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Global Manufacturing &
Industrialisation Summit

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UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION



UNITED ARAB EMIRATES
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Contents

INTRODUCTION.....	2
OPENING OF THE CONFERENCE.....	3
PARTNERS	5
EXECUTIVE SUMMARY	6
CANADIAN MANUFACTURING SECTOR AND ITS VISION TO 2030.....	6
FOURTH INDUSTRIAL REVOLUTION (4IR)	6
EMERGENCE AND ADOPTION OF NEW TECHNOLOGIES IN CANADIAN MANUFACTURING	7
WOMEN IN THE MANUFACTURING SECTOR: FEMALE PARTICIPATION IN SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS (STEM) AS AN ENABLING FACTOR	7
CANADIAN MANUFACTURING SECTOR AND ITS VISION TO 2030.....	9
FOURTH INDUSTRIAL REVOLUTION (4IR)	13
PREDICTION MACHINES: THE SIMPLE ECONOMICS OF AI.....	13
FROM LAB TO FAB: SCALING-UP ADVANCED MANUFACTURING IN CANADA.....	14
EMERGENCE AND ADOPTION OF NEW TECHNOLOGIES IN CANADIAN MANUFACTURING	15
WOMEN IN THE MANUFACTURING SECTOR: FEMALE PARTICIPATION IN STEM AS AN ENABLING FACTOR	17
WAY FORWARD.....	19

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CANADA ARAB BUSINESS COUNCIL
CONSEIL DE COMMERCE CANADO-ARABE
المجلس التجاري الكندي العربي



INTRODUCTION

Professor Dr. Walid Hejazi, Rotman School of Management, University of Toronto

The Rotman School of Management and Canada Arab Business Council (CABC) planned and hosted a Global Manufacturing & Industrialisation Summit (GMIS) roadshow on May 11, 2018, under the support of GMIS, a joint initiative between the Ministry of Energy and Industry of the United Arab Emirates (UAE) and the United Nations Industrial Development Organization (UNIDO). The event explored the Fourth Industrial Revolution (4IR) and Canada's evolving manufacturing sector.

GMIS was established in 2015 to build bridges between manufacturers, governments and NGOs, technologists, and investors in harnessing the transformative impact of 4IR to regenerate the global economy. GMIS aims to pursue the future prosperity of the manufacturing sector while being fully aligned with the UN's 2030 Agenda for Sustainable Development in order to build stronger societies and communities, as well as businesses. The arrival of 4IR promises considerable opportunities for inclusive and sustainable development and GMIS aims to act as a catalyst to build and strengthen partnerships and mobilising resources with the objective of achieving sustainable development and prosperity for all. GMIS aims to harness the potential of advanced manufacturing technologies and 4IR for sustainable development and prosperity for all, in line with the UN SDGs.

The GMIS roadshow brought together an impressive group of high-powered speakers, who, together, shared their insights into how 4IR and technological innovation is transforming the world we live in and how private and public sector, as well as not-for-profit organisations, can prepare for these changes, to work towards inclusive, sustainable and prosperous communities of tomorrow.

OPENING OF THE CONFERENCE

Namir Hourani, Managing Director, Global Manufacturing and Industrialisation Summit (GMIS)

We developed this initiative due to the significant role of the manufacturing sector to the gross domestic product (GDP) – almost 85% of global exports are linked to manufacturing and the sector accounts for hundreds of millions of jobs.


The manufacturing sector is evolving and is being disrupted on a daily basis. 4IR faces challenges related to data. More than 90% of the data we have today was generated in the last two years. Can we analyse this data and what are the risks associated with this data? Another challenge for the manufacturing sector is related to the workforce. Today's youth are not looking to the manufacturing sector for employment opportunities and this issue needs to be addressed.

GMIS was introduced to create a cross-industry event. The first event, held in March 2017 in Abu Dhabi, created a platform which brought together governments, manufacturers, start-ups, enterprises, academia, and civil society to discuss and address challenges facing the manufacturing sector.

The event was held under the patronage of His Highness Sheikh Mohammed Bin Zayed Al Nahyan, and the opening ceremony was attended by His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE, Ruler of Dubai. The leadership is comprised of H.E. Eng. Suhail Mohamed Faraj Al Mazrouei, UAE Minister of Energy & Industry, H.E. Li Yong, Director General, UNIDO, and H.E. Khaldoon Khalifa Al Mubarak, Chairman of the Advisory Board, Group CEO of Mubadala.

