INTELLIGENT INDUSTRY: THE ENGINE DRIVING CLIMATE RESILIENT GROWTH

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SUMMARY

The digitalization of the physical world has created a transformational opportunity to accelerate climate resilient growth. More than opportunity, it is required to develop the needed efficiency gains across multiple industries to meet the current climate goal. At the steering wheel is Canada, a country assuming a leadership role in building and scaling the technology companies at the forefront of the digitalization trend, driving this global shift founded not only on climate concerns, but competitive advantage.

Simply converting to renewable energy generation will yield only a fraction of the change needed to reach the multitude of climate-based goals including global warming, greenhouse gas emissions and carbon intensity. The most significant changes are to be driven by traditional industries, transportation, buildings, cities and infrastructure, and agriculture and food.

Addressing climate change is no easy task. Systemic problems such as this require systemic solutions, and that we look to root causes and seek interventions that change patterns of outcomes. Digitalization enables the discovery of continuous improvements, solving problems and optimizing outcomes in real-time with software and data. These solutions are numerous and both big and impactful as well as small and iterative that, when added up, would have a major impact towards reducing the impact of climate change and facilitate the goal of a sustainable future.

Intelligent Industry represents an unprecedented opportunity to capitalize on this transformation. Over the last three decades, the Internet Age has evolved into a next-generation platform founded on a diverse set of advancements across software, communications and computing technologies. Intelligent Industry is the adoption of the application of data, machine learning, artificial intelligence, software defined systems, Industrial Internet of Things and other technologies – all supported by cloud computing – to drive innovation, reduce the impact of climate change and create operational efficiencies.

The Intelligent Industry's engine is digital and its fuel is data. The number of monitoring and control points connecting industrial and commercial infrastructure to the Internet is expected to reach at least 75 billion by 2025, more than 20 times the size of the current Internet, with the potential to generate almost $60 trillion in the next 15 years.

Intelligent Industry is able to harness that data to create more, with less waste. It can drive

improvements in the productivity of physical capital, infrastructure, and other asset-intensive operations leading to a reduction of natural resource consumption and carbon intensity, optimizing asset efficiency, and minimizing the output of undesirable by-products such as waste materials and environmental pollutants, especially those that contribute to global climate change.

The market for these technologies is already growing rapidly. In fact, we are already seeing demand from global markets that businesses driving such traditional industries adopt "fit-for-future" technologies to stay competitive. Global policy is also embracing Intelligent Industry. The role of the Intelligent Industry is critical to the United Nations' 2030 Agenda for Sustainable Development and perhaps best embodied through the application of Sustainable Development Goal 9 (SDG 9): Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation. The three foundational pillars of SDG 9 – infrastructure, industry and innovation – all share the objective of achieving environmentally sustainable economic development. The U.N.'s Intergovernmental Panel on Climate Change labels the Intelligent Industry a fundamental requirement moving forward.

Furthermore, the adoption of sustainable technologies facilitates the shift in business practices to lower carbon intensity and reinforce climate resilience. Inclusive and sustainable industrialization has strong ramifications for most, if not all, of the United Nations Sustainable Development Goals ("SDGs"). SDG 9 has approximately 20 targets and indicators related to its three pillars and is closely linked to other SDGs related to job creation, sustainable livelihoods, improved health, technology and skills development, gender equality, food security, green technologies and, importantly, climate change. It is this intersectional nature of the SDGs that makes it imperative to promote industrialization patterns that de-couple economic growth from

unsustainable resource consumption and environmental degradation.

Canada has a unique leadership position in this opportunity, one that shines on a global stage. Canada has one of the most robust innovation ecosystems on the planet. It houses three of the top 20 ecosystems spanning country and globally recognized machine learning and artificial intelligence expertise. Canada is second only to Israel in GDP-adjusted financing activity, outpacing the United States by 30%. Within this robust innovation ecosystem, Canada has the highest concentration of Intelligent Industry technology companies globally. It has the second highest total activity, ahead of major industrial economies and leaders in digital transformation such as Germany and China. The Intelligent Industry is being driven by Canada's innovation.

