Manitoba Ecosystem
Cybersecurity

Acknowledgements

Introduction

In a society shaped by tech, what comes to mind when you think of your career? As you begin to navigate the professional world, it is useful to consider the future of work. Technology will disrupt an estimated 25 per cent of Canadian jobs in the next decade, however, more jobs will be created by technology than lost. Currently, Manitoba is experiencing a tech talent shortage as there are more jobs available than people to fill them. Because of this, tech workers are often incredibly valued, have high job security, and plenty of job opportunities.

More people own digital devices and are connected to the internet than ever before, leading to increased sharing of personal and financial information over the internet. Combined, these factors bring to light the criticality of cybersecurity infrastructure and skilled cybersecurity talent, both key measures to protect individuals and businesses from growing instances of cybercrime.

Although many people enter the field of cybersecurity with a formal academic background – specific skillsets and experience are key such as System Analysis, Windows Servers, and Data Analysis are most important. The field also demands soft and transferrable skills such as interpersonal communication, teamwork, and problem solving.

The importance of cybersecurity professionals

The global cost of cybercrime is estimated to be $6 trillion USD (2021). Cyber-attacks can include denial-of-service attacks, phishing where misleading messages are used to trick users into providing personal information; and malware, where malicious software is installed on a user's computer without their consent. Fortunately, Canada is home to a vibrant cybersecurity industry, attracting professionals with high-salaries and boasting low levels of unemployment.

Cybersecurity accounted for one of the top ten digital roles identified in ICTC's 2020 Outlook Report. Yet at the same time, the industry is predicted to see severe shortages in cybersecurity personnel. Amid this shortage, there is an excellent opportunity for Manitoba to assume a leadership role in the cybersecurity field.

Did you know?

Approximately 6 trillion is expected to be spent globally on cybersecurity in 2021.
There is a hacker attack every 39 seconds.

Definition:

Cybersecurity Professionals design and maintain secure systems to protect their organization from digital attacks, or to respond to these attacks. Cybersecurity professionals are familiar with computer networking concepts and protocols, risk management, privacy, cyber threats and vulnerabilities, and the operational impacts of cybersecurity lapses. They are also familiar with laws, regulations, policies, and ethics related to cybersecurity. They have roles ranging from "ethical hackers," who test the limits of existing security strategies; to high-level cybersecurity strategists; to hardware or database experts; to C-suite roles focused on the management on information systems and intellectual property. Depending on their level of experience, they possess a range of skills such as security analysis, identity and access management, risk management, threat-hunting, incident management, data science, or computer forensics.

Did you know?

The number of cyber attacks is going UP not down. Though white hat hackers continue to improve, the total number of cyber attacks doubled in 2017. That is according to the Online Trust Alliance (OTA), which has named 2017 "the worst year ever in data breaches and cyber-incidents around the world.

Cyber Defence Occupations

The NICE Framework

One way to understand the breakdown of cybersecurity staff by role is through the categories supplied by the NICE Framework. This American framework has been adopted by organizations around the world with the intention of adopting standardized terminology for cybersecurity jobs and skills and classifies the field of cybersecurity into 7 categories.

Securely Provision (SP)

Conceptualizes, designs, procures, and builds secure information technology systems and networks

Enterprise Architect   Security Architect   Systems Developer

Analyze (AN)

Performs highly specialized analysis of incoming cybersecurity information to determine its usefulness for intelligence and improve security

Threat/Warning Analyst

Operate and Maintain (OM)

Provides the support, administration, and maintains the security of systems, data, and networks

Database Administrator   Data Analyst   System Administrator

Systems Security Analyst

Investigate (IN)

Investigates cybersecurity events or crimes related to information technology systems, networks, and digital evidence

Cyber Crime Investigator   Law Enforcement/ Counterintelligence Forensics Analyst

Oversee and Govern (OV)

Provides leadership, management, direction, or development and advocacy so the organization may effectively conduct cybersecurity work

Privacy Officer   Cyber Instructor   Information Systems Security Manager

IT Project Manager

Collect and Operate (CO)

