Manitoba Ecosystem
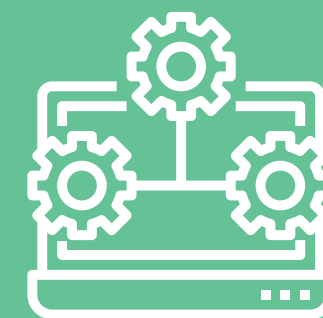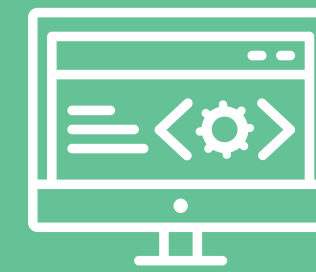## Software Development

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.

Software Developer, Full Stack Developer, UX/UI Designer and DevOps Engineer - were identified among the top ten most in-demand ICT roles, by ICTC in its report Canada's Growth Currency: Outlook 2023, signaling their importance for the sector. With all of this in mind, this booklet provides a detailed understanding of the local software development ecosystem present in Manitoba. Software development has experienced growth rates and low unemployment over the past ten years in Manitoba, which stand out even compared to other professions in the ICT sector. Employers in this field in Manitoba represent a wide range of industries, including financial services and insurance, the public sector, manufacturing, and the creative industries.

Although most people enter the field of software development with a formal academic background – specific skill-sets and experience are key such as SQL, Python, and Java are most important. This field also demands soft and transferable skills such as interpersonal communication, teamwork, and problem solving.
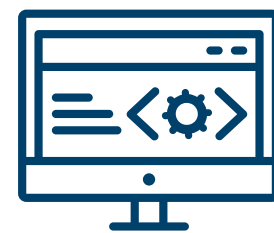
The Importance of Software Developers

Software is the basis of all applications, big and small, from smart phone apps to video games and operating systems, to global eCommerce or inventory management solutions. All these activities have a fundamental need: the right talent to build out the necessary software. Software Developers play an essential role in constructing the digital worlds that we increasingly inhabit.

Software Developers are an indispensable part of Canada's digital economy. In 2020, Software Developers were identified by Canadian employers as one of the top ten most in-demand occupations in the digital economy. This is partly because Software Developers are vital for many kinds of digital companies.

Definition:

Software Developers build applications and programs, then test and maintain those developed products. They can be full-stack developers, with foundational knowledge in many areas of software development, or focused on a specific part of development, such as back-end development, front-end development, or UX/UI. Depending on their level of experience and their unique specification, they will have knowledge of a variety of programming languages and automation and version control tools; and may be proficient with increasingly important aspects of software development, such as database management tools and application programming interfaces (APIs).
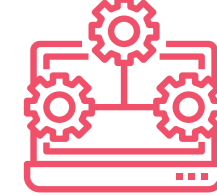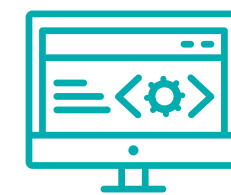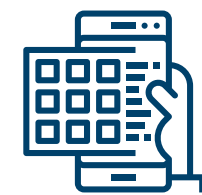
Software Developer Occupations

The four most in-demand digital occupations that could be generally referred to as Software Developer include: Software Developer, Full Stack Developer, UX/UI Designer, DevOps Engineer.

Full Stack Developer

Full stack developers are proficient with both the back and front end of software development. This means they can manage IT infrastructure like databases or servers, and develop and manage APIs along with other elements that focus on the functionality of the product. At the same time, full stack developers are also proficient with the front-facing parts of a website that operate according to the principles of user design and user experience. This includes architecture that monitors responsiveness of applications, design features and usability. Full stack developers are proficient with a number of programming languages like **C/C++**, **HTML**, **Python**, **Java**, **JavaScript**, **and Ruby on Rails**. They are also proficient with database management tools and platforms like **MySQL** or **MongoDB.**

UX/UI Designer

UX/UI Designers are often a hybrid blend of software development and design. They possess an understanding of usability, ease in navigation, accessibility, and other skills related to creating effective user interfaces and designs for desktop and mobile devices. UX/UI designers are utilized in anything from web design, game design, visual effects, and even graphic design. While UX/UI designers do not in all cases need to be proficient with a variety of programming languages like software developers do, they do require knowledge of design platforms like **InDesign**, and cloud computing platforms like **AWS**, **Azure** or **Google Cloud**. UX/UI designers also tend to possess proficiency with web development tools like **Google Chrome Developer Tools**, **jQuery** or **Angular.js**.

