The Demand for Digital Skills in Canada's Nonprofit Sector

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CANADIAN CENTRE FOR NONPROFIT DIGITAL RESILIENCE

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CANADIAN CENTRE FOR NONPROFIT DIGITAL RESILIENCE

The Canadian Centre for Nonprofit Digital Resilience (CCNDR) works to create a digitally-enabled nonprofit sector, where Canada's nonprofits use data and tech to multiply their impact.

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Executive Summary

The nonprofit sector in Canada is currently undergoing dramatic changes, with the pressure to digitize mounting. Despite employing more than 2 million Canadians, the nonprofit sector faces an uphill struggle to keep pace with the increase in demand for digital skills—many nonprofits already report not having the necessary skills to use technology already in place. This problem will only grow as Canada continues to digitize.

In an effort to understand the current demand for digital skills within the nonprofit sector, this report analyzes job postings data to understand skills demand trends within the nonprofit sector. Using the approach developed by the Brookfield Institute for Innovation and Entrepreneurship in *I, Human* (2019) and expanded upon in the Dais's work *Skills Algorithm* (2023), we identify digital skills based on a proven quantitative method.

1. **Compared to adjacent knowledge sector jobs, nonprofit jobs have a lower demand for digital skills.** When analyzed against jobs demanding a university or college degree and tech jobs, nonprofit job postings on average demand a lower amount of digital skills, but contain a similar number of unique digital skills. In addition, nonprofits contain less Software/product development and data digital skills which are generally higher in digital intensity.

2. **While Microsoft digital skills are highly demanded across each subset of jobs, the top demanded digital skill in each subset reveals relative digital strengths and needs for workers.** The top Microsoft skill demanded in nonprofit jobs was Microsoft Office (which offers a bundle of software including Outlook, Powerpoint, Excel, and Word), compared to more technical skills such as Microsoft Excel for jobs requiring a university or college degree, and Microsoft Azure (a cloud computing platform hosting a range of software and infrastructure services) for tech jobs.

3. **While digital needs for nonprofit jobs may not be as strong compared to other knowledge sector jobs, there is evidence that nonprofit jobs are keeping up with digital skills trends to some extent.** The share of all nonprofit job postings demanding

artificial intelligence skills increased by 32.7% in the second half of 2023 compared to the first six months. This indicates a willingness for the sector to adapt to changes in digital skills trends.

4. **Many nonprofit job postings did not contain any digital skills at all.** 63.3% of nonprofit job postings did not require any digital skills, which is on par with job postings requiring a university or college degree (63.4%) but pales compared to 13.8% of tech job postings. This signifies a difference in the digital nature of tasks in each subset of jobs, which leaves room for upskilling and incorporating digital processes into everyday activities.

Futureproofing the Community Service Workforce

Unlocking the nonprofit sector's digital skills to strengthen community services

The nonprofit sector is the cornerstone of community services in Canada, delivering invaluable support to people in every region of the country. But as in most sectors, nonprofits are responding to rapid changes to digital technology. A digitally skilled nonprofit workforce is increasingly essential to successfully serve the evolving needs of communities.

However, there is **limited research** that assesses the current skills and future demands for the nonprofit workforce in Canada. What we do know is that there is a **growing gap** between the **digital skillsets and capacity** they have now and what they need to continue delivering services effectively.

In response, **Futureproofing the Community Service Workforce** aims to understand, and then unlock, the nonprofit workforce's facility with Digital Skills Plus (DS+). DS+ encompasses digital as well as adjacent skills often deployed with digital tools, including communication, creativity, innovation, adaptability and problem-solving skills. With funding from Employment and Social Development Canada (ESDC)'s Skills for Success program—and driven by a consortium of organizations with expertise in nonprofit capacity building and the digital skills economy—the 17-month project has four strategic **Phases**:

1. Understanding the current supply and future demand for DS+.
2. Analyzing the gaps in supply versus demand for DS+.
3. Co-designing and rapidly testing solutions to close this gap.
4. Creating a scalable DS+ talent model.

By the end of our project timeline, we hope to achieve the following **Objectives**:

- reinforce the evidence base in Canada on current and future needs for DS+ in the nonprofit sector, informing the sector's future training and talent strategies, increasing awareness of the forecasted demand for DS+ and enhancing the sector's ability to articulate and close the most pressing skill gaps;
- use this research to inform and test a prototype (or prototypes) of a scalable DS+ upskilling model that provides practical, tailored and broadly applicable training for the nonprofit workforce (in other words, to help them develop foundational and advanced digital competencies, fostering a culture of continuous learning and innovation); and
- mobilize findings and learnings via public reports, research briefs and recommendations to bring greater evidence-informed discussion to the nonprofit sector around its DS+ needs and paths forward.

Who We Are

Futureproofing the Community Service Workforce is led by a partnership between Imagine Canada, The Dais at Toronto Metropolitan University, the Digital Governance Council (DGC) and Blueprint. The Canadian Centre for Nonprofit Digital Resilience (CCNDR) provides a platform to share information about this project at https://futureproof.ccndr.ca/.

