Innovation for a Better Canada Strategy

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Data Collection

Innovation Better Canada for a What We Heard

Annual Report 2017—2018

How Talent Can Help Unlock the Innovation Potential of Canadian SMEs

Bridging the Gap: The Role of Innovation Intermediaries in Canada

Text Preprocessing

1. Tokenization
2. Lemmatization
3. Removing Stop Words

```
# Function to do data preprocessing including lemmatization
def data_preprocessing(text):
    # Removing stop words
    stop_words = set(stopwords.words('english'))
    # Do the tokenization
    word_tokens = word_tokenize(text)
    # Do the lemmatization
    lemmatizer = WordNetLemmatizer()
    filteredlemmatized_text = [lemmatizer.lemmatize(word.lower()) for word in word_tokens if not word.lower() in stop_words]
    return ' '.join(filteredlemmatized_text)
```

❖ Tokenization

Example: "Innovation drives the future"

- "Innovation"
- "drives"
- "the"
- "future"

❖ Lemmatization

Example: "The leaves on the ground were gathered by the children playing in the park."

- "leaves" → "leaf"
- "gathered" → "gather"
- "children" → "child"
- "playing" → "play"

❖ Removing Stop Words

Example: "The innovation in technology has led to significant advancements in various fields, including healthcare, education, and environmental protection."

Stop words: "the", "in", "to", "has", "and"

Text After Removing Stop Words: "Innovation technology led significant advancements various fields, including healthcare, education, environmental protection."

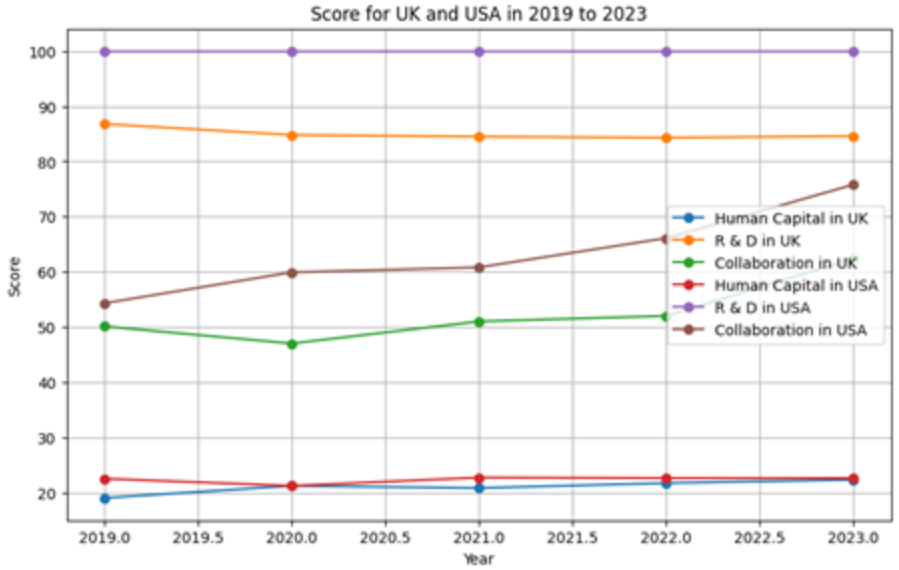
Innovation Factors and Strategies

❖ Target Countries

1. United Kingdom
2. United States

❖ Innovation Factors

1. Human Capital
2. Research and Development Spending
3. Collaboration Between Universities and Industry
4. Entrepreneurial Ecosystem



❖ Strategies Implementation

1. Specialized STEM Initiatives
2. Increasing Spending in Clean Energy and Biotechnology
3. Transferred technology initiatives
4. Cultivating Global-Leading Entrepreneurial Ecosystem in Digital Technologies

Term Frequency-Inverse Document Frequency (TF-IDF)

Evaluation of Generative Pre-trained Transformers' performance

Theorem 2.6. The $tf.idf_{t,d}$ weight of a term is the product of its $tf_{t,d}$ weight and its $idf_{t,d}$ weight.