Software Developer

Software developers build applications and programs, then test and maintain those developed products. They work with build automation and version control tools to automate and validate applications based on source code and create consistent processes. They have knowledge of a variety of programming languages including but not limited to **Java, JavaScript, C++, C#, Python and SQL.** Software developers possess at least a basic level of comfort with machine learning principles and practices, and increasingly, must be proficient with building and using APIs.

DevOps Engineer

DevOps Engineers are a merger between software development, planning, testing, and troubleshooting. They provide guidance on system opportunities, risks and cost-benefit analyses - all of which contribute to effective strategic organizational and project planning. They also develop and implement IT solutions, upgrades, and troubleshooting for system maintenance. DevOps Engineers possess an understanding of various programming languages like **Python** and **JavaScript**, and can work with a number of development platforms such as **Node.js**, or **React Native**. DevOps Engineers often possess proficiency with **Git** and **Jira**, and are experienced with cloud computing platforms like **AWS**. Lastly, DevOps Engineers also have experience with deployment technologies like **Kubernetes**, **OpenStack** or **Jenkins**.

Critical Hard Skills for four in-demand roles related to Software Development

Nationally

Full Stack Developer

- Proficiency with **CSS**
- Proficiency with **HTML**
- Proficiency with **JavaScript**
- Ability to use cloud platforms like **AWS**
- Ability to work with open-source platforms like **Node.js**
- Proficiency with **SQL**
- Proficiency with **Python**
- Proficiency with **Java**
- Ability to work with and create **APIs**
- Proficiency with **PHP**

DevOps Engineer

- Extensive experience with continuous integration
- Proficiency with **Java**
- Proficiency with **SQL**
- Ability to use cloud platforms like **AWS**
- Proficiency with container management tools like **Docker**
- Ability to work with and create **APIs**
- Proficiency with open-source automation software like **Jenkins**
- Proficiency with open-source container orchestration systems like **Kubernetes**
- Familiarity with open-source deployment tools like **Ansible**
- Proficiency with automation products for software infrastructure like **Puppet**

Software Developer

- Proficiency with **Java**
- Proficiency with **SQL**
- Proficiency with **Python**
- Proficiency with **CSS**
- Proficiency with open-source version control platforms like **Git**
- Proficiency with **JavaScript**
- Proficiency with **HTML**
- Ability to work with and create **APIs**
- Ability to use cloud platforms like **AWS**
- Proficiency with **C/C++**

UX/UI Designer

- Proficiency with **JavaScript**
- Proficiency with **HTML**
- Ability to work with and create **APIs**
- Expert use of **InDesign**
- Ability to work with open-source front-end web frameworks like **AngularJS**
- Expert use of design toolkits like **Sketch**
- Expert use of **Photoshop**
- Proficiency with open-source version control platforms like **Git**
- Familiarity with JavaScript libraries like **jQuery**
- Familiarity with product design platforms like **InVision**

Manitoba

In a sample of 3,407 Manitoba-based job postings for roles included in software development, the top 12 hard skills were: **JavaScript**, **Java**, **C#**, **SQL**, **CSS**, **Agile Methodology**, **.NET Framework**, **HTML**, **Python**, and **Application Programming Interfaces (APIs)**.

Globally

Similar findings appeared in a recent global survey of more than 40,700 professional developers: **JavaScript**, **HTML/CSS**, **SQL**, **Python**, **Java**, and **C#** were rated top languages and **.NET** was rated a top framework

Did you know?

90% of developers report using more than one programming language, while half reported using four or more!

Soft Skills

Software Developers 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".

Soft skills, such as effective communication, are skills which are not technical or role-specific, but still vital for the job. These skills are often cross-cutting in that they apply to many different types of roles. In a sample of 3,407 Manitoba-based job postings for roles related to software development the top 12 soft skills were: *communication, problem solving, troubleshooting, innovation, management, detail oriented, research, integration, planning, leadership, interpersonal skills, and written communication.*

Domain (Specialist) Knowledge

Domain knowledge, on the other hand, is knowledge that pertains to the specific place, industry, or sector that the development team operates in. Examples of this kind of place, industry, or sector-specific knowledge are provided below.