Yaletown Partners is a leading investor in technology companies that enable the Intelligent Industry, consistently producing a strong track record of performance across multiple funds and demonstrating the returns potential of technology companies in the sector. Our research, thought-leadership, and investment experience have earned us institutional recognition. Last year, we were honoured with the CVCA Deal of Year Award for our investment in Bit Stew Systems, a Canadian-based Intelligent Industry company combining IIoT and AI to transform utilities and industrial companies.

FROM INFORMATION TECHNOLOGY TO THE INTELLIGENT INDUSTRY
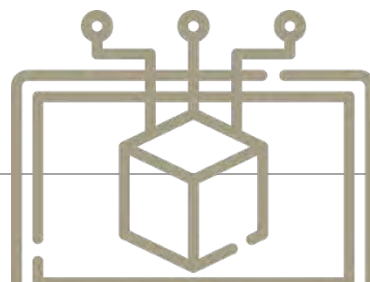
Software adoption beyond traditional applications is building the foundation for next generation technologies and the expansion of the innovation economy, creating new markets and investment opportunities. Software applications are the core technology enabler for a new value creation stream, which is built on three principles: Data Foundation, Intelligence from Digitalization, and Intelligent Infrastructure:

DATA FOUNDATION:
a. the creation and generation of data
b. the collection, storage and management of data
c. the interpretation, analysis and organization of data to develop insights

INTELLIGENCE FROM DIGITALIZATION:
a. the conversion of physical or cyber-physical processes and operations to be fully digital, enabling constant improvement and optimization
b. the enablement of digital processes to be linked into broader systems, and, with the aid of software, contextualizing decisions with human input
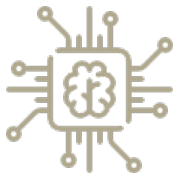
INTELLIGENT INFRASTRUCTURE:
a. the partial and full automation of processes and workflows, managed by software
b. the self-analysis and optimization to achieve sustainable outcomes