Introduction

The nonprofit sector is vital in providing essential community-based resources and services to those often most in need of support. As Imagine Canada states, "Nonprofits are key drivers of economic and social development: they provide essential programs and services, offer meaningful employment opportunities, and enhance social connections by mobilizing volunteers."[1]

In addition, the nonprofit sector contributes significantly to the Canadian economy. According to Imagine Canada, there are over 170,000 registered nonprofits in Canada.[2][3] The nonprofit sector employs 2.5 million people in Canada as of 2021, with 618,000 working in community-based nonprofits which directly serve households.[4] The sector generated almost $200 billion in GDP in 2021, with $32.5 billion in GDP from community-based nonprofit institutions which serve households.[5]

In this report, the demand for digital skills for nonprofit workers is examined against jobs of similar skill sets and educational requirements. These skills profiles are compared to measure the digital capacity of the nonprofit sector, and whether it is keeping pace with digital trends across the labour market. Ensuring the digital capabilities of nonprofit workers is important to keep up with the changing digital landscape across the economy. While day-to-day operations in the nonprofit sector may not be as digitally focused compared to for-profit companies that provide technical products and services, digital skills demanded from employers reflect the preparedness of the nonprofit sector to respond to an evolving digital economy. In turn, this could help identify where digital upskilling is needed within the sector in terms of which skills are lagging behind compared to other parts of the labour force.

What is a Nonprofit?

Imagine Canada classifies three types of nonprofit organizations:[6]

1. **Nonprofits serving households:** These nonprofits provide goods and services to individuals and groups of people, often at low or no cost. Examples of this type of nonprofit include food banks, museums, religious services, housing assistance, and youth and family services.

2. **Business nonprofits:** Examples of this type of nonprofit include chambers of commerce, professional and labour organizations, and airport authorities.

3. **Government nonprofits:** Examples of this include some universities and colleges, residential care facilities, and hospitals.

The classification of nonprofits in this report is constructed in alignment with North American Industry Classification System (NAICS)[7] industries identified by the Ontario Nonprofit Network's (ONN),[8] Statistics Canada's Satellite Account of Nonprofit Institutions and Volunteering (SANIV),[9] and a text classifier to identify nonprofit job postings based on job descriptions.[10]

Examples of some industries nonprofit organizations often exist under include:[11]

- Social advocacy organizations supporting social and/or political causes (NAICS 8133);
- Community care, nursing care and residential care facilities (NAICS 623);
- Unions and business/professional organizations (NAICS 8139);
- Not for profit educational services (universities, colleges, and school boards) (NAICS 611);
- General medical and surgical hospitals (NAICS 6221);
- Employment services (NAICS 5613).

A notable definitional exclusion to nonprofit industries is any government-run organization or entity that resides in the public administration NAICS (91). The full list of NAICS industries in which nonprofits could be included is in Appendix A.

Methodology

Using job postings in 2023, the digital skills[12] from three subsets of jobs (nonprofit jobs, jobs requiring a university or college degree, and jobs for tech workers) are compared and contrasted. Nonprofit workers are compared against the other two subsets of workers given their employment in knowledge industries and similar educational requirements. Jobs requiring a university and college degree provide a baseline of the skills composition that a knowledge worker would possess, which allows for a useful comparison against a specialized sector such as the nonprofit sector. However, it can be acknowledged that digital skills needs for different sub-sectors in the knowledge economy may vary. Using jobs for tech workers as an example of a sub-sector that likely has among the highest need for digital skills, the scale of the difference in digital capacity compared to nonprofit jobs can be analyzed. In a similar fashion, jobs in industries such as trades, manufacturing, and retail, may not provide a useful comparison to nonprofit jobs given the difference in occupational tasks, educational requirements, and work environments.

Job posting data was collected by Vicinity Jobs, a Canadian company specializing in retrieving and processing labour market information through online job postings. Job postings data are online advertisements placed by employers (or third-party entities on behalf of employers) seeking candidates who identify themselves as a good fit for an open position in the employer's organization. Vicinity Jobs collects job postings from a variety of online sources, including regional, provincial, and municipal sites. Job postings data was retrieved from sources such as the Government of Canada's Job Bank, large national aggregators such as Indeed, and directly from corporate websites, and government sites such as kwcareers.ca (for jobs in Kitchener-Waterloo) and workBC.ca (operated by the British Columbia government). French language postings are also included, with information on skills and occupation types standardized in English.

The ability to use NAICS as a nonprofit classifier with Census data and with job posting data differs. Classifying nonprofit job postings using just NAICS industries is imperfect; around half of job postings do not have NAICS information associated. Furthermore, the definition of a nonprofit may exist beyond what NAICS could capture. Therefore, using a sample of 300,000 job postings with job description text in 2023,[13] a text classifier model was trained and applied to the postings to identify which postings constitute nonprofit jobs.

More detail on the text classification process and model is provided in Appendix B. Supplementing the ONN definition with additional NAICS from SANIV, as well as using keyword identification enhanced the identification of nonprofit jobs. Through this process, 82,177 nonprofit job postings were identified, and subsequently used in the skills analysis.[14] [15]

The definitions for digital sub-clusters and tech jobs are identified based on previous work by the Dais. Digital sub-clusters are grouped together based on the tendency for certain skills to co-occur in the same job postings.[16] Intuitively, skills that show up together more often tend to be classified by the algorithm as belonging to the same community. Tech jobs definitions are identified from a subset of occupations as defined by their National Occupational Classification (NOC) codes, and classified according to their competencies within six O*NET skills.[17] For jobs requiring a university or college degree, each job posting is classified according to their Training, Education, Experience and Responsibilities (TEER) category[18] as identified by its NOC code. For a closer comparison to the subset of job postings in the nonprofit space, the completion of college degree programs 2 years or over is considered in the skills analysis.