- *In developing an effective e-commerce solution, a software development team needs to have a thorough understanding of e-commerce, including for processes like online shopping, e-commerce transactions, inventory management, and shipping and delivery.*

- *In creating a good restaurant POS (point of sale), a software development team needs to clearly understand the relevant restaurant processes, such as floor plans and common mechanisms to identify specific tables and customers, or communication norms between servers and kitchen staff.*

- *To build a useful, digital solution for pharmacies and their staff, a software development team would need to know what processes are involved in filling a prescription, including drop-off, data entry, filling, patient, medication, and dose review, and consultation.*

Software Developer Experience Track

The specific skills and responsibilities required by a Software Developer will also change over time based on their level of experience. The Software Developer Experience Track is the path that many Software Developers take when progressing from Junior to Senior positions. The Experience Track, outlined on the right, provides a high-level overview of the types of projects and tasks that a Software Developer would have at each experience level.

Junior Software Developer

- Approximately 1 year of experience and 1-3 completed projects
- Tasks include Q/A testing, UI, small bug fixes, and simple features

Software Developer

- Approximately 2 years of experience and 3-5 completed projects
- Tasks include more severe bug fixes, nontrivial features that are mission-critical, and perhaps leading a small team

Senior Software Developer

- 3 or more years of experience and more than 5 completed projects
- A highly experienced group lead with architecture and development tasks that are mission-critical and product critical
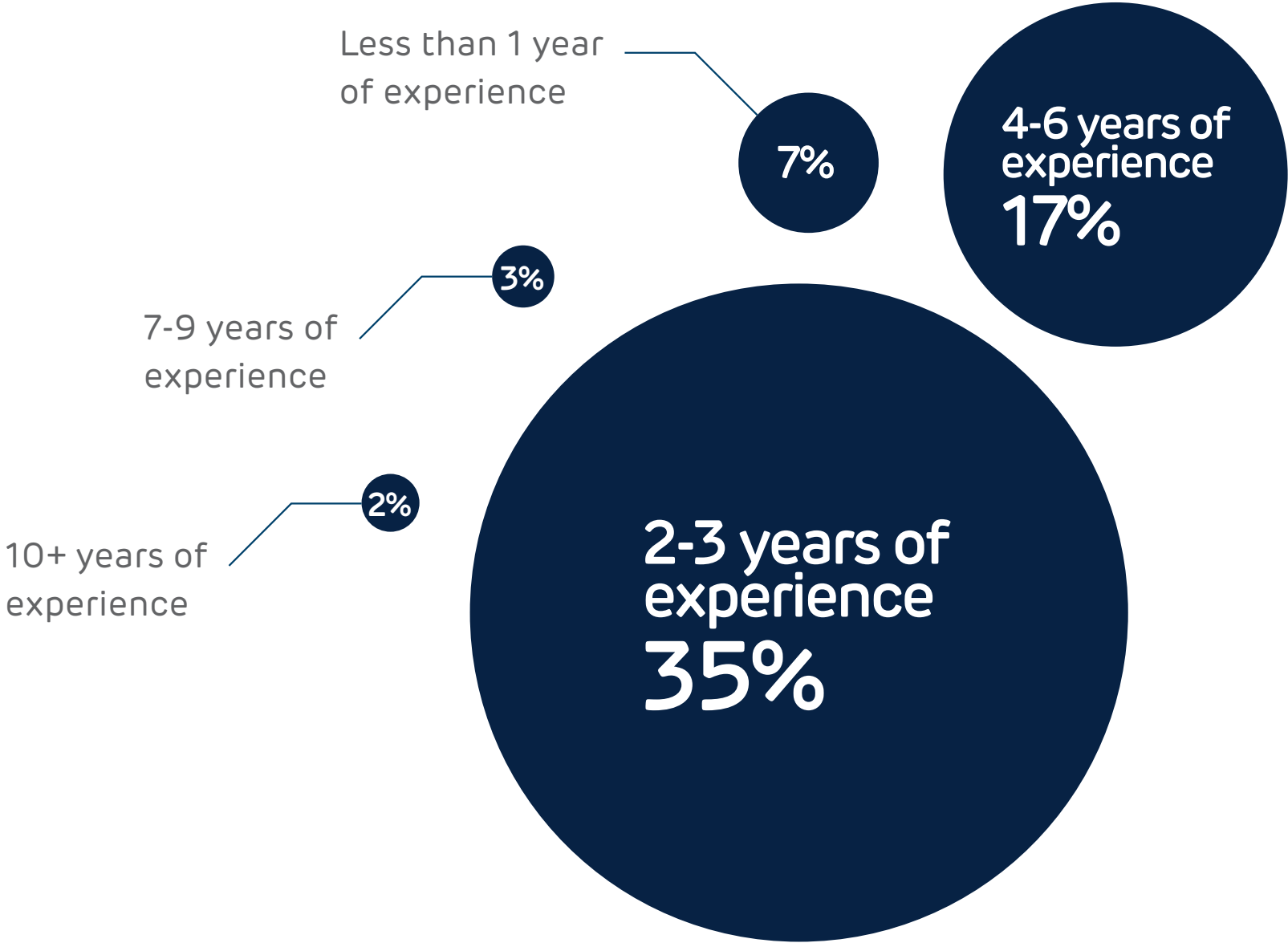
Did you know?

