ᒪᓯᓇᑕᐦᐃᑭᔾᔨᓂ ᐊᒐᐦᑭᐱᕽᐃᑲᓇ
MASINATAHIKEYIN ACAHKIPEHIKANA
TYPING SYLLABICS

by

Justin Houle

A thesis submitted in partial fulfillment of the requirements for the degree of

Master of Arts

Humanities Computing

University of Alberta

Abstract:

I have created a custom keyboard for Western Plains Cree syllabics based on a symmetrically square layout. It is called the Star Chart Keyboard and currently runs on Apple iOS devices. It allows for previously difficult to access syllabics characters to be typed digitally in as few steps as possible and its culturally inspired design assists in language learning. It has generally been complex and frustrating to type in Cree syllabics online, and this keyboard will make it easier for people to use the writing system in a wide range of contexts.

Keywords:

Star Chart Keyboard, Western Plains Cree; syllabic keyboard; indigenous language revitalization; mobile smartphone; iOS, Android, social media memes

Dedication

This work is dedicated to my dad,

Eugene Paul Houle.

Acknowledgments

I would like to express my immense appreciation and gratitude to everyone who helped me along this journey. To my supervisor Dr. Geoffrey Rockwell, whose guidance and attention helped me craft this whole idea into something tangible. To all of my professors and in particular Dr. Harvey Quamen, Dr. Sean Gouglas, Dr. Maureen Engel, Aiden Rowe, and Dorothy Thunder, for the courses they taught that directly informed my thesis topic and for their time and expertise. To my advisors, Janey Kennedy, and Nicola DiNicola, who kept me on track. To Dr. Evelyn Steinhauer and Dr. Lidio Valdez Cardenas, for their references that granted me the opportunity to attend graduate studies. To my sisters, Jolene, Colleen and Bernadine, for being there to edit and critique, for leading the way and for having the next generation. To my brother Jordie, for keeping me on my toes. To all my aunties, uncles, cousins and their kids for surrounding me with the Crees language and people to speak it with. To my grandma Roseanna, for teaching us the Star Chart. To my dad Eugene, for dreaming up this keyboard idea and being the impetus to make it happen. To my mom, Lorraine Houle for giving me life, and her love, support and incredible patience ever since. And to my dear wife, Jillian Houle, whom I met in the middle of all of it, and who believed in me and pushed me to finish this project. Thank you all, with love.

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ᑕᐊ᐀ᐤ (tawâw - welcome)

This project relates to a Cree syllabics keyboard demonstration application I designed and created as part of my project-based thesis, at my late father's behest. It is based on a unique teaching method my grandmother used. I have utilized this keyboard demo to create all of the syllabic text that appears throughout.

Figure 1 - Star Chart Keyboard Latest Version for iPad (Created by Author).

This document is called ᒪᓯᓇᑕᐦᐃᑫᔨᐣ ᐊᒐᐦᑭᐯᐦᐃᑲᓇ (masinatahikeyin acahkapehikana) which in Cree translates to 'typing syllabics' or more accurately 'typing spirit symbols'. I utilize a mixture of languages and writing systems throughout this dissertation and will briefly explain what you can expect to see. The document title is written in Western Plains Cree syllabics using the 'Y' dialect. The text in parentheses is the same word expressed in Standard Roman Orthography (henceforth SRO). In this text I use APA citation and the terms First Nations, native, aboriginal, and indigenous are used interchangeably.

My dissertation begins with a brief background for those unfamiliar with Cree. I will talk about how the keyboard idea was born, who this project is for, and why this keyboard matters. What follows that is an environmental survey of the Cree syllabic keyboard applications currently available. I explain features of the Cree language and Cree syllabics that are essential to usefully operate the keyboard in Chapter 2. I go into greater detail about the actual creation of this application and the design decisions I have chosen in Chapter 3. Finally I apply a heuristic analysis to the demo I have created in Chapter 4. I will first introduce myself and how I came to be working on this project.

I ᐯᕽᐦ ᐊᐧᐦᑯᑐᐦᐃᓵ (peyak : wahkohtowin)

Justin Houle ᓂᑎᓯᔨᑲᓵ ᐁᑲ· ᓂᖅᐦᐃᕆᐊᓵ ᐅᓂᐦᑭᑭᑲ·>ᐃᓂˣ ᐁᑲ· ᒪᖫᑲ·ᑭᓯˣ ᐁᑲ· ᑊᓇ ᑭᐦᑭ ᐊᓯᑕᒻᒋᐃᓵ ᓂᑯᑕ·ᓯᐦ ᐅᐦᑭ ᓀᓕ

Justin Houle nitisiyikâson ekwa ninehiyawân onihcikiskwapowinihk ekwa maskwacisihk ekwa mîna kihci asotamâtowin nikotwasik ohci nîya

My name is Justin Houle and I am Plains Cree from Saddle Lake and Maskwacis in Treaty No. 6 Territory of the Cree People.

I am a Master’s student in Humanities Computing at the University of Alberta, with an Undergraduate degree in Native Studies, and certificates in Software Testing and E-commerce Development. I am learning Cree but do not speak it fluently; however I can read and write in Cree syllabics. I grew up half in the city and half on the reserve, so I understand some of the language, and this project has been my impetus to really learn it properly.

I have relayed who I am and where I am from, which are important parts of a Cree introduction. When meeting someone from the reserve however, the first thing they will ask you is who your parents are, or depending on their age, who your grandparents are. So I will introduce my parents, as well as their parents.

Eugene Houle ᓄᐦĊᐃ·<ᐤ ᐁᑲ· Lorraine Houle ᓂᑲᐃ·ᐩ ᐁᓯᐦᑲᓯᑭᐦ

Eugene Houle nohtâwîpan ekwa Lorraine Houle nikâwiy esihkasôcik

Eugene Houle, is my late father and Lorraine Houle is my mother, are their names.

My parents married at the age of twenty and raised five children in a stable, sober household. We all graduated from high school and continued on into higher education. My mother's reserve is the Maskwacis Cree Nation, an hour south of Edmonton. Through her, I descend from Chief Ermineskin. Lorraine taught Cree in Maskwacis. So did her sister Cecilia Saddleback. Along with my cousin Shannon Houle, they are who I turn to when I have questions about Cree. There are lots of teachers on both sides of my family. All of my sisters have some connection to schools, as do most of my aunties and many cousins. They are my living link to the language.

George Wildcat ᓂᒧᓱᒼᐸᐣ ᐁᑿ Emma Wildcat ᓄᐦᑯᒼᐸᐣ ᐃᓯᐦᑲᓲᒋᐠ

George Wildcat nimosompan ekwa Emma Wildcat nohkompan isihkasôcik

George Wildcat is my late grandfather, and Emma Wildcat is my late grandmother, are their names.

These are my mother's parents. George Wildcat farmed, surveyed and was a musician. Emma tended the house and looked after the children, teaching them our cultural ways. They were Catholics. We regularly made the three-hour trip between Saddle Lake and Maskwacis to visit my mothers's side of the family, but I was around 11 when they passed, within a few years of each other, and I wish I had known them better.

My fathers's reserve is the Saddle Lake Cree Nation. It is located two hours northeast of Edmonton, and where I was raised. Eugene was a band council member a decade before becoming the Chief of Saddle Lake from 1986 to 1988, among a number of his professions. He had wisdom and conviction at a young age, becoming a leader of our people, in government and business. He developed ideas into realities, raised buildings and started companies. My parents were married 43 years until my dad died of cancer at 63.

Joseph Houle ᓂᒧᓱᒼᐸᐣ ᐁᑲᐧ Roseanna Houle ᓄᐦᑯᒼᐸᐣ ᐃᓯᐦᑲᓲᒋᐠ

Joseph Houle nimosompan ekwa Roseanna Houle nohkompan isihkasôcik

Joseph Houle is my late grandfather, and Roseanna Houle is my late grandmother, are their names.

These are my father’s parents. Joseph Houle was a World War II veteran, a tough man and strict. He farmed most of his life. Both he and Roseanna were band councillors in the 1960s. He passed away in 2008.

Roseanna Houle was a teacher, well-regarded by accounts of those who knew her . She taught Cree at the Blue Quills Residential School near Saddle Lake in the 1970s. I did not get to know her because she passed away in tragic car accident the year I was born. She was 57. This had an immeasurable effect on our family. After her death my grandpa moved to Edmonton and eventually remarried.

Roseanna helped create Cree language learning materials and used a special method for teaching the Cree syllabic writing system. She taught it to my dad, who taught it to me. Exploring the technique my grandmother taught has been a way of getting to know her. Due to this unique teaching method, called the ‘Star Chart’, I am able to read and write syllabics not fully knowing the language, and using the keyboard is beneficial in learning it. Roseanna’s methods were effective for teaching children Cree. Stanley Redcrow worked with her at Blue Quills, and said about the children she taught, “[s]ome of them didn't even know how to speak Cree, their own language and now they are starting to learn their own language again by reading and writing and practising with the others” (An Interview with Stanley Redcrow, 1972).

Figure 2 - Mrs. Houle Teaches the Cree Alphabet (An Interview with Stanley Redcrow, 1972).

ᑭᐢᑭᓄᐘᐦᐊᒫᑐᐏᐣ (kiskinowahamâtowin - learning)

I was raised on the family farm, although there were few animals by then. My grade one teacher was a nun. I went to the reserve school until I was 8, when we moved to Edmonton. After that we moved around often, switching schools every 2-3 years until I graduated high school.

No-one spoke much Cree to us growing up. We heard it, when we had visitors, but it was not directly to us. My parents, understandably, had issues regarding their own journeys with the language, but they made sure we heard it. However I usually tuned it out anyway. Yet, because it was always around, I know local Cree pronunciation. Now I am actively listening to understand.

My parents had us all baptized but over time started to follow native traditional spirituality, where we could find it. They began to taking us to ‘sweats’ more and more and taking us to church less and less. The sweat lodge is a spiritual and cleansing ceremony that can be performed weekly, similar to church (Wikipedia contributors, Sweat Lodge). Eventually one was replaced by the other. My dad would speak before feasts and gatherings, followed by a prayer in Cree. He would sing in Cree during the sweat lodge ceremony. I have heard it said that Cree is the only language our ancestors can hear, that they gave it to us for a reason and that syllabics is writing their spirits can read.

I have personal experience with boarding school living. When I was in junior high I went to an Anglican boarding school called the St. John’s School of Alberta. It was a private, all male school near Wabamun that had about 100 students, from grades 7 to 12. My brother and five of my cousins also attended, at different times. It had an extensive outdoors program that included hikes, canoe trips, winter camping, snowshoe races and dogsledding. There was a student uniform, and everyone was given the same shoes and haircut. The school was big on student labour and religious study, including mandatory choir practise and recitals as well as door-to-door sales for fundraising. There were elected student representatives and a mock parliament was held every Thursday that accurately emulated Canadian parliamentary procedure.

The school also utilized corporal punishment, or ‘swats’, and everyone got them eventually. There were rumours about sexual impropriety and I found out later that one of my teachers had a previous history of inappropriate sexual conduct. Almost 15 students died while attending, eventually leading to its closure. The school operated from 1962 to 2008 in several locations (Wikipedia Contributors, St. John’s School of Alberta).

I went there for two years before I rejected their methods and left. I went back to the reserve and drove tractor to help my dad, who took over the farm from his dad. I spent each grade of high school at a different school. After graduation I went to the University of Alberta for two years for Native Studies but had a hard time and withdrew after two years. I then went to a technical school for a year and learned programming, websites and databases. I eventually came back to the University of Alberta after 7 years and finished my undergrad degree in Native Studies, immediately continuing on to pursue my Master's degree in Humanities Computing.

I took Cree classes at various times throughout the years, but it never really sunk in beyond the fundamentals such as colors, numbers, animals etc. When I took it at the University of Alberta, syllabics were not taught until the third level advanced course. The first time I went they taught syllabics with the grid pattern, which many still use. But by the time I went back, they were teaching syllabics using the method Roseanna taught, referring to it as the Syllabary of Saddle Lake Cree First Nation.

ᑭᐢᑭᓄᐘᐦᐊᒫᑐᑲᒥᐠ (kiskinowahamâtokamik - school building)

I have a strange relationship with residential schooling, because without it I would not be here. My parents met at the Ermineskin Indian Residential School in Maskwacis, then known as Hobbema. They met again when they were transferred to the Blue Quills Residential School. At around five years old they were taken away by white people in black or white robes. They seldom saw their families except during summers. Their entire childhood and developing years were hijacked. I really do not know much about their time in residential school however; they did not talk about it.

Much has been said about the history of colonialism (Daschuk, 2013) and genocide (Standard, 1992) throughout North American history, so I will only briefly summarize as it pertains to language and writing systems. The residential school period in Canada aggressively sought to accomplish the aim of converting indigenous children to Christianity and to 'civilize' them. (Wikipedia Contributors, Canadian Indian residential school system). Using the Indian Act, the Department of Indian Affairs forcibly removed children from their parents in mass numbers. They did this in waves and are still doing it now (Puxley, 2015).

Once the children were in custody, they were given a new name and a number which they were often referred to by; punishments were severe if they forgot their number (Quan, 2015). Their clothes were taken and replaced (Deer, 2017), their bodies were scrubbed, and their hair was cut short. They were kept indoors and away from animals. They were taught about Jesus and made to sing strange songs in a different language. The children were punished for speaking their own languages. They were taught that their culture was bad, dirty, and wrong.

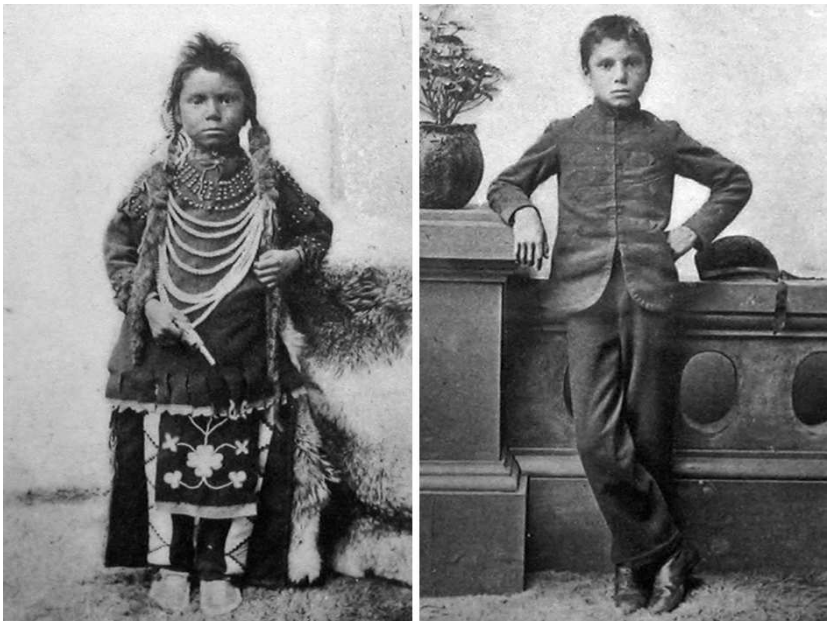


Figure 3 - Thomas Moore Before and After Circa 1896 (Quan, 2015).

