.

Proposition 3:		
A LearningCITY is founded on adaptive individuals, organizations, and ecosystems through aggregation mechanisms, such as knowledge diffusion, boundary spanners and shared vision.	*Systematic spiraling up:* Consistent with Proposition 2, this study concludes that a LearningCITY is the effective spiraling up – the aggregation of adaptive individuals, organizations, and ecosystems. *Open learning:* The city's traditional learning system represents a small fraction of the city's learning capacity. The modern learning system, including employers, schools boards, postsecondary institutions, non-profits, learners and beyond, is highly fragmented with limited coordination and no shared vision or purpose. *Significant barriers:* There are enormous structural and cultural barriers to the development and implementation of a city-wide learning strategy. *Lacking structural capital:* With no shared vision or purpose, the city lacks the core structural capital that underpins the capacity to aggregate adaptive individuals, organizations, and ecosystems into a LearningCITY. Instead, most aggregation mechanisms remain limited internally to organizations, with only limited examples of aggregation at an ecosystem level. There was no evidence of intentional and systematic use of mechanisms to aggregate adaptive individuals, organizations, and ecosystems at a city-level. The result is risk of system-level duplication and inefficiencies.	*Shift from closed to open learning system:* The city must transform to an integrated open learning system that leverages the full capacity of the current learning resources and ensures scarce resources are aligned towards a shared goal. *Define a shared vision:* This re-envisioned learning system must be founded on a shared vision of developing a LearningCITY, anchored in adaptive individuals, organizations, and ecosystems. *Invest in structural capital:* The foundation of a shared learning vision should be the commitment to developing the required structural capital for the city's learning system to work as a system. The anchor should include the establishment of a unified community competency model to prioritize future resource allocation. Additional areas include establishing mechanisms for system wide knowledge mobilization, coordinated experiments and shared open resources.

CONCLUSION

TRANSFORMING CALGARY INTO LEARNINGCITY 2025: AN ACTION PLAN

We are not educating students for the world we grew up in, not even for the world that exists today, but for the future they will live into, a future that we can barely imagine.

– Gordon Brown[11]

In this report, we assert that reinventing Calgary must begin by reinventing how we learn. Our study explored the rich multidisciplinary literature and delivered two empirical studies to examine how Calgary's learning system could be optimized to drive social and economic prosperity in the face of accelerating uncertainty. In this section, we offer a series of five pillars to transition Calgary to a LearningCITY.

It is important to acknowledge that systemic innovation does not need to be solely a top-down initiative, rather it can be triggered by piloting and iterating small-scale experiments. Therefore, though we identify the lack of coordination and shared vision as a critical barrier, progress towards an integrated open learning system is not dependent on the process of developing institutional and political consensus and an associated plan. Rather, progress can begin by harnessing and coordinating the learning ecosystem, including educators, practitioners, policymakers, and learners, who are today experimenting and iterating new approaches to learning. Moreover, numerous organizations, including Calgary Economic Development, the Calgary

Chamber of Commerce, Platform Calgary, the Immigrant Education Society, and others are beginning to proactively confront the learning challenges facing our city. The future must build on our rich traditions yet be re-envisioned to develop the essential adaptive capacity that will define and anchor our future prosperity. Only when every Calgarian possesses the capacity to embrace uncertainty as an opportunity, will our city and every citizen step back from the precipice and climb to new heights.

Based on the results of this study, we define five pillars to initiate the process of transforming our learning system. These pillars are summarized in Table-3. For additional details on these pillars, refer to the report, ***Calgary on the Precipice: The Path to LearningCITY 2025*** available **HERE**.
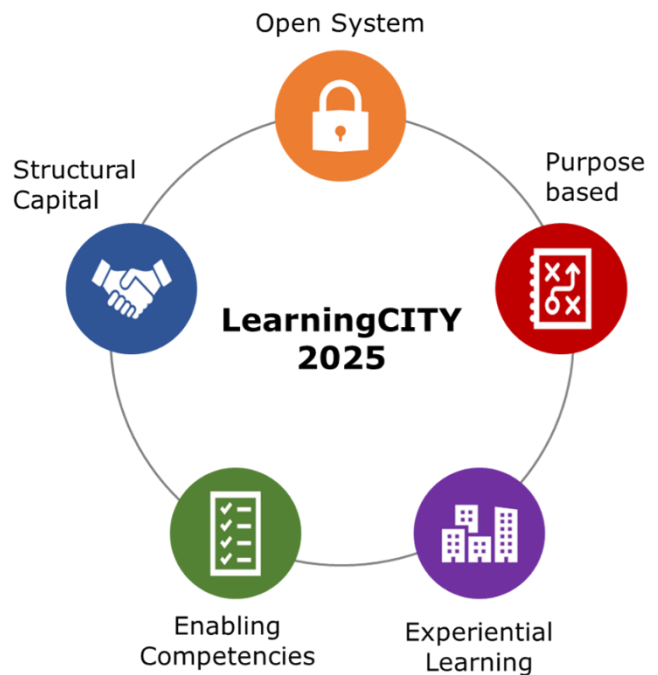

Figure-5: A plan for LearningCITY 2025

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[11] Former Dean of Engineering at MIT as quoted in Luksha et al. (2018).