Provides specialized threat detection and deception activities to identify and mitigate security risks

Cyber Operator   Ethical Hacker

Protect and Defend (PR)

Identifies, analyzes, and mitigates threats to internal information technology systems, data, and networks

Cyber Defense Analyst   Vulnerability Assessment Analyst

Critical Hard Skills for Cyber Defence

The precise hard skills required for different types of cybersecurity professionals will vary depending on their level of experience, area of focus or specialization, and the specific technological situation of their employer. Job titles and descriptions in the cybersecurity ecosystem are not always easy to categorize due to the distinctive needs of different organizations. Research has shown that employers will often write very broad job description to attract a diverse array of applicants, and thus will often resemble the "wish lists" of an organization rather than the actual needs.

In a sample of over 5000 unique Manitoba-based job postings for roles in Cybersecurity, the top hard skills were:

SQL	Automation	Business Requirements
Project Management	Agile Methodology	Systems Analysis
Windows Servers	Data Analysis	Software Development
Technical Support	Active Directory	Operating Systems

Soft Skills

Cybersecurity professionals also require soft skills to perform their jobs well. Some of these skills, such as problem-solving and effective communication, can be learned in an educational context, while others are more suited to learning "on-the-job." In a sample of over 5000 unique Manitoba-based job postings for role in cybersecurity, the top soft skills were:

Communication   Management   Problem solving   Leadership

Customer service   Planning   Operations   Infrastructure

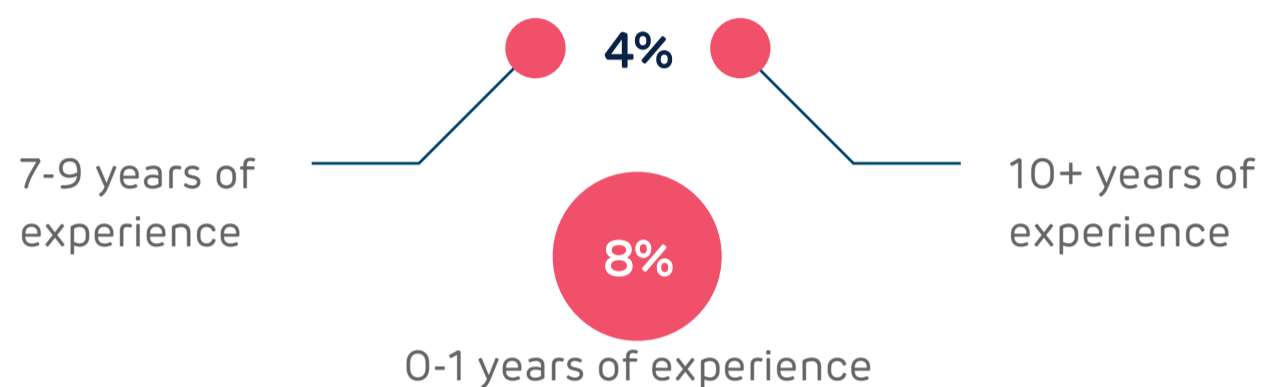**Interpersonal communications   Detail-orientation**

Did you know?

In the last three years alone, job-postings for roles related to cybersecurity included several dozen titles including IT Manager, Systems Analyst, Software Tester and System Administrator.

Cybersecurity Experience Track

According to a review of over 5000 unique postings related to Cybersecurity in Manitoba, the most-frequently requested level of experience was two-three years (30%). 34% of the postings did not specify a preferred level of experience.