Figure 4 - Ermineskin School Grand Opening in 1956 From Personal Records (Photo by Author, April 15, 2018).

The children were under the ‘care’ of priests and nuns, government agents and the RCMP. Many were abused, mentally, physically, and sexually. They were neglected, purposely starved, and experimented on. Many children died from tuberculosis, exposure while running away, suicide, or subsequent addictions. At least 6,000 never made it home and reside in unmarked graves (Wikipedia Contributors, Indigenous peoples in Canada).

Initially the children were taught industrial skills, sewing and farming. Over time they learned other skills including reading and writing. The nuns put pencils in the children’s hands and made them write strange characters until their fingers cramped. They filled white papers with

alien words, disrupting eons of oral tradition. Eventually they were taught to type on typewriters, which my aunty referred to as ᒪᓯᓇᑕᐦᐃᑫᔨᐣ (masinatahikeyin) in Cree or 'writing by pounding'.

Article 2 of the United Nations Convention on the Prevention and Punishment of the Crime of Genocide includes, "[f]orcibly transferring children of the group to another group" (Wikipedia Contributors, Genocide Convention). Culture was disrupted by attacks to the self esteem of children, their identities, and their very notion of safety. The children formed tight bonds with each other but had little in the way of parental role-models, so their parenting skills suffered when they got out of school.

Spirituality was the main impetus and justification for colonization, from the Papal Bulls of the Vatican to Manifest Destiny (500 years ago: Pope gives permission to conquer Indigenous people, 2017). The 'White Man's Burden' meant bringing Christ to the heathens, and was a tool used to divide us both internally, and externally. Many reservations including Maskwacis and Saddle Lake have rival Protestant and Catholic churches and it contributed to splitting families apart. Meanwhile our traditional ways were outlawed; it was illegal to practise religious ceremonies until 1951 (Henderson, 2006).

150,000 children went through this system, in a period that lasted from 1847 to 1996 (Wikipedia Contributors, Canadian Indian residential school system). In 1867 it is estimated that there were only 100-125,000 aboriginal people left alive in Canada. Now there are over 1 million, and over 2 million including Métis (Aylsworth, 2012). We are the fastest growing population in Canada. We survived being attacked en masse and left in a state of cultural shock. We suffer from the trauma of attempted genocide, which has been passed down in our DNA and our

collective cultural memories (McLeod, 2007). The impact of residential schools as an assimilation tool has been devastating (Kelly-Scott, 2015).

ᐃᑌᔨᐦᑕᒧᐏᐣ (iteyihtamowin - an idea)

The language was beaten out of the children and replaced with English in an attempt to eradicate our culture. Conversely, our own language is the best way to help us maintain our culture. Our language was taken, with our children, our women, our agency. Stolen like the land, our mother. Erased, like our traditional names for sacred places. Paved over like our burial sites.

Yet we have always adapted to survive, as evidenced by the seamless incorporation of first the horse, then gas-powered snowmobiles. Our ceremonies and culture are our lifeline, a link between ancestors that went before and descendants who will come after. ᒐᐸᐣ (capan) is the Cree word for great-grandparent and it can also be used for grandchild, because the baby teaches the Elder as much if not more. This is just one way that Cree culture is built into the language. It was my dad's idea to create this keyboard. He wanted me to build him a website chat room, where people could speak Cree to each other, and type Cree syllabics with ease. Here are his reasons, in his own words (from the 'About' page of our proposed website):

> Having raised our children on the Saddle Lake First Nation lands, my wife and I realized that we had unfortunately not spent enough effort in teaching our children the Cree language and so we have decided that in our retirement, we can now make the effort to teach them and our grandchildren as much of the language as we can recall. Because of distances and work commitments, we realized that we need to find a way to do this with the available time and resources that we have.
>
> We initially intended this to be a family project to assist in finding a way for our family to communicate with each other and exercise speaking and writing our language. This

> project is quickly moving into an application that could be useful to others wishing to learn the basics and exercise the use of the language. We have decided that we would share this concept with as many people as are wanting to learn and expand on their knowledge of the Cree language as we speak it on the Saddle Lake First Nation. This is a labor of love and does not solicit funding from governments or foundations to continue operations. We will therefore provide a subscription with value for dollars contributed to this site by the subscribed members.
>
> Of course, we do it with the usual proviso that we are not experts in linguistics nor academics in language instruction. This site is intended to be most useful to those who already have some familiarity with the language and awareness of the syllabic system. I do not intend to define or correct any syllabic or language impediments that may exist. This site is intended to be a Cree chat line where all discussion will be in Cree and the syllabics are used to record or allow participants to leave messages with each other. May 24, 2012.

We bought a URL but the website never happened. Eugene passed away that November after battling cancer for two years.

The loss of my dad threw me off for a long time. My family and I took years to recover. I resolved to finish this project, because it is something my dad chose to work on with the time he had. To honour his wishes and extend both he and his mother's legacy, I would make this keyboard the subject of my project-based thesis and see it through to the end.

My dad wanted to revitalize the language, by increasing access to tools and avenues in which to use it. It is already happening, with the release of Cree language applications, the details of which I explore in the next section.

ᓂᑮᐘᐸᐦᑌᑦ (nikîwapahten - I had looked)

When I began work on the Cree Star Chart syllabic keyboard I researched existing Cree syllabic keyboard / language revitalization projects and their developers. I will briefly mention the features of each project and how they have informed aspects of my keyboard design. My goal is to demonstrate an awareness of other Cree syllabics keyboard projects, and what I learned from them. With an appreciation of what has come before, I can illustrate that my project is worth doing and is suitably unique enough to be a useful alternative to other keyboards. This is a brief review of seven key indigenous language revitalization projects involving Cree syllabics in the digital domain. It includes websites where you can download fonts, keyboard layouts, language learning applications and/or the keyboard itself. They will be presented in the rough order that they were released.

This is an environmental scan more than a literature review, as the items are large projects (websites, dictionaries, applications) rather than specific papers or books. And while the key figures behind the various projects are often academics with a breadth of published papers, I chose to focus on the keyboard product itself and the content of their companion websites. There is much overlap between projects and this bird's eye view reveals these connections. Additionally some projects are concerned with many more indigenous languages other than Western Plains Cree, but as that is the language this keyboard is designed for, it is that language I will focus on.

There are features common to many of these projects, including the existence of companion blogs, forums, and digital storefronts (East Cree, 2012, Horsethief, 2014). There is a wide variety of funding partners, from provincial, federal and private sources (Harvey, 2012, Durdin). There is also an emphasis on community involvement, usually tied to local schools (Online Cree

Dictionary, East Cree, 2012, Arppe, 2013). There are numerous cases where a researcher from one project will co-author papers with someone involved with another project (Harvey, 2012, Arppe, 2013). I also benefited from learning about this web of connections in language revitalization as it provides a model of cooperation and opportunities for funding options.

There was much change on the technological side, that affected all of these projects. Progress in the areas of Unicode standards, mobile and web application development design guidelines, and innovations in hardware have provided opportunities and hindrances to the task of language revival. For a long time I was unable to complete certain tasks on certain platforms and it helped seeing that larger scale projects faced the same problems.

For instance many sites continue to rely on Flash, which is becoming obsolete. Another example is the copy and paste method for getting converted syllabics text from a virtual keyboard. This was and still is for many, the main way to access and use syllabics in a meaningful way (Harvey, 2012, Online Cree Dictionary). However it requires at least five non-intuitive steps that include first typing the word you want converted to syllabics in a word processor, finding the proper 'accent' or diacritic to denote any long vowels, copy and pasting the word into a syllabics conversion website like CreeDictionary.com, convert to syllabics, then copy it back to whatever you are using it for. Even for simple transcription this process is needlessly complicated. Eventually desktop applications arrived that one could download and install, such as Keyman Desktop software or the First Voices app, each discussed in its own section (Harvey, 2012, Durdin). They are usually between 4 and 10Mb in size, and cost a minimal fee, while some are free.

In the last decade smart mobile devices were released, and have been widely adopted on reservations in Canada where previously the internet had not been widely accessible compared to

urban areas. With the proliferation of 'native apps', there are now downloadable keyboards that can take the place of your phone's default keyboard ('native' in this context refers to applications that are developed for a specific mobile Operating System such as Android Ice Cream or iOS) (Castledine, 2011). However there are at least 8-12 steps involved with this process, necessitating the need for instructions and a companion website (Horsethief, 2014, First Voices, 2007). Still it is a one-time only process and there is no need to continually copy-and-paste (however you now have to switch between keyboards). My latest demo emulates this functionality.

Languagegeek

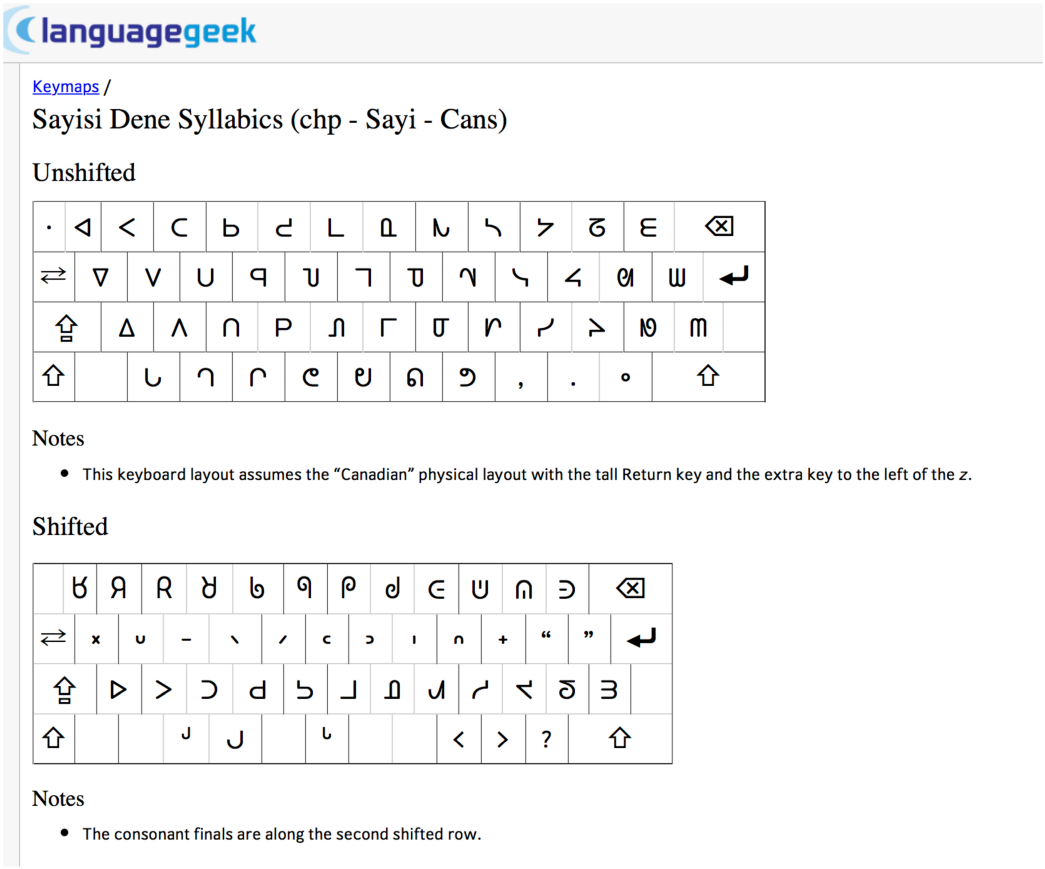


Figure 5 - Screen Capture of Language Geek Website Keyboard (Harvey, 2012).

The first Cree keyboard project I will discuss is Languagegeek developed by Dr. Chris Harvey, a pioneer in the domain of digital syllabics. With an academic background in Linguistics and Anthropology, he has been developing language fonts and keyboard layouts since the 1990s. His website has a companion blog called Languagegeek Musings that operated from 2009 to 2013. Harvey is active in language revitalization, publishing and presenting papers at conferences and teaching linguistics at the University of Toronto.

Languagegeek was the earliest source to find syllabics fonts. It offered them for Cree, Ojibwe, Oji-Cree, Naskapi, Blackfoot, Dene and eventually many other indigenous languages including Cherokee, Hawaiian, and Icelandic (Harvey, 2012).

The website is also very informative on general orthography and linguistic topics in regards to syllabics such as: apostrophes, capitalization, diacritics, topographies of language use and technical aspects such as Unicode. Underlying web technologies have changed much since the 1990s and Language Geek fonts have also adapted (Harvey, 2012). LanguageGeek has partnered with Tavultesoft on the First Voices App.

East Cree

This project began in 2000 and is funded by the Social Sciences and Humanities Research Council (SSHRC). It is a partnership between the James Bay Cree in northern Quebec, Carleton University, and the Cree School Board. This project opened doors to language revitalization by creating and distributing fonts and sound files as well as creating language learning resources like dictionaries and online databases for terminology. East Cree allows downloading

fonts on their site or directs users to get them from Languagegeek, and their keyboards require Keyman software by Tavultesoft. The site is trilingual (Cree, French and English).

The Cree Living Language Encyclopedia Project or CLLEP (2004-2011) is an extension of the original East Cree website and includes the online Cree Encyclopedic Dictionary and the Multimedia Linguistic Atlas (MLA) which allows one to hear how a phrase in an Algonquin language would sound spoken by speakers from different areas of the country (Junker, 2005). Three significant contributors are Prof. Marie-Odile Junker (Carleton University), Prof. Margarita McKenzie (Memorial University) and Bill Jancewicz, an expert in syllabic fonts. Every year, several local students are hired onto the project. This seems like a great way to get community youth involved and ensure continual interest (East Cree, 2012).

Figure 6 - Screen Capture of East Cree Website Keyboard (East Cree, 2012).

My project is mainly concerned with Western Cree but I did make use of East Cree when researching the differences between Western and Eastern Cree syllabics, and whether this keyboard could adapted for that use. Cree is widely spoken in eastern Canada, and making this keyboard accessible to another half of the country would greatly extend its usefulness. The value of making this modification would be ascertained by the results of a heuristic study that includes eastern Cree speakers.

Online Cree Dictionary

Figure 7 - Screen Capture of Online Cree Dictionary Website Keyboard (Online Cree Dictionary, N.D.).

The next resource is the Online Cree dictionary. It is the result of a partnership between the Maskwacis Cree Nation (formerly known as Hobbema), the Miyo Wahkohtowin Community Education Authority (MWCEA), the Cree Language Resource Project (CLRP), the University of Alberta and Intellimedia Technologies Inc.

This has been an invaluable resource since the 2000s for people wanting to learn Cree, because it was one of the first online language portals; it makes use of four Cree dictionaries: the Alberta Elders' Cree Dictionary by Dr. Earle Waugh (Dir. Center for Culture & Health Family Medicine), Cree: Words /nêhiýawêwin: itwêwina / by Prof. Arok Wolvengrey, the Maskwacis Dictionary, and the Hobbema Language Committee Dictionary. Ramona Washburn is the Cree Resource Developer for Miyo Wahkohtowin and contributed to the development to the Cree dictionary website. She currently administers a Cree learning group on Facebook, which is among a network of active Cree language groups.

