Submitted by Karen Kwan

Making Public Libraries Relevant

A study on how public libraries have responded to changes in community needs

Introduction

The modern public library tracing its roots to the Public Library Act of 1850 was created to provide universal free access to information and literature. With the advent of the Internet and "Googling", this mandate has been somewhat overtaken. Public libraries have responded to the changes in society by reinventing themselves with services that reach beyond the traditional library model.

This project will be an exploratory analysis of the data collected from the Annual Public Library Survey. The main question studied is how public libraries in Ontario have responded to the technological shifts in society and remain a relevant civic function. In particular, changes in library usage, collections, programs and facilities will be investigated.

Literature Review

The following six works were selected to showcase the breadth of literature on the subject of public library changes and trends.

Bester, G. (2014), Idea Exchange Music Hub Hits the Right Note in Community, *Partnership: the Canadian Journal of Library and Information Practice and Research***, vol. 9, no. 1**

The essence of how libraries are changing and adapting its role in a community was demonstrated in this short article. The public libraries in the City of Cambridge, Ontario went as far as rebranding and renaming itself to 'Idea Exchange' in order to reinvent itself beyond the traditional library model. The focus in this article centered on the library's newest innovation, the "Music Hub" where musical instruments were made available for public use. Details about the challenges of this program as well as the positive response from the community were also described.

Bruce, L., Canadian Electronic Library (Firm). (2011), Places to grow: public libraries and communities in Ontario, 1930-2000, Guelph, Ontario, Canada

This book documents how the modern day public library has survived and transformed itself through economic turmoil and political upheaval from the Great Depression to government and legislation changes. At each significant era in history public libraries preserved by responding to the prevailing needs of society. The establishment of military libraries during the Second World War, creating cultural centers in preparation for Canada's centennial celebrations and planning for the eventual ubiquity of "Information Highway" at the turn of the millennium, all show the historical dexterity of public libraries.

Canadian Electronic Library (Firm); Lumos Research Inc. ; Canadian Urban Libraries Council, (2011), An analysis of public library trends, Toronto, Ontario, Canada

This research report summarizes public library data compiled from 2000 to 2009. The subject libraries are urban libraries from across Canada, stretching from Halifax to Vancouver. Findings in this report indicate that in the 10 years under study, library usage has increased 45% with the main driver being

access to electronic material. The report also found that spending on materials had a strong role in increasing library usage.

Demers, Patricia (chair), Guylaine Beaudry, Pamela Bjornson, Michael Carroll, Carol Couture, Charlotte Gray, Judith Hare, Ernie Ingles, Eric Ketelaar, Gerald McMaster, Ken Roberts. (2014). Expert Panel Report on *The Future Now: Canada's Libraries, Archives, and Public Memory*. **Royal Society of Canada, Ottawa, ON.**

This in depth report examines libraries and information archival services across Canada and gives recommendations on how these services can evolve in the future. The section on public libraries emphasizes the need for community connections and the need to address inclusivity issues. Three areas of note that were highlighted include: the divide between services offered by urban and rural public libraries, services to underserved Canadians and issues with interlibrary loan services.

Fitch, L. and Warner, J. (1998) 'Dividends: The value of public libraries in Canada', *The Bottom Line*, **11(4), pp. 158–179.**

While this article was written about a study that was conducted nearly a decade ago, the topic of value as it relates to public libraries is just as relevant today. In a climate of shrinking funding, the authors argue that the return on investing in public libraries touches Canadian social, cultural and economic values. By promoting life-long learning and supporting the democratic access to information public libraries are a vital part of Canadian society.

Stevenson, S.A. and Domsy, C. (2016),"Redeploying public librarians to the front-lines: prioritizing digital inclusion", *Library Review*, **Vol. 65 Iss 6/7 pp. 370 – 385**

The human factor in public libraries is the focus of this article. As libraries adapt to the needs of the communities they serve, so to do the required competencies of professional librarians and library staff. Beyond the infrastructure, hardware, new spaces and innovative programs, the authors of this article argue that the public library's quest for digital inclusion should also give due regard to the staff who are charged with implementing these changes.

Dataset

The dataset is a compilation of the answers to the annual survey conducted by the Ontario Ministry of Tourism, Culture and Sport from all public libraries found at https://www.ontario.ca/data/ontario-public-library-statistics. This data includes responses from approximately 380 public libraries, First Nation public libraries and contracting organizations*.

The data captures information from 1999 to 2015 but for the purposes of this investigation, the latter five years, (2011 to 2015), will be used. From 2011 onwards, the dataset reflects the addition of

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* Communities without libraries contract library services from neighbouring communities.

information collected in relation to e-resources, information technology support and project grants. These added data segments give an indication as to how public libraries are expanding their role beyond traditional library services.

Approach

Step 1: Combine datasets

As the data is from surveys that have been changed over the period under study, some of the attributes will not have directly comparable numbers across all the years. This step involves reading all five data sets into R then merging each dataframe on a common column to produce a combined dataset. The common columns in this case would be a combination of the library number and year.