What is a job posting?

In addition to skills, each job posting contains the following information:

- Job title
- NOC code, which assigns each job posting to a standardized Statistics Canada classification of occupations[19]
- Geography, which includes city, district and province
- Employer name
- Date of job posting
- Remuneration at an hourly or annual rate
- North American Industry Classification System (NAICS) code
- Skill level outlining the education level required for this occupation. Categories include:
  - University degree (bachelor's degree, master's degree, or doctorate)
  - Management position (education requirements vary by job)
  - Post-secondary education or apprenticeship program (with the program length either less than two years or between two and three years)
  - Secondary school
  - No formal education requirements
- Certifications required
- A job description is available for a subset of 300,000 job postings, which includes the raw detailed textual information listed by an employer or hirer, which could include skills and education qualifications, information about the company, job benefits, etc.

Digital Skills Analysis

Digital skills of nonprofit jobs are compared to two subsets of jobs: job postings for tech workers, and job postings requiring a university or college degree. This provides a baseline comparison of whether skills demanded by nonprofit industry are keeping up with those in adjacent industries and occupations. The digital intensity of a skill can be analyzed through the digital skill sub-clusters they are in, as certain sub-clusters tend to be used in more technical contexts. For example, more digitally intense skills could include programming skills primarily used by tech workers, whereas less digitally intense skills are used in a more general sense (e.g. word processing software used by office workers, administrative workers, etc.). Naturally, subsets of jobs that are more digital will have a greater proportion of higher digital intensity skills.

What is a digital skill sub-cluster?

As identified in The Skills Algorithm, digital skills were grouped into five sub-clusters, which are listed below in order of digital intensity:

1. **Software/product development and data skills,** which have a heavy concentration in the skills profiles of tech workers and industries (e.g., SQL, Apache, programming languages such as Java, Python, C++).

2. **Cybersecurity and system infrastructure skills,** which are used to manage security systems and maintain information technology systems (e.g., technical support, information systems).

3. **Industrial modelling and geospatial software skills,** which are focused on the visualization of 3D spaces (e.g., computer-aided design (CAD) and AutoCAD).

4. **Design and marketing skills,** which are commonly used by designers and marketing professionals (e.g., Adobe Photoshop, Google Analytics).

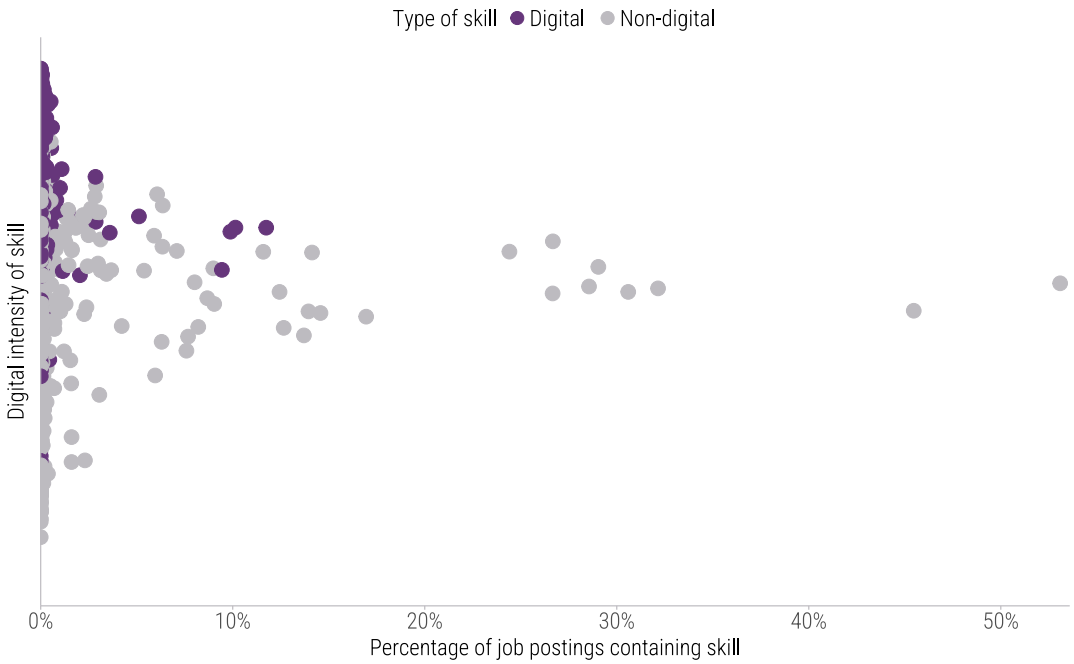
5. **Workforce digital skills,** which are lower-digital-intensity skills used by workers across many contexts, occupations and industries (e.g., Microsoft Office suite, email software, enterprise resource planning software such as SAP and Oracle).

Skills demand in nonprofit jobs

Nonprofit job postings

Around half of skills in nonprofit job postings are digital (52% of unique skills are digital), as seen in Figure 1. Non-digital skills such as communication, teamwork and interpersonal skills are among the top skills that employers demand, with each skill found in 53%, 45%, and 32% of job postings, respectively. Digital skills that are required of nonprofit workers tend to be low to moderately digitally intense and tend to be skills that do not require a technical background.