The website provides Cree words and definitions for multiple dialects (Maskwacis, Saskatchewan and Woods Cree). It also has a word converter, syllabics virtual keyboard and downloadable apps. However it can be tricky to use for Cree syllabics transcription due to the number of steps involved, and reliance on the 'copy and paste' method. There is also a version designed to appeal to children, with bright colors, bold fonts and simplified options.

According to the news page, the virtual keyboard and syllabic converter were released in 2006 with updates to the site continuing until 2013 (Online Cree Dictionary). The site also offers free downloads of language apps for iPhone and Android, 'widgets' for Mac OS, 'gadgets' for Windows, keyboard layouts and virtual keyboards for Joomla and Moodle systems. These were created by their technical partner, Intellimedia Technologies Inc.

Keyman Desktop

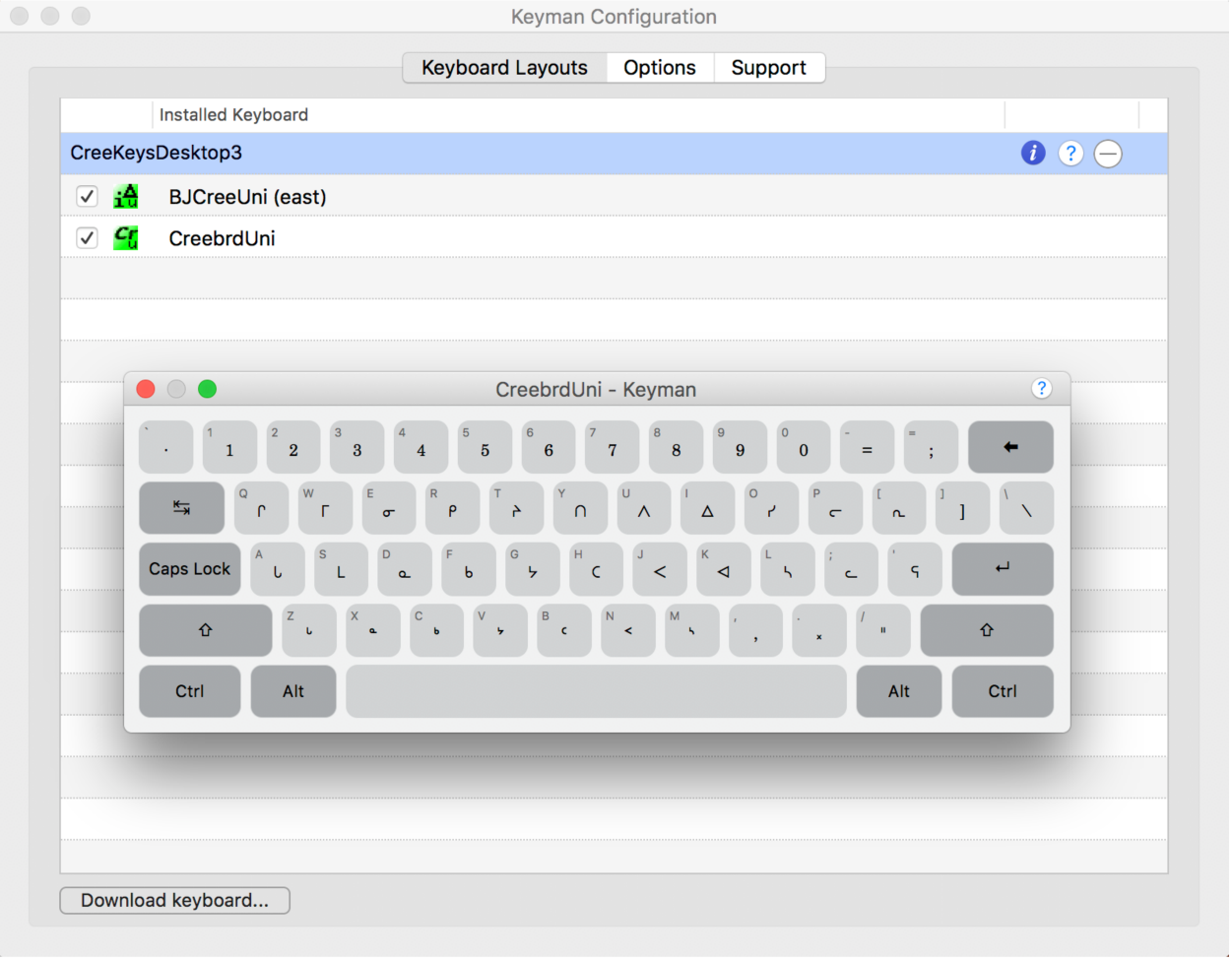


Figure 8 - Screen Capture of Keyman Desktop Website Keyboard (Durdin, N.D.).

Keyman Desktop is a product of Tavultesoft, which has been purchased by SIL (Summer Institute of Linguistics) International. SIL is a faith-based non-profit organization that has been providing technical innovation in language use since 1934. Tavultesoft has been the technical partner for EastCree, Language Geek, and First Voices Keyboards.

The Keyman product was initially developed by Marc Durdin as a teenager, before completing a Bachelor of Computing degree at the University of Tasmania. He became an employee of Tavultesoft in 2005, working on Keyman full-time and providing help in the forums while maintaining a personal blog.

Today the program allows one to type in 1000 different world languages. The website offers virtual keyboards, desktop downloadable programs and apps for iPhone and Android. There are bookmarklets and plugins for browsers, Wordpress and Wikipedia (Durdin). Keyman software cost between $24 and $68 CDN but is now free since the acquisition by SIL.

The success of Tavultesoft and their numerous technical partnerships has shown me what can be done from a technical standpoint such as developing and distributing fonts, targeting for specific operating system, and various emerging technologies. It has also been illuminating seeing the breadth of groups they have partnered with in regards to funding and educational research. Like them, I would look to create blogs and forums to provide avenues for extraneous help.

The Western Cree Font Keyboard

Dr. Christopher Horsethief is a research professor and consultant from the area of Washington state, USA. His primary assertion is that indigenous language and culture are inextricably linked and he studies the social network activity of traumatized community members (post-crisis network fragmentation) (Horsethief, 2014). He has delivered keynote addresses at conferences including TedTalks (TED, 2017) and has been developing language learning curriculum and resources for the last decade.

Figure 9 - Screen Capture of Western Cree Font Website Keyboard (Horsethief, 2014).

His website has been live since 2014. It does not focus on specific language learning on the site itself, but does describe his research interests in detail. One can download language apps for seven language font keyboards including: Ktunaxa, Salish, Eastern and Western Cree, Cheyanne, Maori, Navaho, Warlpiri & Phonetic font keyboards. They have been available since 2015 although it took longer for Android versions to be released.

The installation process is similar to other keyboards, but the keyboard characters are split into four screens, each requiring the installation of a separate keyboard. Switching between

them is accomplished by using the ‘NK’ button, for ‘Next Keyboard’. It was released in 2015 for $5 US and readily available on the Apple and Android app stores.

First Voices Keyboards

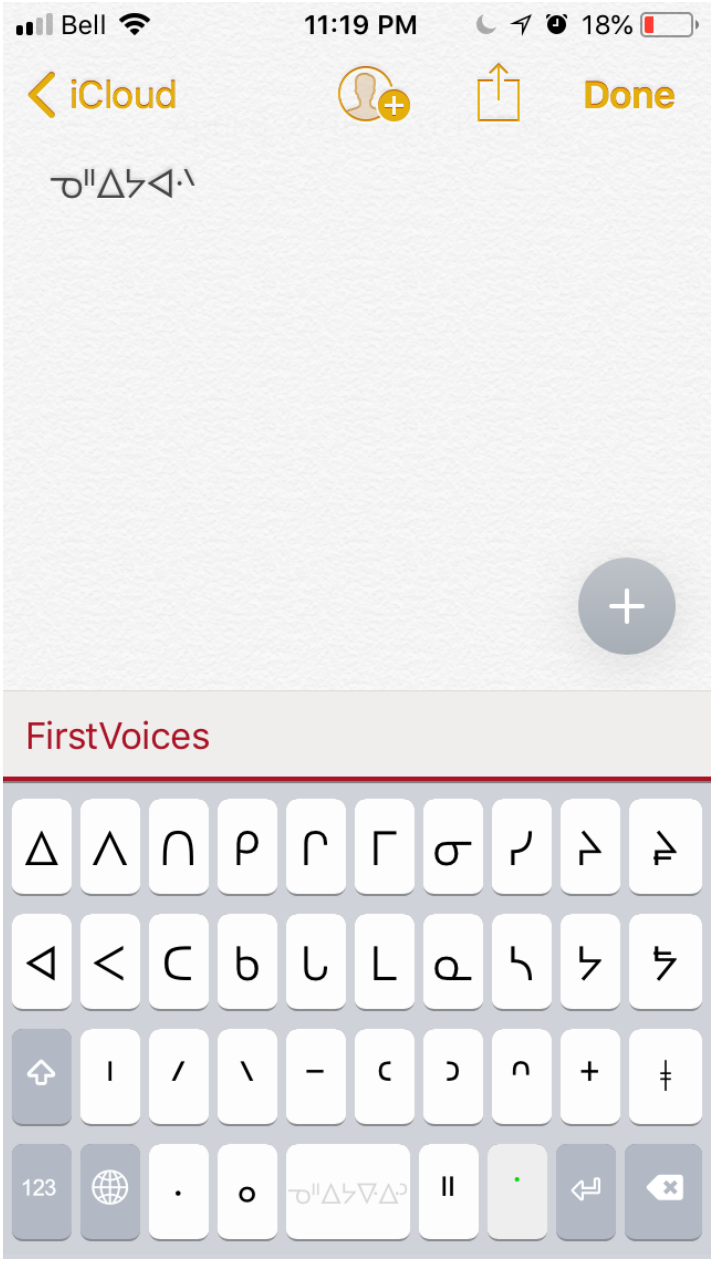


Figure 10 - Screen Capture of First Voices Website Keyboard (First Voices, 2007).

The First Voices Keyboard was created by Tavultesoft, in partnership with the First Peoples Cultural Council of BC, previously known as the First Peoples Heritage, Language and Culture Council. It has a variety of funding sources including: the Ministry of Aboriginal Affairs and Reconciliation (MAAR), the Aboriginal Language Initiative (ALI), British Columbia Language Initiative (BCLI), and the Department of Canadian Heritage (DCH). There is also the First Citizens Fund, and arts programs including the Aboriginal Arts Development Award (AAPA), Aboriginal Youth Engaged in Arts (AYEA) and the Online Arts Toolkit.

In 2003 First Voices was launched as a group of web-based tools and services designed to support Aboriginal people engaged in language archiving, language teaching & culture revitalization. It offers an alphabet, dictionary and phrasebook, and interactive teaching applications with graduated learning exercises in vocabulary development, reading comprehension, listening and speaking. There are also cultural camps, language nests and two year mentorships with an Elder (First Voices).

Eventual additions include a Language Tutor /Language Lab in 2009, the First Voices Chat program in 2012 and in 2016 a host of keyboards and 15 smartphone learning apps. The keyboards cover languages from Australia, New Zealand, the USA, and Canada but focuses primarily on ones from British Columbia. There is also First Voices Kids, geared towards younger users.

The project was initially created by two Vancouver elementary teachers, John Elliott and Peter Brand, and it eventually grew into something much greater. It is an great example of how groups like this can pool their resources and with technical help and community involvement, create functional keyboards that are culturally supported and locally recognized.

21st Century Tools for Indigenous Languages

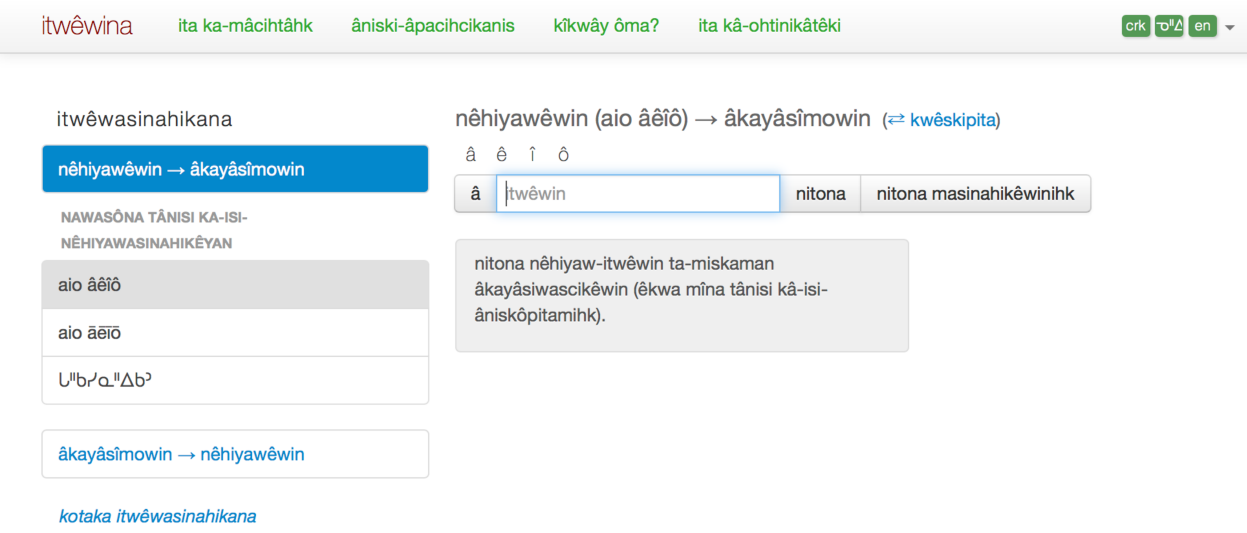


Figure 11 - Screen Capture of 21st Century Tools Website Dictionary (Arppe, 2013).

The last project I will showcase is the 21st Century Tools for Indigenous Languages, which was funded by a Research Cluster Grant from KIAS or KULE Institute for Advanced Study. It focuses on two languages, Plains Cree and Northern Haida. It consists of text based tools one can use while typing in a document of some kind. It has an automated spell-checker, text prediction capabilities, speech to text analysis, and language training and education applications.

It is in development by Antti Arppe, Assistant Professor of Qualitative Linguistics and founder of Alberta Language Technology Lab (ALT-LAB) at the University of Alberta. In the 1990s Arppe worked at Lingsoft, a Finnish company making text tools for Nordic languages. He successful created versions of these tools for his native Finnish language. Once in an English speaking environment, the decision was made to apply the tools to Indigenous languages.

His hope is to improve the lives of indigenous language users in their communications, administration and business/educational contexts. Arppe states, "[t]he retention of native languages is integral to the empowerment, cultural vibrancy and prosperity of Aboriginal communities, allowing for the continuation of traditions of thought and experience developed among indigenous peoples" (Westgrid).

There were three factors that led to Cree being the first language to be pursued:

1) Cree is widely spoken in Alberta

2) Cree is currently taught at the University of Alberta and has been for decades, and

3) Cree has extensive documentation including the existence of a standard orthography or spelling system, grammar and vocabulary dictionaries, accessible text collections and scientific research conducted (Kerman, 2015).