Step 2: Clean data and make consistent

Convert variables into appropriate data types, check for missing data, and resolve/correct any data input errors. The annual survey collects over 325 pieces of information from public libraries in 7 broad categories, any non-relevant attributes and observations will be removed in this step. For example, the financial and funding information will be taken out as it is not part of the focus of this study.

Step 3: Group attributes for detailed analysis

To isolate particular areas that show how libraries have changed, sub-setting the cleaned dataframe into separate groups would allow for more manageable datasets with fewer attributes to evaluate in each. Basic identifying information as well as population attributes will be common among all sub-setted dataframes so that all attributes can be traced back to the libraries from which the information came.

Step 4: Explore datasets with basic descriptive statistics

With the new dataframes, use the structure, summary, head, tail commands in R to summarize the features of each. The yearly average and median figures for some of the attributes will also be compared across all five years and/or library types.

Step 5: Visualize data to analyze patterns

Create scatterplots, histograms, boxplots and other graphs to see the relationship between variables, the distribution of variables and the skewness of variables, respectively.

Results

Number of Libraries Consistent

While the number of libraries from 2011 to 2015 decreased from 316 to 310 for a net loss of six libraries, the demand for library services has not diminished. Taking a closer look at the data showed that of these six libraries, three no longer exist, two chose not to complete the survey as they are still in operation and one merged with a larger system. As a relatively small number, this should not affect the compiled results of the dataset so the data from these libraries that was collected was not removed.

Library Usage Steady and Growing

Public libraries serve a wide range of communities, from First Nations libraries with 47 residents to Toronto libraries with 2,790,200 residents.

For comparison purposes cardholders per population showed that on average, 45.6% of the population in Ontario with library services were active cardholders. In each of the years of study, this average has remained fairly consistent. Interestingly, the outliers seen in the below show that for a number of libraries there were more active cardholders than residents. Rather than an error, these outliers are caused by non-residents being active cardholders. Resident numbers are taken from census information, however, in many smaller communities where there are seasonal inhabitants who are not recorded as residents (e.g. cottagers, foreign students).

Cardholders per Population by Year
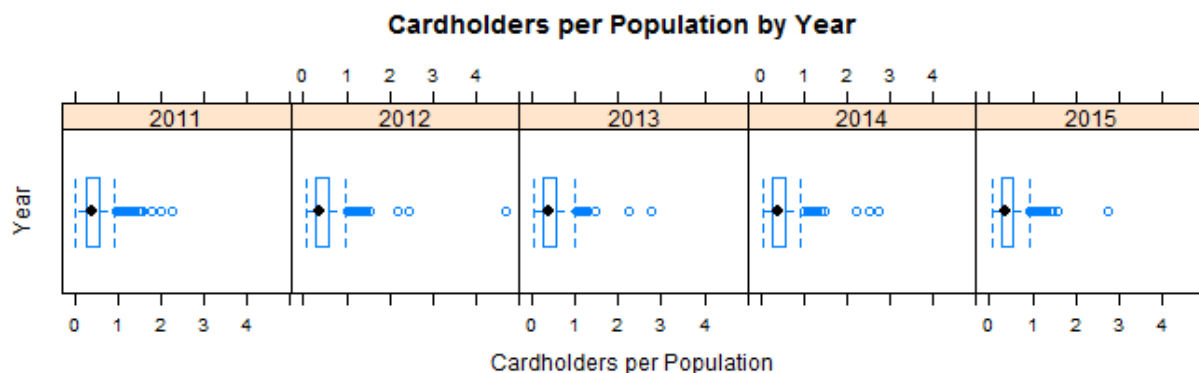
These outliers show that libraries remain an important service not only to permanent residents but also to seasonal inhabitants. In total there were 89 observed instances where there were more cardholders than residents, accounting for about 5% of the 1,561 records.

Looking at the cardholders to households also show that library services are consistently in high demand with 89% all households having at least one active cardholder. Over 40% of all households have more than one cardholder and nearly 20% of the 1,561 records showing over two cardholders per household.

Cardholders per Household by Year
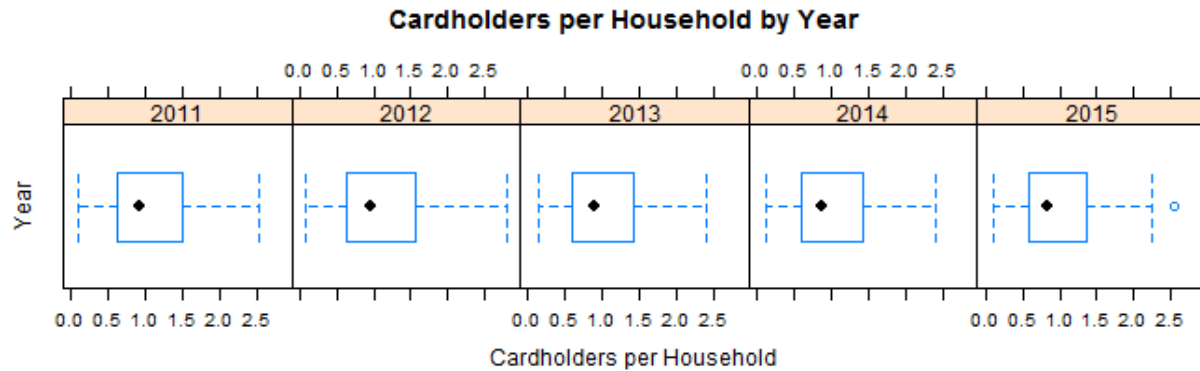
While the total figures per year give a high level overview of library cardholders in all public libraries, separating this data by the library type yields some more granular patterns as seen in the matrix of boxplots below.