$$
\begin{aligned}
w &= tf.idf_{t,d} \\
&= tf_{t,d} \times idf_{t,d} \\
&= (1 + log\,(tf_{t,d})) \times log\left(\frac{N}{df_t}\right)
\end{aligned}
$$

$$
Score\,(q,d) = \sum_{t \in q \cap d} tf.idf_{t,d}
$$

❖ **Compare the Similarity:**
Global Innovation Index 2023 report VS Results collected by ChatGPT 4.0 model

1. Data Preprocessing: NLP

1. Reading and Preprocessing Text

    - Innovation factors comparison
    - Target countries comparison
    - Top innovation factors using to derived strategies

1. Vectorization

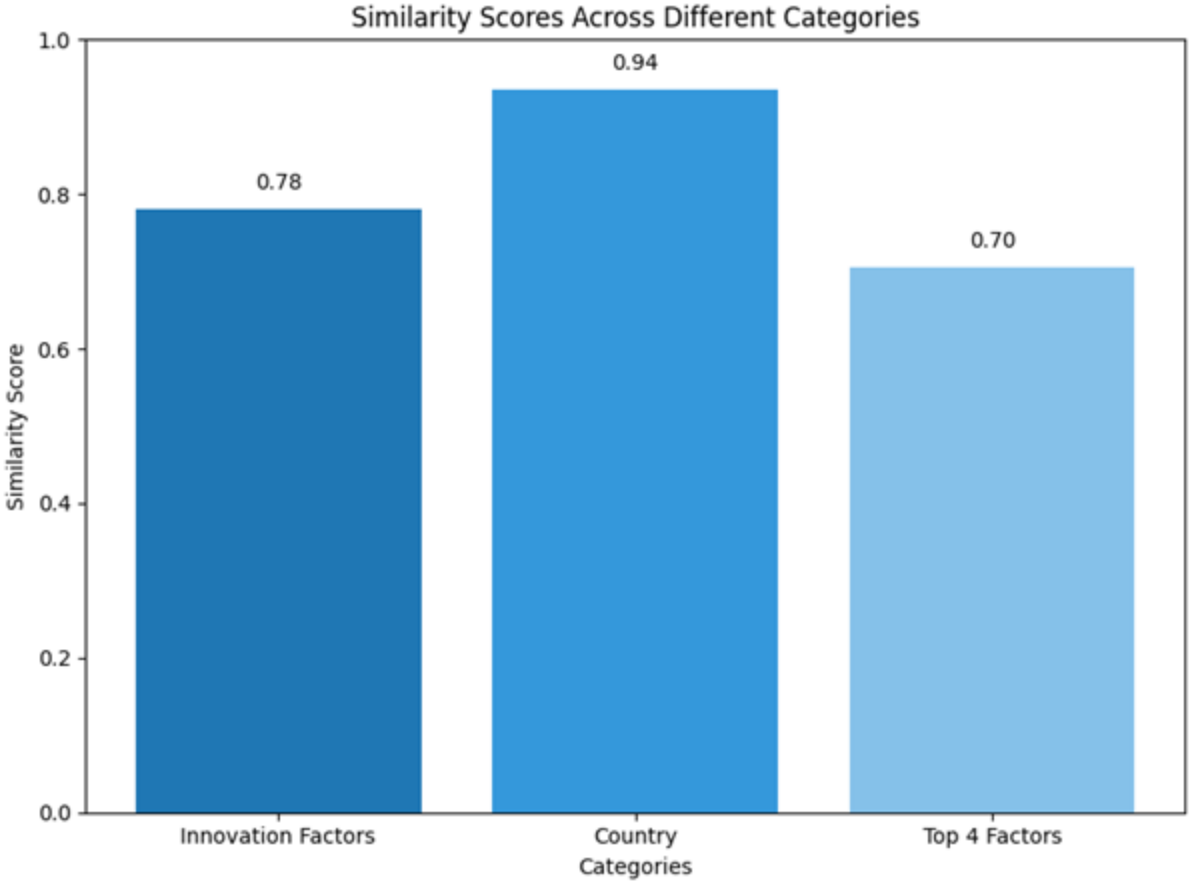
    - Preprocessed texts are transformed into numerical vectors based on the TF-IDF weighting
    - Fit and transform the text to a TF-IDF representation