THE NEW VALUE CREATION STREAM
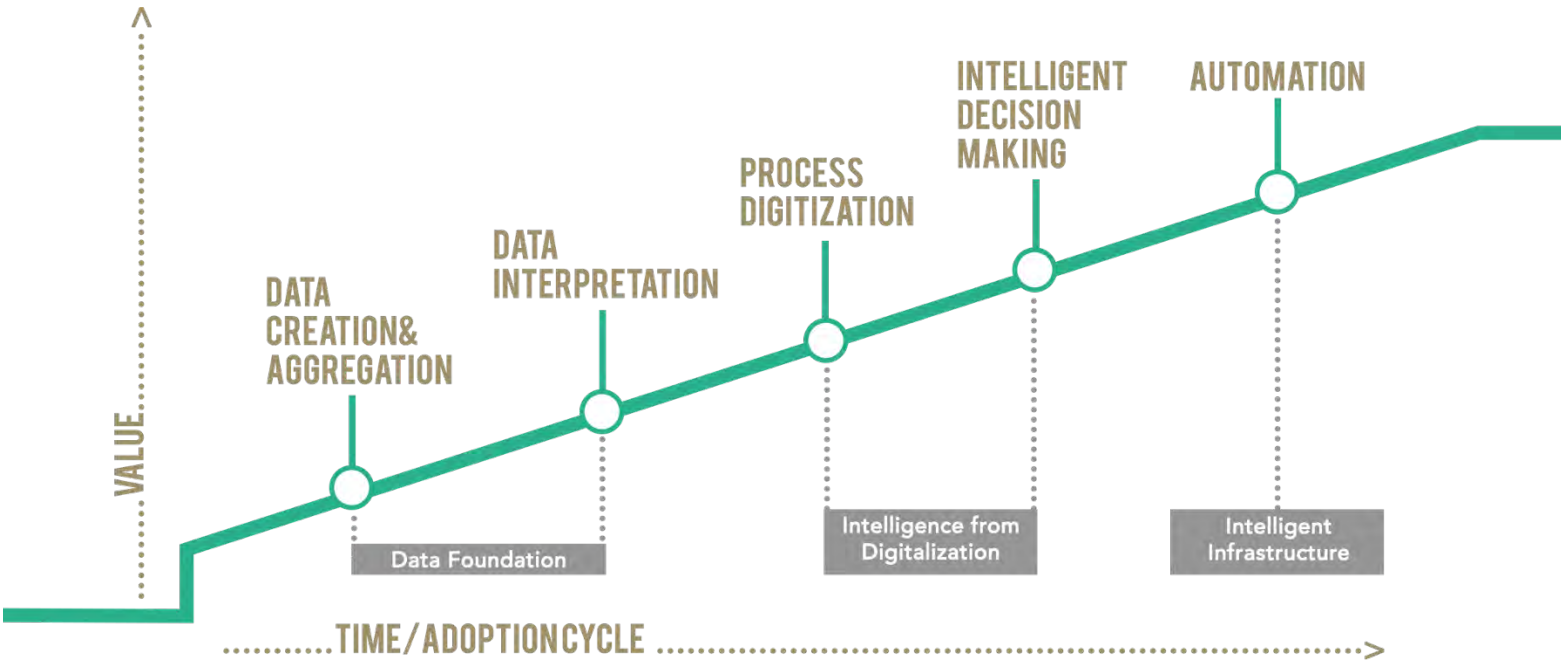
Transformation to the Intelligent Industry requires a robust Data Foundation to support the significant amount of data required to contextually analyze and digitalize complex processes and workflows. The Data Foundation is the requisite digital infrastructure layer across all capitally intensive sectors. Intelligence from Digitalization comes from combining data and advanced analytics with institutional and application knowledge -- bridging the physical and digital environments -- to achieve specific productivity and efficiency outcomes. Multiple sectors can take advantage of this element by driving improvements that come from solutions such as digital twinning, predictive maintenance and asset optimization. With the foundation of these first two elements laid, the Intelligent Industry can truly unlock automation and Intelligent Infrastructure, and step forward towards its goal of building climate-resilient growth.

IT CONVERGENCE

Over the last three decades, the Internet Age brought significant gains in human capital and knowledge-worker productivity to traditional enterprises, shaping the information technology sector of today's global economies. The most significant changes were those rooted in a diverse set of advancements across software, communications, and computing technologies. Fast-forward to today, a new wave of next generation technologies has emerged and is driving the expansion of the innovation economy, including:

CLOUD COMPUTING:
- the underlying computing infrastructure used to deliver the IT Convergence

INDUSTRIAL INTERNET OF THINGS ("IIOT"), CONNECTIVITY AND EDGE COMPUTING:
- device, communication, compute and data technologies that support and enable the Data Foundation principle

APPLIED ANALYTICS, MACHINE LEARNING & ARTIFICIAL INTELIGENCE:
- the underlying computing infrastructure used to deliver the IT Convergence

SOFTWARE DEFINED SYSTEMS:
- integration and application technologies that support and enable both Intelligence from Digitalization and the Intelligent Infrastructure principles

INTELLIGENT INDUSTRY
THE NEW TECHNOLOGY ADOPTION VALUE CHAIN

INTELLIGENCE: DECISION-MAKING IMPROVEMENT

> ### PRODUCTIVITY: DO MORE WITH LESS

> ### ENVIRONMENT: ELIMINATE WASTE & INFLUENCE BEHAVIOR

These 'next-gen' technologies are providing novel advancements in scale, efficiency and productivity for the knowledge-worker while simultaneously driving rapid declines in costs to adopt and utilize computing infrastructure. They have broken down historical silos and, for the first time, enabled an opportunity that is an order of magnitude greater than the Industrial Revolution: the digitalization of the physical world. This Information Technology and Operational Technology Convergence ("IT Convergence") is driving newfound intelligence and productivity gains in traditional industries, transportation, buildings, cities and infrastructure, resources, and agriculture and food.