Cardholders per Population by Library Type and Year
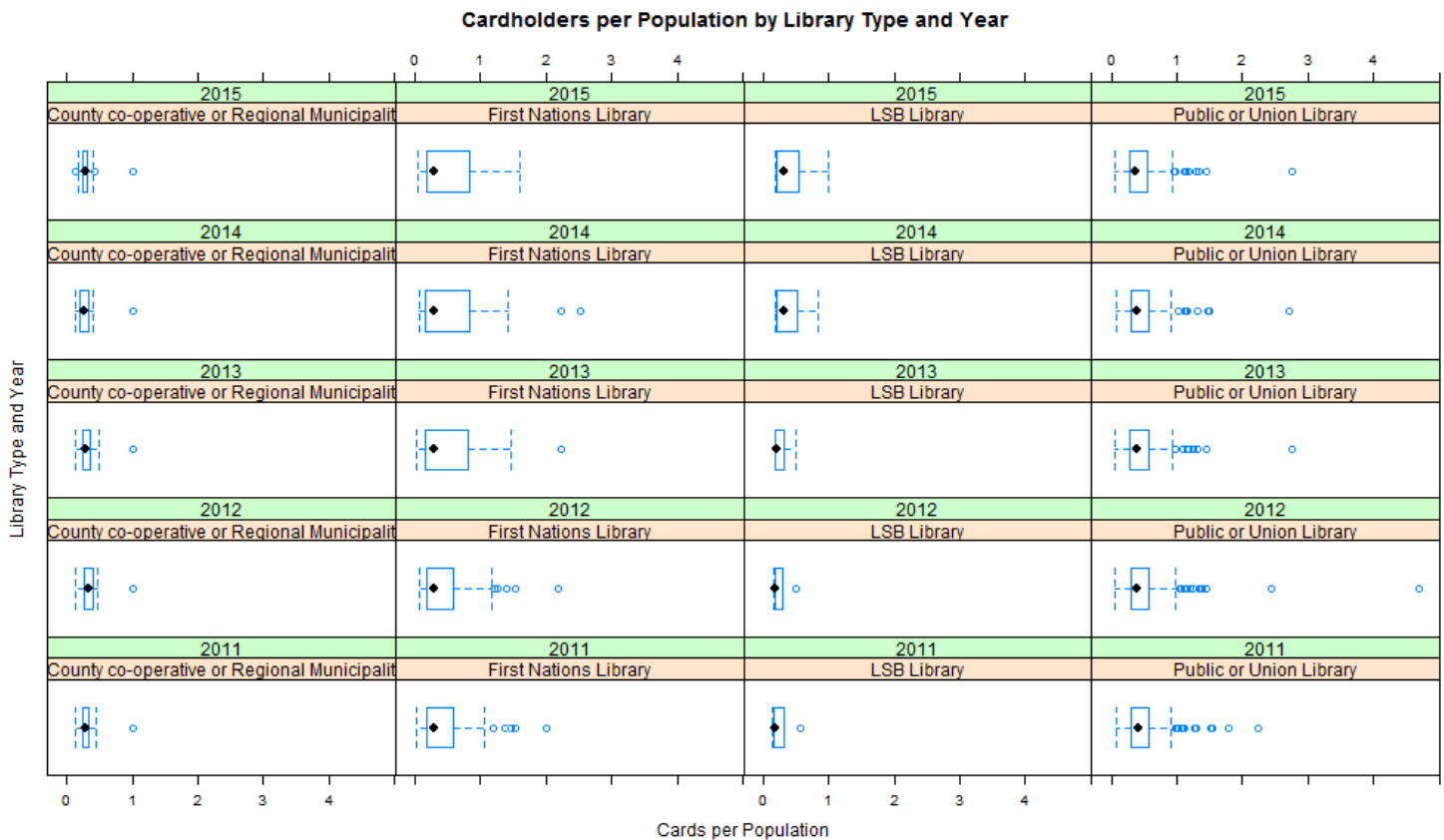
Looking at the separate plots, one that stands out is the strange outlier in 2012 for public or union libraries. Investigating this anomaly showed that the population figure entered for this particular outlier was likely an error. In each of the other years the population was recorded at a figure close to 90,000 people but in 2012 the population figure was only about 9,000. It is unlikely that the community lost over 90% of its population in 2012 then regained it in 2013. To correct this number the average for the preceding and successive year was taken and substituted as follows:

Year	Population served	Population Served – revised
2011	89,900	89,900
2012	**8,861**	**89,542**
2013	89,184	89,184
2014	89,931	89,931
2015	91,726	91,726