1. Cosine Similarity Calculation

    - Cosine of the angle between the vectorized representations of the two sets of documents
    - Providing a similarity score between 0 and 1, where 1 means identical

TF-IDF output: Similarity Score

- **Benchmark:** Global Innovation Index 2023 report
- **Generative Pre-trained Transformers:** Extracting the responses derived from ChatGPT 4.0 model using multiple documents related to the innovation initiatives



Sub-Strategy → Human Capital

USA and UK highlights:

- USA emphasis on innovation, global leadership, and strategic investment in human capital, focusing on AI, renewable energy, and quantum computing areas.
- UK stress on recovery, growth, and innovation through human capital in science, technology, and skills development.

Comparative Insight:

- Both countries underscore the pivotal role of human capital in maintaining competitiveness in critical technologies.

Crafting Canada’s Human Capital Strategy

Strategy Overview:

- ❖ Inspired by USA & UK, aiming to position Canada as a leader in AI, renewable energy, and quantum computing.

Key Components:

- ➔ Human Capital Development Strategy: Training programs, industry-academic partnerships, R&D investment.

Implementation Vision:

- ★ A collaborative approach involving government, education, and industry stakeholders for long-term success.

Call to Action: "Investing in our people is investing in our future."

Sub-Strategy

TARGETED INCREASE R&D SPENDING

CLEAN ENERGY

BIOTECHNOLOGY

THREE ACTIONABLE STEPS

- Strengthening SR&ED (Scientific Research and Experimental Development) Program
- Establishing Specialized R&D Centers with Government Funding
- National Strategy and Global Collaboration

IMPROVEMENT IN CANADA'S INNOVATION SCORE:

- Development of "*New Technologies*" & "*Products*"
- Uptick in "*Patent Filings*" & "*Research Publications*" & "*Technology Exports*"

Clean Energy & Biotechnology

LEADER

Sub-Strategy

Collaboration Between Universities and Industry

- **US Focus:**
  Accelerating technological innovation for national defense, emphasizing rapid advancement and international collaborations.

- **UK Focus:**
  Spurring sustainable growth via fintech and health tech collaborations, with an emphasis on digital literacy and global digital divide reduction.

Adapting Best Practices in Canada

THREE ACTIONABLE STEPS

Specialized TTOs:
Bridge between academia and industry with a focus on digital health and smart manufacturing.

Innovation Clusters:
Government-funded clusters to foster innovation and collaboration.

Mentorship and Investment Programs:
Support for startups and scaling operations.

Sub-Strategy ⇒ Entrepreneurial Ecosystem in Digital Technologies

Background:

- Concisely state the vision for elevating Canada's international innovation rank in key technology domains such as blockchain, IoT, and cybersecurity.
- Highlight the significance of a robust entrepreneurial ecosystem for economic growth and societal well-being.

Insights from the USA:

- Extract key strategies from the "National Defense Science & Technology Strategy 2023": cross-sector collaboration and creating supportive environments for startups.
- Emphasize the inspirational US model: tax incentives, funding supports, and academic-industry cooperation.

Implementation Steps

THREE ACTIONABLE STEPS

- Enhanced tax incentives and strategic funding for emerging technologies

- Expansion of academic-industry collaboration through accelerators and incubators

- Creation of a national large-scale investment fund for technology startups

PR Strategy

🚀 Exciting News! 🚀

Canada unveils its groundbreaking Innovation Strategy, focusing on key areas like Human Capital, R&D Spending, Collaboration, and Entrepreneurial Ecosystem. 🌟 Stay tuned as we revolutionize our tech landscape! #InnovationCanada #TechRevolution 💡CA

🧠 **Human Capital:** Investing in skills development and talent to drive innovation.

💰 **R&D Spending:** Boosting funding for clean energy, biotechnology, and more.

🤝 **Collaboration:** Strengthening partnerships between universities and industry.

🌱 **Entrepreneurial Ecosystem:** Fostering startups and creativity for economic growth.

Let's lead the way in innovation and make Canada a global tech powerhouse! 💪🌎 #Innovation #Canada #Tech #FutureReady

—— Image used to support promotion