Table-3: The Path to LearningCITY 2025

Calgary 2020	LearningCITY 2025	Action
TRANSITION TO AN INTEGRATED OPEN LEARNING SYSTEM		
o Closed system dominated by 402 accredited learning institutions with limited integration. o Anchored by 294,000 learners registered in accredited programs. o Limited knowledge or integration of non-accredited learning into the current system.	o Open-innovation model of 154,661 accredited learning institutions, employers, other service providers, accreditation bodies and learners.	o LearningCITY task force facilitates the development of a shared city learning vision. o Delivering this vision becomes the shared goal of the entire learning system.
TRANSITION TO PURPOSE-BASED LEARNING		
o Learning system defined by life stage. o Anchored by 294,000 learners registered in accredited programs.	o Personalized lifelong purpose-based learning anchored in scaled empowerment, mission mapping and experimentation. o Incorporates 1.4M Calgarians.	o Integrate a consistent system wide mission mapping process starting in grade 10 through postsecondary and beyond.
UNIVERSAL EXPERIENTIAL LEARNING		
o Experiential learning is defined by program needs. Therefore, in applied/ professional programs it is deeply embedded, in others, it is non-existent.	o Integrated experiential learning defined by universal self-directed experiential learning for all postsecondary students.	o Establish integrated and scalable experiential learning model to empower educators, learners, and community partners.
DEVELOP ENABLING COMPETENCIES		
o Limited accountability for systematic EC development from kindergarten to postsecondary. o DSCs developed through multi-year degrees and diplomas, or fragmented self-directed learning/ professional development.	o Lifelong systematic and measured EC development anchored in a competency model. o DSCs developed through an agile stacked micro-credential system. Credentials defined by domain.	o Open learning system develops and commits to a unified community competency model.
INVEST IN CITY-LEVEL STRUCTURAL CAPITAL		
o Limited processes or structures enabling the coordination and alignment of the system.	o Systems and processes established to maximize open learning system coordination and knowledge mobilization.	o Develop a community forum for educators to share best practices and tools.

A PATH FORWARD. TOGETHER.

Today, Calgary's already-fragile economic and social fabric is threatened by both the pandemic and oil prices declining to the lowest level in a generation. These crises provide both a challenge and an opportunity to leverage our learning system as the essential driver of our city's transformation. These major threats and the dramatic changes that Calgarians are experiencing in their personal and professional lives have paved the way toward a different way of thinking about old problems.

The goal of this discussion paper is to start a debate about the future of Calgary and the role of learning and talent development as part of this re-envisioning and rebuilding. Decades of multidisciplinary research show us that embracing uncertainty is difficult for most people, organizations, and systems. The common response is a combination of denial and resistance. For this reason, we focus on the underlying multidisciplinary science to guide us on the many challenges of developing a LearningCITY. In doing so, we conclude that addressing these challenges must start with developing an open learning system committed to accelerating and nurturing the adaptive capacity within each of us. To be a city that adapts, Calgary's citizens must possess the life-long capacity to learn.

This is not simply about adjusting the learning outcomes for students in kindergarten, university, or college. It's about re-envisioning the nature of learning and the learner by recognizing that traditional education systems, though essential, are only a small component of our city's rich, but fragmented learning system.

A central component of this report is the proposed adoption of the open innovation learning model. This model, adopted by companies ranging from Google to LEGO, recognizes that when you empower people, you accelerate innovation. Learners and employers are no longer customers of the traditional education system. They are, and need to be, co-creators in the learning process at all levels of education. However, with this empowerment comes significant responsibility to invest in this new model.

For learners, it means we must take increasing ownership of our learning, regardless of whether we are 16 or 60. Harvard is developing the Sixty Year Curriculum initiative to develop "new educational models that enable each person to retrain as their occupational and personal context shifts".

For employers, it means investing in learning far earlier and on a sustained basis. This investment may be collaboration with experiential learning in high schools, universities or colleges, or investment in training existing employees.

For policymakers and educators, it requires support for the timely development and approval of programs that provide the foundation of a re-envisioned open learning system designed to train adaptable citizens. Collaboration, though, can be difficult, especially across such diverse partners as policymakers, educators, and employers. Therefore, the greatest challenge for most of us is not external, but the embedded rules, routines, practices, and cultures that influence our individual mindsets, behaviours, and organizations. Yet we believe that the collaboration, compromise, and consensus required to implement an agile and open learning system anchored in adaptive capacity is an essential step forward.

The challenge to move forward on any of these proposed actions lies in the reality that education is a provincial mandate and is highly politicized. It's also a highly change-resistant sector. Therefore, we propose that Calgary city council establish an independent **LearningCITY Task Force**. This task force would incorporate the lessons learned from the Calgary Bid Exploration Committee, which was established to study the potential of

hosting the 2026 Olympic and Paralympic Games and could work alongside other task forces including the COVID-19 Economic Resilience Task Force. The LearningCITY Task Force would be given 12 months to engage the broader learning community and explore the following areas: [12]

1. Identify emerging competency demands required to deliver on the *Calgary in the New Economy* economic strategy.

2. Benchmark global "best in class" open learning systems.

3. Audit the existing Calgary learning system, including:

    a. programming gaps and opportunities

    b. system-level interoperability

    c. system-level governance

    d. sustainability of current funding model

4. Define a LearningCITY 2025 vision.

5. Identify early adopter organizations and individuals in the city to rapidly begin open learning system experiments and share outcomes across the ecosystem.

Figure-6: A Proposed LearningCITY Task Force

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[12] For an analysis of the CBEC process, please see Finch, D. J., Legg, D., O'Reilly, N., Wright, S., & Norton, B. (2020). A social capital view of an Olympic and Paralympic Games bid exploration process. *European Sport Management Quarterly*, 1-20.

6. Identify opportunities for increasing system-wide collaboration and accelerating partnerships and programming between employers and educational institutions.

7. Recommend a comprehensive path forward, including policy, funding, measurements, and governance to deliver on the LearningCITY 2025 vision.