The inaugural GMIS held more than 40 sessions, with more than 3,000 attendees and 23 international ministers. The GMISx Manufacturing Exhibition captured the capabilities of its host country, had international pavilions, and an Innovation Circle where pilot projects were showcased. It offered an opportunity to start-ups and small and medium-sized enterprises to connect with larger manufacturers and governments.

GMIS' strategy is action-oriented. It is an initiative that creates partnerships while also making manufacturing aspirational for youth.



The 2017 GMIS Outcomes are captured in the event booklet available on the GMIS website. The associated Mohammed Bin Rashid (MBR) Initiative for Global Prosperity was announced during the inaugural summit. The objective of the initiative is to seek solutions to pressing real-world issues through fostering high technology innovation and creative capital of SMEs, entrepreneurs, multinational firms and technologists. There are two different streams within the MBR, the Global Maker Challenge and the Global Prosperity Award. The MBR online platform was created to form a community dedicated to spreading global prosperity. Further information is available at makingprosperity.com.

PARTNERS



The United Nations Industrial Development Organization (UNIDO) is the specialised agency of the United Nations with a mandate to promote and accelerate inclusive and sustainable industrial development in its Member States.

UNIDO's mandate is fully recognised in Goal 9 of the 2030 Agenda for Sustainable Development, which calls to “build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation”. The relevance of ISID, however, applies in greater or lesser extent to all SDGs.

Accordingly, UNIDO's programmatic focus is structured in four strategic priorities:

- [Creating shared prosperity](#)
- [Advancing economic competitiveness](#)
- [Safeguarding the environment](#)
- [Strengthening knowledge and institutions](#)

Canada Arab Business Council (CABC) is Canada's only not-for-profit association focused exclusively on bringing the Canadian and Arab business communities together. The Council advises governments in Canada and Arab countries on policies to facilitate and expand two-way trade and investment. CABC further supports the members by organising missions to the Arab region, receiving incoming delegations, and hosting conferences to provide information about the latest business opportunities and insights into relevant political-economic developments in Arab countries.

Rotman School of Management, one of the world's most innovative business schools, is located in Toronto and is part of the University of Toronto. Established in 1827, the University of Toronto is recognised worldwide as Canada's top research university. [The Rotman School's](#) history of transforming business education goes back to 1901 and offers a wide array of MBA offerings and specialised Masters programs, a world-class PhD program, as well as professional development opportunities.

EXECUTIVE SUMMARY

CANADIAN MANUFACTURING SECTOR AND ITS VISION TO 2030

The Canadian manufacturing sector is very conservative and extremely risk-averse to adaptation. Moving towards digitalisation means a company has to invest and embrace change. In Canada, companies need to realise that if they do not use digital technologies, they run the potential risk of going out of business. It is not a matter of choice, but a matter of survival.

Several solutions were proposed. We have to design an approach to make it easier for SMEs to move into Industry 4.0, and formalise the approach in a toolkit that will provide guidance around technical, legal aspects, planning, and tax incentives. The manufacturing sector has to encourage more people to enter the field by challenging stereotypes about what working in manufacturing means. Furthermore, Canadian companies should have formal Industry 4.0 plans and embrace change to capture larger market share and increase competitiveness.

To implement the proposed solutions, Canada can leverage its numerous advantages. Canada is uniquely positioned to succeed since it is a country that has experience in being able to find solutions and perform well in niche manufacturing work. The Southern Ontario technological centre of Canada has an extraordinary concentration of knowledge and expertise to contribute to advances in manufacturing. In addition, the country's government programs, internationally recognised academia, as well as a highly skilled workforce, are factors that can enable the manufacturing sector to adopt new technologies, increase competitiveness and take advantage of the immense opportunities that 4IR offers.

FOURTH INDUSTRIAL REVOLUTION (4IR)

A number of transformational ideas emerged from the discussions on Prediction Machines and Innovation.

A benefit of Artificial Intelligence (AI) is lowering the cost of prediction, which is the input into decision-making. When it comes to manufacturing, the question is where can we develop our own AI and integrate it into the manufacturing process? To understand the technology and its impact on business we have to ask ourselves

what business applications we can build that will allow us to make faster, more accurate decisions, resulting in growth and increased competitiveness.

Innovation in creating advanced materials shape manufacturing, since materials are not just raw inputs. If we can simplify manufacturing using new materials, the cost could be reduced hundreds of times, the footprint of equipment could be smaller and the supply chains more efficient.

EMERGENCE AND ADOPTION OF NEW TECHNOLOGIES IN CANADIAN MANUFACTURING

Canada has great opportunities for creating and adopting new technologies in the manufacturing sector. The country has superior knowledge supply chains, technology supply chains, manufacturing supply chains, services, and end users. We need to find a better way to connect all these areas by improving business management capabilities and business strategy. Companies, academics, and government can bring together everyone into a community, and support examples of what success is, and commercialise innovations in Canada.