After correcting for this error, the matrix shows that:

- Cardholders at public and union libraries have remained largely unchanged
- Active cardholders in county libraries have fluctuated in the five years. While the median has remained fairly consistent, the spread and overall range has changed. Suggesting that the population has become more homogenous in their use of library services
- First Nations libraries showed the most dramatic changes in active cardholders. The range for the latter three years shows an upward trend. The larger interquartile range combined with a higher first quartile suggests that there has been a greater use of libraries by a larger number of people in the past three years.
- LSB libraries also saw increases in library usage between 2011 and 2015. The median number of cardholders changed from 18% of the population in 2011 to over 30% in 2015. The range also jumped significantly from 13.7% in 2011 to 33.8% in 2015. While these changes in numbers appear large and suggest a huge surge in the demand for library services, this type of library typically services smaller communities so they would be more sensitive to even incremental shifts in library usage.

Cardholders per Population by Library Type and Year
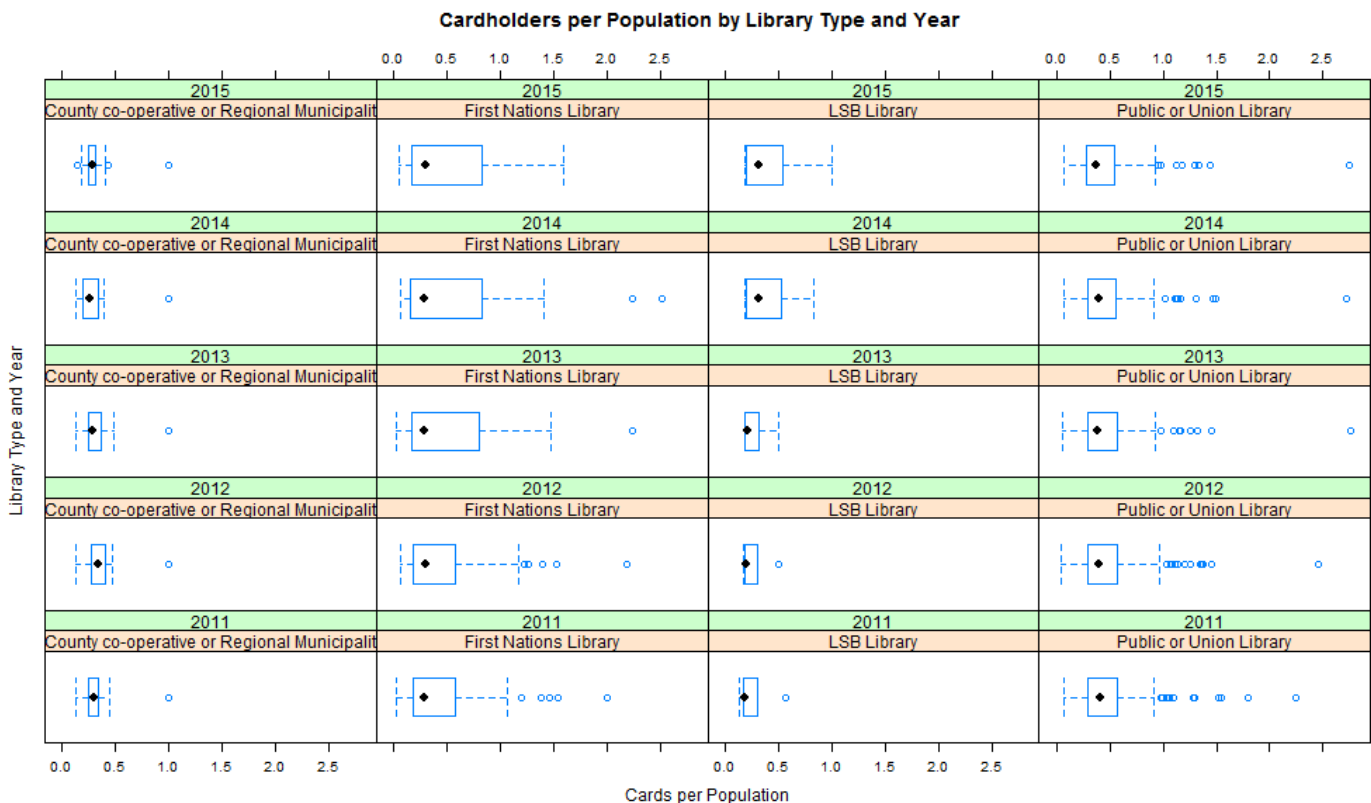
Although the correction does not change the overall findings, the revised plot of the total figures also appears more consistent from year to year.