95% of developers have at least some college or university education.

Required or Preferred Level of Experience, Manitoba Job Postings

Not all jobs or job postings specify a required or preferred level of experience. In a sample of 3,407 Manitoba-based job postings classified as software development, 37% did not specify a preferred or required level experience, while 53% did. The most common required or preferred level of experience was 2-3 years.

Less than 1 year of experience

7%

4-6 years of experience 17%

7-9 years of experience

3%

10+ years of experience

2%

2-3 years of experience 35%

Did you know?

In Manitoba, over the last three years, job-postings for roles related to software development have included more than forty different job titles, including Software Engineer, Programmer, Web Developer, Java Developer, User Interface Designer, DevOps Engineer, and Android Developer.

Industry Size and Growth

In terms of employment, Manitoba's software development ecosystem has seen steady growth since 2005. Beginning with approximately 2558 jobs in 2005 the ecosystem grew to 4,569 jobs in 2019.

Unemployment Rates

The unemployment rate among software development has remained relatively low in Manitoba over time, fluctuating between 0% and 5.5% since 2005 and averaging approximately 2% in the last five years alone. Unemployment in software development has also remained consistently lower than unemployment in the province generally. Low unemployment rates generally signal strong demand and/or talent shortages.

Regional Distribution

Winnipeg is the centre of Manitoba's software development ecosystem; the city is where most of the province's relevant jobs, companies, and academic programs are located. Winnipeg accounted for 88.8% of the software development jobs located in Manitoba in 2019, and this trend has remained steady for some time. Interestingly, while jobs located in Winnipeg have fluctuated between 4066 to 4150 over the past five years, jobs located outside of Manitoba have increased 19% from 470 to 561 since 2015.
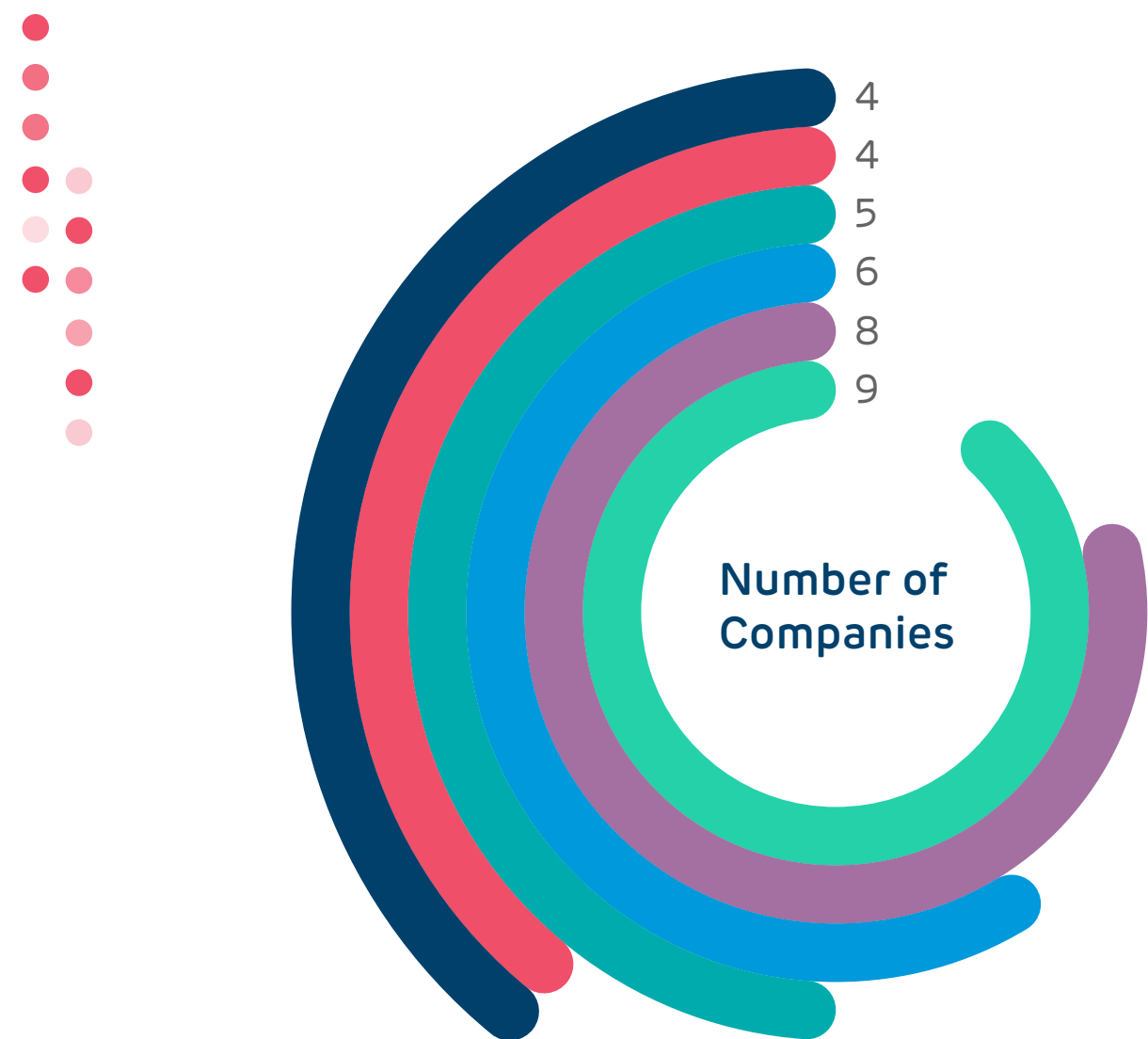
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Did you know?

As software becomes increasingly pervasive, developers are being employed in industries ranging from finance and media to healthcare and education.