8. We propose that the task force be structured with five working groups to explore the five pillars (refer to Figure-7). These groups would receive support for extensive stakeholder engagement and benchmarking research through the LearningCITY Lab, an open collective of researchers and educators committed to evidence-based innovation in learning. The task force would submit a report to the community within 12 months. It's important to note that the task force should not become a barrier to concurrent innovation within the system.

Open System Working Group

Purpose-based Learning Working Group

Experiential Learning Working Group

Structural Capital Working Group

Competencies Working Group

LearningCITY Report to Community

Ad Hoc Innovation Continues

LearningCITY Lab

Stakeholder Engagement

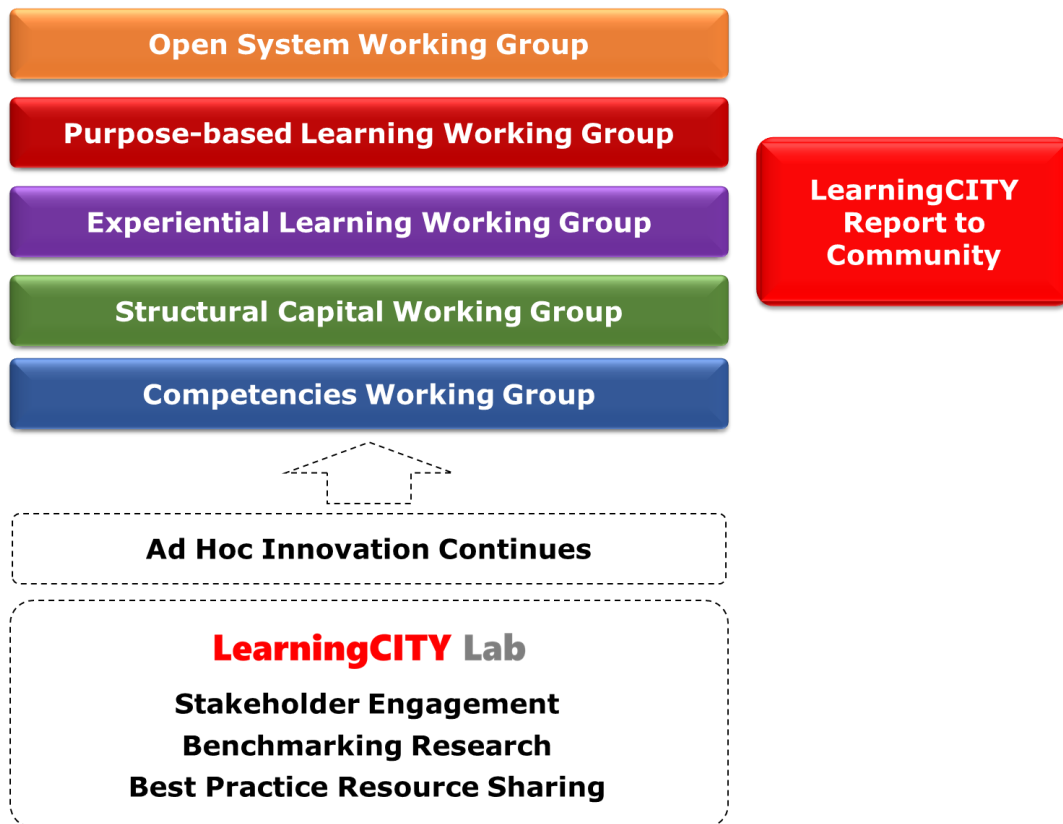**Benchmarking Research**

Best Practice Resource Sharing

Figure-7: A 12-month LearningCITY program

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APPENDICES

APPENDIX 1: GLOSSARY OF KEY TERMS

Adaptive Capacity: Adaptive capacity is the ability for an individual or institution (e.g., organizations or ecosystems) to anticipate systematic changes and proactively reconfigure existing resources (e.g., competency development), or acquire new resources (e.g., recruit new talent), to maintain a competitive (and/or comparable) advantage. Adaptive capacity presumes that the individual or institution maintains significant independence from the external environment through systematic planning. This is in contrast with resiliency that assumes dominance of the external environment over the individual or institution.

LearningCITY: A LearningCITY is the aggregation of adaptive individuals, organizations, and ecosystems.

Adaptive Ecosystems: An adaptive ecosystem is a form of inter-organization collaboration facilitating accelerated learning and innovation. Enabled by increased connections across specialized areas, ecosystems leverage shared knowledge to develop new, co-created solutions and business models that address complex problems. Clear governance mechanisms are essential to ensuring that as ecosystems evolve, the value continues to accrue to the shared goals of the ecosystem.

Adaptive Institutions: Adaptive institutions incorporate the adaptive capacity embedded in organizations or ecosystems.

Adaptive Organizations: An adaptive organization can anticipate change and reconfigure existing resources or acquire new resources to maintain a sustainable competitive advantage. Adaptive organizations are dynamic and embody a culture of experimentation and a state of continuous learning and reinvention. This is manifested in developing learning and dynamic capabilities.

Adaptive Individuals: Adaptive individuals manifests itself through career adaptability, where individuals anticipate and proactively assume responsibility for the development of their future competencies. Career adaptability includes embracing uncertainty, continuous learning, and reinvention. Career adaptability is facilitated by the ability of individuals to successfully combine personal competencies with career uncertainty.

Apprenticeship: Apprenticeship is an agreement between a person (an apprentice) who wants to learn a competency and an employer who needs a skilled worker and who is willing to sponsor the apprentice and provide paid related

practical experience under the direction of a certified journeyperson in a work environment conducive to learning the tasks, activities and functions of a skilled worker. Apprenticeship combines about 80 per cent at-the-workplace experience with 20 per cent technical classroom training, and depending on the trade, takes about 2-5 years to complete. Both the workplace experience and the technical training are essential components of the learning experience.