Cardholders per Population by Year
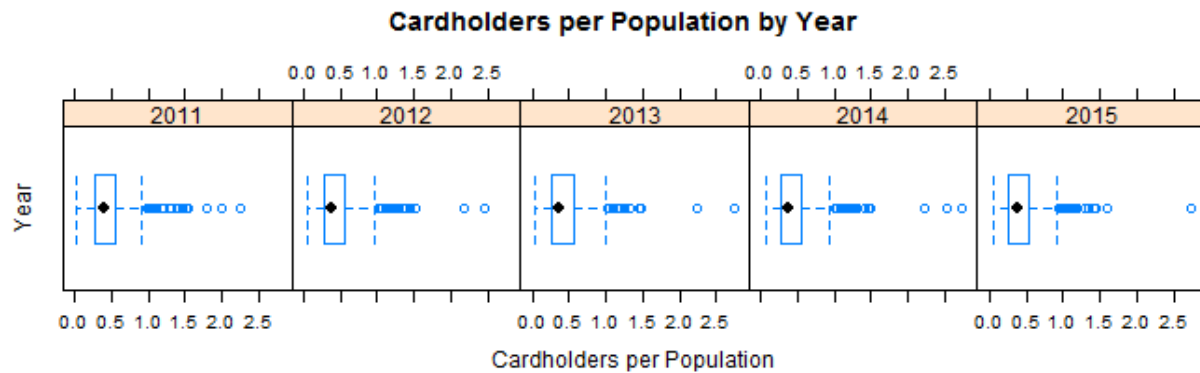
Overall, the ratio of active cardholders to population in all communities and all library types has remained consistent between 2011 and 2015. As the population has grown, the demand for library services continues to be in demand. The ways libraries have adapted to the changes in society to maintain this demand for services is directly influenced by their collection, the activities available and the facilities they offer. These three areas will be detailed in the following sections.

## Up, Down and Around Ontario

Programs

In addition to the material available at libraries, another key service provided is the programming for its community. These include early literacy, new immigrant, senior, ESL, homework help and book clubs to name a few. Taking the total programs offered and the total number of active cardholders for the entire dataset a quick check on correlation yields a coefficient of 0.937, suggesting a very strong positive correlation. However, programming at the various types and sizes of libraries are not homogenous and a closer look at the data when divided into groups of libraries with "very low", "low", "medium", "high" and "very high" number of programs, it is revealed that there is in fact no correlation between number of programs and active cardholders. The total number of programs across all libraries may be too macro a number to accurately capture any relationship between it and the number of active cardholders.

A more insightful way to see the relationship between programs and cardholders is through the program attendance numbers. As libraries strive to remain relevant to the communities they serve the goal is to maintain a constant level of attendance and react to the needs of their population. From the plot below there is a clear indication that libraries have continued to maintain their relevance as attendance to programming has been increasing year-over-year.

| Year	Median Attendance†
2011	0.6003975
2012	0.6762741
2013	0.7375176
2014	0.7724426
2015	0.8554869
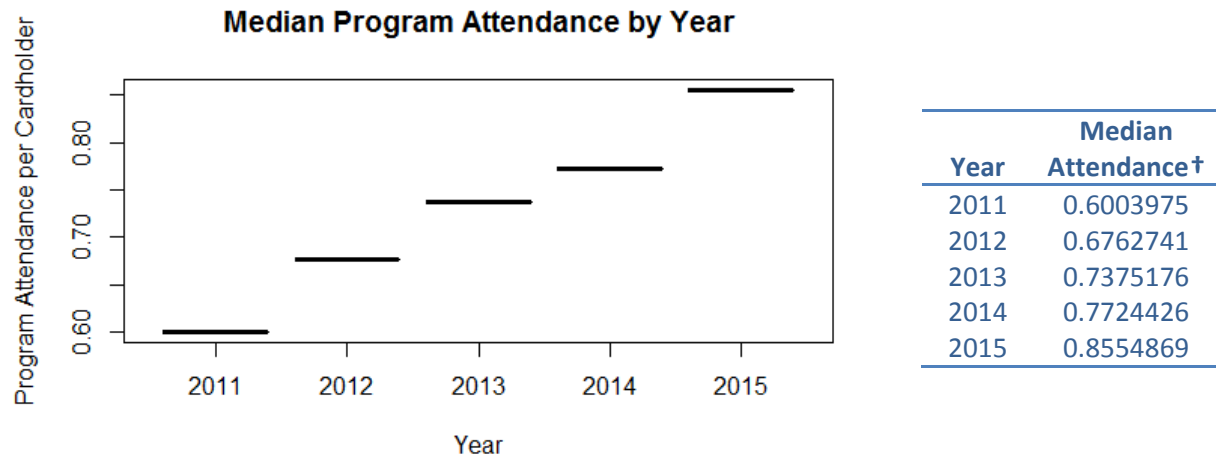
Another consideration when looking at the attendance at programs is the type of library offering the programs. In the following plots it can be seen that per cardholder, First Nations libraries offer the most programs. Correspondingly, attendance per cardholder graph shows that the First Nations programs are very well attended. Similarly, for Public or Union libraries attendance year-over-year has increased, so too has the number of programs.
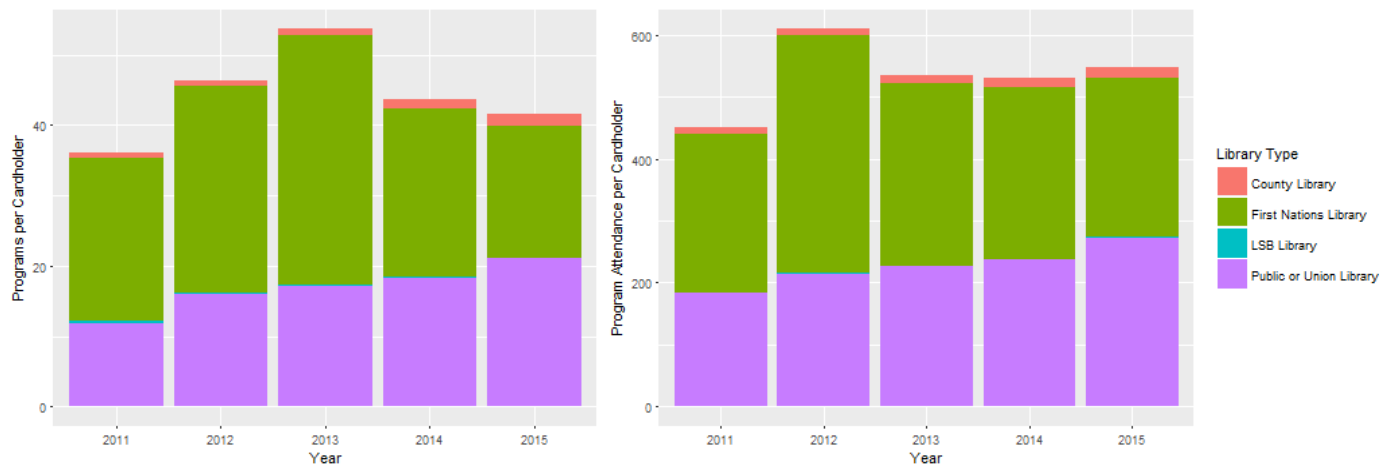
The types of programs that have been provided at libraries have also changed over the five year span. In the following graph it can be seen that "Early literacy and Early learning" and "Other Children's" programs have been consistently strong and growing gradually through all five years. More recently programs that cater to technology and adult learning appear to growing at a more rapid pace. The "Maker space" category, while small compared to other programs made an appearance in 2015 and will likely see an increase when data from current years are compiled. The "Other" category is also noteworthy, its emergence in the 2014 and 2015 point to libraries providing programs that reach beyond traditional categories and may be unique to the communities in which they operate.

