



Savoir-faire
LINUX

Creating Value with Software

Small Business Digitization Initiative (SBDI) - Day 3

By Marc Lijour

March 22, 2017



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- late 1950's – academic field of *Computer Science*
- 1968 – the term *Software Engineering* is coined, and another academic discipline is born

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- 2010's – IoT, AI, VR, AR...

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The birth of UNIX (Pic by Peter Hamer [CC BY-SA 2.0], via Wikimedia Commons)



Figure: Ken Thompson (sitting) and Dennis Ritchie at PDP-11

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- Also the rule of secrecy (NDA) violates *hacker ethics* and the *Golden Rule* (once bound to secrecy, one can't help his/her next of kind)

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- St IGNUcius leads his adepts to the land of Freedoms

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- ④ You have the freedom to distribute modified versions of the program, so that the community can benefit from your improvements.

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An introduction to Free/Libre Open Source Software (Intel, 2014)

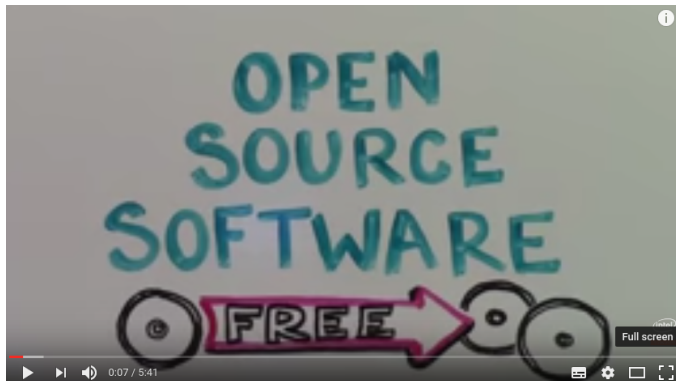


Figure: Credit: Intel Software (2014)

<https://www.youtube.com/watch?v=Tyd0FO0tko8>

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- Free/Libre Open Source Software (FLOSS) to (over)simplify

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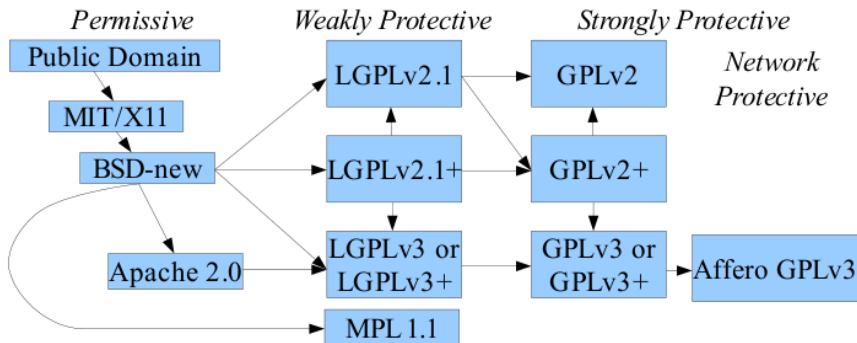
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- Mixing licenses –the question of license compatibility

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FLOSS License Compatibility (Picture by David A. Wheeler [CC BY-SA 3.0], via Wikimedia Commons)



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- understand how that plays out with company strategy

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- What are the implication of switching to another license?