Boundary Spanners: Boundary spanners are these individuals (and organizations through them) who possess the capacity to push beyond their current boundaries. From a city perspective, boundary spanners are individuals and institutions who link or aggregate resources, knowledge, and practices in novel ways to accelerate or expand a city's adaptive capacity. At a city level, boundary spanners incorporate institutions that are designed, and in practice, bridge traditional sectoral boundaries. This may include economic development agencies, chambers of commerce, ecosystem facilitators or non-profit organizations.

Cognition: Cognitive resources incorporate critical thinking skills, decision making, problem solving, reasoning, ability to learn from previous situations and the competency to self evaluate one's cognitive abilities to do any of the previously listed cognitive tasks. Includes meta-cognitive self-reflection (thinking about, and critically evaluating, one's own thought processes) and personal meta-cognition knowledge.

Competency Models: Competency models allow policymakers, employers, and individuals to assess the current state of human capital and guide the allocation of scarce development resources (e.g., education and training). They have proven to be effective because they provide guidance, common vocabulary, and consistency in competency classifications.

Complex Adaptive Systems: Complex adaptive systems are when agents interact to generate system wide patterns that

influence both the behaviour of the agent and the system. In a social context, interaction influences the attitudes and beliefs of the agency that influence their respective behaviours. This behaviour then influences system-wide patterns.

Co-operative Education (co-op alternating and co-op internship models): Co-op alternating consists of alternating academic terms and paid work terms. Co-op internship consists of several co-op work terms back-to-back. In both models, work terms provide experience in a workplace setting related to the student's field of study. The number of required work terms varies by program; however, the time spent in work terms must be at least 30 per cent of the time spent in academic study for programs over 2 years in length and 25 per cent of time for programs 2 years and shorter in length.

Domain-Specific Competencies: DSCs incorporate the knowledge, skills, attitudes, values, and behaviors required to complete specific tasks associated with a role (e.g., accounting, welding) and/or a sector (e.g., energy, sport).

Ecosystems: A form of inter-organization collaboration. What makes the ecosystem lens unique is that the interdependency recognizes that the health of the individual components is dependent on the overall health and sustainability of the larger one. The reliance of the whole thus depends on the breadth and depth of interconnections between the component parts. In a business context, an ecosystem is a formal or informal network of stakeholders (e.g., producers, distributors, consumers, educators, government agencies, competitors etc.) that collaborate to create, scale, and serve markets beyond the capacity of a single organization or traditional sector.

Education: Education encompasses both accredited and non-accredited training that contribute to the development of cognitive and personality resources. This incorporates all delivery forms from formal education (kindergarten to postsecondary)

to vocational training to self-directed (e.g., reading).

Enabling Competencies: ECs (also referred to as meta-skills, human-skills, soft-skills, and transferable-skills) incorporate the knowledge, skills, attitudes, values, and behaviors required to deliver adaptive, thinking, interpersonal, communication, organization, and professional competencies.

Entrepreneurship (EL): Allows a student to leverage resources, space, mentorship and/or funding to engage in the early stage development of business start-ups and/or to advance external ideas that address real-world needs for academic credit.

Experience: Experiences are professional (e.g., paid), volunteer (e.g., not compensated work) and contextual (e.g., personal experiences, such as travel) activities. Experience activities are more closely related to developing domain-specific competencies.

Experiential Learning Cycle: Kolb's (1984) holistic experiential learning cycle provides a model of transformational learning that intersects experience and conceptualization, drawing the attention of scholars and educators to the critical role of reflection in transforming an *experience* into a *learning experience*. However, this form of reflection must extend beyond simply thinking about an experience; it must encompass a deeper critical analysis to enable a learner to integrate theory into the durable practice forms that will guide their future actions. The University of Calgary has defined it as:

> *Experiential learning (EL) is learning-by-doing that bridges knowledge and experience through critical reflection. EL activities are intentionally designed and assessed. As such, they empower learners to enhance individual and collaborative skills such as complex problem solving, professional practice skills, and teamwork. Reflecting critically on these activities helps individuals develop higher order thinking to*

> *challenge and advance their perspectives. The EL process prepares students to take on roles as active citizens and thrive in an increasingly complex world* (Kaipainen, Braun, & Arseneault, 2020 p. 11)

Faculty-Directed Experiential Learning: EL experience delivered as a course-based requirement. This initiative is integrated by a faculty member within a specific course and embeds an instructor-led critical reflection mechanism to enrich the learning experience. Examples of faculty-directed EL today include course-based community-service learning, course-based live case studies; and course-based community-engaged research projects (e.g., honours thesis, directed reading).

Field Placement: Provides students with an intensive part-time/short term intensive hands-on practical experience in a setting relevant to their subject of study. Field placements may not require supervision of a registered or licensed professional and the completed work experience hours are not required for professional certification. Field placements account for work-integrated educational experiences not encompassed by other forms, such as co-op, clinic, practicum, and internship.

Human Capital: Used herein as a synonym to *high-valued talent* and defines competencies as capital, similar to other forms of capital (e.g., financial capital, social capital). Herein, human capital can be viewed at the level of an individual, institution (e.g., organization or ecosystem) or city.

Internships: Usually discipline specific (typically full-time), supervised, structured, paid, or unpaid, for academic credit or practice placement. Internships may occur in the middle of an academic program or after all academic coursework is completed and prior to graduation. Internships can be of any length but are typically 12 to 16 months long.