Being an expert in the language is not a prerequisite for using the tools. While Arppe speaks several languages, when it comes to Plains Cree he admits he is only a beginner. This statement gives me heart because I too am only a beginner with the language yet that has not hindered me from creating this application. The cumulative effect of using these tools should be to facilitate language learning.

Similarly to the Online Cree Dictionary, three dictionaries and their authors were consulted: the Aboriginal Elders' Cree Dictionary by Earle Waugh, the Maskwacis Cree Dictionary and Cree: Words / nehiyawewin: itwewina by Arok Wolvengrey. Also consulted were Dorothy Thunder, the full-time Cree instructor at the University of Alberta and Dr. Jean Okimasis of the First Nations University of Canada. Wolvengrey is Okimasis' husband and together they have created miywasin ink, a Cree language consulting and publishing company. Other consultants include

Sally Rice, David Beck, Cree Literacy Network director Arden Ogg as well as Giellatekno and Divvun of the University of Tromsø, Norway (Arppe, 2013).

That concludes my discussion of existing Cree syllabic keyboard projects. In following the progress of these projects over the years, I have witnessed the good work being done in digital language revitalization by passionate people from all over the world (Ratzlaff, 2018). I have seen what works well and what does not, as well as what still needs to be done. It has generally been complicated for the average native person to access Cree syllabics. It was too technical and there were too many ways to do something. But now, with the proliferation of smartphones and digital storefronts as well as major simplifications behind the scenes (in code standards, hardware, business practices and funding opportunities) it is now easier than ever to simply install an iPhone keyboard or Android app and get using Cree syllabics in text, documents and social media.

This is especially important as the target audience includes both Elders and young children, the main keepers and receivers of the language respectively (New Children's book released in Cree, Dene, Michif and English, 2018). These groups have unique relationships with technology and therefore simplicity is vital for the success of these tools.

One thing that struck me was the ‘all in one’ nature of some of the projects, such as Keyman Desktop that can be used for over 1000 languages. My goals is to focus on just one language, but the result must be lean and intuitive, so that using and learning the writing system is as easy as possible for people of all ages and language level proficiencies.

Another thing I noticed is that after the initial funding partnerships that created these projects, some were free and some charged for the use of their products (Durdin, Horsethief,

2014). I had always intended this keyboard to be free because I want the language to flourish with no barriers to access but I am aware of the financial realities of delivering and maintaining online services. I will keep this in mind when developing the final keyboard version and launching it officially.

I know the keyboard will involve a companion website, from which to download and learn about the keyboard, and perhaps purchase other products. Blogs and forums, especially in social media zones will also factor into that. But again, I intend to pare it all down into just doing one thing well: produce a simple syllabics keyboard for Western Plains Cree that adapts the cultural learning technique of my homeland (the Saddle Lake Star Chart). After that I can gauge the real world response and decide what new directions may need to be developed.

I am interested in seeing whether the Star Chart syllabics keyboard can be adapted for the use of Eastern Cree users, and perhaps other languages like Dene, Blackfoot, and Inuktitut, as they all use the same base characters (with additional ones added). However, there are vast cultural differences between those tribes, as well as in their languages. Therefore the syllabics function in a manner specific to my language only. As I am no expert in even Western Plains Cree, I cannot say whether it would be feasible without consulting speakers of other languages.

It is important when dealing with cultural indigenous knowledge to adhere to protocols of respect and truth. Then anyone listening to me can tell who I know, what I know, and what I do not know. This is how oral history is peer reviewed (Joseph, 2014). Some traditional knowledge is not to be shared outside of our communities. There are ceremonies that should not be photographed, and legends not to be told except in winter. Therefore I will omit what is not appropriate to be shared here. At the same time, some indigenous knowledge has to be shared so that

we don't lose it. Native peoples have always had to adapt in order to survive, and we are masters at it. By this marriage of culture and technology, aboriginal people will thrive. Embracing and merging new methods and technologies with our traditional ways, has and will continue to benefit us all (Weatherford, 1988).

Figure 12 - a Meme on Social Media Saying 'Mosom Sêwêpicikanis' Meaning 'Grandpa Mini Phone' (N.D.).

I have now introduced myself and my background so that the reader can better understand my motivations for this project. The title of this chapter is ᐊᐧᐦᑯᐦᑐᐃᐧᐣ wahkohtowin which means 'kinship' or relations (Wahkohtowin, 2013). I introduced my family because they are my credentials, and my target audience.

II ᓂᓯ ᓀᐦᐃᔭᐤ (niso : nehiyawak)

Apparently Christopher Columbus got lost looking for India and now my family are called ‘Indians’. Centuries later the name and the myth persist. Our name for ourselves is ᓀᐦᐃᔭᐤ (nehiyawak - the people) but others have named us the Cree. Names are important in indigenous cultures but we are familiar with our names being brushed aside (Neufeld, 2016). Yet there is currently a native resurgence happening across the nation, where scholars, artists, meme craeators, warriors, mothers and children are rising up and reclaiming the spaces we once occupied (Pearce, 2018). Idle No More erupted in Canada and five years later its reverberations are still being felt (Idle No More, 2012).

Why is the existence of a Cree syllabics keyboard based on the Star Chart important in this context? It is my belief that being able to easily type Cree syllabics in online domains will help with language revitalization. Language revitalization is what will help save indigenous cultures. And indigenous cultures with the ability to freely express themselves in all areas will benefit themselves and the lands they occupy (Professor says language plays key role in revitalization, 2016). This section will explore these ideas by answering the question: what happened to the Cree language?

I will start by introducing the Cree. We are a proud people, originally from the east. At one point there must have been many Cree. Today, in Canada there are 200,000 people who identify as Cree (Wikipedia Contributors, Cree) . That is 1/150th of the population north of the border. We are one of the largest groups of First Nations in North America and Cree is the most spoken non-official indigenous language in Canada (INAC), with an estimated 110,000 speakers.

The North American societies of Canada and the United States were born in colonialism that continues to this day. The net effect of this dispossession has led to the loss of culture and language for the over 500 nations that originally resided here. Cree people were eliminated through disease, colonialist legislation, religion and racism (Daschuk, 2013). They were forced to gradually cross the continent, while genocide took place all around them. Made to rub shoulders with enemies, tribes were pitted against each other and Europeans ransacked at will.

The Hudson's Bay became one of the largest property owners in the world, purchasing from Britain lands that had no bill of sale from any tribe. The United States became independent from Britain and embarked on their 'Manifest Destiny'. Chiefs signed nation to nation Treaties with the Crown, then Canada came into being (Brown, 2017). The residential school system followed Confederation and my family's story begins, as discussed in the previous chapter.

ᐊᑌᐦᑭᐯᐦᐃᑲᓇ (acahkipehikana - syllabics)

There are three syllabic scripts in use: Cree, Blackfoot, and Dene-Carrier, each language as distinct as Japanese is to Spanish. But they all conform to this principle: every character represents a syllable (consonant + vowel) such as ᐊᐧ (wa), a final consonant such as ᐩ (y), or a diacritic (a modifier of a syllable or consonant to make it a long sound) such as ᒧ (moo) (Harvey, 2012).

Other aboriginal languages have moved to Roman writing systems, and the usefulness of syllabics is questioned in terms of "accuracy, ease of learning, standardization, appropriateness, and computer literacy" (Harvey, 2012). Syllabics that are easily accessible on computers do not hinder language learning but actually bolster it. I believe syllabics should be taught on day one.

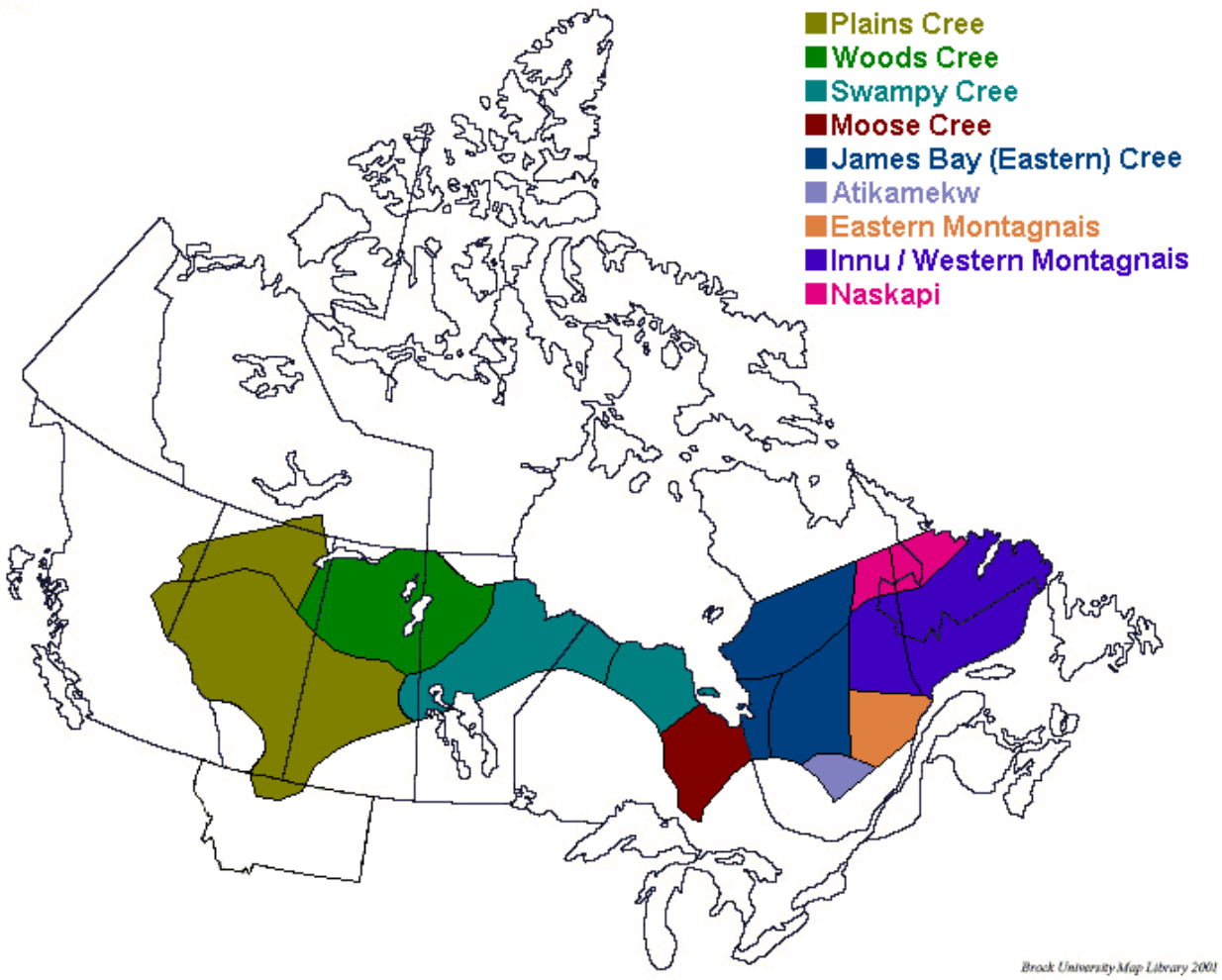


Figure 13 - Cree Dialects Across Canada (Wikipedia Contributors, Cree).

Now I will talk about the development of the syllabic writing system in the mid-19th century, exploring conflicting versions of its origin. This includes a discussion of the oral history as well as a brief biography of James Evans, who was influential in the dissemination of syllabics.

Cree oral history tells that the people were given the gift of syllabics by the Creator. An account of this was told by Chief Fine Day of the Sweetgrass First Nation, Saskatchewan. "[A]

Wood Cree named [Calling Badger] died and returned to life with the gift of writing from the Spirit world" (Stevenson, 1999). He and two companions were travelling to the site of a sacred meeting, when they saw a light and fell to the ground. Calling Badger heard a voice calling his name; soon after he became ill and passed away. When it came time for him to be buried, his people noticed that he did not look dead. He woke up, having been granted the knowledge and symbols of the Cree syllabic writing system, spiritual teachings, and prophecies of the future. He was taught how to make ink and write characters on birch bark and he shared it with his people. On the other side of the continent a similar experience happened to a man called Machiminahtik (Hunting Rod). They shared the syllabics so the people could write in their own language.

This took place 10-15 years before Fine Day's birth in 1846. Anthropologist David Mandelbaum recorded this telling in the 1930s but dismissed it out of hand, as did most scholars (Mandelbaum, 1940). The events in the account were echoed by Raining Bird, a Plains Cree on the Rocky Boy reservation in Montana and recorded by anthropologist Verne Dusenbury in 1959 (Stevenson, 1999).

This version stands in contrast to the origin that is more widely accepted in academia, that identifies Methodist missionary James Evans as the sole creator of syllabics. It is documented that Evans was the first European to publish a syllabary for Cree in 1840. He also printed numerous religious materials with his own hand-made printing press and distributed them (Hutchinson, 2000). Biographers and anthropologists unquestioningly supported his claim of authorship until recent re-evaluations of the research have cast doubts.

Oral accounts tell of the arrogation of syllabics: "the birch bark book with the teachings and Cree syllabary was stolen and taught to the missionaries who disregarded the spirit teach-

ings, took the syllabary and claimed they invented it" (Stevenson, 1999). Oral accounts have always been unfairly disregarded by academia due to a lack of documentation and a colonialist bias towards written records and convoluted legalese. Any writings done by natives would have used birch bark with charcoal, which is not the most resilient combination of materials; the only surviving examples today are Evan's own printed hymn books (Tiro Typeworks, 2007).

ᐱᑭᖁᐧᐃᐧᐣ (pîkiskwê - speak)

Native people in North America were primarily an oral culture and used the telling of stories to pass on their history from one generation to the next. This reliable, peer-reviewed system did not tolerate drastic deviations in content. The Supreme Court of Canada validated oral history in 1995 with the Delgamuukw decision, concluding that "oral histories were just as important as written testimony" (Wikipedia Contributors, Oral History: Legal interpretation and relationship to historical truth). Yet Evans' claim has endured.

The emergence of a Cree writing system during the immigration of white settlers could be an indication that Evans invented syllabics, but it also supports the theory of stimulus diffusion (in which one people receives a culture element from another but gives it a new and unique form) (Dusenberry, 1998).

The Cherokee writing system also came from this period, developed by Sequoyah, a Cherokee man would read and write. In fact, "by the 1820s, when Sequoyah developed the syllabary, the Cherokee not only had direct knowledge of writing and its utility, but many were literate in English. " (Stevenson, 1999). Word of this development may have reached the Cree, and

provided inspiration for the spirits to grant the gift of writing to the people through Calling Badger and Machiminahtik.

Whether he invented or simply disseminated Cree syllabics, the figure of James Evans looms large in the scholarship and bears mention. He was a Methodist Minister born in 1801 in Kingston Upon Hull, England. He came to Canada in 1823, learning the Ojibwe language in the course of his evangelism. In 1836 he presented an Ojibwa syllabary to his Mission society for publication but it was rejected (Hutchinson, 2000). In 1840 he was appointed Superintendent of missionaries in Hudson's Bay Company lands around Lake Superior. Supposedly he mastered Cree and invented the Cree syllabary in a matter of months - despite having to rely on a Cree interpreter throughout the remainder of his time in Canada (Stevenson, 1999). He published a simple but robust Cree syllabary with 9 consonants and 4 vowels.