Figure 1: Skills distribution in nonprofit job postings



Similar to the digital skills demanded across all jobs, the top digital skills requested for nonprofits include lower digital intensity Microsoft Suite applications such as Office. These are classified as Workforce digital skills, which are generally used across various occupations and industries, and usually do not require a technical background to use and understand.

Table 1: Top 10 digital skills in nonprofit job postings in 2023

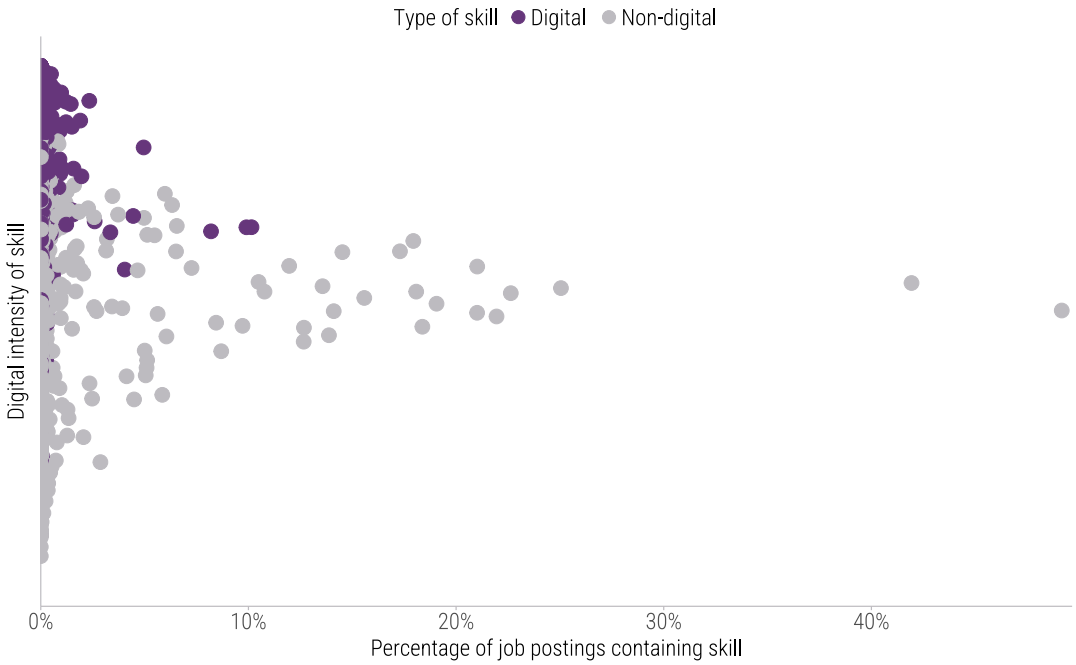
Skill	Percentage of overall nonprofit job postings	Digital sub-cluster
Microsoft Suite[20]	20.2%	Workforce digital skills
Computer skills (administrative)	9.4%	Workforce digital skills
Information Systems	2.9%	Cybersecurity and System Infrastructure skills
MEDITECH software	2.0%	Workforce digital skills
Electronic Data Interchange (EDI) systems	1.4%	Workforce digital skills
Technical Support	1.1%	Cybersecurity and System Infrastructure skills
Oracle Learning Management	0.8%	Workforce digital skills
Customer relationship management (CRM) software	0.6%	Workforce digital skills
Business Analysis	0.6%	Software/Product Development and data skills
Oracle PeopleSoft	0.6%	Workforce digital skills

The use of digital tools such as MEDITECH software (used for managing patient records in healthcare), Electronic Data Interchange (EDI) systems (used for managing purchase and payment documents between businesses and organizations) and Customer Relationship Management (CRM) software (used for managing data and information from partners, customers or clients) are more prevalent for nonprofit jobs. The prominence of nonprofit healthcare institutions and nonprofits interacting with customers and suppliers for goods and services is unique to this subset of workers. While these skills are relatively lower in digital intensity, equipping nonprofit workers with these skills helps the industry keep pace with rapidly changing digital technologies, especially given the need to accommodate stakeholders who may also interact with these technologies.

Job postings requiring a university or college degree

Similar to nonprofit job postings, non-digital skills are more frequently demanded by employers than digital skills, with teamwork and communication at the forefront. However, as Figure 2 shows, higher-intensity digital skills are more often demanded compared to nonprofit job postings. Furthermore, a similar proportion of unique skills demanded by employers are digital (48%).

Figure 2: Skills distribution of job postings requiring a university or college degree



A combination of moderate and high-intensity digital skills are among the most demanded digital skills by employers. Greater demand for Software/product development and data skills such as SQL, cloud computing, Python, and business analysis, as well as Cybersecurity and system infrastructure skills such as technical support is featured through job postings for this subset of workers. However, comparatively lower digital intensity skills such as Microsoft Suite tools continue to be important requirements for this subset of workers.