Top Employers by Industry

Number of Companies

4
4
5
6
8
9

Other
Precision Farming, Healthtech, Retail, etc.

Creative Industries
Creative Sector Solutions, Video Game Companies

Public Sector
Public Organizations, Public Service Solutions

IT Services
IT Consulting, Digital Transformation

Industrial Manufacturing
Equipment Manufacturers, Services

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

Top Employers by Location

Location	# of Companies
Companies based in Winnipeg	20
Companies with offices in Winnipeg (but not based in Manitoba)	11
Companies based in Manitoba (other than Winnipeg)	5

Top Employer Snapshots

Job postings data also highlights which Manitoba employers have strong employment histories when hiring skilled talent into software development roles; the most common industries were the financial industry/business solutions, industrial manufacturing, and general IT services. Just over 80% of the companies were located in Winnipeg. Overall, a wide range of companies have hired software development talent in Manitoba over the last three years, including agricultural equipment manufacturers, insurance companies, and investment management firms.

Salary Trends

National Level Trends

At the national level, Back-end Developers, Front-end Developers, and Full Stack Developers make between CAD $70,000 to $130,000 a year, with Full Stack Developers making slightly more than their counterparts. Within this range, CAD $70,000 to $90,000 is considered low, $90,000 to $100,000 is considered medium, and $100,000 to $130,000 is considered high. More senior roles, such as Technical Leads or Software Architects, tend to earn around $100,000 to $150,000.

National Salary Range, Software Development Talent

Role	Low	Medium	High
Back End Developer	70k to 90k	90k to 100k	100k to 110k
Front End Developer	80k to 90k	90k to 100k	100k to 120k
Full Stack Developer	80k to 90k	90k to 110k	110k to 130k
Technical Lead	100k to 110k	120k to 135k	135k to 140k
Software Architect	100k to 110k	110k to 130k	130k to 150k

Provincial Level Trends

There is a general tendency for salaries to be lower in Winnipeg and Manitoba than across Canada. There is also a tendency for Web Developers to have lower reported salaries than Software Developers and Software Engineers.