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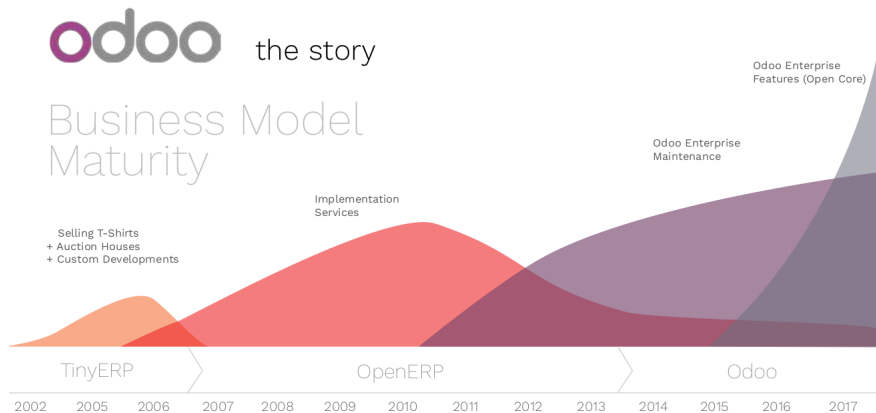
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- Creates and strengthens a local labour market and healthy competition (same as the ability to choose between a car agency and the neighbourhood mechanic)

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- Equal and fair access to Internet and Computing Resources (e.g. Net Neutrality)
- Keeping democracies honest and incentivizing civic engagement (e.g. voting machines, Code.org)

FLOSS and Business Strategy

The drawback of FLOSS (Eghbal, 2016)

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- Is FLOSS dying from its success (like smartphones are now called phones)? (see [Nadia Eghbal](#))

FLOSS and Business Strategy

Make the world a better place: examples from the FSF High Priority List

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- Do you want support locally or are you fine with off-shore support?

Acquiring an IT Solutions

Comparing Apples to Apples

Comparing purchase price of FLOSS vs. Proprietary Solutions

FLOSS can be downloaded for free, while proprietary software requires a payment. Their cost structure differs. How do we compare apples to apples?

Acquiring an IT Solutions

Comparing Apples to Apples: Total Cost of Ownership (TCO)

- Cost of building or buying

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- Other costs (see <https://www.business-case-analysis.com/total-cost-of-ownership.html>)

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Think IT Strategy before planning the procurement process

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- Have a back-up plan in case the solution goes bust

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- Example: opening an e-commerce service

Creating Value with Software

References

- Eghbal, N. (2016, July). *Roads and Bridges: The Unseen Labor Behind Our Digital Infrastructure*. Retrieved from <http://www.fordfoundation.org/library/reports-and-studies/roads-and-bridges-the-unseen-labor-behind-our-digital-infrastructure>
- Intel. (2014). Open source basics. Retrieved from <https://www.youtube.com/watch?v=Tyd0FO0tko8>
- Meeker, H. (2008). *The open source alternative: understanding risks and leveraging opportunities*. Wiley.
- OSI. (1998). History of the Open Source Initiative (OSI). Retrieved from <https://opensource.org/history>
- Rosen, L. (2005). *Open Source Licensing: Software Freedom and Intellectual Property Law*. Prentice Hall PTR.
- Stallman, R. M. (1998). The GNU Project. Retrieved from <https://www.gnu.org/gnu/thegnuproject.html>
- Williams, S. (2002, March). *Free as in Freedom*. Retrieved from <http://www.oreilly.com/openbook/freedom/>

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 - Software Licensing
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 - Acquiring an IT Solution

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 - Currency Competition
 - Trade Barriers
 - Fiscal Policies
 - Competitiveness Rankings

Global Competition

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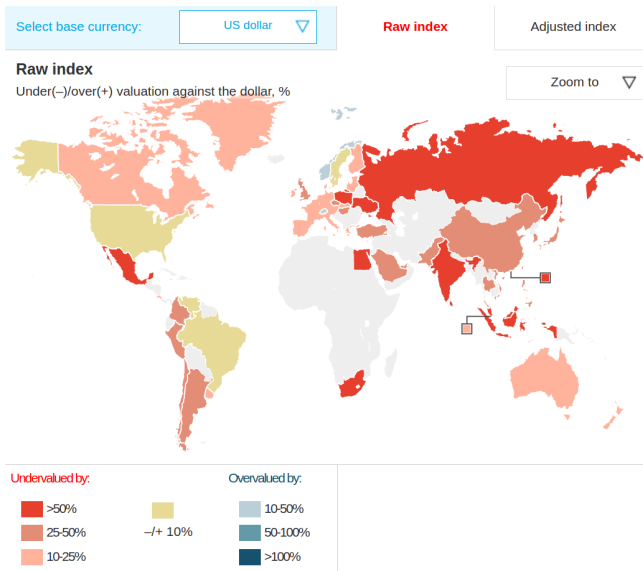
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 - Policies such as currency fluctuation and trade barriers