Table 2: Top 10 digital skills in job postings requiring a university or college degree in 2023

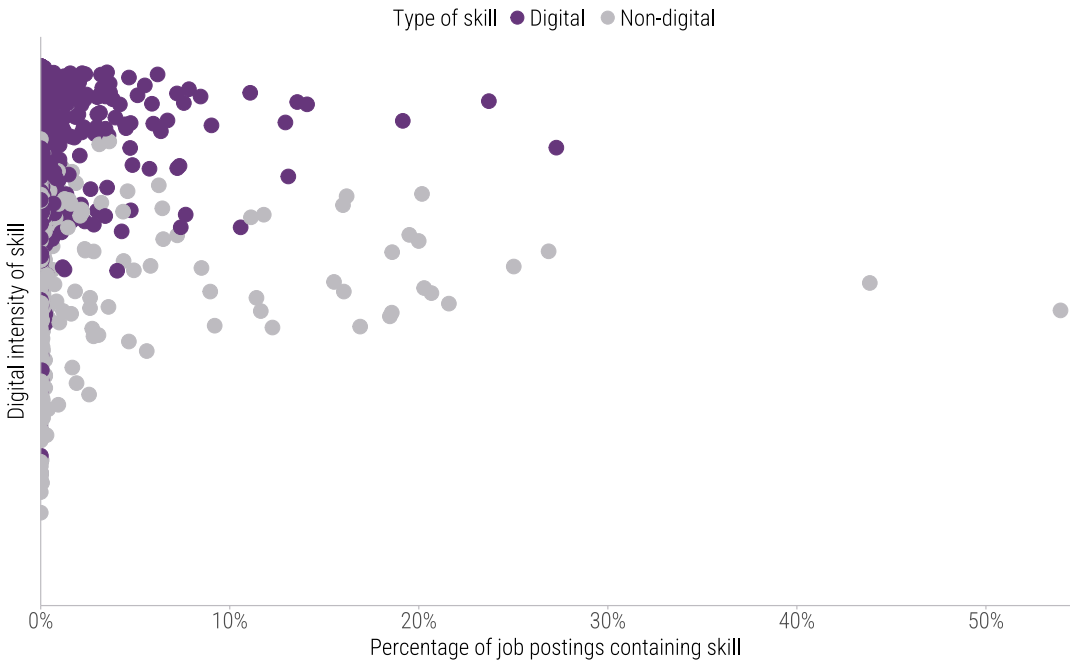
Skill	Percentage of overall university/college job postings[21]	Digital sub-cluster
Microsoft Suite[22]	19.5%	Workforce digital skills
Cascading Style Sheets (CSS)	5.0%	Software/Product Development and data skills
Computer skills (administrative)	4.0%	Workforce digital skills
SQL (Structured query language)	2.3%	Software/Product Development and data skills
Information Systems	2.0%	Cybersecurity and System Infrastructure skills
Cloud Computing	1.9%	Software/Product Development and data skills

Technical Support	1.6%	Cybersecurity and System Infrastructure skills
Business Analysis	1.5%	Software/Product Development and data skills
Python	1.4%	Software/Product Development and data skills
SAP	1.2%	Workforce digital skills

Job postings for tech workers

While digital skills are imperative for most tech workers, the presence of soft, non-digital skills remains important. Similar to job postings for nonprofits and postings requiring a university or college degree, teamwork and communication are the top core competencies that employers look for, with 54% and 44% of job postings seeking candidates with these skills, respectively. Not surprisingly however, the vast amount of unique skills demanded from employers are digital (over 70%), with digital skills appearing much more frequently in tech job postings compared to job postings from nonprofits (as seen in Figure 3).

Figure 3: Skills distribution of tech job postings



Microsoft Suite skills continue to be the most demanded digital skills within job postings for tech workers, with two in five postings requiring at least one Microsoft skill. However, job postings for tech workers have a high concentration of highly technical and digitally intense skills, most of which are concentrated in the Software/Product Development and data skills sub-

cluster. Over a quarter of job postings require knowledge of Cascading Style Sheets (often used in web development), while over one-fifth of postings require knowledge of SQL. Almost a quarter of job postings require a programming/coding skill of some kind (e.g. SQL, Python, C++, Java, etc.).

Table 3: Top 10 digital skills in job postings for tech workers in 2023[23]

Skill	Percentage of overall tech job postings	Digital sub-cluster
Microsoft Suite[24]	42.1%	Workforce digital skills
Cascading Style Sheets (CSS)	27.3%	Software/Product Development and data skills
SQL (Structured query language)	23.7%	Software/Product Development and data skills
Cloud Computing	19.2%	Software/Product Development and data skills
Python	14.1%	Software/Product Development and data skills
Information Systems	13.1%	Cybersecurity and System Infrastructure skills
Agile Software Development	12.9%	Software/Product Development and data skills
Java	11.1%	Software/Product Development and data skills
JavaScript	9.0%	Software/Product Development and data skills
Linux	8.5%	Software/Product Development and data skills

Digital skills comparison across job posting subsets

Compared to tech jobs and overall jobs that require a university and college education, nonprofit jobs do not tend to demand more intense digital skills typically used in the creation of digital products and services, data analysis, cybersecurity, and information systems. Software/product development and data skills, which include HTML/CSS, SQL, artificial intelligence, and coding skills such as Python and Java are not as often demanded in nonprofit postings compared to those in other jobs which require similar education credentials, and within tech jobs.