?

Did you know?

The first Computer Programmer was an English woman called Ada Lovelace who was born in 1815?

EDUCATION PATHWAYS:
Traditional and Emerging Education

The education pathway required for a career in software development has changed immensely in recent years. New education formats have emerged alongside traditional diploma and degree programs, including certificate programs, boot camps, and Massive Open Online Courses (MOOCs). This change, importantly, is not a transition but a diversification – one form of education is not necessarily replacing another. Instead, prospective students benefit from a diverse set of academic choices with varying time and financial commitments, while prospective employers' benefit from an array of diversely educated students.

Traditional Education

In terms of Computer Science, Computer Engineering, and IT, Manitoba-based academic institutions provide the following programs (listed in order of program length)

Program Title	Academic Institute	Program Length
Diploma, Software Developer	MITT	1 Year
Diploma in Business IT	Red River College	2 Years
Bachelor of Science (BSc) in Computer Science	Brandon University	3 to 4 Years
BSc in Computer Science	University of Manitoba	3 to 4 Years
BSc or BA, Major in Applied Computer Science	University of Winnipeg	3 to 4 Years
BSc (Engineering) in Computer Engineering	University of Manitoba	4 Years
BSc, Honours in Computer Science	University of Manitoba	4 Years

Emerging Education

Coding bootcamps, MOOCs, and other forms of emerging education can be delivered in part-time or at-a-distance formats and can therefore complement traditional diploma and degree programs. In Manitoba, companies like SmartNinja and NobleProg provide training courses, bootcamps, and certificate programs related to software development in person, while many more are available from other companies online.

Summary

Manitoba's software development ecosystem has seen steady growth over the past ten years and has shown consistently low unemployment rates and a 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 Software Developer)

Software Development: Relevant Companies by industry

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

- SkipTheDishes, a food ordering and delivery service – **skipthedishes.com**
- Wawanesa Insurance, an insurance company – **wawanesa.com**
- Bold Commerce, an eCommerce software company – **boldcommerce.com**
- IGM Financial, an investment management firm – **igmfinancial.com**
- 24-7 Intouch, an outsourced customer service solutions company – **24-7intouch.com**
- Canada Life an insurance company – **canadalife.com**
- iQmetrix, a retail commerce solutions company – **iqmetrix.com**
- Market Force Information, a software company – **marketforce.com**
- Ceridian a human capital management company – **ceridian.com**

Industrial Manufacturing (Equipment Manufacturers, Services)

- MacDon Industries, a manufacturer of high-performance harvesting equipment – **macdon.com**
- Price Industries, a mechanical and industrial engineering company – **priceindustries.com**
- Hippo CMMS, a web-based maintenance management company – **hippocmms.com**
- Buhler Industries Inc., an agricultural equipment manufacturer – **buhlerindustries.com**
- WGI Westman Group Inc., a group of companies that operate in manufacturing, sales, and distribution – **westmangroup.com**
- General Electric Company, a mechanical and industrial engineering company – **ge.com**
- Triple E Canada/Triple E Recreational Vehicles, a Winkler-based manufacturer of motorhomes and RVs – **tripleerv.com**
- BEHLEN Industries LP, a Brandon-based manufacturer of steel building systems – **behlen-industries-lp**

Public Sector

- The Government of Manitoba has posted several job postings for offices located in Brandon, such as job postings for the Manitoba Health System Transformation Program - **gov.mb.ca**
- Various public organizations, such as the University of Manitoba and the Workers Compensation Board of Manitoba based in Winnipeg.
- Jacobs, a government solutions company – **jacobs.com**
- Federal Public Service positions located in Manitoba.

Professional IT Services (IT Consulting, Digital Transformation)

- Neo Biz Solutions Inc., a Brandon-based consulting agency – **neobizsolutions.ca**
- Norima Consulting Inc, an IT consulting company – **norimaconsulting.com**
- Online Business Systems, a digital transformation and cybersecurity consultancy – **obsglobal.com**
- Imaginet – **imaginet.com**
- Custom Software Solutions Inc. – **cssionline.com**
- Terracor Business Solutions, an IT consulting and software development firm – **terracor.ca**

Creative Industries (Creative Sector Solutions, Video Game Companies)