4%

7-9 years of experience

10+ years of experience

8%

0-1 years of experience

20%
4-6 years of experience

30%
2-3 years of experience

This data leads to an interesting point – what are employers looking for when hiring in cyber security? Certifications are a major feature in the cybersecurity ecosystem. A 2019 study found that 59% of cybersecurity professionals either planned to obtain at least one certification in the year or were already pursuing one. Many employers value tangible cybersecurity-specific training more than degree programs. A wide range of certifications are available for cybersecurity professionals, covering applications as diverse as cloud computing to information systems. The following is a sample list of them:

- **Certified Information System Security Professional (CISSP)**
- **SANS**
- **GIAC**
- **CompTIA Security+**
- **Certified Ethical Hacker (CEH)**
- **Certified Information Security Manager (CISM)**
- **Certified Information Systems Auditor (CISA)**
- **NIST Cybersecurity Framework (NCSF)**
- **Certified Cloud Security Professional (CCSP)**
- **Computer Hacking Forensic Investigator (CHFI)**
- **Cisco Certified Network Associate (CCNA)**
- **Cisco Certified Network Professional (CCNP)**
- **Cisco Certified Entry Networking Technician (CCENT)**
- **Microsoft Security Engineer (MCSE)**
- **Microsoft Solutions Architect (MCSA)**

Certifications allow cybersecurity employees to customize their skillset, however certifications can be expensive. Among job postings in Manitoba in cybersecurity, the most requested forms of cybersecurity certification were **CCNA, CISSP, CCNP,** and **CISM,** which is line with other sources such as reports by Cybersecurity and IT Security Certifications and Training.

Industry Size and Growth

In terms of employment, Manitoba's cybersecurity-related ecosystem has grown slowly but steadily from 7,017 jobs in 2005 to 7875 jobs in 2019.

Unemployment Rates

The unemployment rate in cybersecurity-related jobs has remained low over the last five years. Unemployment in cybersecurity has remained consistently lower than unemployment in the Manitoba ICT sector generally, the Manitoba economy and the Canadian economy.
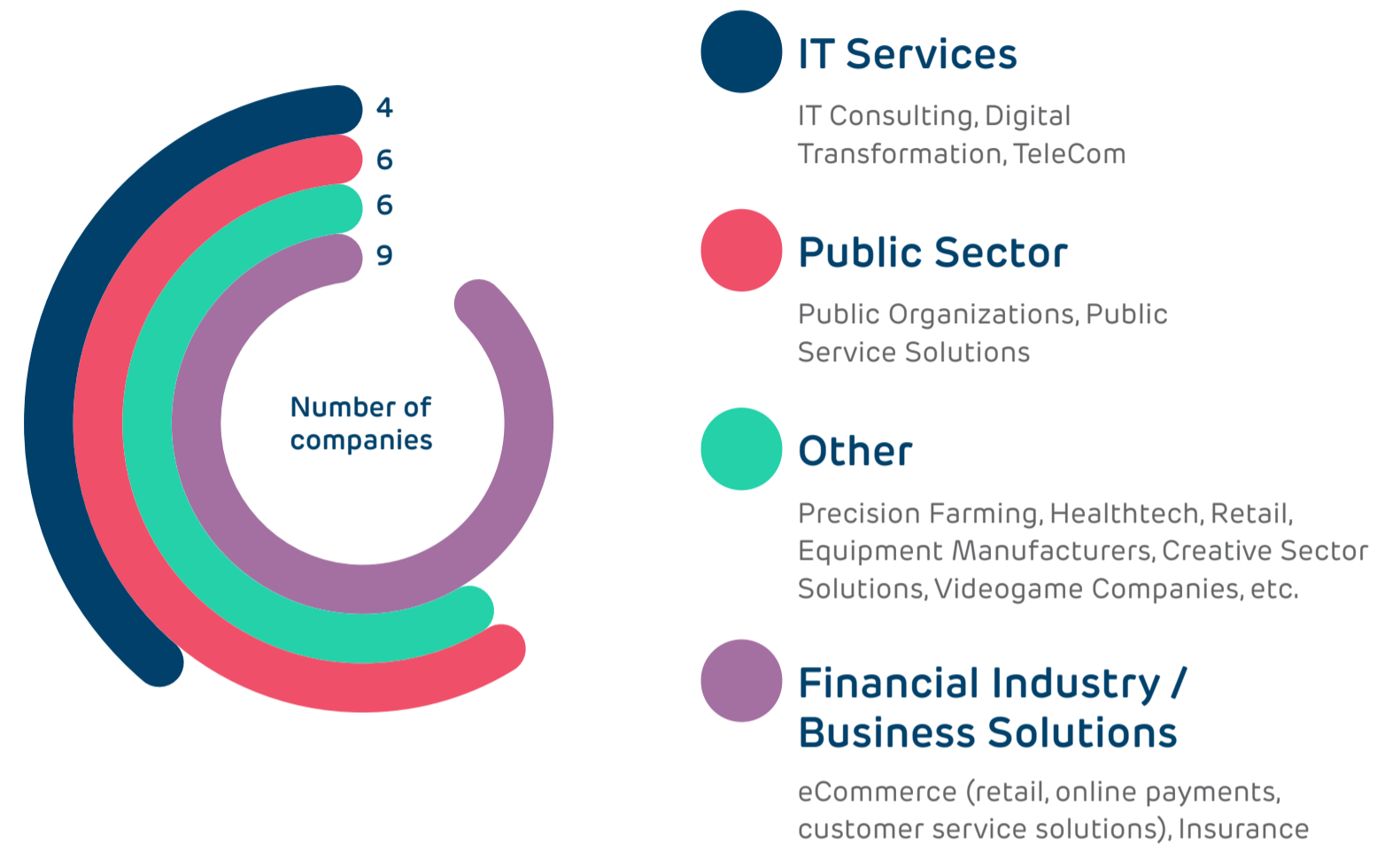
Regional Distribution