Figure 14 - James Evan's Syllabary (Wikipedia Contributors, Canadian Aboriginal Syllabics).

Europeans tended to group all natives into one ‘Indian’ culture despite the existence of over 500 distinct tribes, a practise known as ‘pan-indianism’. English was determined to be the only viable language for religious instruction as opposed to Greek, Hebrew or French. Therefore Evans syllabary was not acceptable to publish, for acquiescing to native language (Hengstler, 2003). Despite this, the syllabics writing system spread like wildfire. Church historian Bruce Peel, whom a U of A library is named after, stated, “Evans … produced a script so simple that any unlettered Indian could master it within days” (Stevenson, 1999).

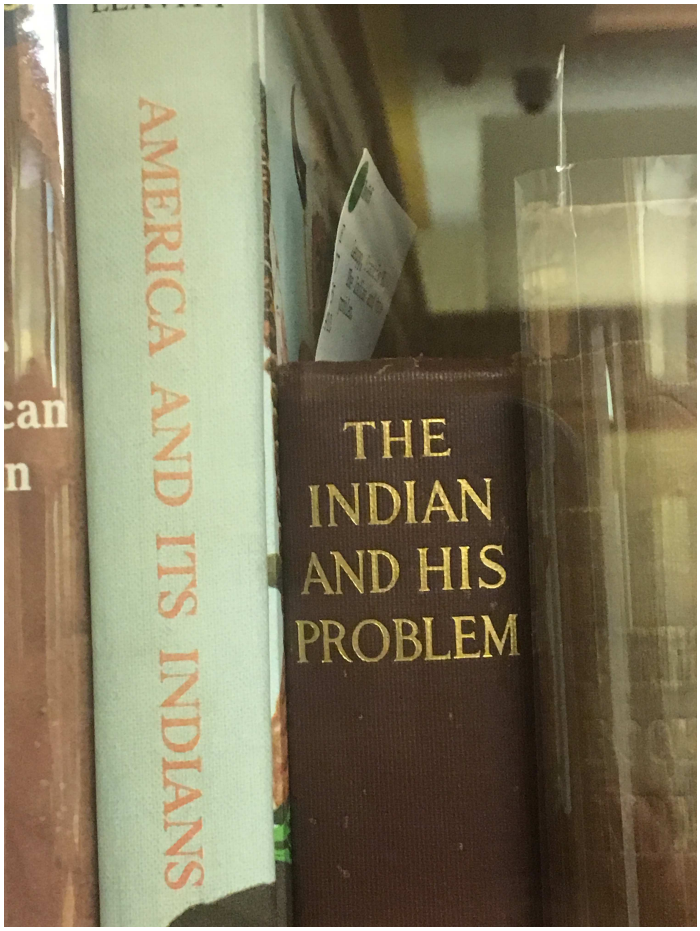
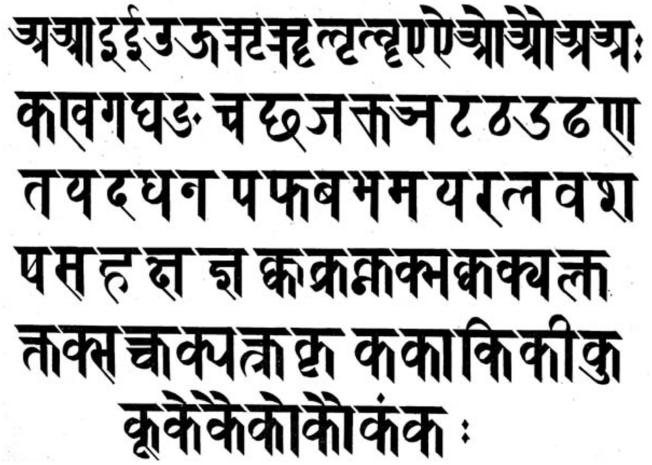


Figure 15 - Bruce Peel Library Book Selection (Photo by Author January 30, 2017).

The Cree syllabary spread rapidly among the Cree and Ojibwe, “without the aid of missionaries, who were often reluctant to use it, as the newly literate quickly taught the system to others” (Valentine, 2003).

Then a number of scandals befell Evans, leading to his downfall. In 1844 while passing a gun, it fell and discharged, accidentally killing his valued assistant Thomas Hassall. In 1845 disputes with the Hudson’s Bay Company over free-trade with the natives and working on the Sabbath led to his alienation with the HBC. In 1846 he faced accusations of sexual misconduct with three native girls in his household. He was brought to London and investigated, and eventually found not guilty although the situation was deemed one of impropriety. The stress combined with kidney disease and heart problems resulted in his early death by a heart attack in 1846 (Shirritt-Beaumont, 2001).

There are similarities between the ‘final’ characters of Cree syllabics and Devanagari script, as well as Pitman shorthand, of which Evans was familiar. Shorthand is a way of condensing what is being written in forms that serve to speed up transcription. There are quite a few major accepted styles, although every writer usually has their own variation. Pitman shorthand is notable for containing what looks to be the inspiration for the final consonant characters in syllabics, as the comparison below shows (Tiro Typeworks, 2007). Devanagari is an Abugida or alphasyllabary, a segmental writing system in which consonant–vowel sequences are written as a single unit: each unit is based on a consonant letter, and vowel notation is obligatory but secondary (Tiro Typeworks, 2007). The Cree language is well suited to this mode of transcription. For example, ᑎ stands for ‘t+i’ or ‘ti’.



Pitman source of final Cree consonants

Pitman		Cree	
˥	p	˩	-p
˩	t	ˊ	-t
ˊ	ch	ˉ	-c
ˉ	k	˥	-k
˖	m	˓	-m
˅	n	˒	-n
˒	s	˖	-s
·	i	·	-y

Figure 16a - Devanagari Script (Above) (Devanagari. n.d.).

Figure 16b - Pitman Shorthand Comparison (Below) (Wikipedia Contributors, Canadian Aboriginal Syllabics).

Standard Roman Orthography (SRO)

James Evans felt that Roman orthography was unsuitable for expressing Cree words in writing. Evans put it this thusly: “[a]ll who have attempted to represent the Indian dialects by written characters, have proved the impracticability of accomplishing this object by the use of the Roman character” (Hengstler, 2003). For expediency I rely on it throughout this paper. Roman orthography refers to the act of relaying Cree word sounds using the Latin based characters of the English alphabet (Ogg, 2014). For instance ᓂᐦᐱᐩ (nîpiy) which means water, comes from ‘nee’ and ‘pih’ if you sounded out the letters. The caret or macron over the first ‘i’ makes it a long sound. However, ᓂᐱᐩ (nipîy) means leaf (‘nih’ + ‘pee’), the only difference being the position of the macron. At the time the macron was not used in type, and was developed later. This was a big problem, especially in the case of words like ᓂᐸᐣ (nipâ) which means ‘sleep’, or ᓂᐸ (nipa) which means ‘kill’, depending on the pronunciation. The solution to this and other obstacles was to create a new set of characters specific to the language. The result is that there are 2

main types of characters. The main 2-letter per unit syllabics, and their corresponding final consonant forms.

A few things to consider: Cree does not need any capitalization, nor any punctuation because emphasis is a decision made by the speaker. Cree Elders frequently pause in their speech, so indication of those pauses would litter the text with commas everywhere. Apostrophes are not needed because there are no contractions in the language and ownership is denoted by prefixes within words ex. ᓂ (ni) is ‘my’ and ᑭ (ki) is ‘your’ as in ᓂᒧᐢᑫ (nimosom - my grandfather) and ᑭᒧᐢᑫ (kimosom - your grandfather). The ᓂ (ni) prefix vowel becomes the vowel of whatever direction you apply it to ex. my grandmother is ᓇᐦᑯᑫ (nohkom) and your grandmother is ᑯᐦᑯᑫ (kohkom). Questions are asked with ᕕ (ci) which is itself a word; no question mark is needed. Brackets, colons, dashes, ampersands, percentage symbols, etc, are all indicators of European concepts of language, none of which exist in Cree. That is one reason why the standard QWERTY keyboard is not ideal for expressing Cree syllabics.

The need for a period is the only punctuation that is used, and not consistently. In the past a period used to be denoted by the ˣ symbol but it is now an extra space or two is used to show a full stop. Long sounds were indicated by placing gaps within the syllabic itself, but printing concerns made this impractical. Today vowel length is shown by placing a dot on top of the syllabic, known as a diacritic, for example ᐅᐦᐅ (ôhô - owl). The dot can also be placed next to a syllabic to indicate a ‘w’ in between the 2 letters, for example ᑲ (ka) becomes ᑳ (kwa) as in ᒪᐢᑳ (maskwa). This is known as the ‘glide’. A hollow dot or “ᵒ” is used to show a final ‘w’, as in ᐃᐢᖳᐧᵒ (iskwew - woman).

Furthermore, different locations rely on dialects that favour one sound over another. For instance, Plains Cree (spoken in the western prairies) is known as the 'Y' dialect. Other dialects are the 'TH' dialect (Woodland Cree) or the 'N' dialect (Swampy Cree) which replace all 'y's in a given word, with 'th' or 'n' respectively. Adapting the Star Chart keyboard for dialects (or languages) other than specifically Western Plains Cree would involve the creation of buttons for sounds like 'th', 'sh', 'spwa', etc. While these exist as unicodes, I am not aware of any cultural correlation between those dialects and the Saddle Lake Star Chart. A discussion with Cree speakers from those speaking locales would be needed to ascertain the feasibility of adapting this keyboard to a wider audience of Cree speakers. Therefore that is beyond the scope of this demo and dissertation.

There are English alphabet characters that have no corresponding sound in Cree, such as: 'b', 'd', 'c', 'f', 'g', 'j', 'u', 'v', 'x', and 'z'. A few are similar and get replaced: 'b' and 'v' sound like a 'p', and 'd' sounds like a 't'. Also 'c', 'g' and 'q' become 'k', and 'j', 'x' and 'z' become 'c' which is pronounced 'ts' or 'tz'. The letter 'f' is only used by certain dialects. The 'u' sounds like the short sound of 'a', when pronounced. Lastly, 'r' and 'l' are sometimes used for proper names, so a special set of syllabics have since been created for them.

It should be noted that the language is always changing especially in today's world of technological advance. Symbols are re-purposed over time, such as ᙭ which used to refer to the Greek symbol for Christ, but now means "hk", and is better than using ᖻᖽ (h + k). This could be a move away from the Christian influence instilled by residential schools (Dusenberry, 1998).

The Star Chart

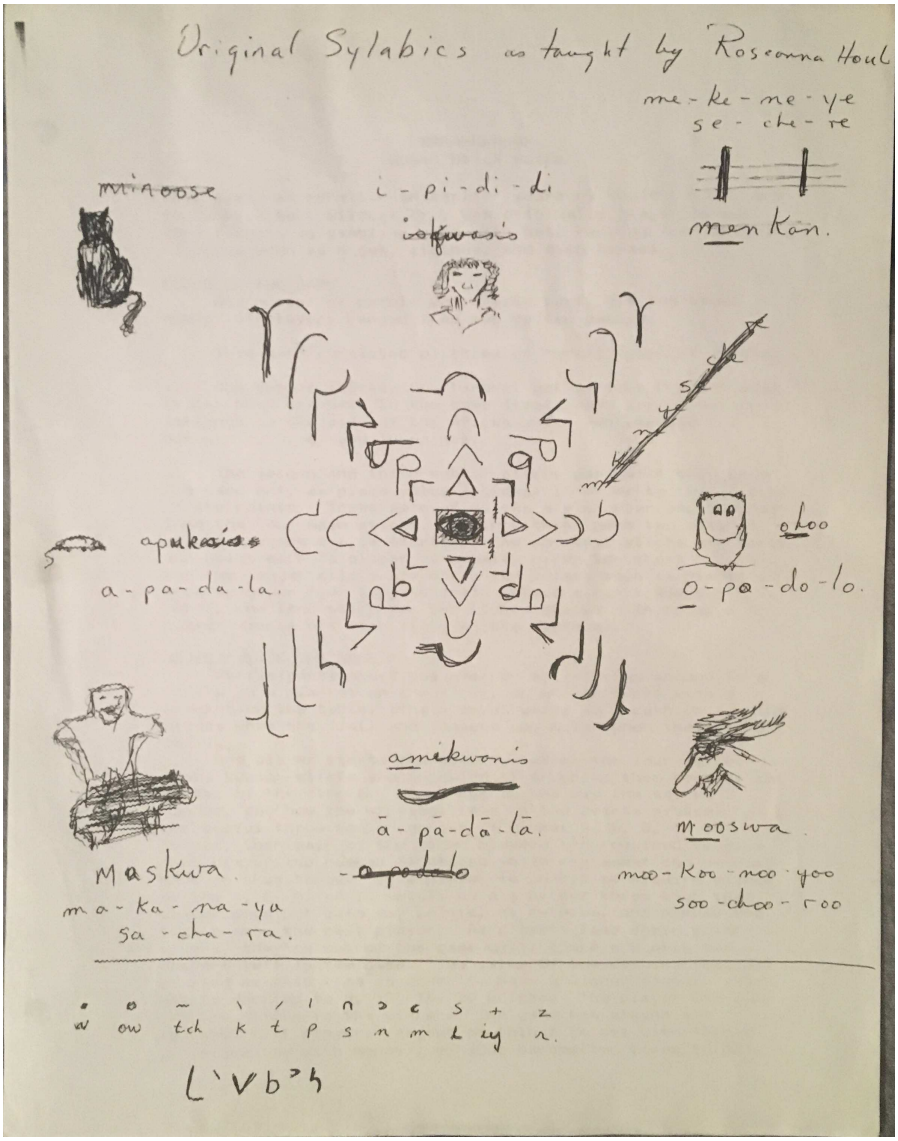


Figure 17 - my Father's Depiction of the Star Chart (Photo by Author, n.d).

The Star Chart features the syllabics in the form of a star, and each line corresponds to a vowel sound and an image of a cree word that represents that sound. The simplicity and elegance of the original syllabic system is what I believe led to its widespread adoption amongst Cree speaking peoples, as well as its adherence to native principles of symmetry and especially the importance of the number four. The teachings say there are four directions, four seasons, four

elements, four stages of life, four times of the day, and four areas of health (Spiritual, Emotional, Mental, Physical). This is consistent for tribes throughout the entire continent, from the Cree to the Lakota to the Navajo (Hill, 2001). The grid chart mode of teaching is functional but the Saddle Lake chart improves on it by taking full advantage of the symmetrical nature. I found that I could reproduce the entire character chart by memorizing just a quarter of it and simply rotating the characters. This layout structure reinforces the ease of use of the original design.