- Tactica Interactive, an interactive digital media company – **tactica.ca**
- Pollard Banknote Limited, an entertainment company – **pollardbanknote.com**
- AWS Thinkbox, a software company for artists in the entertainment industry – **awsthinkbox.com**
- Ubisoft, an in-house game development company – **ubisoft.com**

Other Industries (Health Tech, Retail, AgTech)

- Farmers Edge, a global leader in decision farming – **farmersedge.ca**
- The Dufresne Group, a retail furniture and retail solutions company – **the-dufresne-group**
- Varian Medical Systems, a cancer care technology and solutions company – **varian.com**
- D2L, a global leader in EdTech and the creator of Brightspace – **d2l.com**

Software Development: Relevant Companies by Location

Winnipeg-based companies

- SkipTheDishes, a food ordering and delivery service – **skipthedishes.com**
- Wawanesa Insurance, an insurance company – **wawanesa.com**
- Norima Consulting Inc, an IT consulting company – **norimaconsulting.com**
- Tactica Interactive, an interactive digital media company – **tactica.ca**
- Bold Commerce, an eCommerce software company – **boldcommerce.com**
- IGM Financial, an investment management firm – **igmfinancial.com**
- The Dufresne Group, a retail furniture and retail solutions company – **the-dufresne-group**
- Buhler Industries Inc., an agricultural equipment manufacturer – **buhlerindustries.com**
- Farmers Edge, a global leader in decision farming – **farmersedge.ca**
- 24-7 Intouch, an outsourced customer service solutions company – **24-7intouch.com**
- Pollard Banknote Limited, an entertainment company – **pollardbanknote.com**
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- Price Industries, a mechanical and industrial engineering company – **priceindustries.com**
- Imaginet – **imaginet.com**
- Various public organizations, such as the University of Manitoba and the Workers Compensation Board of Manitoba based in Winnipeg.

Companies with offices in Winnipeg

- AWS Thinkbox, a software company for artists in the entertainment industry – **awsthinkbox.com**
- iQmetrix, a retail commerce solutions company – **iqmetrix.com**
- Varian Medical Systems, a cancer care technology and solutions company – **varian.com**
- D2L, a global leader in EdTech and the creator of Brightspace – **d2l.com**
- WGI Westman Group Inc., a group of companies that operate in manufacturing, sales, and distribution – **westmangroup.com**
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- Ceridian a human capital management company – **ceridian.com**
- Market Force Information, a software company – **marketforce.com**
- General Electric Company, a mechanical and industrial engineering company – **ge.com**
- Federal Public Service – **canada.gc.ca**

Companies based in Manitoba (other than Winnipeg)

- BEHLEN Industries LP, a Brandon-based manufacturer of steel building systems – **behlen-industries-lp**
- Triple E Canada/Triple E Recreational Vehicles, a Winkler-based manufacturer of motorhomes and RVs – **tripleerv.com**
- The Government of Manitoba has posted several job postings for offices located in Brandon, such as job postings for the Manitoba Health System Transformation Program - **gov.mb.ca**
- Neo Biz Solutions Inc., a Brandon-based consulting agency – **neobizsolutions.ca**

Appendix B: Salary Data

Software Developer Salary Data
(National and Provincial)

Glassdoor Salary Data

Job Title	Manitoba	Canada
Software Developer	Median: $64k Based on 148 salaries	Median $75k Based on 6,230 salaries
Software Engineer	Median: $71k Based on 23 salaries	Median $83k Based on 3,460 salaries
Web Developer	Median: $54k Based on 11 salaries	Median $58,790 Based on 912 salaries

LinkedIn Salary Data

Job Title	Greater Winnipeg Metropolitan Area	Canada
Software Dev/Engineer	Median: $60k	Median $75k
Web Developer	Median: $50k	Median $55k

EMSI Salary Data

Job Title	Manitoba	Canada
Software Engineers and Designers	Median: $78,100 Based on 137 salaries	Median $90,000 Based on 10,036 salaries
Computer Programmers and Interactive Media Developers	Median: $65,900 Based on 94 salaries	Median $82,800 Based on 4,665 salaries
Web Designers and Developers	Median: $60,000 Based on 39 salaries	Median $78,200 Based on 5,101 salaries

Indeed Salary Data

Job Title	Greater Winnipeg Metropolitan Area	Canada
Software Dev/Engineer	Median: $69,083	Median $80,715
Web Developer	Insufficient data	Insufficient data