Most cybersecurity job postings (95%) over the last three years originated in Winnipeg. The only other notable city for postings was Brandon, Manitoba.

Top Employer Snapshots

Cybersecurity professionals may work for dedicated cybersecurity firms and organizations, academic institutions, or government bodies. Research has found that investment in cybersecurity personnel is more common in larger organizations across Canada.

An analysis of the top 25 hiring companies in Manitoba over the past three years found that just over one-third focused on financial and business solutions and were mostly related to insurance. One-quarter were in the IT services sector, including several national telecommunications companies and the final third were spread across a range of industries ranging from video games to AgTech.

Top Employers in Cybersecurity-related jobs by Industry

Number of companies

IT Services — 4
IT Consulting, Digital Transformation, TeleCom

Public Sector — 6
Public Organizations, Public Service Solutions

Other — 6
Precision Farming, Healthtech, Retail, Equipment Manufacturers, Creative Sector Solutions, Videogame Companies, etc.

Financial Industry / Business Solutions — 9
eCommerce (retail, online payments, customer service solutions), Insurance

Top Employers in Cybersecurity-related jobs by Headquarters Location

Location	# of Companies
HQ in Winnipeg	14
HQ in Canada, outside Manitoba	5
Multinational Company	4
HQ in Manitoba, outside Winnipeg	2

Salary Trends

National Level Trends

National-level salary data from 2020 is provided by Hays Canada. According to this data, roles in cybersecurity span a wide range of salaries. The lowest-paid jobs start in Administrative, Analysis, or Consultant roles. Salaries in those roles range from under $50,000 CAD to just under $100,000. Engineering and Architect roles range from $80,000 to $160,000. The highest salaries in cybersecurity go to executives, such as Chief Information Security Officers, and VPs or Directors of Information Security. Salaries at this level start at six-figures and can exceed $200,000.

Role	Average Salary Range
Chief Information Security Officer (CISO)	180k to 230k
VP, Information Security	130k to 200k
Enterprise Security Architect	130k to 160k
Director, Information Security	100k to 150k
Network Security Architect	105k to 135k
Cloud Security Architect	90k to 130k
Application Security Engineer	80k to 110k
Digital Forensics Analyst	65k to 95k
Senior Penetration Tester	60k to 90k
Data Security Consultant	60k to 90k
Malware Analyst	60k to 90k
Security Administrator	45k to 75k

Provincial Level Trends

Salaries in Manitoba for cybersecurity professions appear to trend between $2,000 to $5,000 a bit below the Canadian average, depending on NOC code. Statistics Canada reports that Information Systems Analysts and Consultants in Manitoba make $2000 more than the Canadian average.

Did you know?