We need to recognise the capabilities we have here and create a marketplace for manufacturers and technology companies to come together. We need strategic discussions to build collaboration across the ecosystem, and that is why the Rotman School of Management Creative Destruction Lab has a critical role in recognising talent and potential of technology start-ups that can have significant impact on manufacturing sector growth.

WOMEN IN THE MANUFACTURING SECTOR: FEMALE PARTICIPATION IN SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS (STEM) AS AN ENABLING FACTOR

The obstacles encountered by women entering STEM careers, as well as retention aspects in the STEM environment were analysed. A number of solutions to increase women's participation in STEM have been identified, such as women's increase willingness to take risks, implementation of Government policies that encourage women to go into business and enter the labour market. In addition, it has been stated the deeply ingrained ideas about the value of a woman's work lead to opportunities for women that are coloured by lower monetary value, and by the

fact that they are not necessarily leaders of households or important economic units.

The risks for a country's economy and for regional development are the untapped potential, and the missed opportunity to bring more perspectives to the table and to encourage innovation.

To leverage this potential, there has to be a change of mindset for both men and women. Moreover, we can encourage higher participation of young women by celebrating women in STEM, as role models. We have to recognise and bring into the dialogue the men leaders of technology companies who acknowledge women's capabilities as leaders, team players, creative designers, problem solvers.

CANADIAN MANUFACTURING SECTOR AND ITS VISION TO 2030

Panelists:

Faisal Kazi, President & CEO, Siemens Canada

James Strapp, Partner Consulting & Deals, PricewaterhouseCoopers (PwC)

Mathew Wilson, Vice-President, National Policy, Canadian Manufacturers & Exporters (CME)


Moderator:

Professor Walid Hejazi, Associate Professor, Rotman School of Management, University of Toronto

Participants discussed the reasons for Canada lagging in implementation of new technologies and emphasised the unique advantages Canada can leverage to increase its competitiveness on the global manufacturing stage and expand into new markets.

Strapp stated that in the PwC Global Digital Operations Study 2018, there were no 'digital champions' identified in Canada. The reason might be the predominance of small and medium-sized enterprises (SMEs). Strapp summarised the findings of a joint paper of PwC with GMIS on Canada macroeconomic environment and the evolution of Canadian manufacturing. The paper provides two recommendations. Firstly, given the predominance of SMEs in Canada, we need an approach to make it easier for SMEs to move into Industry 4.0. The approach should be formalised in a toolkit that will provide guidance around technical and legal aspects, planning, and tax incentives.

The second recommendation is related to the labour force. We have to encourage more people to become part of the manufacturing sector. We have a highly skilled labour force due to our strong immigration policy based on merit, and yet we are behind the U.S in terms of upscaling for manufacturing roles in Canada. In addition, only 28% of the manufacturing workforce is female, showing there is untapped potential that could lead to significant increase in our manufacturing sector competitiveness.



Speaking about Canada's policies and initiatives, Wilson highlighted the CME initiative started two years ago, looking at the current landscape of the manufacturing sector in Canada and its future. Wilson called this 2030 initiative, as a spinoff of Industry 4.0 in Germany. What we saw was that other countries had formal Industry 4.0 plans and Canada had not designed any. Manufacturing is evolving from being a group of companies that produce finished goods more into a combination of technology, services, and manufacturing put together. Canada is uniquely positioned to be in that space, since it is a country that does a great job in being able to find solutions and able to do a lot in niche manufacturing work, but we should do it on a scale like Germany, for example.

Another advantage Wilson mentioned is the Southern Ontario technological centre of Canada. The concentration of knowledge and expertise allows for combining technology with manufacturing, but the two are treated as separate.


In terms of long-term plans, CME looked at what can be done to bring together the technical and manufacturing communities. We have to find solutions to help smaller companies adopt new technologies. We have already support programs from the Government, such as the Supercluster initiative and a funding mechanism. The other challenges are to increase the labour force in manufacturing, to develop students and retrain workforce in new technologies.

Wilson emphasised the importance of leveraging global opportunities that our companies should target to increase growth.

Kazi provided insights into Siemens' success in Canada and discussed the Canadian manufacturing sector reasons for lagging behind countries such as Germany.

Digitalisation is the use of digital technologies to create value, to create new revenue streams, to reduce cost, to increase quality, and to introduce new business models. For example, Facebook is the biggest media provider, without writing any content, Uber is the biggest transportation company, without owning a single car.