Learning Organizations: Senge (1990) frames learning organizations as being

rooted in five disciplines. (1) personal mastery; (2) mental models; (3) a shared vision; (4) team learning; and (5) systems thinking that integrates the other four disciplines. Building on the Senge model, Garvin (1993 p. 7) defines a learning organization as one that is "skilled at creating, acquiring and transferring knowledge, and at modifying its behaviour to reflect new knowledge and insights".

Learning System: Core members of a learning system would include educational institutions, educators, policymakers, employers, and students.

Mission Mapping: A plan to deliver on a personal mission. This mission map can be organized around four components: (a) education & learning resources, (b) employment experience, (c) Community/ volunteer experience, (d) Contextual experience. We also recommend this map include the anticipated relationships they will need to achieve their mission (e.g., mentors, professional and personal). Developing a mission map will enable students to select the appropriate EL activity for their educational pathway.

Open Innovation: Learning occurs when knowledge is shared and converted into new practice. Open innovation is an example of knowledge diffusion that has facilitated the development of partnerships and the leveraging of complementary knowledge for innovation.

Professional Practicum/Clinical Placement: Involves work experience under the supervision of an experienced registered or licensed professional (e.g., preceptor) in any discipline that requires practice-based work experience for professional licensure or certification. Practica are generally unpaid and, as the work is done in a supervised setting, typically students do not have their own workload/caseload.

Research Projects: Students are engaged in research that occurs primarily in workplaces, including consulting projects, design projects, community-based research projects (e.g., honours etc.).

Personality: Incorporates intrinsic personality traits including emotional stability, openness to experience, extraversion, agreeableness, and conscientiousness.

Service Learning: Community Service Learning (CSL) integrates meaningful community service with classroom instruction and critical reflection to enrich the learning experience and strengthen communities. In practice, students work in partnership with a city-based organization to apply their disciplinary knowledge to a challenge identified by the community.

Shared Vision: Shared vision is a picture of "what do we want to create?" It is an aggregation of "personal visions" from within a community.

Structural Capital: Structural capital is most commonly defined as the value of an organization when the employees have gone home and includes the processes and structures that enable the effective leveraging of other forms of capital, such as human capital or physical capital that generates incremental value. Structural capital may include dimensions such as intellectual property, culture, and knowledge management systems and processes. Herein, we propose structural capital as the tangible and intangible processes and infrastructure that facilitate the effective collaboration and alignment of individuals and institutions within a city.

Student-Directed Experiential Learning: This is when a student completes a self-directed community work experience initiative that directly supports the learning outcomes of their program but is independent of their program. Though this is independent, this type of EL embeds a supervised critical reflection mechanism to enrich the learning experience but is not necessarily assessed or graded for credit as part of the student's program of study or course requirements. Examples of student-directed EL mechanisms include entrepreneurship, co-curricular

professional portfolio, research assistant for community- engaged research project, volunteer-experiences with embedded reflection. The benefit of this form of EL is that it empowers students to own and be accountable for developing a EL pathway that aligns to their professional and personal goals as defined by their mission map. In addition, this has a dual benefit of increasing student accountability, self-efficacy and reducing administrative burden and oversight.

Universal Experiential Learning (UEL): We define universal EL as a core requirement of all university undergraduate programs for all students, regardless of discipline. Students must complete a minimum of one EL experience, incorporating a minimum of 450 EL hours prior to graduation.

VUCA: Incorporates the constructs of volatility, uncertainty, complexity, and ambiguity. *Volatility* reflects the dynamic and speed of change. *Uncertainty* is the inability to predict the future due to external factors beyond a decision-makers control. *Complexity* acknowledges that systematic interacting forces make it difficult to identify direct cause-effect relationships. *Ambiguity* reflects the vagueness of present and future situations, amplifying risk to a decision-maker.

Work Experience: Intersperses one or two work terms (typically full-time) into an academic program, where work terms provide experience in a workplace setting related to the student's field of study and/or career goals.

Work-Integrated Learning (WIL): A model and process of curricular experiential learning which formally and intentionally integrates a postsecondary student's academic studies within a workplace or practice setting.[13]

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[13] WIL and EL related definitions sourced from https://www.cewilcanada.ca/_Library/2019/WIL-Def-ENGLISH_-_Updated_2019.pdf

APPENDIX 2: INTEGRATED DYNAMIC CAPABILITIES DEVELOPMENT
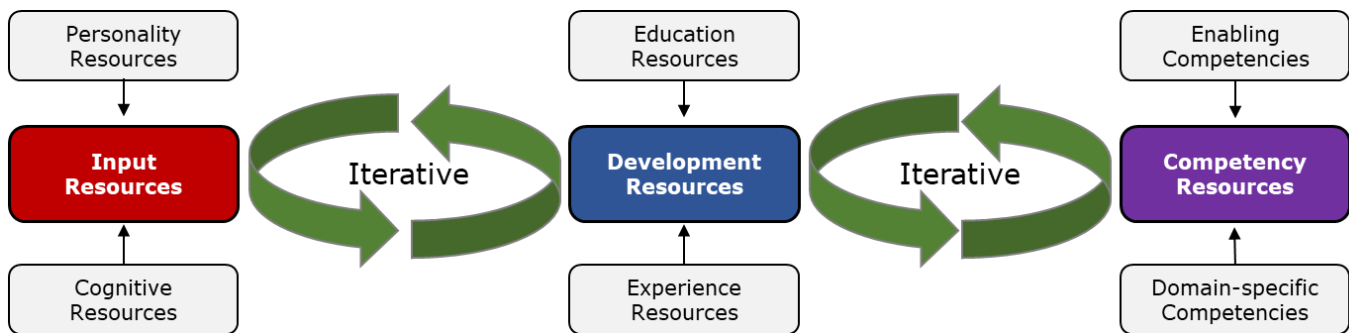
APPENDIX 3: PHASE 1 SAMPLE BY TALENT DEVELOPMENT STAKEHOLDERS

