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CRÉATION, DÉVELOPPEMENT ET COMMERCIALISATION DE L'INNOVATION

Adoption of digital and advanced technologies in Canada

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Project context and objectives

- Understand the effect of advanced technology adoption – especially Business Intelligence in contrast with the early start of Smart Manufacturing – on Canadian firms
  - Portrait of firms adopting bundles of technologies
  - Explain the low adoption rate of advanced technologies
- Provide key policy implications and opportunities for the Canadian digital landscape

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Methodology

- Survey of Advanced Technologies (SAT) 2014
  - 7,912 Canadian firms surveyed on their adoption of advanced technologies
  - 5 families of technologies
    - Manual Handling, Business Intelligence, Processing, Design, Green
- Association rules (*apriori, cspade)*
  - Find frequent bundles of technologies adopted together
  - Explain the chronological order of adoption

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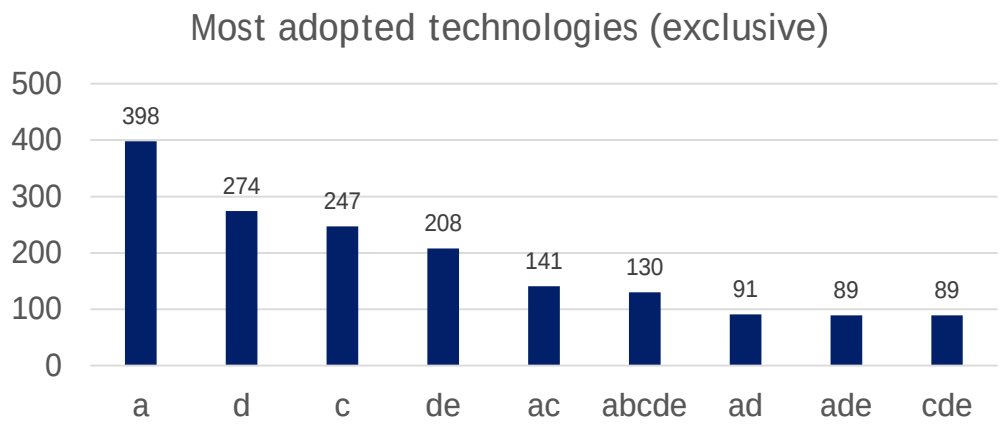
Advanced business intelligence technologies

- 31% of firms adopted BI technologies, behind Material Handling (44%) and Design (48%).
- From the 31%, only 24% have adopted a software for large scale data processing (big data). This is less than 600 firms in the sample.
- Less than 2% of all firms have adopted ALL BI technologies which are considered important for AI/ML capabilities.



a. Executive dashboards for data analytics and decision making
b. Software for large scale data processing (e.g. Hadoop)
c. Live-stream processing technology or real-time monitoring
d. Software as a service (SaaS) and cloud computing software
e. Infrastructure as a service (IaaS) and cloud computing hardware

Rules	Description	S	C	L
2	ce => d	0.135	0.89	1.72
6	abce => d	0.053	0.98	1.90
10	abcd => e	0.053	0.81	2.49

- Technologies CDE are a very popular choice as more than 13% of firms have adopted them together
- Rule 6 almost has a 100% confidence rate
- Rule 10 is similar to rule 6 and is more likely to happen because it has the higher lift