There are white hat hackers that hack for good reasons and workplaces such as government buildings to identify loopholes in the existing technology and fix it before black hat hackers discover them. Blackhat hackers hack for bad reasons and some of their activities include stealing credit card information and accessing email accounts. Other hackers hack just because they are able to, or cause chaos, and not have any real agenda.

EDUCATION PATHWAYS:
Traditional and Emerging Education

Cybersecurity is a fast-evolving field that attracts self-motivated, ambitious professionals who enjoy learning new skills. It is also a field in which the education and career pathways are not clear-cut; a 2019 study by (ISC) found that nearly half of cybersecurity professionals did not begin their career intending to pursue cybersecurity. Likewise, jobs postings for cybersecurity roles in Manitoba reflect that the industry is heavily focused on skills.

Traditional Education

Many cybersecurity professionals do not begin their job search intending to work in cybersecurity but are instead drawn into the field for various reasons including the challenge, the desire for rewarding work, and high compensation in a relevant field. Currently however, IT remains the most common educational background for cybersecurity professionals, and in Manitoba, there are a select number of academic programs that fall into this category. Listed below are all the post-graduate programs in Manitoba which focus either on Cybersecurity or provide a foundation with which to enter the field.

Emerging Education

Cyber bootcamps, Massive Open Online Courses (MOOCs), and other forms of emerging education provide an alternative or complementary approach to traditional education in universities or colleges. Manitoba has some training centers, such as those operated CED, which offer intense prep session for people pursuing a specific cybersecurity certification.

10 months — Certificate, Network and Systems Administrator
MITT

11 months — Diploma, Network Security Technician
Robertson College

16 months — Diploma, Network Security
University of Winnipeg /MITT

20 months — Diploma, Cyber Defence and Cloud Administration Diploma
MITT

3 to 4 Years — BSc or BA, Major or Honours Major in Applied Computer Science
University of Winnipeg

3 to 4 Years — BSc, Major or Honours in Computer Science
University of Manitoba

4 to 5 Years — BSc (Engineering) in Computer Engineering
University of Manitoba

3 to 4 Years — BSc, Computer Science
Brandon University

2 Years — Post Graduate Diploma, Information Security
Red River College

1 year — MSc in Computer Science
University of Manitoba

1 year — MSc in Applied Computer Science
University of Winnipeg

? Did you know?

MyDoom is the most expensive virus that the world has ever experienced. This virus caused approximately $38.5 billion worth of financial damages. The virus originated in Russia and it was first spotted in the year 2004 but the author was never discovered. This virus spread quickly through email worms.

Did you know?

93% of breaches could have been avoided by taking simple steps, such as regularly updating software or leveraging modern cloud-based solutions. Can you believe that breaches are easy to prevent? There is an old saying that "the best defense is a good offense". It applies to the cyber security world too.

Summary

Manitoba's cybersecurity ecosystem has seen steady growth over the past ten years and has shown consistently low unemployment rates and relatively high salaries in the last decade. The increasing prominence of digital devices in the workplace and home paired with long-term labour market trends provide a strong impetus for Manitoba to prioritize its growth and competitiveness in this tech field. The tech ecosystem offers high paying jobs and interesting work, yielding exciting opportunities for Manitoba students.

Appendix A: Employer Lists
(who hires in Manitoba in Cybersecurity)

Cybersecurity: Relevant Companies by industry

Financial Industries—eCommerce (Retail, Online Payments, Customer Service Solutions), Insurance

- Wawanesa Insurance, an insurance company – **wawanesa.com**
- Canada Life an insurance company – **canadalife.com**
- iQmetrix, a retail commerce solutions company – **iqmetrix.com**
- Ceridian, a human capital management company – **ceridian.com**
- Manitoba Public Insurance Corporation – **mpi.mb.ca**
- Celero, a financial services and fintech company – **celero.ca**
- MNP LLP, a professional services firm – **mnp.ca**

Professional IT Services (IT Consulting, Digital Transformation, Telecommunications)