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† To negate the effect of differently sized libraries attendance numbers were divided by active cardholders to get per cardholder attendance.
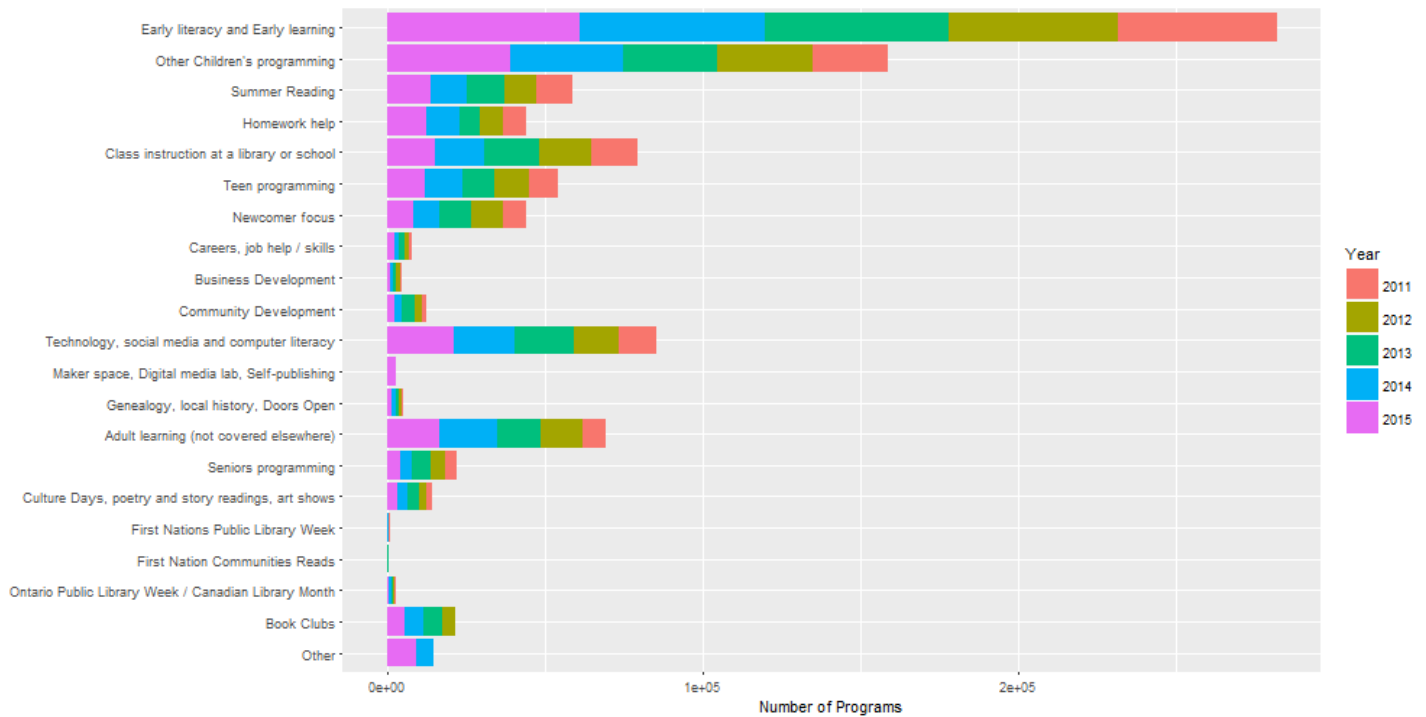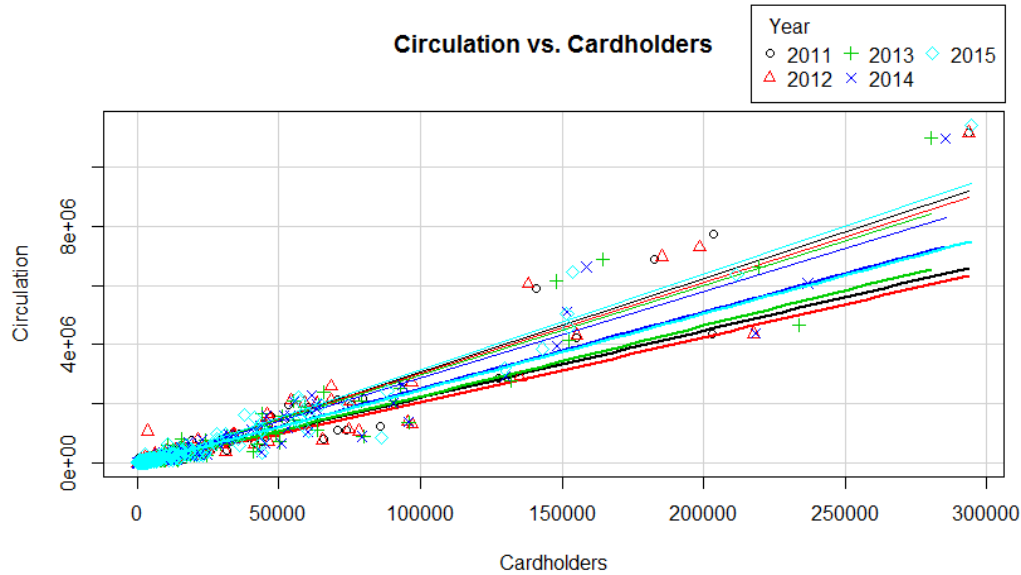
Circulation