Digitalisation in the manufacturing sector - known as Industry 4.0, or 4IR - is the conversion of physical and digital worlds. It consists in unifying the knowledge of the product, the supply chain, and the utilisation of the product into one database.



Kazi emphasised the importance of digitalisation in changing the business environment. According to the World Economic Forum (WEF), in the next decade, 100 trillion US dollars' worth of value will be created or unlocked through digital technologies.

In Canada, companies need to realise that if they do not use digital technologies, they run the risk of going out of business. The Canadian manufacturing sector is very conservative, extremely risk-averse to adaptation. Moving towards digitalisation means a company has to invest and embrace change. There are challenges, but also huge opportunities: 900 billion US dollars are invested outside of Canada into manufacturing. Siemens finds that in factories where they implemented Industry 4.0 in how they design and produce, how they communicate with employees and with supply chain, there is an extremely high increase of quality and improvement in time to market.

Siemens implementation of digital enterprise consists of a digital twin of the product – a product is created first in digital form, then in prototype, the digital twin of the manufacturing – a product is tested, and the digital twin of the process – links supply chain, design and production. By implementing a digital enterprise, Siemens is able to create customisation on a large scale.

Kazi's message to the Canadian manufacturing sector highlights the immense opportunities for Industry 4.0 and the urgency of implementing new technologies. It is not a matter of choice, but a matter of survival. We have to do it now because digitalisation is here and there is a share for everybody in the 100 trillion dollars potential for creating value through digital technologies.

The Canadian government is taking a major step with the manufacturing cluster, and it is the companies' responsibility to add value to the cluster. The government can ensure that the process is fast-tracked and companies do not face delays in taking advantage of these opportunities and can start contributing as soon as possible.

In regards to the future of the Canadian manufacturing sector, panelists were optimistic about companies' capabilities and opportunities for increasing

competitiveness, the governmental support, and the strong, impactful role of our academia.



FOURTH INDUSTRIAL REVOLUTION (4IR)

PREDICTION MACHINES: THE SIMPLE ECONOMICS OF AI

Speaker:

Professor Joshua Gans, Jeffrey S. Skoll Chair in Technical Innovation and Entrepreneurship at the Rotman School of Management, University of Toronto

Professor Gans spoke about his latest book, 'Prediction Machines: The Simple Economics of Artificial Intelligence', and the impact of AI on business. Part of the concern about the development of AI is the human element - the role of people in this process, as business managers. The pioneering efforts of the past 10 years - deep learning, machine learning, and neural networks – have been employed all throughout the high tech industry so far. Global heavyweights such as Google and Microsoft will be pushing out tools for everybody to use. When it comes to manufacturing, the question is where we can develop our own AI and integrate it into the manufacturing process. The Rotman School of Management has built a program called Creative Destruction Lab, with mentors from, among others, Facebook, Apple and Urban AI.

Through advancements in technology, economists believe the basic rules of economics still apply. All big companies have Chief Economists who participate in strategy. To understand the technology and its impact on business, we have to understand what cost is this technology help reducing. What current AI can do is lower the cost of prediction, which is the input into decision making. Lowering the cost of prediction enables companies to use it in more applications, such as predicting loan defaults, the risk of portfolios, medical diagnoses.

FROM LAB TO FAB: SCALING-UP ADVANCED MANUFACTURING IN CANADA

Speaker:

Michael Helander, CEO, OTI Lumionics

Advanced materials shape manufacturing and can create innovations. For example, Apple iPhone has been made possible by numerous innovations in materials developed over multiple decades, while innovation in 3D printing is due to decades of research to develop certain types of alloys used in printing.

In the manufacturing process if we change one material, it affects the manufacturing process, cost and final performance. If we change one material, we can disrupt the complete manufacturing process. At OTI Lumionics, with the support of Rotman School of Management Creative Destruction Lab, we discovered a small improvement in one of the materials and eliminated 70% of the manufacturing steps, reduced cost by 50% and increased performance between two to three times.

If we can simplify manufacturing using new materials, the cost could be reduced hundreds of times, the footprint of equipment could be smaller and the supply chains more efficient.

Digitalisation enables OTI Lumionics to predict materials, to develop new materials digitally, simulate their properties, and predict what their structure should be before producing them, allowing to accelerate the 10 years horizon of developing an advanced material down to one year - or even months.

The fast turnaround cycles allow us to see materials not just as raw inputs for manufacturing, but also as major sources of innovation that can solve problems, increase productivity and give us new capabilities that were never possible before.