This digitalization of IT Convergence of traditional industries is directly correlated to improvements in productivity of physical capital, infrastructure, and other asset-intensive operations and will lead to a reduction of natural resource consumption and carbon intensity, optimizing asset efficiency, and minimizing the output of undesirable by-products such as waste materials and environmental pollutants, especially those that contribute to global climate

change. Furthermore, beyond damaging environmental consequences, it is these very side effects of traditional industries that have, in turn, resulted in drastic negative effects on social inclusion and well-being of humankind. In yielding positive advances through innovation, infrastructure and industry, the three pillars of SDG 9, the Intelligent Industry seeks to decouple economic growth from unsustainable resource consumption and environmental degradation all while implicitly positively impacting social considerations such as job creation, sustainable livelihoods, improved health, technology and skills development, gender equality, food security, green technologies and, importantly, climate change.
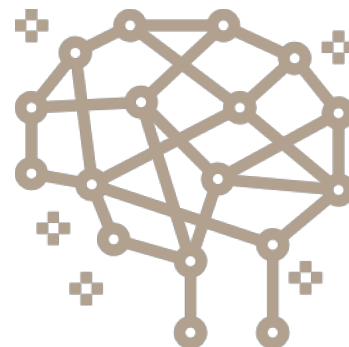
IT CONVERGENCE AND THE NEW VALUE CREATION STREAM

The next-gen technologies empowering the Data Foundation are the fundamental building blocks of the Intelligent Industry. The number of monitoring and control points connecting industrial and commercial infrastructure to the Internet is expected to reach at least 75 billion by 2025, more than 20 times the size of the current Internet, with the potential to generate almost $60 trillion in the next 15 years. In addition to the data, the connectivity and compute infrastructure needed to support such growth requires significant investment. However, the availability of such investment capital is greatly insufficient to support the data generation needs.
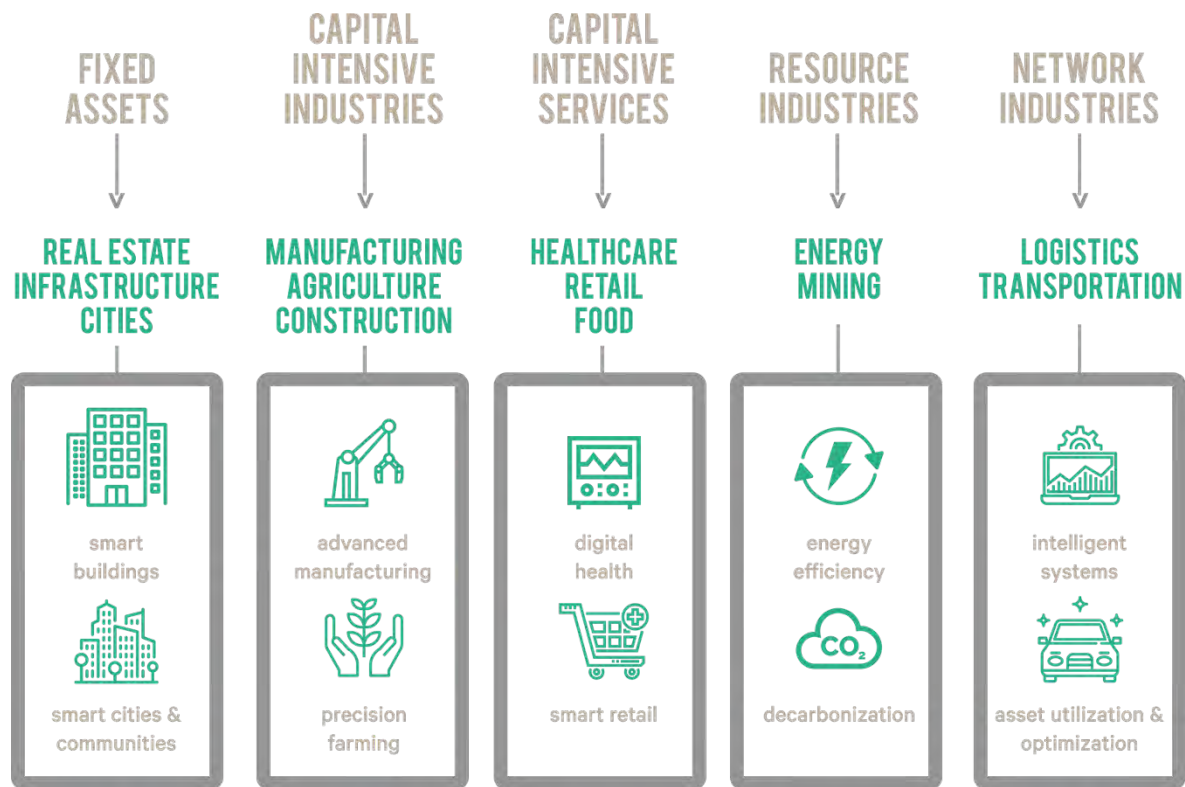
The technologies unlocking Intelligence from Digitalization are seeing initial adoption of applications in more advanced industries. Highlighted by digital twinning, predictive maintenance, physical asset optimization and automation, this principle enables industrial enterprises to improve upon products and business practices through full digital transformation. An excellent example today is the automotive sector. Developing highly complex software for embedded systems across the supply-chain has become a primary driver for constant product improvement and management of high-efficiency combustion, hybrid and electric vehicles.