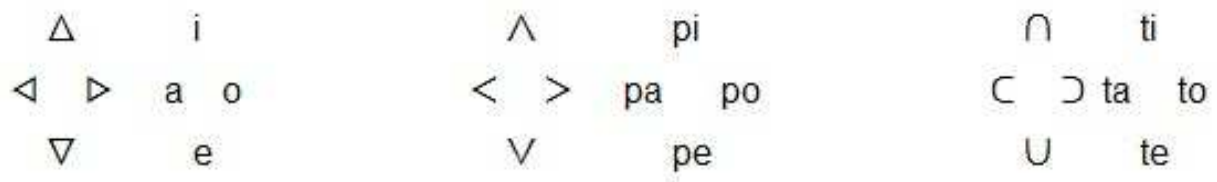


Figure 18 - Symmetric Symbols Arranged in Fours (Wikipedia Contributors, Canadian Aboriginal Syllabics).

The early missionaries spread the syllabic writing system in order to connect with native people to further a religious agenda. There is no way to conclusively state who the inventor of syllabics was due to an environment that was and still is deeply rooted in colonial modes of thought (Laroque & Larson, 2018). However the arrival of the Europeans was instrumental in the need for its creation, and “but for the influence and example of the alien culture, the invention would never have been made" (Dusenberry, 1998). This speaks to a marriage of cultures to create something new and unique. The creation of the Star Chart keyboard is a similar endeavour. This keyboard will open access for readers and writers of Cree syllabics to converse in digital environments, leading to an increase in syllabic literacy.

In conclusion, I knew that there was a large amount of background I should be aware of in going forward with the project. This includes the debatable origins of syllabics almost two centuries ago, and the Cree language features that impact my design. I know I still have much yet to learn and that it will be a life-long journey. In the next chapter I explore the process of creating a working keyboard demo for iOS devices.

Figure 19 - Star Chart Images Correspond to Cree Vowel Sounds (Created by Author's Father, n.d.).

III ᓂᐢᑐ ᐊᑐᐢᑫᐏᐣ (nisto : atoskewin)

The title of this third chapter translates to ‘work’ or ‘labour’. It describes how I arrived at the current version of this keyboard. The key element was the cultural information encoded in the layout. I wanted to retain as much as I could to honour the spirit of the pattern, while adapting and updating it to fit the tools of today. Many aboriginals have a mobile or tablet device now with internet access. That is why is important to be able to access the information stream and share with each other in our own voice.

As a standalone application for iOS, the keyboard resembles a calculator. The main goal is to print characters to an input field. This would be much the same as the Operating System keyboard solution, except that the only buttons needed are ones that are useful for this app. So unless it has functionality like a text editor with multiple lines, there is no need of an ‘Enter’ key.

Figure 20 - Screen Capture of iPhone Standard English QWERTY Keyboard (Photo by Author, 2012).

Press any button (aside from utility buttons) and the corresponding character will appear in the display screen at the top. Final syllabics are usually used at the end of a word, but can appear within the word. However they never start a word. The utility buttons act like regular keyboard option buttons including ‘Space’, ‘Delete’, ‘Enter’ and the ‘International Keyboard’ button for switching between keyboards. There are a few buttons that are specific to Western Cree: the ᐦᐧ key, Diacritic ᐅ̇, Glide ᐅᐧ and the SRO key.

ᐦᐧ - LW: toggles display of the seldom used L and R main syllabic buttons.

ᐅ̇ - Diacritic: pushing this button directly before any syllabic converts the syllabic to its long vowel version. Pushing the SRO toggle replaces this button’s label to one of the various Cree diacritic styles: ‘â’, ‘ā’ or ‘aa’, selected by holding the button down. The default is ‘â’. Pushing it with no syllabic or a final syllabic has no effect.

ᐅᐧ - Glide: pushing this button directly before any syllabic converts the syllabic to its glide version. This adds a ‘w’ between the consonant and the vowel so ᐸ (pa) becomes ᐸᐧ (pwa).

SRO - Standard Roman Orthography: toggles all the syllabic labels to their Latin character counterparts. While my dad disliked relying on SRO to teach Cree, I use it for expediency. The consonant and vowel pronunciations are different from Latin based languages.
Some consonants do not exist and some are only used by regions where they speak a unique Cree dialect (the ‘N’ or ‘TH' dialects in other parts of Canada for example). Some consonants are not used in Western Plains Cree but are sometimes used when saying proper names ᐦ ᐣ (‘L’ and ‘R’).

Why not QWERTY?

The standard QWERTY keyboard (named because the first five letters are literally

‘Q-W-E-R-T-Y’) is the most used input/output device on the planet. It makes sense to adapt it to allow for Cree syllabics. However there are several problems: the QWERTY is 5 rows in height, and has room for 15 buttons per row. The Star Chart requires 56 buttons and at least 7 rows in height. Also the symmetrical aspect of the Star chart is lost when applying it’s square shape to the rectangular shape of standard keyboards. Finally, it has already been done. This functionality has been available for decades but it is a complicated process that never really caught on.

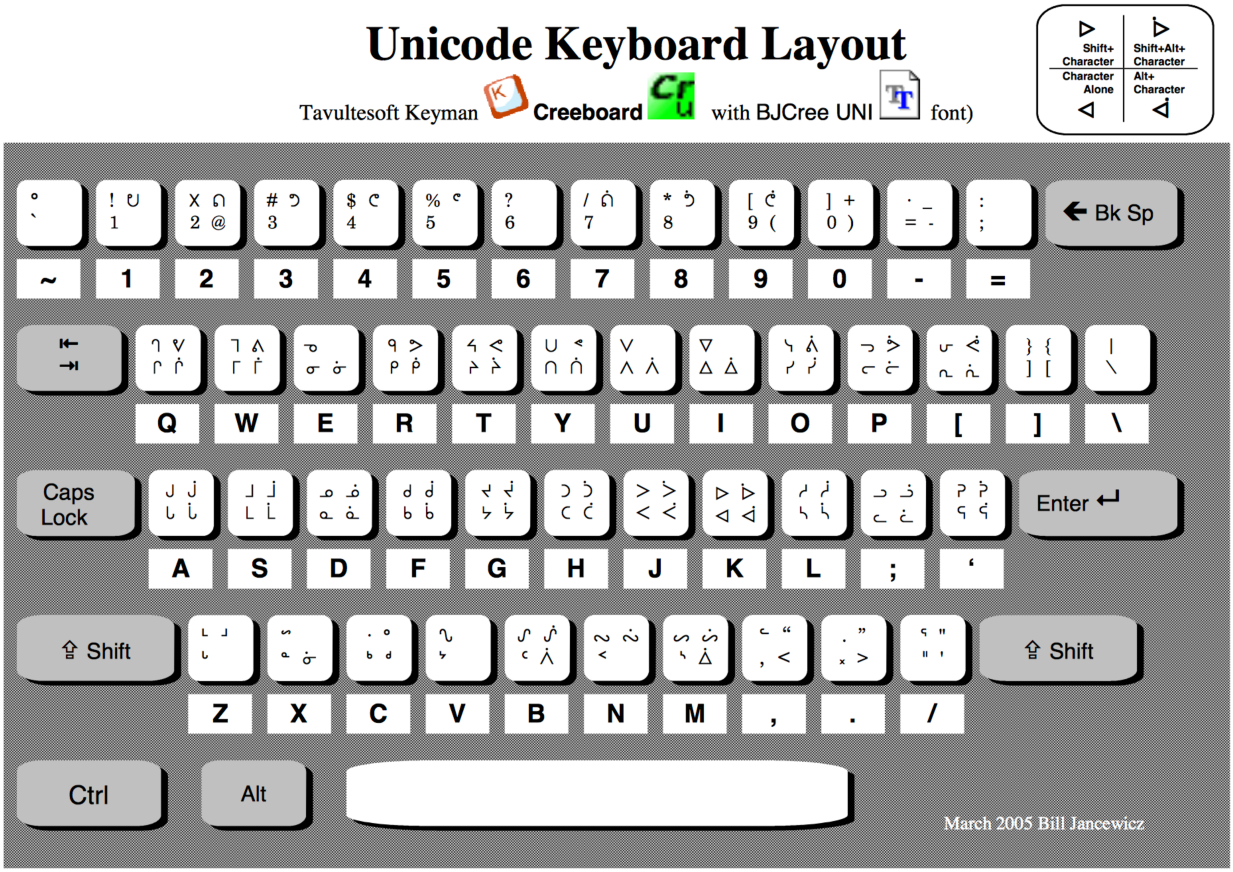


Figure 21 - Cree Syllabics Mapped To Standard QWERTY Keyboard (Jancewicz, 2005).

This keyboard is a fresh approach to the writing method. It jettisons everything not essential and focuses only on doing one thing well: to efficiently express Western Plains Cree syllabics by translating key presses into text. I incorporated the Star Chart into the keyboard layout due to

its cultural significance. It is fast, easy, elegant and intuitive because its design takes full advantage of the symmetrical nature of four by simply rotating the characters.

Version 1

The first version of this keyboard was started in the early 2000s. I know because I did it in Flash which was just coming out then. Now Flash is on its way out and I do not even have a screenshot of that first prototype. It was very simple however and looked something like this:

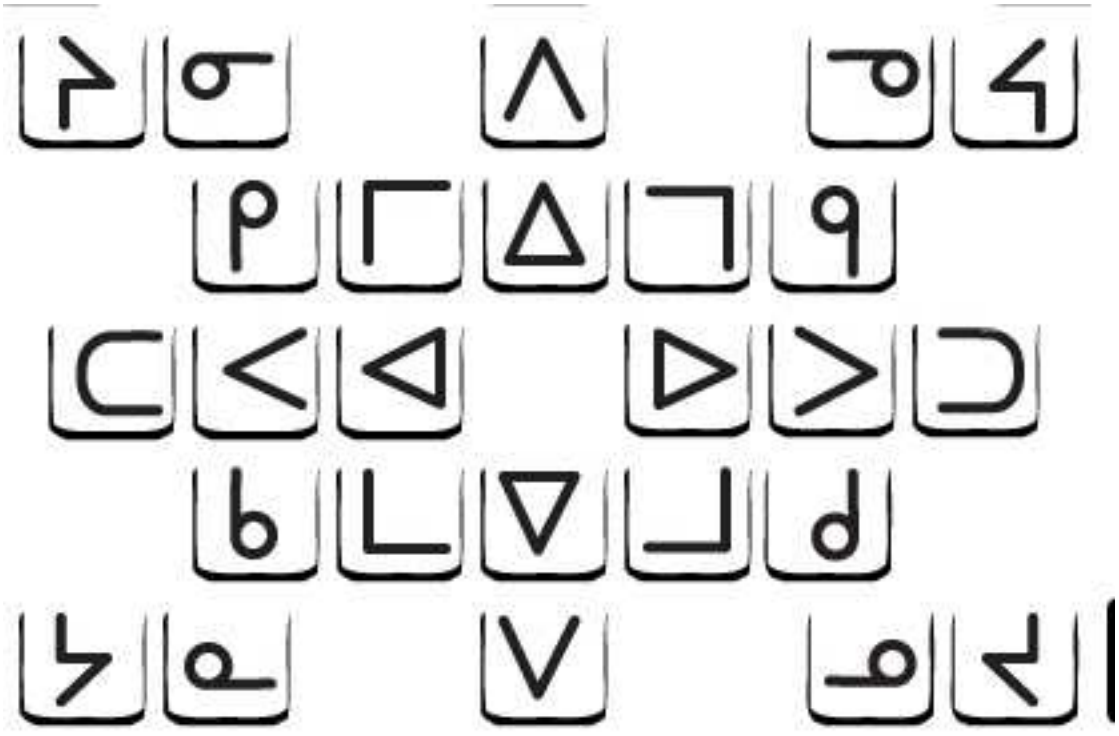


Figure 22 - Star Chart Keyboard Version 1 (Created by Author).

I approached it like a game, creating the 'sprites' within the program based on the syllabic characters. From its inception I arranged the symbols in the same layout that there were taught to me, in the Star Chart pattern. I added button behaviours to each sprite, including a large version of each button that responded to mouse over and click events. Finally I recorded pronuncia-

tion sounds for each button to play on the click events. That was basically the limit of its usefulness, as it had no display nor did it print the characters anywhere.

Version 2

In 2012 I was starting a Master's program in Humanities Computing, and took a course called Design 596 Interactive Media II. Assigned was an app proposal and demo, as well as a 12 page background paper. I chose the topic of a Cree syllabics keyboard for both, and used this opportunity to explore it from a design perspective. This helped immensely as there was no need to create an actual app, but a visual approximation using any means. I did it using a mixture of Photoshop and Flash. The demo allowed you to click the buttons and have them respond as an iPhone would, but no text appeared anywhere when buttons were pressed. The button labels were simply copy and pasted from a page that had all the syllabics (Wood, 2009). The target was within Flash, so there was no need to download special fonts. However that also made it severely limited, especially when Flash fell out of favour.

I modelled version 2 using iPhone image assets and custom vector syllabics (Apple Inc., 2018). I shrunk the entire star pattern to slightly larger than an iPhone QWERTY keyboard. I placed the dot modifiers along the left of the main screen and the utility buttons along the right side, as more people are right-handed. A toggle button led to an alternate character screen, which contains Eastern Cree dialect syllabics ('East Mode'). The final characters are also located on an alternate screen. Because these are less used, clicking one automatically returns to the main screen, after adding that character to the input field. The International Language button (a globe symbol) is used to access the standard QWERTY, numeric and symbol keyboards, which will

allow the merging of ‘texting’ language with Cree. The standard keys for ‘Space’, ‘Enter’ and ‘Delete’ are a different color to maintain consistency with standard OS keyboards; non-applicable keys are discarded.

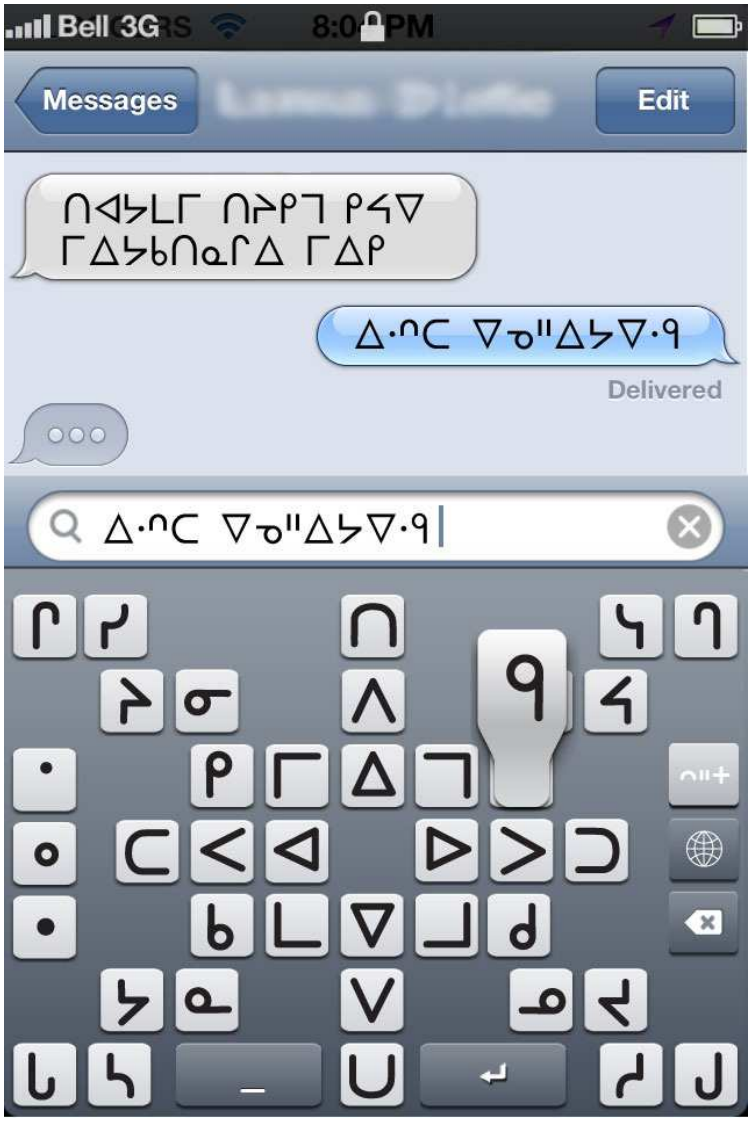


Figure 23 - Star Chart Keyboard Version 2 (Created by Author).