Stakeholder Group	Scope	Stratification Variables	% Participant
Accredited educational institutions	Individuals who facilitate accredited learning. This incorporates both educators and administrators. Inclusive of all accredited educational institutions from kindergarten to postsecondary.	o Level o Gender o Discipline o Role	22% (24)
Other education providers	Individuals who are non-accredited learning. This incorporates both educators and administrators. Inclusive of all non-accredited educational providers, including continuing education, professional development, and community-based education programming.	o Level o Gender o Discipline o Role	8% (9)
Employers	Organizations or individuals who employ staff.	o Industry o Size o Role	66% (73)
Other	Including policymakers, professional associations and accreditation bodies and funders.	o Industry o Occupation o Role	4% (4)

(n) = total sample from respective stakeholder group

APPENDIX 4: PHASE 2 COMPETENCY MODEL INVENTORY

Domain	Publisher	Year	Scope
1. Accounting	Chartered Global Management Accounting	2019	Global
2. Accounting Education, Training, and Certification	World Bank	2018	Global
3. Sales	Canadian Professional Sales Association	2017	Canada
4. Human Resources	Society and Human Resource Professionals	2012	Global
5. Human Resources	Human Resource Professional Association	2014	Canada
6. Policing	College of Policing	2016	United Kingdom
7. Engineering	Association of Professional Engineers & Geologists of Saskatchewan	2018	Saskatchewan, Canada
8. Social Work	Steering Committee for the National Social Work Competency Framework	2015	Singapore
9. Civil Service	Civil Service Human Resources	2017	United Kingdom
10. United Nations Education, Science Organization (UESCO) Management	UNESCO	2015	UNESCO
11. Organisation for Economic Co-operation and Development (OECD)	OECD	2014	OECD
12. Systems Engineering	ICOSE UK	2015	United Kingdom
13. International Atomic Energy Agency (IAEA) Staffing	IAEA	N.D.	IAEA
14. Prescribing Professionals	Royal Pharmaceutical Society	2016	United Kingdom
15. United Nations International Children's Emergency Fund (UNICEF) Staffing	UNICEF	N.D.	UNICEF

APPENDIX 5: ENABLING COMPETENCY MAPPING

Competency	Phase 1 Study	Alberta Education	MIT Human Skills	ETAM
Analytical Skills				
Adaptive Capacity	Included	Included	Included	Included
Analytical Thinking	Included	Included	Included	Included
Contextual Agility	Included	Included	Not Included	Included
Creativity	Included	Included	Included	Included
Curiosity	Included	Included	Included	Included
Perseverance	Included	Included	Included	Included
Problem Solving	Included	Included	Included	Included
Reflection	Included	Included	Not Included	Not Included
Problem Solving	Included	Included	Included	Included
System Thinking	Included	Included	Included	Included
Taking Initiative	Included	Included	Included	Included
Time Management	Included	Included	Included	Included
Interpersonal Competencies				
Collaboration	Included	Included	Included	Included
Conflict Resolution	Included	Included	Included	Included
Effective Listening	Included	Included	Included	Included
Emotional Intelligence	Included	Included	Included	Included
Influence	Included	Included	Included	Included
Integrity	Included	Included	Included	Included
Relationship Curation	Included	Included	Included	Included
Foundational Literacies				
Civic Literacy	Not Included	Included	Not Included	Included
Financial Literacy	Not Included	Included	Not Included	Included
Numeracy	Not Included	Included	Not Included	Included
Technology Literacy	Included	Included	Not Included	Included
Verbal Communication	Included	Included	Included	Included
Written Communication	Included	Included	Included	Included
Professional Enabling Competencies				
Define Workplace Goals	Included	Included	Included	Included
Manage Resources	Included	Not Included	Included	Included
Inspire and lead others	Included	Included	Included	Included
Professional Identity	Included	Included	Included	Not Included

Included — (green)   Not Included — (grey)

APPENDIX 6: ENABLING COMPETENCY CODEBOOK

Competency	Definition	Keywords	Source(s)
Analytical Competencies			
Analytical Thinking	The ability to deconstruct issues into smaller, more manageable pieces, use evidence and reasoning to identify unique relationships between concepts and weigh the costs and benefits of the alternative actions available. Includes: o Analyzing evidence and assumptions o Applying reason and appropriate criteria to make a judgement. o Apply knowledge from across fields to discover new or expand one's understanding. o Ability to be objective and open-minded.	o Critical thinking o Cost-benefit analysis o Boundary spanning o Systems thinker o Critical evaluation	Government of Alberta, 2016; Betts, 2015
Contextual Agility	The ability to work well no matter the context. The contextual setting can include the culture, socio-economic conditions, organization size, industry type, culture, and team composition.	o Accepting o Open-minded o Sensitivity o Cultural competency o Diversity o Openness to experience o Flexible thinking	Pignault & Houssemand, 2016
Creativity	Use of imagination or original ideas to create something new and appropriate for the problem at hand.	o Innovative o Out of the box thinking o Original thinking o Inventive o Imagination	Kilgour & Koslow, 2009