Global Competition

Currency Valuation: The Big Mac Index (The Economist, 2017)



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- Tax on the circulation of goods

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- Impact on the Manufacturing Industry, Global Supply Chain, Foreign Investment, Currencies. . .

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Global Competition

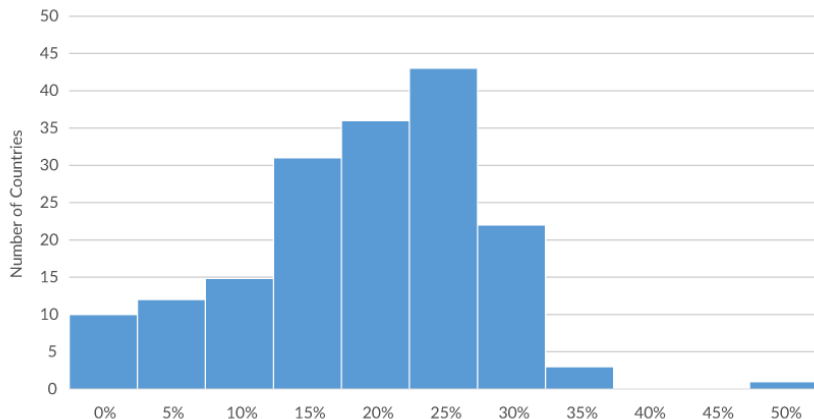
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- Protected Designation of Origin (e.g. Champagne, Feta cheese)

Global Competition

Corporate Tax Rates

Distribution of Worldwide Corporate Tax Rates, 2015



Source: Tax Foundation calculations based on data from the World Bank, OECD, and KPMG.

Global Competition

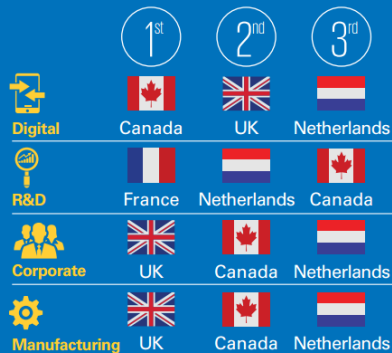
Corporate Income Tax Rates Competition (G7 Top 3 from KPMG, 2016)

Top 3 cost competitive countries

Major cost factors



Corporate income tax rates



Global Competition

Countries with the lowest business cost (G7 Top 10 from KPMG, 2016)



Global Competition

Business Cost Advantage: Greater Toronto vs USA (York Region, 2016)

- 13% lower Corporate Income Tax than U.S. avg. (State-Fed)
- 50% lower employer healthcare costs
- Lower salary costs (up to 45% in Tech) and employee attrition in tech/management roles than in the U.S.
- 40%-60% R&D cost reduction via SR&ED incentive program



Metro Toronto business cost advantage vs. U.S. metro areas

Source: KPMG Competitive Alternatives 2014

Metro Area	Software Development / Digital Media	Electronic Systems Development & Testing	Financial Services
vs. New York City	21%	19%	20%
vs. Los Angeles	17%	15%	10%
vs. San Francisco	21%	21%	18%
vs. Denver	12%	7%	2%
vs. Chicago	16%	11%	9%
vs. Boston	18%	13%	14%
vs. Raleigh	11%	14%	-1%
vs. Austin	11%	7%	1%
vs. U.S. average	16%	13%	10%

Global Competition

Manufacturing Competitiveness (Global Top 10 from Deloitte, 2016)