Once the course was over, I had all of these assets and a syllabics background paper, but no clear way forward. The idea was to release the completed keyboard on the website my father and I had planned. I would embed this Flash keyboard onto a language blog, where one could

use it to practise syllabics with others. However this is the time that my dad got sick. I took a leave of absence to be with my family.

Version 3

Eventually I resumed my classes while working on a new version of the keyboard. For this version I chose not to use Flash, which in the intervening years had been purchased by Adobe. Apple opted not to support Flash in their future iPhone and iPad products, leading to a general shift towards open source multimedia options on the internet, which essentially killed the Flash format (Apple iOS, 2012). My alternative was to go browser based, using the new standards of HTML5, Custom Style Sheets (CSS) and Javascript. I also made use of the Unicode standard, which is an update to ASCII.

ASCII is a character encoding standard developed in 1960 that maps common characters such as numbers, the upper and lower case Alphabet, punctuation and basic operators all within the first 128 slots of memory. They are one byte long, which was a necessary concession to early computer storage limitations. Since the 1990s advances in computer hardware led to the creation of Unicode, a multi-byte standard that allowed for 128,000 characters covering 135 modern and historic scripts, as well as multiple symbol sets. By this time Cree syllabics had become a standard part of the Unicode set. Characters for Eastern and Western syllabics (as well as those for Blackfoot, Dene and Inuktitut) were created in Unicode, as well as font sets and keyboard mappings available on various sites such as Languagegeek (Harvey, 2012).

I am developing on Apple iOS devices because Apple products make use of the Unicode standard right out of the box. Android devices have issues with font support and script rendering,

so an Android version will be be developed after. Using Unicode meant I just had to look up the character I need such as U+140F which is ᐃ (Alan Wood, 2009). I then used those sequences in the code, which is then displayed in a browser. Almost every character in the chart has 4 modes: diacritic, glide, both and neither. There are no long “e” syllabic Unicodes currently available, which may change in the future.

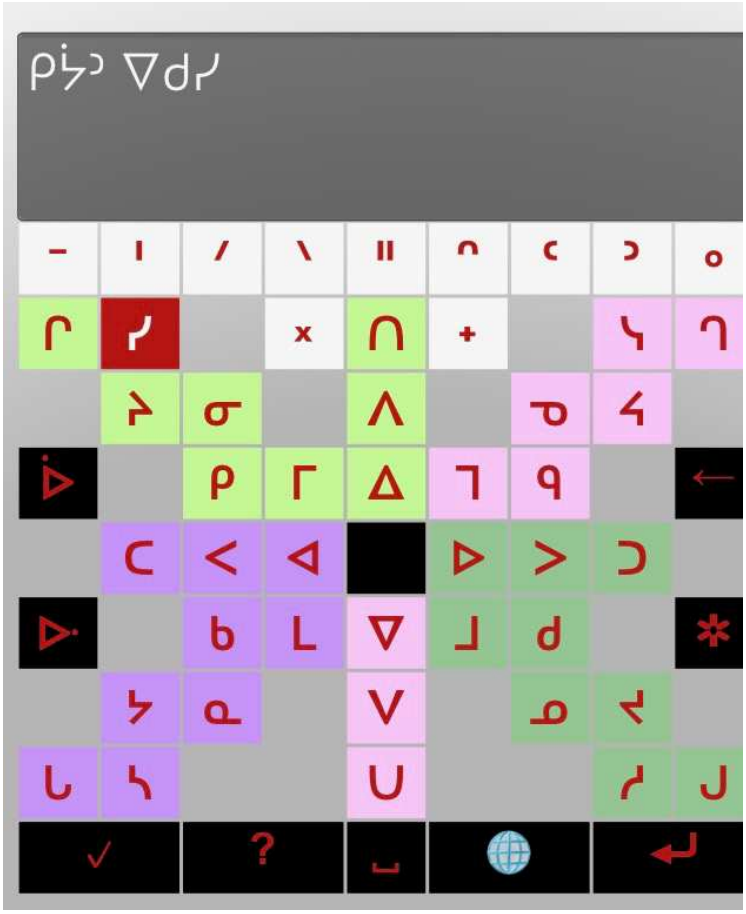


Figure 24 - Star Chart Keyboard Version 3 (Created by Author).

I emulated the star chart by printing the translated codes (the syllabics themselves) as the labels for my buttons in HTML. This was the first version to utilize crude color coding to distinguish vowel directions. It also allowed you to use the glide and diacritic modes simultaneously, requiring four unicodes for most of the main syllabics. I initially used javascript and tables for laying out the code of the webpage. Then I learned about optimization and used CSS for the look

of the page and Unicode for the labels on the buttons. This worked fine but it behaved differently depending on your device and orientation. Also it failed when switching between mouse clicks and keyboard input, which required a refresh. As of this writing it is still online and can be accessed here (refer to the poster for assistance): **http://hucodev.artsrn.ualberta.ca/jrhoule/**

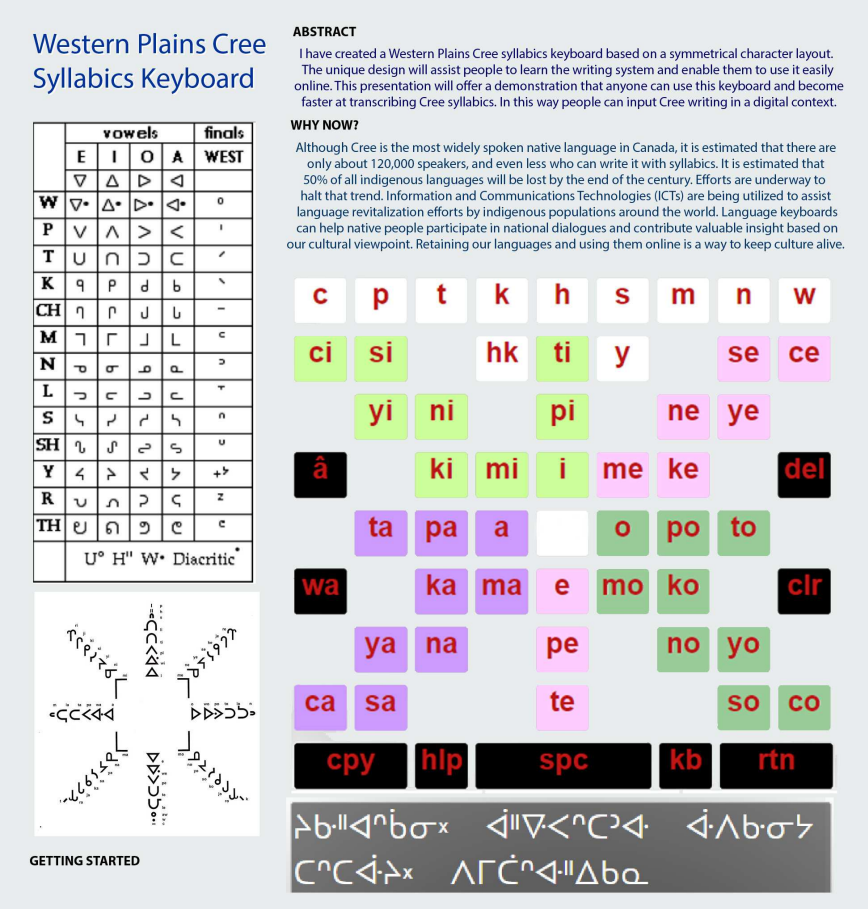


Figure 25 - Star Chart Keyboard Poster Presentation (Created by Author).

Version 4

Rather than learn about detecting screen resolution issues and mastering CSS, I abandoned the web version altogether; I had at this time discovered prototyping with Axure. I was amazed at the power and speed offered by this program. I immediately created a new version that was tastefully colorful and was mostly functional as well. I could move the buttons around

quickly and see them in action. It created wrapper web pages automatically and you could quickly try out ideas and share them. Ultimately, for all its strengths it could not compare to the power afforded by a native application ('native' here meaning an application written specifically for a device, and not browser-based). I have since focused on creating an app for the iPhone/iPad.

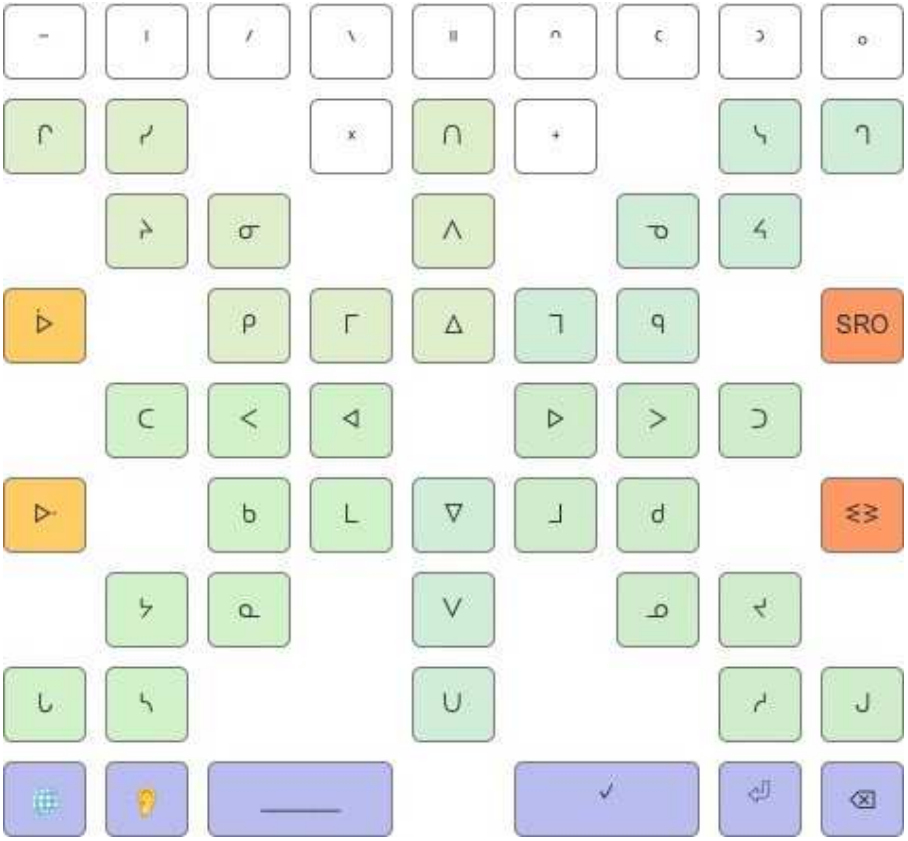


Figure 26 - Star Chart Keyboard Version 4 (Created by Author).

Version 5

Using Xcode and the Swift language, I developed a few rudimentary apps for the iPhone, then attempted to recreate the syllabics keyboard in the new environment. I created keyboard number 5, or the 'crossword' version. It was barebones, and a drab grey color that focused on functionality. The characters appeared in the text area, and the glide and diacritic toggles worked.

Figure 27 - Star Chart Keyboard Version 5 (Created by Author).

By this time I was nearing the end of my class requirements, and a course was offered that focused on thesis writing. I put the demo aside and just wrote. The course helped in many areas as it forced students to write an hour a day, rain or shine. We also peer reviewed each other's progress, in teams. By the end I had tens of thousands of words, and had to edit it down to this document. During this time I worked on heuristics that I could use to compare to the keyboard interface in terms of usability, described in Chapter 4.

Version 6

I had the biggest breakthrough when I realized I could shrink the entire keyboard down without losing functions. I went back to the Axure files and played with the buttons until I made it work. Originally the keyboard required a 9x9 button grid. However by eliminating the open spaces and sliding everything inward, I was able to fit the entire keyboard into 7x8, leaving a whole column for other keys, to use or not.

I envision this keyboard for use on iPhone, Android, as well as the iPad tablet. Each will all require a re-design for space and image assets (and there are issues with Android not allowing access to underlying OS functions so an Android version will take longer). It will available as a downloadable app and like the First Voices App, you set the language setting to Western Cree Syllabics when you want to use it.

Once enabled, any time one focuses their cursor in a text input field, the keyboard slides up from the bottom of the phone. This is the ideal situation but still requires an initial setup and the need to switch keyboards for using standard letters and numbers. The app will come with instructions on installation. Apart from the setup step, there is no need to use the 'cut and paste' method of syllabics use any more because you can bring up the keyboard from any application that has input fields. This includes Facebook, Twitter, Google search, blogs, chat rooms, SMS texting, as well as any programs that make use of text, like graphics software, language learning applications and meme generators.

Figure 28 - Keyboard Star Chart Version 6 (Created by Author).

I also had a few recent notions for the keyboard that may improve it. I am planning to make a physical peripheral version, as well as ones that include recorded voices to learn the pronunciation of each syllabic. I will also create customized overlays, and button backgrounds that could be animated, portraying animals whose first syllable in their name correspond to the vowel directions ex. ᒥᓅᐢ (minos - cat), or ᒨᔃ (môswa - moose).

When demonstrating the keyboard, I have noticed that most people have an initial reluctance to even press any keys because the keyboard is full of symbols that most will not recognize. But their eyes will naturally find the SRO button because it is the only button labelled with characters from the English alphabet. When clicked, the SRO toggle temporarily changes all the

labels to their Standard Roman Orthography equivalents. An option can be added to hold down the button for 2 seconds which will lock the keyboard in SRO mode. The difficulty lies in the various ways to show long sound diacritics in English text. I would enable users to select which mode to use while in SRO mode (â', 'ā' or 'aa'), but it will be tricky to educate new users without overwhelming them.