Curiosity	The ability to be curious and explore a deeper meaning than what is being overtly expressed. It can lead to the expansion of social networks and learning opportunities.	o Continuous learning o Build professional capacity o Continuous improvement o Personal development o "know what they don't know" o Inquisitive o Humility o Lifelong learning o Continuous review o Active learning o Respond to feedback o Outward-looking nature	Bower & Konwerski, 2017; Loewenstein, 1994.
Perseverance	Perseverance in the face of professional challenges is essential to adaptive capacity. This includes improvements in an individual's control of their emotional reactions to an intellectual challenge, learning from failure, understanding the importance of practice for competency development, how to manage obstacles in career advancement, and personal hardiness when faced with adversity. One caveat is that perseverance must be maintained within the context of excellent metacognitive abilities that are necessary to determine the point at which perseverance in a career becomes detrimental to being adaptable to uncertainty.	o Drive results o Resilience o Cope with pressure o Dedicated attitude o Remain calm in stressful situations o Committed o Overcome barriers o Accountability o Deliver o Proactively complete tasks o Work to completion o Achievement focus o Resolve	Credé 2017; Hochanadel 2015; Luthans 2006; Reed & Jeremiah, 2017
Problem Solving	Problem solving often leverages analytical thinking. Effective problem solving is made up of four interrelated skills: o The ability to identify vital questions and problems and communicate them clearly. o The ability to gather and evaluate relevant information. o The ability to think open-mindedly, recognizing and assessing assumptions, implications, and practical consequences. o The ability to come to well-reasoned conclusions and solutions, testing them against relevant criteria and standards.	o Managing uncertainty o Flexible thinking o Troubleshooting o Decision making o Decide and initiate action o Outside the box o Asks questions o Generating insights	Government of Alberta, 2016; Kiilgour & Koslow, 2009
Reflection	Contemplation about one's character, actions, and motives. Provides an understanding of self, values, and how they impact thinking and actions. This	o Introspection o Self-contemplation o Introspection	Ash & Clayton, 2004. Kolb & Kolb, 2005; Slatcher & Pennebaker, 2006.

	competency is under the umbrella of meta-cognitive thinking.		
System Thinking	The ability to evaluate the interdependency of discrete components of a whole, as well how these components affect the whole and vice-versa. This includes an individual's ability to understand complex systems, enabling the ability to anticipate potential outcomes and develop approaches to influencing these outcomes.	o Complex systems o Strategy mapping o Mind Mapping o Interdependency o Critical Evaluation o Seek Root Cause o Insight o Considers the larger picture o Ecosystem Management o System Leadership o Seeing the big picture	Boulding, 1956; Ackoff, Ackoff & Emery, 2005; Arnold, & Wade, 2015
Takes Initiative	The discipline and ambition to start a task, regardless of difficulty, with limited guidance from others and be self-reliant under pressure.	o Self-starter o Self-management o Independence o Responsive o Achieve results o Detail oriented o Self-motivated	Finch, Nadeau & O'Reilly, 2013
Time Management	Efficiently and effectively managing one's own time, the time of others, and deliverables for projects. Time management also includes the ability to manage and filter vast levels of information to make timely decisions.	o Organized o Personal organization o Planning and organizing o Scheduling o Follow timelines o Productivity o Meets deadlines	Vivek Bindra, 2015; WEF, 2018
Interpersonal Competencies			
Collaboration	Work proactively to have positive and mutually beneficial relationships with others. This includes the ability to cooperate with others to work towards a common goal.	o Collaborative o Team player o Work with people o Relationship management o Work effectively across diverse groups o Able to work with all levels of members of organization	Government of Alberta, 2016; Human Skills Matrix, N.D.
Conflict Resolution	The ability to resolve conflict or create common ground and reach a consensus when different options for forward movement in an organization are considered. The development of this competency encourages people with diverse perspectives to work together to evaluate options and resolve a shared problem.	o Negotiation o Understand new perspectives o Resolve issues o Conflict management o Resolve differences o Reconciles conflict	Jackson & Chapman, 2012
Emotional Intelligence	The ability to identify, assess and modulate one's own feelings and to understand the feelings of others. Emotional intelligence requires a mix	o Emotional intelligence o Empathy o Self-awareness	Coetzee & Harry, 2014

	of self-awareness and empathy towards others. Dimensions of emotional intelligence include emotional management, self-awareness, optimism, motivation, empathy, and social skills.	o Emotional management o Self-management o Understanding others' needs	
Influence	The ability to sway the attitudes or behaviour of others through evidence, logic, and emotion.	o Influence o Persuasion o Negotiation	WEF, 2018
Integrity	Display consistent principles that conform with socially acceptable standards within the context of a place of employment. Includes encouraging others to be honest and trustworthy.	o Ethical behaviour o Professionalism o Fairness o Transparency o Respect for rules & policies o Commitment to personal integrity o Ethics o Honesty o Truthfulness	Human Skills Matrix, N.D.
Relationship Curation	The ability to develop and maintain relationships with individuals who may share common interests or future goals.	o Relationships o Networks o Establishing Rapport o Networking o Build Trust o Partnerships o Stakeholder Relationships o Relations	Human Skills Matrix, N.D.
Foundational Literacies			
Civic Literacy	Both the knowledge of and the ability to effectively engage in, and influence change in social systems, including political, economic, and cultural.	o Knowledge of government, political, economic systems o Knowledge of Government o Social Literacy o Social knowledge o Political Savvy	Government of Alberta, 2016; Hylton, 2018.
Effective Listening	The ability to commit full attention to what other people are saying, taking the time to understand points being made and ask questions when appropriate, without interrupting at improper times. (Listening to listen versus listening to answer.)	o Listening o Attention to detail	Cooper, 1997; Goby & Lewis, 2000
Financial Literacy	Both the knowledge of and the ability to make informed decisions on the allocation of financial resources. Includes areas such as personal financial management, budgeting, and investing.	o Financial o Finance/Accounting o Financial Reporting o Financial knowledge	Human Skills Matrix, N.D.