Intelligent Infrastructure, the third principle of the Intelligent Industry, increases the velocity of sustainability and resource efficiency. While opportunities to address sustainability and resource efficiency are well established today within industrial applications, the deployment of the Data Foundation and Intelligence from Digitalization accelerates the adoption of sustainable business practices. This is the original promise of clean technology, renewed and delivered through the Intelligent Industry.

NEW TECHNOLOGY ECOSYSTEMS EMERGING FROM TRADITIONAL INDUSTRIES

Simply converting to renewable energy generation will only yield but a fraction of the change needed to reach the multitude of climate-based goals, including global warming, greenhouse gas emissions, and carbon intensity. The most significant changes are those being driven by traditional industries, transportation, buildings, cities and infrastructure, and agriculture and food. Technology enables us to create more with we have and with less waste; in fact, we are already seeing demand from global markets that businesses driving such traditional industries adopt "fit-for-future" technologies to stay competitive. These new technology ecosystems are driving the adoption of the systemic-solutions approach of the Intelligent Industry.

FIXED ASSETS	CAPITAL INTENSIVE INDUSTRIES	CAPITAL INTENSIVE SERVICES	RESOURCE INDUSTRIES	NETWORK INDUSTRIES
REAL ESTATE INFRASTRUCTURE CITIES	MANUFACTURING AGRICULTURE CONSTRUCTION	HEALTHCARE RETAIL FOOD	ENERGY MINING	LOGISTICS TRANSPORTATION
smart buildings	advanced manufacturing	digital health	energy efficiency	intelligent systems
smart cities & communities	precision farming	smart retail	decarbonization	asset utilization & optimization

Transformation of traditional industry brought on by Intelligent Industry will initially be focused on sector-specific, applied solutions developed from the underlying platform technologies of the Data Foundation and Intelligence from Digitalization phases. Thereafter, themes such as Advanced Manufacturing, Smart Buildings, Digital Health and Logistics Asset Optimization will combine with technologies like machine learning and AI to capture key productivity and efficiency gains, setting the foundation of Intelligent Infrastructure. These new tech ecosystems are developing based on demand to utilize data and technology to gain and maintain competitive advantages and transform traditional business models and processes.