ᓲᔨᓇᐦᐃᑫᔭᓂ (masinatahikeyin - typing)

ᓲᔨᓇᑕᐦᐃᑫᔭᓂ masinatahikeyin is the first word in the title of this dissertation. I had asked my aunty Cecilia if there was a word for computer or keyboard, and she told me that predictably, there was not. However, when they were in residential school they were taught how to use typewriters, and the word they used for it was ᓲᔨᓇᑕᐦᐃᑲᓂ masinatahikan. It is an extension of the word for 'book' which is ᓲᔨᓇᐦᐃᑲᓂ (masinahikan) and to write, which is ᓲᔨᓇᐦᐃᑫ masinahike. ᓲᔨᓇᑕᐦᐃᑫᔭᓂ masinatahikeyin means 'writing' in a pounding motion. This mimics the action of the typewriter keys stamping the words into a book (when translating modern words for which there is no Cree equivalent, it is common to describe what the action being performed is). This digital keyboard is a modern extension of those physical typewriters, hence the title.

ᓂᐱᒪᐧᑐᐃᓐ ᐁᒪ ᐊᑲ· ᓂᑕᑭᒧᐃᓐ ᐁᒪ

nipimohtewin ôma ekwa nitacimowin ôma

This is my walk/journey and this is my story.

This is the first book I have written. One of my goals was to include as much text in Cree syllabics as I could, using my keyboard demo to create them. Another goal of mine is: ᐁᓄᐧᐦᑐᓂᐧᑦᑎᐧᐃᐱᐊᓐᓂ (enohtenihtânehiyaweyân - I want to learn to be fluent in Cree). My end

goal is to ensure the survival of the Cree language, by maximizing user access to Cree syllabic characters and opening avenues for Cree readers and writers to converse in digital environments.

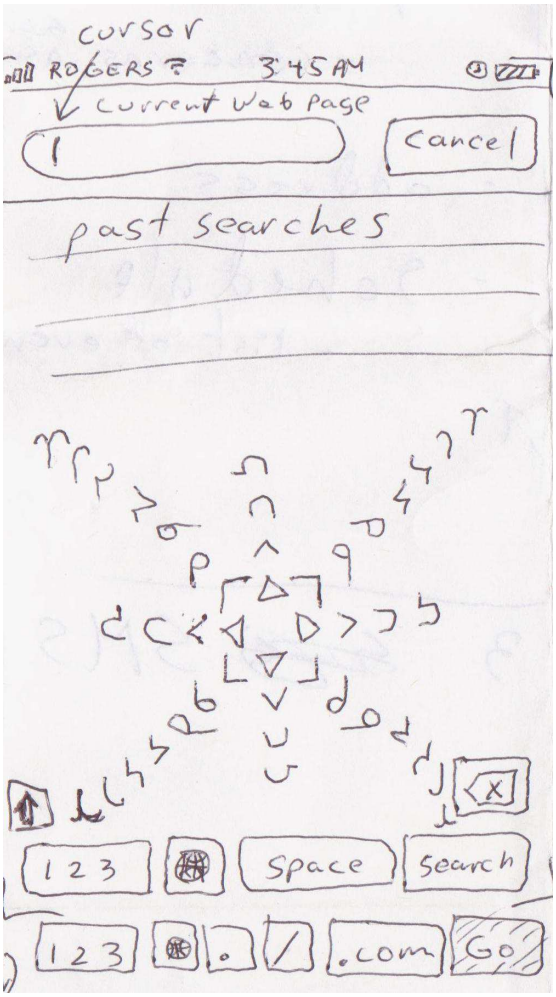


Figure 29 - Star Chart Keyboard Early Design Sketch From 2012 (Created by Author, January 19, 2017).

IV ᓀᐅᐧ ᑕᐘᐦᐃᑫᐤ (newo : tawahikêw)

The title of this chapter means “clears a path”. In this section I will discuss heuristics or recognized usability principles. I researched heuristic studies that applied to this keyboard (Cardello, 2010, Molich, 1990, Nielsen, 2014, Xerox Corporation, 1995), then adapted and compiled them into a list of 12 heuristics. Sources include the published articles of Jakob Nielsen, whose 10 original heuristics laid the foundations for all of heuristics work. In addition I have incorporated into this list heuristics studies about the elderly (Al-Razgan, 2014), and young children (Alsumait, 2010).

Usability is, according to the ISO rule 9241-11, “[a] measure by which a product can be used by a set of determined users, to get specific objectives with effectiveness, efficiency and satisfaction in a context of specified use” (ISO, 1995). Heuristics evaluation is, “a usability engineering process for finding the usability problems in a user interface design so that they can be attended to as part of an iterative design process” (Nielsen, 1995). It consists of a set of guidelines or rules of thumb against which a design can be compared, and seen if it is compliant.

I have a working keyboard demonstration application that is informed by the following list of adapted heuristics. The bullet points are specific properties of each broad heuristic, and the bold text describes how the demo satisfies that condition. User may refer to child, adult, or elderly persons. Heuristics 1 to 10 are from Nielsen’s original list, and may be modified with updates for children and/or the elderly. Heuristics 11 and 12 are specifically suited for the needs of children and the elderly.

12 Heuristics for the Star Chart Syllabics Keyboard

1. Visibility of system status

Does the system always keep users informed about what is going on, through appropriate feedback within a reasonable time? A pressed character immediately appears in the display area.

The user knows where they are at all times, how they got there, and how to get back to the main page. A cursor in the text window shows where text will appear during the course of use. The effect of any toggle is immediately apparent because the button labels change.

2. Match between system and the real world

Does the system speak the users' language, with words, phrases and concepts familiar to the user and follow real-world conventions, making information appear in a natural and logical order? No, it is a writing system that will not be familiar to people who are not Cree speakers or linguists. Any description or labels follow language terms such as diacritic, macron, Eastern Cree characters, glide, finals, and SRO (standard Roman orthography). There will be support material that explains these terms. Supporting documents are in mostly English, but SRO is also used where necessary. If you are a Cree speaker/writer, the interface will be easy to navigate.

The help tutorial makes information appear in a natural and logical order. The planned help materials will present information in a logical and relevant way.

All learning objects and images should be recognizable and understandable to the user, and speak to their function. The utility buttons will be familiar (Space, Delete, Enter). Other buttons (apart from toggles) have a one-to-one relationship with their effect: push a character key,

and the character appears in the window. There will be a visual component that include images of animals: bear, cat, owl, moose, etc. that will be used to reinforce cultural cues and identify parts of the chart by vowel sound.

3. User control and freedom

Is the user able to undo and redo an action made by mistake, and recover from input errors? There is a delete button if you type the wrong character. Any activated toggle can be deactivated by pressing again and button states are visually differentiated to be darker when selected.

Navigation objects and tools are kept in particular and clearly-defined positions. Utility and toggle buttons are located on the sides and colored differently than the main syllabic buttons.

The user should perceive a sense of control and impact on the application. They are allowed to move around in the program in an unambiguous manner. Selecting/deselecting toggles provide immediate visual feedback and function. For example, pressing the 'diacritic' toggle converts all the main syllabic labels to their long-vowel counterparts (where applicable), then switches back after pressing one. It is the same with the glide, SRO and East Mode toggles.

4. Consistency and standards

Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions. In the context of this keyboard, copy means 'copy to clipboard'. 'Space' creates one space where the cursor is; however two spaces are advised to differentiate between words due to the way syllabics font characters appear close together.

The user experiences the user interface as consistent (in control, color, typography, and

dialog design). Color is utilized to differentiate the different types of buttons. The font and size is consistent throughout the keyboard.

Control keys are intuitive, convenient, consistent, and follow standard convention. Utility keys such as Delete, Return, and Space behave as expected. The International key, if it is used, can access the standard keyboards: QWERTY, numeric, emojis etc. There are at least 3 shift buttons that behave like toggles. There may be functions to copy text, and hear sounds.

5. Error prevention

Does the keyboard provide a means of error prevention? There are no destructive actions available to users except deleting what was typed. Retype it in that case.

The keyboard does not allow the user to make irreversible errors. The only pitfall is that a user can type a lot of text and delete it all by mistake. However it is easy to type it in again, similar to how a calculator functions. Whatever frame application the keyboard is used in may have its own 'undo' functionality, for example, word processing applications.

The keyboard is carefully designed to prevent common problems from occurring in the first place. Key placement reinforces cultural learning and all tasks are designed to be accomplished in as few keystrokes as possible.

6. Recognition rather than recall

Does the keyboard minimize the user's memory load by making objects, actions, and options visible? The keyboard relies on and facilitates the user memorizing the placement and function of buttons. Knowing them makes overall use more efficient, similar to court transcription.

Are instructions for use of the system visible or easily retrievable whenever appropriate? Users will most likely get the keyboard from a website or the App Store, which will contain instructions. The keyboard itself has the SRO button for showing the 'English' labels as well as a button that links to the companion website or help file.

The keyboard makes objects, actions, and options visible so that the user does not have to remember information from one part of the program to another. There is at most one layer of complexity between any mode, and effects have visual feedback. Button types are delineated by color schemes: final, main, utility and toggle buttons are shaded darker when selected.

Icons and other screen elements are intuitive and self-explanatory. There is a one-to-one relationship between the characters and what is typed in the text screen. Toggles offer increased functionality and their effect is immediately known. Utility keys 'Space', 'Delete', and 'Enter' use the commonly accepted icons.

Navigation is consistent and logical. Multiple toggles can be applied at once, but their cumulative effect is represented on all affected syllabic labels. For example, both 'East mode' and 'SRO mode' can be toggled simultaneously and shows the rarely used characters as well as their SRO label. Additionally both diacritic and glide modes can be applied at the same.

7. Flexibility and efficiency of use

Does the keyboard cater to both inexperienced and experienced users? Does the system consider frequent actions? The keyboard is designed to speed up interactions for the expert user, but also to cater to the needs of the inexperienced user. If you are an expert cree speaker and syllabics user, you will be able to use the keyboard faster because the mnemonic shortcuts will be

known already. Also most keys will have a secondary function accessed by holding the key down for a set amount of time. For example, 'Enter' inserts a newline, while holding it down does that and also copies the entire screen text to the clipboard. 'Delete' behaves like backspace and holding down 'Delete' for 2 seconds clears the entire window.

8. Aesthetic and minimalist design

The screen layout is efficient and visually pleasing. The Star Chart layout is already very efficient and visually pleasing. This keyboard aims to present it in the best way. The interface attracts new users to play around with it, and does not distract from learning the writing system.

The font choice, colors and sizes are consistent with good screen design for ease of use. Make elements on the page easy to read. Even on smaller phones the keys will always be legible. Font choice, colors and and sizes are consistent and designed to be visually striking.

Is the font is large enough for older adults? The iPad layout includes large font sizes.

Is there any option to enlarge the font size? The size is set but the iPad layout is large.

Do the text and background colors have good contrast? Color options will be carefully considered for contrast as well as for color-blind people.

Is it possible to customize colors? No, but that may be possible in the future.

Is the amount of text minimized; is only the necessary information presented? The amount of text is minimal and there are very few 'English' readable characters.

Do color choices allow for easy readability? Button types are differentiated by color and each vowel group has a different color tone.

Does the keyboard interface contain information which is irrelevant or rarely needed? The keys for finals ‘L’ and ‘R’ are rarely needed for Western Plains Cree, but are used for proper names so the keys are always available. ‘L’ and ‘R’ versions of main syllabics, such as ‘RI’ or ‘LO’ are available by switching to ‘East mode’ using the ᐊᐅ toggle key.

9. Help users recognize, diagnose, and recover from errors

Are there error messages to the user? There are no error messages as the only mistakes that can be made are nonsensical text. The system does no language checking whatsoever (future versions may possibly include word completion and suggesting the next commonly used character). If the user types a lot of text then accidentally deletes it all, they will have to retype it (similar to how calculators function).

Support material uses simple language that does not include programmer code or jargon. Aside from instillation, the user does not have to know anything about Unicode, downloading fonts, international keyboard settings, hotkeys or mapping existing keyboards to new layouts.

10. Help and documentation

Can the keyboard be used without documentation? The user does not need a manual to use the application but without any knowledge of Cree, usefulness is limited.

Does it provide help and documentation? The user has the option to receive additional guidance, instruction, or other forms of assistance as needed.

The user should not get stuck or have to rely on an instructor. Supplementary help material will be provided, accessible through a web link.

Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large. Help material will conform to these guidelines and standard help conventions. Task based tutorials will guide the user.

The help material includes interesting tutorials or flashes that mimic actions on the keyboard. Tutorials will expand on concepts taught within the keyboard itself such as the animal associated with each vowel direction, mnemonic exercises, and techniques for learning syllabics.

11. Use Appropriate Hardware Devices.

Input/output devices are used for their own purposes and are suitable for the specific age group of the user. There are two distinct layouts: compact for mobile devices and large for use on tablets; recommended for children, the elderly and those hard of sight. A physical keyboard version is planned for the future, as well as one utilizing sound capability.

Potential users have all the necessary computer skills to use the application. There should be a consistency between the motor effort and skills required by the hardware and the developmental stage of the child or the faculties of an elderly user. If one can use an ATM machine or calculator, they can use this keyboard. Language proficiency has little impact on one's physical ability to use the keyboard.

12. Make clickable items easy to target and hit

Is it obvious which item is clickable and which is not? All buttons are clickable and change visually when clicked. Toggles are darker when selected.

Are buttons large enough to easily see the image or text on them? The tablet layout will be large and in high contrast colors.

Is there enough space between buttons to prevent hitting multiple or incorrect buttons? Is buttons size adequate to finger touch? There is adequate space between the individual buttons. The mobile layout buttons are not too small to touch, and the tablet layout buttons are large.

Is the image on a button or an icon easy to predict what it does? Each button just prints out the character on it to a text field. Toggles alter the button and label so their state is known.

I adhere to these recommendations with each successive iteration of the keyboard. I will also refer to this list when designing support materials such as a help file, accompanying website and media tutorials for the final product. None of these exist yet apart from this document and a poster I created when I presented the keyboard demo at the University of Alberta.

ᐁᑯᓯ **(ekosi - conclusion)**

In the future I aim to incorporate sound to aid pronunciation. I will also adapt the list of heuristics I created into a survey and give it to people as they try the keyboard demo. The final version will need further user testing following best practices. By aiming for a 7x8 button grid, development can begin on physical keyboards for Arduino or Raspberry Pi. Future versions will focus on accessibility and will incorporate heuristics regarding persons with disabilities. As new input/output devices are developed and improved on such as voice recognition, virtual reality and wearable computing, this keyboard will be re-evaluated to accommodate them.

Through this project I have gained connections to the Cree language, the people who speak it and the lands and culture that it describes. I have also learned methods that I can apply to future endeavours, and I have many other app ideas to complete. But it all started with the gift of an idea that my dad gifted to me.

Eugene Houle wanted to see people communicating in Cree online. That is starting to happen in various ways, in the form of blogs, dictionary sites, mobile app downloads and social media groups. I only wish he could have witnessed it in person and that he could have used the keyboard that he willed into being. But he joined his mother, Roseanna Houle, and all my ancestors who came before, and I know that they have been with me through it all. They placed this project in my path, let me struggle with it for years, provided unexpected insights just when I needed them and gave me the strength and wisdom to see it through to completion. I could not have done it without their guidance. This keyboard is for ᓄᐦᑕᐄᐸᐣ Eugene, ᓄᐦᑯᒼᐸᐣ Roseanna and my family. Thank you, ay hay. ᐊᐩ ᐦᐊᐩ

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