Perhaps the one area that immediately comes to mind when libraries are brought up is the subject of books. At its core, the primary reason for going to a library is to borrow material whether for reference or leisure. The positive correlation between active cardholders and circulation is seen in the following graph and when calculated is near perfect at 0.988.
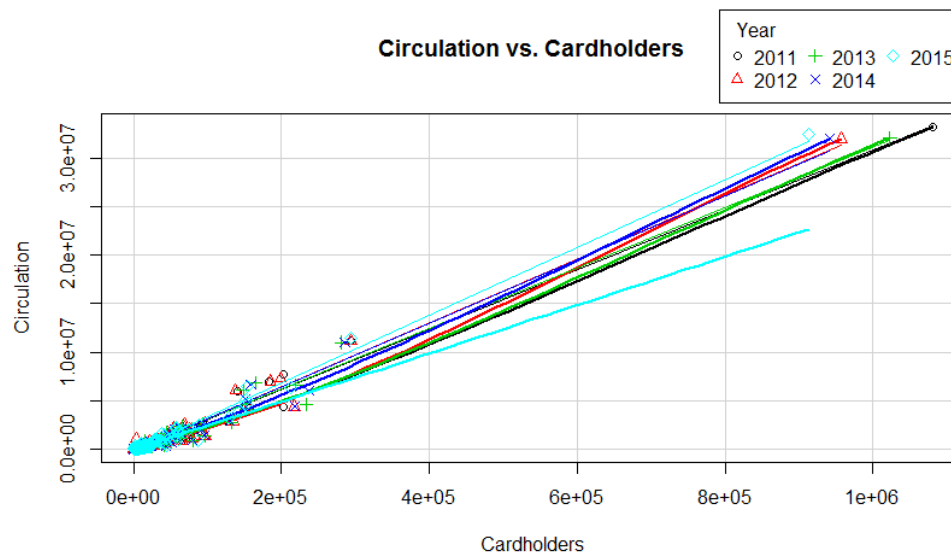

The correlation however may be exaggerated as the data points for Toronto bias the fit lines towards the upper right corner. Testing out this theory, when Toronto is removed from the dataset and the variables are re-plotted the following graph shows that there is still a strong positive correlation and the calculated correlation is still strong at 0.958.