2016 (Current)		
Rank	Country	Index score (100=High) (10 = Low)
1	China	100.0
2	United States	99.5
3	Germany	93.9
4	Japan	80.4
5	South Korea	76.7
6	United Kingdom	75.8
7	Taiwan	72.9
8	Mexico	69.5
9	Canada	68.7
10	Singapore	68.4

Global Competition

Global Competitiveness Index (Global Top 15 from World Economic Forum, 2016)

	Economy	Score ¹	Prev. ²	Trend ³
1	Switzerland	5.76	1	
2	Singapore	5.68	2	
3	United States	5.61	3	
4	Germany	5.53	5	
5	Netherlands	5.50	8	
6	Japan	5.47	6	
7	Hong Kong SAR	5.46	7	
8	Finland	5.45	4	
9	Sweden	5.43	10	
10	United Kingdom	5.43	9	
11	Norway	5.41	11	
12	Denmark	5.33	13	
13	Canada	5.31	15	
14	Qatar	5.30	16	
15	Taiwan, China	5.28	14	

Global Competition

VC Money Invested in North American Cities (Thomson Reuters, 2016)

Metro Region	First 3Q 2016 Rank	2015 Rank	First 3Q 2016 VC Invested (CAD \$ Millions)	First 3Q 2016 North American Market Share	Change in Rank From 2015
San Francisco	1	1	\$15,981	28.3%	-
San Jose	2	2	\$7,829	13.9%	-
New York City	3	3	\$6,126	10.9%	-
Boston	4	4	\$5,280	9.4%	-
Los Angeles	5	5	\$3,267	5.8%	-
Washington D.C.	6	6	\$1,154	2.0%	-
San Diego	7	8	\$1,066	1.9%	+1 ▲
Chicago	8	9	\$915	1.6%	+1 ▲
Orange County	9	10	\$888	1.6%	+1 ▲
Seattle	10	7	\$795	1.4%	-3 ▼
Montreal	11	16	\$736	1.3%	+5 ▲
Philadelphia	12	15	\$651	1.2%	+3 ▲
Toronto	13	14	\$645	1.1%	+1 ▲
Austin	14	13	\$552	1.0%	-1 ▼
Houston	15	24	\$523	0.9%	+9 ▲
Vancouver	20	19	\$315	0.6%	+1 ▲
Kitchener-Waterloo	21	26	\$295	0.5%	+5 ▲



THOMSON REUTERS

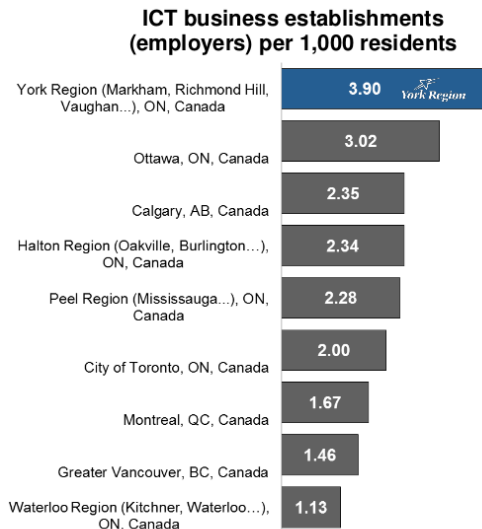
11

Contributors to our venture capital & private equity analyses are entitled to packages of additional data. Please [contact us](#) to participate.