IMPROVING EFFICIENCY AND COMPETITIVE ADVANTAGE

ThoughtWire, based in Toronto has developed a software platform that equips organizations with the capacity to become smarter, safer and more energy efficient by inter-connecting and orchestrating their people, workflows, data and things in the built environment.

Oxford Properties lacked a consolidated view of the building state and the existing "smart" applications. This impeded efforts to have better command and control on overall operations and the tenant experience.

Using ThoughtWire's software platform, Oxford realized full command and control of building operations within weeks and increased daily engagement from zero to 65%.

CANADA'S LEADERSHIP ROLE IN THE INTELLIGENT INDUSTRY

Canada is well positioned to be a global leader of the Intelligent Industry transformation. Already home to numerous data and communication technologies, and machine learning and artificial intelligence expertise, Canada's top ecosystems are developing and scaling new Intelligent Industry companies at one of the highest rates globally. Significant homegrown demand from nationally critical resource and manufacturing sectors have required the country to be a first adopter. Canada aims to be a global sustainability leader, as demonstrated by the Paris Accord and the Vancouver Agreement, as well as its private capital leadership of top pension plans globally to lead the investment sectors on climate action. The Intelligent Industry opportunity in Canada is reaching scale and growing rapidly due to:

1 Three globally recognized technology ecosystems in Vancouver, Toronto and Montreal

2 Recognized innovator and leader in artificial intelligence and machine learning

3 Second highest concentration of innovation sector activity globally -- approximately 30% higher than the United States

4 Highest concentration and second highest total activity of Intelligent Industry companies globally, above industrial leaders such as Germany and China

INTELLIGENT INDUSTRY
Canada's leadership position globally

TOP 2 GEOGRAPHY FOR ACTIVE COMPANIES

2 Canada has the 2nd highest level of active companies

3x Canada has 3x the GPD-normalized concentration of the US and Germany

USA	36.3
CANADA	9.5
GERMANY	7.1
FRANCE	6.5
INDIA	4.2
CHINA	2.4
UK	2.4

TOP 3 GEOGRAPHY FOR EXITS

3 Canada is home to the 3rd most exits behind Germany and the US

1.7x / 1.3x Canada has 1.7x the GPD-normalized concentration level of the US and 1.3x of Germany

USA	41.3
GERMANY	9.8
CANADA	6.8
FRANCE	4.3
INDIA	0.9
CHINA	0.4
UK	0.0
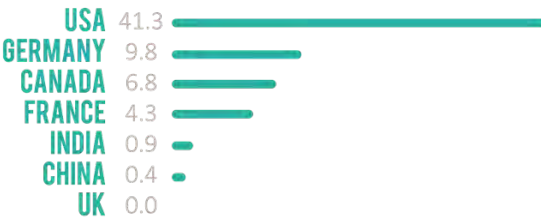
Note: 2017 Analysis based on PitchBook data and companies identified with the following search terms "industrial internet" OR "industrial software" OR "connected machines" OR "machine-to-machine" OR "Industrial networking" OR "IIoT" OR "Industry 4.0". Both venture capital-backed and private equity-backed companies are included.

ABOUT YALETOWN

Yaletown is a leading Canadian IoT and Cleantech investor focusing on Intelligent Industry companies. Our investments enable the application of data and technologies to digitally transform traditional industries, drive innovation, create operational efficiencies and reduce the impact of climate change. In 2017, Yaletown received the CVCA's Venture Capital Deal of the Year award for its investment in BitStew, Canada's largest venture financed exit of 2016. Backed by leading institutional investors, including pension funds, and a network of successful technology entrepreneurs, Yaletown has offices in Vancouver, Calgary, Toronto and Montreal. For more information, please visit www.yaletown.com