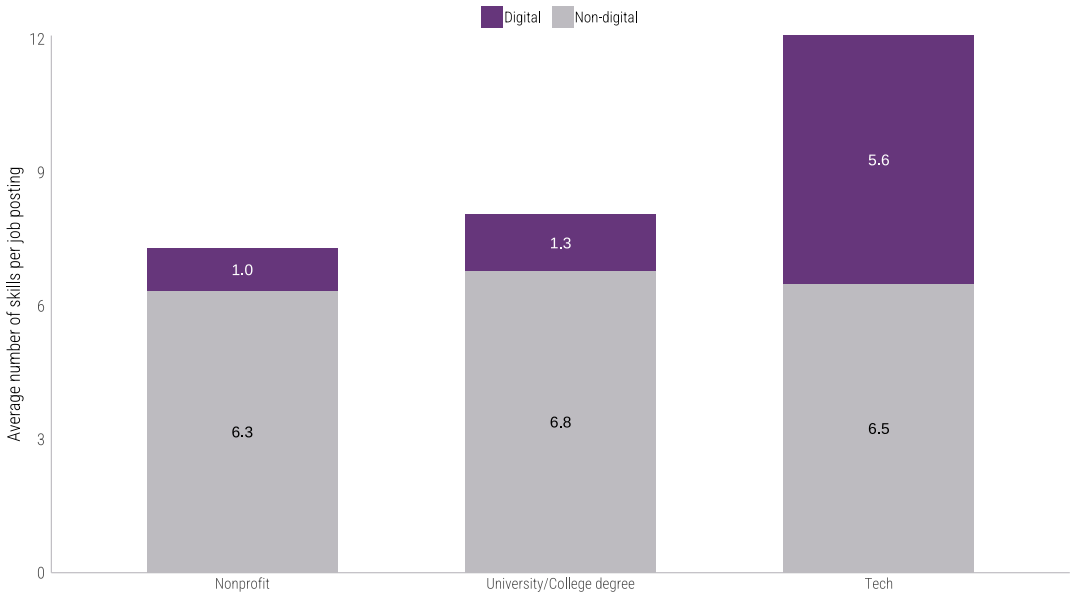
Analyzing the top Microsoft skills across each subset of jobs reveals their relative digital skills strengths. For job postings for tech workers, the top Microsoft skill is Azure, a cloud computing platform in the Software and product development skill sub-cluster. For job postings requiring a university or college degree, the top Microsoft skill was Excel, a spreadsheet software often used for data organization and analysis in the Workforce digital skills sub-cluster. For nonprofit job postings, the top Microsoft skill was Office, which includes a wide range of software including Outlook, Word, PowerPoint, and Excel. While leveraging some of the more technical, higher digital intensity Microsoft skills may not be as ubiquitous in the nonprofit sector, finding ways to adopt more efficient technologies is a way in which the sector can keep up with evolving digital trends.

Artificial intelligence (AI) skills are on the rise in Canada, given the potential to disrupt the labour market. The role of AI skills in creating and operating technologies that could boost productivity for the everyday worker makes these skills highly sought after by employers. In 2023, the prevalence of AI postings in Canada grew from 0.6% of total job postings in early 2023 to 0.8% of total job postings in September 2023, and 1% as of March 2024.[25] While not in the top 10 digital skills, for tech jobs, AI was demanded in 7.1% of postings (or over ten times as much as AI appearances in nonprofit job postings). This was seen prominently in nonprofit jobs as well, where the share of nonprofit job postings demanding artificial intelligence skills increased by 32.7% between the first and second half of 2023 (compared to a 10.6% growth for tech workers), which suggests that to a degree nonprofits are responding to digital skills trends.

The amount of digital skills in job postings for nonprofits pales in comparison to that of jobs in adjacent industries, as seen in Figure 4. An average nonprofit job posting has just 1 skill on average listed as a digital skill, compared to an average of 5 skills in tech job postings. Furthermore, 63.3% of nonprofit job

postings do not demand any digital skills at all, which is on par with jobs requiring a university or college degree. This is contrasted by tech jobs, where 13.8% of postings do not require any digital skills. While it is likely that a greater proportion of nonprofit jobs do not require technical or digital capabilities to perform their duties, upskilling nonprofit workers to possess a baseline of digital skills may be beneficial to boost the digital capacity of nonprofit activities, which may include delivering services, outreach, and managing customer data and information. Evidence shows that digitization and technological infrastructure help strengthen organizational resilience against shocks and economic uncertainty.[26] [27] [28] Nonprofit resiliency, especially coming out of the COVID-19 pandemic, is an imperative focus to ensure communities receive the support that they need.

Figure 4: Average number of digital and non-digital skills by job type, 2023



Conclusion

In an era of rapidly changing digital technologies, the need to adapt is imperative to ensure longevity and competitiveness. The nonprofit sector is no exception; given the role that this sector plays in providing vital resources, goods, and services to communities, its ability to evolve alongside changes in the digital space is essential to keep workers employed and services running.

While the nonprofit sector does not demand similar levels of digital intensity in skills compared to other adjacent knowledge industries, there are opportunities to leverage digital skills to enhance existing tasks of nonprofit workers. Given that the sector has shown to respond to digital skills trends, providing opportunities to upskill workers and finding ways to incorporate digital skills into everyday tasks could support futureproofing the sector from shocks that could arise from an increasingly digital workforce and economy.