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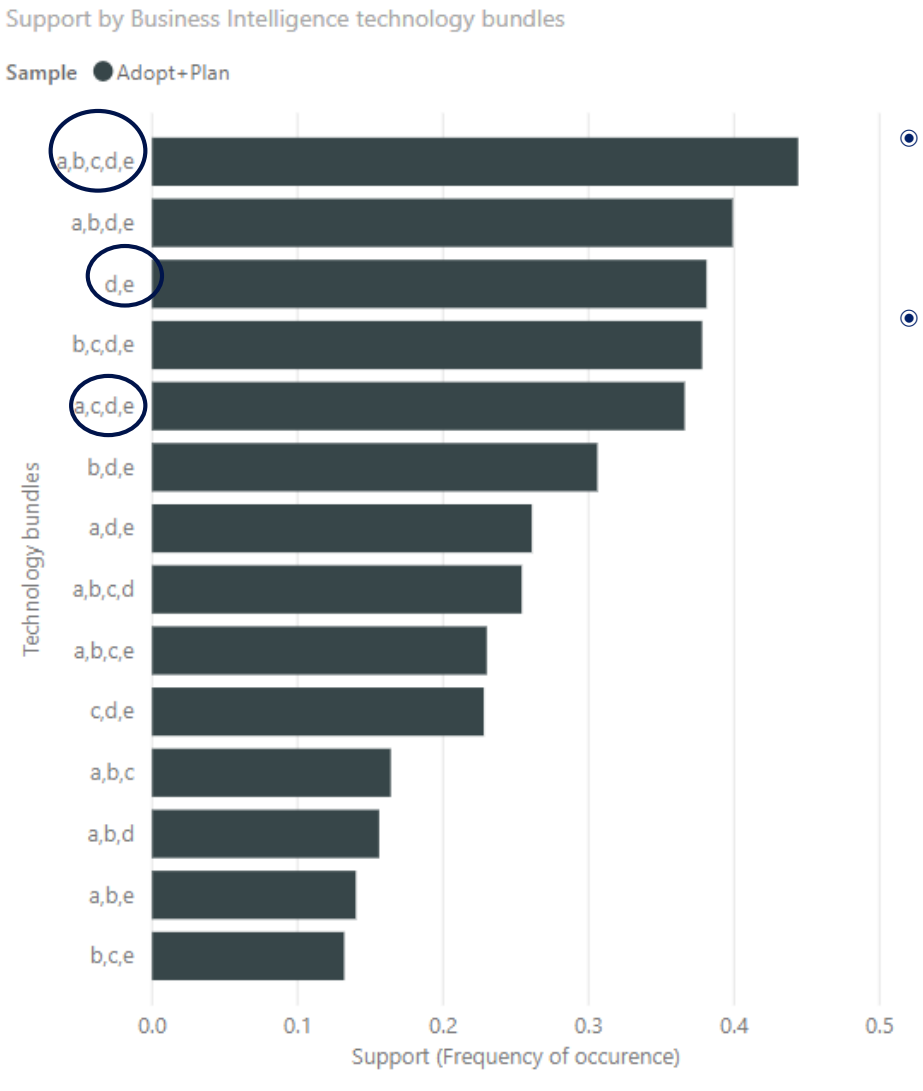
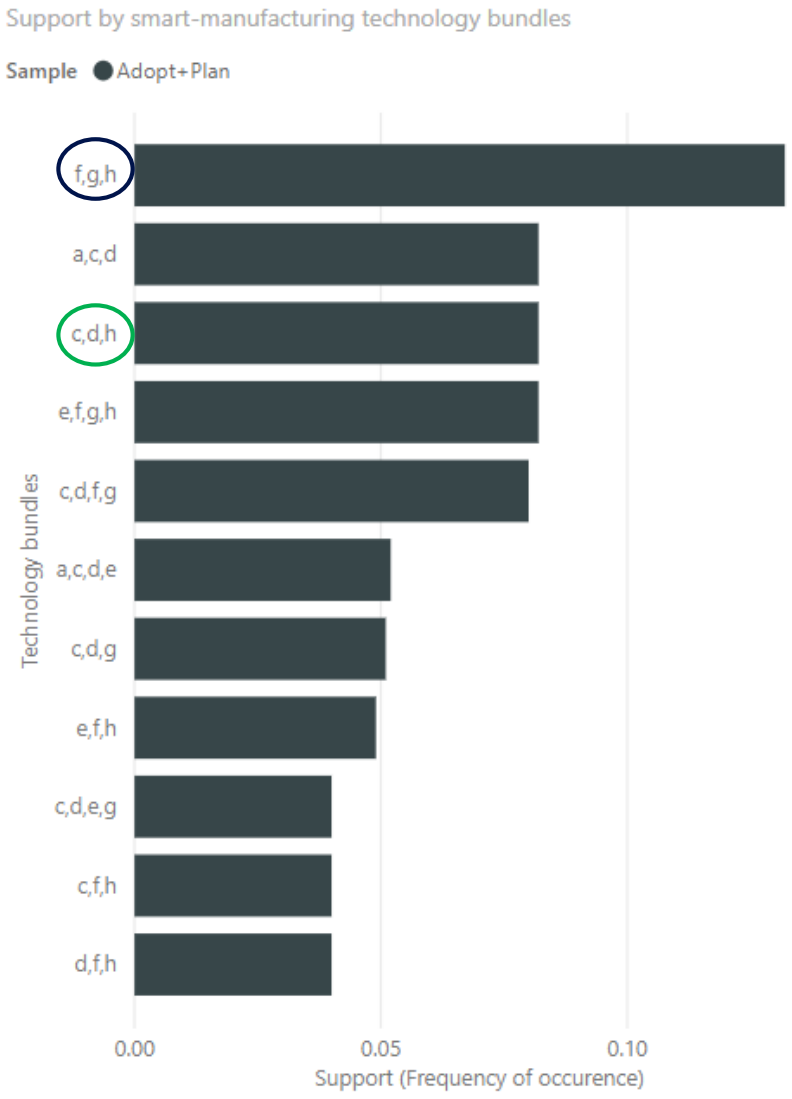
Top Business Intelligence technology adoption patterns are very similar with time



- The **Adopt Only** sample represents firms that have adopted in prior to 2014
- The **Plan Only** sample takes a snapshot at firms that were planning to adopt in 2014-2016
- The top 3 bundles Graph 1 are still in the top 5 in Graph 2, suggesting this family of technologies is mature

a. Executive dashboards for data analytics and decision making
b. Software for large scale data processing
c. Live-stream processing technology or real-time monitoring
d. SaaS and cloud computing software
e. IaaS and cloud computing hardware

Smart manufacturing technology adoption patterns are completely changing with time



- The **Adopt Only** sample represents firms that have adopted in 2014 or before
- The **Plan Only** sample takes a snapshot at firms that were planning to adopt in 2016 or later
- Technologies f,g,h (3D printing are present in the Graph 1 but mostly in the Plan Only Sample
- These technologies are in top bundles in Graph 2, suggesting that 2014 was the birth of Industry of 4.0 and 3D printing

a. Flexible Manufacturing Cells or Systems
b. Lasers used in material processing
c. Robots with sensing or vision systems
d. Robots without sensing or vision systems
e. 4-9 axis computer numerically controlled machinery
f. Additive manufacturing/3D printing for plastics
g. Additive manufacturing/3D printing for metals
h. Additive manufacturing/3D printing for other than plastics or metals
i. Automated machinery for sorting, transporting or assembling parts
j. Plasma sputtering
k. Micro-manufacturing
l. MEMS

Key policy implications

- Managerial vs non managerial Talent
  - Finding the right balance between expensive external consultants and developing internal talent
  - Potential to change the firm's core business model
- Capital investment
  - Adopting all technologies can be very expensive and smaller firms may not have the resources (financial and talent)
  - Adoption can be complex and order of implementation crucial

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Thank you

Questions? Suggestions?

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