- NTT Data, an IT services company – **nttdata.com**
- Rogers, a telecommunications company – **rogers.com**
- Bell Canada (BCE), a telecommunications company – **bell.ca**
- Precision ERP, an IT consulting company – **precisionerp.com**

Public Sector

- Public organizations such as the Winnipeg Regional Health Authority, University of Winnipeg, University of Manitoba, Government of Manitoba, the City of Winnipeg, and Prairie Mountain Health

Other Industries (Health Tech, Retail, AgTech, Manufacturing and Industrial, Creative Industries)

- Motorcoach Industries, a manufacturer of motor coach buses – **mcicoach.com**
- Pollard Banknote Limited, a betting games company – **pollardbanknote.com**
- Ubisoft, an in-house game development company – **ubisoft.com**
- Farmers Edge, a global leader in decision farming – **farmersedge.ca**
- Varian Medical Systems, a cancer care technology and solutions company – **varian.com**
- Hylife, a producer of pork – **hylife.com**

Cybersecurity: Relevant Companies by Location
Headquarters in Winnipeg

- Public organizations such as the Winnipeg Regional Health Authority, University of Winnipeg, University of Manitoba, Government of Manitoba, the City of Winnipeg, and Prairie Mountain Health
- Wawanesa Insurance, an insurance company – **wawanesa.com**
- Canada Life, an insurance company – **canadalife.com**
- Farmers Edge, a global leader in decision farming – **farmersedge.ca**
- Pollard Banknote Limited, a betting games company – **pollardbanknote.com**
- Motorcoach Industries, a manufacturer of motor coach buses – **mcicoach.com**
- Manitoba Public Insurance Corporation – **mpi.mb.ca**

Headquarters in Manitoba, outside of Winnipeg

- Hylife, a producer of pork – **www.hylife.com**
- Public organizations such Prairie Mountain Health

Headquarters in Canada, outside of Manitoba

- Rogers, a telecommunications company – **www.rogers.com/**
- Bell Canada (BCE), a telecommunications company – **www.bell.ca**
- MNP LLP, a professional services company – **www.mnp.ca/en**
- iQmetrix, a retail commerce solutions company – **www.iqmetrix.com**
- Precision ERP – **www.precisionerp.com/**

Internationally located headquarters

- Ubisoft, an in-house game development company – **www.ubisoft.com**
- Varian Medical Systems, a cancer care technology and solutions company – **www.varian.com**
- Ceridian, a human capital management company – **www.ceridian.com**
- Celero, financial services and fintech company – **www.celero.ca/**
- NTT Data, an IT services company – **www.nttdata.com/global/en/**

Appendix B: Salary Data

Average Salaries in Cybersecurity-related Job Titles

Job Title	Salary – Canada	Salary – Winnipeg/ Greater Winnipeg
Chief Information Officer	$165,000 (LinkedIn) $188,000 (Glassdoor)	$146,000 (LinkedIn)
Information Security Director	$109,004 (Indeed)	$128,000 (Glassdoor)
Security Engineer	$85,000 (LinkedIn)	$80,100 (LinkedIn)
IT Security Consultant	$80,000 (LinkedIn)	$74,600 (LinkedIn)
Information Security Analyst	$65,000 (LinkedIn) $64000 (Glassdoor)	Not Available
Penetration Tester	$92,000 (Indeed) $58,000 (LinkedIn)	Not Available

Cybersecurity Salary Data
EMSI Salary Data

NOC Code	Manitoba	Canada
0213 – Computer and Information Systems Analysts	Median: $77,700 Based on 167 salaries	Median: $82,800 Based on 5,340 salaries
2171 – Information Systems Analysts and Consultants	Median: $65,200 Based on 134 salaries	Median: $77,700 Based on 7,278 salaries
2172 – Database Analysts and Data Administrators	Median: $44,400 Based on 86 salaries	Median: $68,500 Based on 3,381 salaries
2281 – Computer Network Technicians	Median: $50,600 Based on 89 salaries	Median: $56,200 Based on 5,621 salaries
2283 – Information Systems Testing Technicians	Median: $47,000 Based on 41 salaries	Median: $57,300 Based on 1670 salaries