While digital upskilling needs may vary by organization, employers making upskilling a priority and allocating the appropriate resources to identify where the gap in digital skills exists (e.g. who needs training and which skills need to be taught) is an imperative part of the equation. Microcredential programs, generally catered towards specific skills/software rather than broad knowledge areas, could be a solution to provide quick and effective upskilling targeted for working professionals who require them.[29] Training programs for digital skills specifically catered to nonprofit workers could support increased resilience of the sector, which may require collaboration from government, educational institutions, and other stakeholders to action. The investment into the long-term development of the sector could translate to improvements in the sector in the form of improved effectiveness in service delivery, innovation and adaptability, and an increased capacity to address complex challenges.

APPENDIX A

Nonprofit NAICS

In addition to the industries of the job postings that were assigned as nonprofit as an output of the text classification, all job postings under the following NAICS industries were classified as nonprofits.[30] This is adapted from the ONN definition and the SANIV definition of nonprofits.

Table A.1: NAICS industries used to identify nonprofit organizations

NAICS Industry	Notable inclusions (non-exhaustive)
5417—Scientific research and development services	Laboratories or establishments conducting research or experimental development in physical, engineering, life sciences, social sciences or humanities
61—Educational services (excluding 6114—Business and computer and management training)[31]	Elementary and secondary schools, Community colleges and C.E.G.E.P.s, Universities, Technical and trade schools
621—Ambulatory health care services	Offices of physicians and dentists, Out-patient care centres, Medical and diagnostic laboratories
622—Hospitals	General medical and surgical hospitals, Psychiatric and substance use hospitals
62321—Residential Developmental Handicap Facilities	Provision of care in a group home or institutional setting, Hospitals or homes for persons with developmental disabilities
62399—Other residential care facilities	Transition homes for victims and survivors of abuse and domestic violence, Homes for children with a mental health condition or disability, Homes for persons with a physical disability, Foster homes
624—Social assistance	Children's aid services, youth centres, Services for the elderly and persons with a disability, Refugee services, Crisis intervention centres, Food banks, Community housing services, Community service employment training programs
7121—Heritage institutions	Museums, Zoos, Nature parks, Historic and heritage sites
813—Religious, grant-making, civic, and professional and similar organizations	Community action advocacy groups, Social change organizations, Public interest groups, Churches, Grant-making foundations, Citizens' unions, Chambers of commerce, Professional organizations / associations, Labour unions, Political parties, Property owners' associations

APPENDIX B

Text classification methodology

A Naive Bayes text classifier was used to identify job postings as nonprofit organizations based on the job description text that was provided through Vicinity Jobs. A sample of 300,000 job descriptions corresponds to approximately 10% of total job postings in Canada in 2023. This provides a sufficient amount of data to estimate the true parameters of the overall population of job postings in the year to a 95% confidence level with a 5% margin of error.[32]

The job postings were split into a training and test set (split 80% and 20% in each set, respectively). Nonprofit status was assigned to the postings based on a combination of keyword matching and NAICS industries. Postings that feature the string of words "non-profit", "non-profit", "charity", "non profit", "philanthropic", "non-profits", "non-profits", "charitable", and "not for profit" were inferred as nonprofit job postings. Certain job postings that featured these words that also were in goods-producing NAICS such as Manufacturing and Utilities, as well as Finance and Insurance industries were removed from nonprofit consideration based on a manual audit of organizations under those NAICS. In addition, postings that had a NAICS code in Appendix A were classified as nonprofit.

The occurrence of each word in a job description was measured for its **term frequency** and **inverse document frequency** for both job postings that are nonprofits and not a nonprofit:

Term frequency (TF): The number of times a word t appears in a job posting j. Naturally, job postings with more words that have a higher term frequency in nonprofit job postings have a higher likelihood of being a nonprofit job posting.

$$TF_{t,j}$$

Inverse document frequency (IDF): The logarithm of the total number of job postings with description text divided by the number of job postings that contain a certain word. This gives a sense of uniqueness that a word carries, and can be expressed with the following equation:

$$IDF_t = log\left(\frac{N}{DF_t}\right)$$

where t represents a given word that appears in a job posting, N representing the total number of job postings with job descriptions (this remains static for each t), and DF_t representing the number of job postings which contain the word t. Given that an IDF is an inverse of the fraction representing the proportion of job postings containing a certain word, the more rare a word features in job postings, the higher the IDF.

The TF and IDF for each word are multiplied together to create a TF-IDF score for each word t in a job posting j.

$$TFIDF_{t,j} = T_{t,j}\, log\left(\frac{N}{DF_t}\right)$$

The likelihood of each job posting being a nonprofit is assigned incorporating the product of the TF-IDFs of each word in a job description, and based on the score which satisfies the following formula:

$$P_j(NP \mid t_1, t_2, \ldots, t_n) = argmax_{NP}\, P(NP) \Pi^n_{x=1} TFIDF_{tx,j}$$

with NP = 0 or NP = 1 representing nonprofit status, t_1 to t_n representing each word in the job description of a job posting j, and P(NP) representing the initial estimate (or "prior") of the proportion of job postings that are in each NP class, $\Pi^n_{x=1} TFIDF_{tx,j}$ representing the product of all TF-IDFs of the words in a job description. A job posting would be assigned as a nonprofit or not a nonprofit depending on which classification receives a higher score from the algorithm above.