Global Competition

ICT Cluster Density across Canada (York Region, 2016)



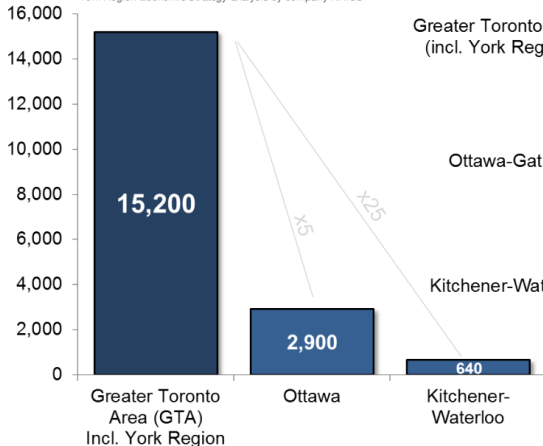
Source: Statistics Canada CBP Dec 2013, NHS 2011 | York Region Economic Strategy analysis by company NAICS

Global Competition

Size of Ontario ICT Clusters (York Region, 2016)

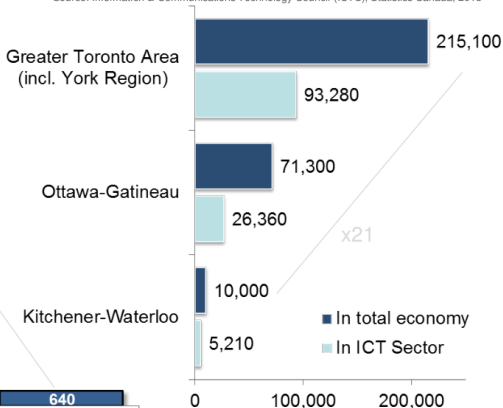
ICT companies in Ontario's key technology clusters

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ICT employment in Ontario's key tech clusters

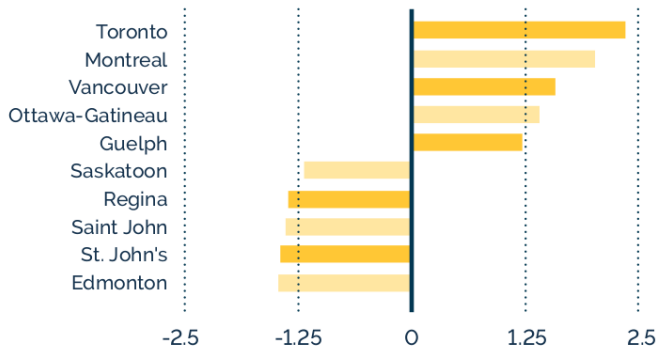
Source: Information & Communications Technology Council (ICTC); Statistics Canada, 2013



Global Competition

Top Canadian Cities by Diversification (TechTO, 2016)

Top And Bottom 5 Canadian Cities By Diversification



Global Competition – References I

- Canada Border Services Agency. (2017, January). Customs Tariff 2017. Retrieved from <http://www.cbsa-asfc.gc.ca/trade-commerce/tariff-tarif/2017/menu-eng.html>
- Deloitte. (2016). 2016 Global Manufacturing Competitiveness Index. Retrieved from <https://www2.deloitte.com/global/en/pages/manufacturing/articles/global-manufacturing-competitiveness-index.html>
- KPMG. (2016). Canada ranks 1st in G7 for corporate tax rate and cost competitiveness. Retrieved from <http://www.investinontario.com/spotlights/canada-ranks-1st-g7-corporate-tax-rate-and-cost-competitiveness>
- McGregor, J. (2017, January). Canada cuts \$48M in tariffs to boost food manufacturing. *CBC News*. Retrieved from <http://www.cbc.ca/news/politics/food-ingredient-tariff-cuts-1.3942870>

Global Competition – References II

- Reuters. (2017, January). Trump threatens German carmakers with 35% U.S. import tariff. *Financial Post*. Retrieved from <http://business.financialpost.com/news/transportation/trump-threatens-german-carmakers-with-35-u-s-import-tariff>
- TechTO. (2016). How Technology Is Changing Toronto Employment. Retrieved from <https://techtoronto.org/Report2016/>
- The Economist. (2017, January). The big mac index. Retrieved from <http://www.economist.com/content/big-mac-index>
- World Economic Forum. (2016). Global Competitiveness Report 2015–2016. Retrieved from http://www3.weforum.org/docs/gcr/2015-2016/Global_Competitiveness_Report_2015-2016.pdf