EMERGENCE AND ADOPTION OF NEW TECHNOLOGIES IN CANADIAN MANUFACTURING

Panelists:

Jayson Myers, CEO, NGM Canada (Next Generation Manufacturing)

Professor Joshua Gans, Jeffrey S. Skoll Chair in Technical Innovation and Entrepreneurship, Rotman School of Management, University of Toronto

Michael Helander, CEO, OTI Lumionics

Moderator:

Prof. Walid Hejazi, Associate Professor, Rotman School of Management, University of Toronto

Myers shared his optimism regarding the emergence of new technologies in manufacturing in the Canadian context. Canada has great knowledge supply chain, great technology supply chain, great manufacturing supply chain, services, and end users. We need to find a better way to connect all these areas by improving business management capabilities and business strategy.

Statistics Canada latest survey on advanced technological business practices finds that 7% of manufacturers do competitive benchmarking and 2% of technology companies with fewer than 50 people do competitive benchmarking. If we bring together technology companies that do 99% of sales outside Canada with the manufacturing companies that are in need of technology we can see exponential benefits in productivity improvement, delivery times, and product development times. In addition, we could see significant benefits in the development of new business models and in our ability to take every product and process and see that as a data platform, and then work out how to generate a solution around it.

Helander emphasised the importance of the ecosystem and described how the University of Toronto supports innovation and facilitates partnerships between start-ups and industrial partners.

Companies, academics and government can bring together everyone into a community, support examples of what success is, and commercialise the

innovations here in Canada. Our ecosystem is supported by our open immigration policy that brings to Canada and Toronto in particular, world-class talent excited to join and contribute at leading edge.

Professor Gans, on the differentiators for success, such as the case of OTI Lumionics, emphasised that recognising talent comes down to judgement. In the Creative Destruction Lab, we create the environment for talented people to succeed.

Myers stated the role of Supercluster is about creating the ecosystem and agreed with the importance of people, processes, and strategy. Technology is a tool we use to create value for the customer. We need to recognise the capabilities we have here in Canada and create a marketplace for manufacturers and technology companies to come together. We need strategic discussion to build collaboration across the ecosystem - and that is why the Creative Destruction Lab is so important.

WOMEN IN THE MANUFACTURING SECTOR: FEMALE PARTICIPATION IN STEM AS AN ENABLING FACTOR

Panelists:

Adot Killmeyer-Oleche, Senior Research and Industrial Policy Officer, Research and Industrial Policy Advice Division, UNIDO

Ann Marie MacDougall, President, LeaderBoom

Marilyn Spink, Mentor To Engineers and Project Managers, Isherwood Geostructural Engineers and Vice President, Professional Engineers Ontario

Moderator:

Professor Sonia Kang, Organizational Behaviour and Human Resource Management, Department of Management, University of Toronto

MacDougall sees potential to leverage women's skills. Some of the challenges lie in women's lack of assertiveness, and lower willingness to take risks and to make decisions that might not be popular. Key leaders of technology companies acknowledge women leaders are highly capable in problem-solving, are solution-focused, team-focused, and highly creative.

Spink believes retention in STEM fields is one of our biggest issues, due to bias in how women are perceived in the workplace. Women are more risk aware and we need problem finders - people who are able to predict problems and design solutions. We need the voices of everyone so it serves all of society.

Killmeyer-Oleche, in her work with developing countries in Europe, Asia, Sub Saharan Africa and the Islands, observed that one of the barriers is the absence of Government policies that encourage women to go into business and enter the labour market. In a developing country, that ecosystem is important for everything, not just for startups as discussed earlier: women need the ecosystem for education, financial credit, ownership of assets like land and buildings. In developing countries, these do not come automatically to women, therefore STEM is important to get women out of their traditional roles. The main obstacle we have to overcome as

global community is the mindset that a woman is different, that a woman would not do things as well as a man or in a way that does not suit the way we work.

Since women are not necessarily leaders of households or important economic units, the opportunities open to them are usually associated with lower monetary value, and their work is perceived as less valuable.

These very deeply ingrained ideas about the value of a woman work have to change. We have to look at the causes and what has to do with the real and true equality.

MacDougall sees a great risk in not capturing talent at country level, bringing all perspectives to the table, encourage innovation. We have to attract women in STEM. Our educators have a role and we all have a role in celebrating women in STEM, as examples. Spink emphasised the need to leverage talent and potential of talent, and referred to our open immigration policy that brings highly skilled workers.

Killmeyer-Oleche believes manufacturing is forward-looking, creative and aims to be more efficient. We have to encourage women to enter STEM fields. There are only 2% of female engineers employed in major manufacturing and technology companies and there are 70% women working in textile which shows there are missed opportunities. 4IR gives us a chance to change this.

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