A series of validation tests was completed to assess the performance of the model on the test set. A confusion matrix assessing the precision (or the proportion of correctly assigned job postings from all job postings that were assigned by the model under each class, including both true positives and false negatives) and recall of the model (the proportion of job postings under each class that were assigned correctly) produced the results in Table A.2, with an overall accuracy score of 97%.

Table A.2: Classification report of the Naive Bayes model

Nonprofit classification	Precision	Recall	F1-score[33]
Not a nonprofit	98%	98%	98%
Nonprofit	94%	93%	94%

Endnotes

1 Imagine Canada, "Get to Know Ontario's nonprofit sector", 2021. https://www.imaginecanada.ca/sites/default/files/Datasheet-ON-2022.pdf

2 Imagine Canada, "Canada's Charities & Nonprofits". 2021. https://www.imaginecanada.ca/sites/default/files/Infographic-sector-stat-2021.pdf

3 Imagine Canada, "About the nonprofit sector". https://www.imaginecanada.ca/en/About-the-sector.

4 Statistics Canada, Employment in non-profit institutions by sub-sector (x1,000), March 28, 2024. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3610061701

5 Statistics Canada, Gross domestic product (GDP) of non-profit institutions by sub-sector (x 1,000,000), March 28, 2024. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3610061601

6 Imagine Canada, "Canada's Charities & Nonprofits", 2021. https://www.imaginecanada.ca/sites/default/files/Infographic-sector-stat-2021.pdf

7 North American Industry Classification System (NAICS) is Canada's national system used to classify businesses and industries, as per Statistics Canada. As of 2022, there are 20 high-level NAICS sectors, with many more sub-sectors within each sector.

8 Ontario Nonprofit Network, "Not Working For Profit: A Labour Market Description of the Nonprofit Sector in Toronto", May 2011. https://theonn.ca/wp-content/uploads/2011/06/Not-Working-For-Profit-ONN-TWIG-Report-May-2011.pdf

9 Statistics Canada, "Satellite Account of Non-profit Institutions and Volunteering", March 28, 2024. https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=5110

10 More detail on the text classifier is provided in the Methodology and Appendix B.

11 This does not mean that every organization under these NAICS industries are nonprofits.

12 The methodology to classify which skills are considered digital or non-digital is included in the report *The Skills Algorithm* (pg. 15-16).

13 From January 1st to December 31, 2023.

14 A similar analysis on digital skills was done using NAICS industries from a larger subset of job postings which do not contain job descriptions to identify nonprofits, which yielded similar results.

15 French language nonprofit job postings were only identified by NAICS, given the limited sample size of French language postings available to be used in the text classification model.

16 See page 17 of *The Skills Algorithm* for a more detailed explanation on how the sub-clusters were developed.

17 Brookfield Institute for Innovation + Entrepreneurship, "The O*NET/NOC Crosswalk, an update.", November 30, 2020. **https://brookfieldinstitute.ca/crosswalk-blog-post/**

18 Government of Canada, "TEER Category", June 2, 2023. **https://noc.esdc.gc.ca/Training/TeerCategory**

19 National Occupational Classification (NOC) is Canada's national system for describing occupations, as per Employment and Social Development Canada (ESDC)'s definition. The 2021 version of the NOC system has 516 unique 5-digit occupations.

20 Any job posting that contains any Microsoft Suite skill, such as Excel, Office, Word, Powerpoint, Access, Visio, Azure, etc.

21 Out of a total of 751,184 jobs that require a university or college education.

22 Any job posting that contains any Microsoft Suite skill, such as Excel, Office, Word, Powerpoint, Access, Visio, Azure, etc.

23 Based on a total of 44,089 tech job postings.

24 Any job posting that contains any Microsoft Suite skill, such as Excel, Office, Word, Powerpoint, Access, Visio, Azure, etc.

25 Based on the author's analysis of Vicinity Jobs data as of May 2024.

26 Nielsen, Mathiassen, Benfeldt, Madsen, Haslam, Penttinen, *Organizational resilience and digital resources: Evidence from responding to exogenous shock by going virtual*, International Journal of Information Management, Volume 73, 2023. https://doi.org/10.1016/j.ijinfomgt.2023.102687

27 Zhang, J.; Long, J.; von Schaewen, A.M.E. *How Does Digital Transformation Improve Organizational Resilience?—Findings from PLS-SEM and fs*QCA. Sustainability 2021, 13, 11487. https://doi.org/10.3390/su132011487

28 McKnight, Gouweloos. *Assessing Non-Profit Resilience in Response to* COVID-19, McMaster University. 2021. https://resilience.degroote.mcmaster.ca/wp-content/uploads/sites/61/2022/08/Assessing-Nonprofit-Resilience-Interim-Update-final.pdf

29 The Dais. *Built to Scale? Microcredentials Use Among Digital Professionals*, October 21, 2023. https://dais.ca/reports/built-to-scale-microcredentials-use-among-digital-professionals/.

30 All definitions are derived from Statistics Canada's North American Industry Classification System (NAICS) Canada 2022 Version 1.0—https://www23.statcan.gc.ca/imdb/p3VD.pl?Function=getVD&TVD=1369825

31 Excluded due to a high concentration of for-profit establishments.

32 For more information on selecting sample size, please refer to this resource from Qualtrics: https://www.qualtrics.com/experience-management/research/determine-sample-size/

33 The F1-score is the harmonic mean of the precision and recall scores.