Numeracy	Both the knowledge of and the ability to work with and use numbers. Has the confidence and awareness to know when and how to apply quantitative and spatial understandings at home, at school, at work or in the community.	○ Mathematical ability ○ Good with numbers ○ Numerate ○ Quantitative ○ Calculations (mathematical)	Government of Alberta, N.D.
Verbal Communication	The ability to share information and explanations with a target audience by speaking in a persuasive and influential way. This includes vocabulary, tone, pace, volume, and articulation, with or without, technological support.	○ Verbal ○ Oral ○ Cold calling ○ Presentation	Gardner, Milne, Stringer, & Whiting, 2005
Written Communication	The ability to share information and explanations with a target audience in writing in a persuasive, engaging, and influential way. This includes grammar, tone, vocabulary, and style.	○ Writing ○ Writing skills	Gardner, Milne, Stringer, & Whiting, 2005; Ariana, 2010; Graham, Hampton, & Willett, 2010
Technology Literacy	Both the knowledge of, and the ability to effectively use technology to access, manage, integrate, evaluate, create, and communicate information in a digital environment. This includes an ability to effectively adapt to new digital devices and interfaces. General technical literacy is different from domain-specific technology competency. .	○ Technical literacy ○ Computer literacy ○ Knowledge of common software programs and tools	Koltay, 2011
Professional Enabling Competencies			
Define Workplace Goals	Capacity to define future goals, objectives, and outcomes at an individual and organizational level and to use these goals to serve as motivators for the present action.	○ Recognize and support team objectives ○ Sets Defined Objectives ○ Goal setting ○ Objective setting ○ Mission ○ Vision	ETAM, N.D.; WEF, 2018
Manage Organizational Resources	Ability to define a plan to achieve organization goals. This may include: ○ Evaluation of current financial and human resources available to execute the defined plan. ○ Identifying current and future macro and micro level risks to achieving plan. ○ Identify and prioritize existing resource gaps and secure incremental resources or alternatives. ○ Ability to develop and manage rigorous budgets	○ Manage budget ○ Resource management ○ Manage people ○ Management experience	ETAM, N.D.; WEF, 2018

	- Ability to influence others to achieve goals, including the ability to delegate tasks. - Ability to monitor progress towards achieving organizational and/or individual performance indicators.		
Inspire and Lead Others	The ability to guide others to complete a task through charisma, rank, intellect, will or experience. A leader's influence may be formal (e.g., supervisor) or informal (e.g., social influence). This includes: the ability to establish a clear goal, the ability to communicate this goal to others, and the ability to balance the interests of others to engage them to deliver on this goal.	- Lead Organization - Guide - Leadership - People management - Take ownership - Supervise - Coach - Mentor	ETAM, N.D.; WEF, 2018
Professional Identity	One's self-concept based on attributes, beliefs, values, motives, and experiences. Research suggests that the formation of an individual's professional identity plays a critical role in the transition between postsecondary. and future job environments. The age of an individual and how open they are to future change can influence their career adaptability.	- Self-identity - Core values	Ibarra, 2013

APPENDIX 7: AN EVIDENCE-BASED LEARNINGCITY

This study is the first contribution to a larger debate. Much discussion and exploration are required to embark on this path to learning innovation. Below, we consider potential areas of future research that will support transitioning Calgary into the re-envisioned LearningCITY. The four benchmarking initiatives below are currently in progress.

Learning System Benchmarking

1. What are best practices of other cities that have gone through similar transformation? For instance, what can we learn from the UNESCO's Learning City Award recipients? [14]

2. What other cities or learning systems have adopted adaptive capacity as a core learning outcome?

3. What other cities or learning systems have deployed a community competency model?

4. What jurisdictions, sectors, disciplines, or professional fields have successfully adopted a 'climbing wall' model for the development of talent?

5. What other cities have successfully developed an open learning system to accelerate talent development?

6. What other cities have scaled meaningful EL opportunities to all postsecondary learners?

Unified Community Competency Model

1. How do we develop the competency model as a shared vision?

2. What are the core ECs that should be incorporated in a competency model?

3. How can ECs and DSCs be balanced in a learning environment with clear accountability in a learning system?

4. What are the short-term and long-term practical implications of deploying a competency model as the anchor for an

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[14] A UNESCO Learning City abides by six principles: "promote inclusive learning from basic to higher education; revitalize learning in families and communities; facilitate learning for and in the workplace; extend the use of modern learning technologies; enhance quality and excellence in learning; and foster a culture of learning throughout life (UNESCO, 2015, p. 9). See 2019 city recipients at https://uil.unesco.org/lifelong-learning/learning-cities/cities-inclusion-winners-unesco-learning-city-award-2019

integrated learning system?

5. What are the implications of adopting a competency model on broader provincial learning policies?

6. How will increasing the adaptive cognitive abilities of individuals enhance institutional and city level adaptive capacity?

7. What are the implications of a competency model on employee professional development?

Learning Measurement

1. How do we effectively assess and measure the learning outcomes associated with adaptive capacity?

2. What are progressive measurement models that could be adopted to evaluate the impact of an open learning system?

Institutional Implications

1. What mechanisms facilitate the aggregation of at the organization and ecosystem level?

2. What is the relationship between adaptive individuals and adaptive organizations and ecosystems?

3. How should institutions work with diverse stakeholders and what role should they play in developing entrepreneurial competencies that enable adaptive individuals?

Implementation Implications

1. How do we implement and measure the effectiveness of the aggregation mechanisms at the city, ecosystem and city levels?

2. What governance mechanisms should be implemented to monitor the city's adaptive capacity?