Circulation, therefore, is perhaps one of the best indicators of how libraries are remaining relevant to their users. This is particularly significant as between 2011 and 2015 circulation has seen a gradual decrease. The median circulation has dropped from 32,297 to under 29,692.

| Year	Median Annual Circulation	Mean Annual Circulation
2011	32,297.5	41,9591.1
2012	30,944.0	42,7980.1
2013	31,700.0	42,1783.4
2014	30,695.0	41,2125.5
2015	29,692.0	41,3426.7

A further breakdown of the data shows that on a weekly basis circulation at every type of library has also been going downward. Conversely, items used in library seem to have rebounded somewhat in the last two years, particularly in First Nations and Public or Union libraries.
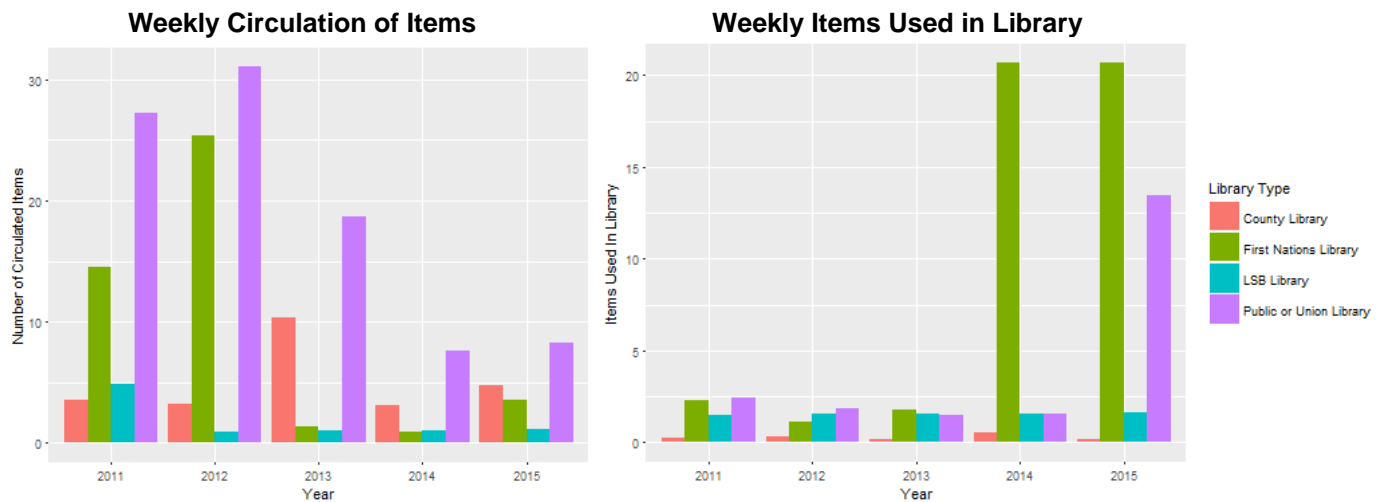
These increases in items used in library may point to libraries responding to certain events or needs in the community and creating other opportunities for cardholders to visit and use libraries for reasons other than to borrow books. For example, maker spaces being introduced into libraries have the effect of drawing user to libraries or as seen previously, programs at First Nations libraries are particularly well attended and program attendees would have more opportunities to use items in library when already attending events at the library.

Interlibrary Loans

Another consideration closely related to circulation is the interlibrary loans being made available. For smaller libraries with limited budgets, the ability to borrow items from other libraries throughout Ontario greatly improves their ability to meet the needs of their users. In the five years under investigation 2012 stands out as a year when either some policy changed or technology was introduced to allow for or facilitate interlibrary loans as the number of items requested and loaned appears to have tripled from the year before.
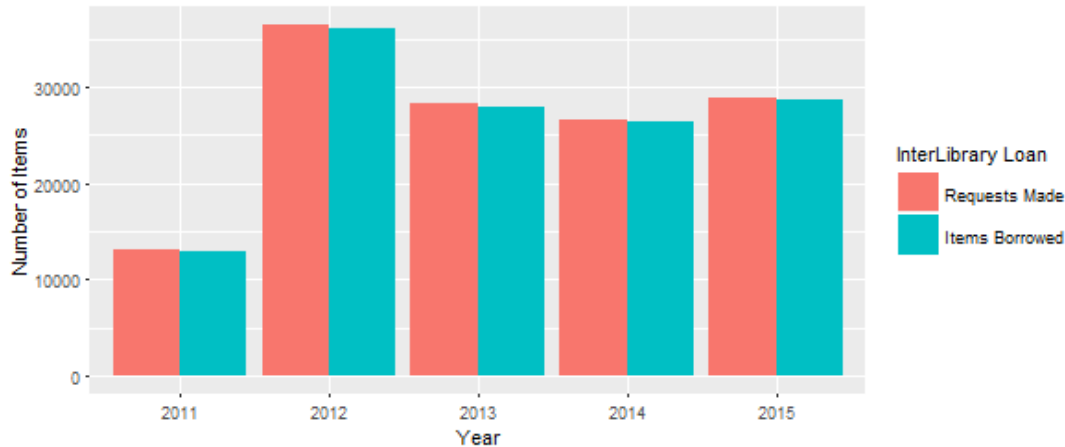
In the latter three years the interlibrary loan service appears to have levelled off while still remaining stronger than before the event in 2012 that caused the spike in usage. As libraries shift and respond to the changes in their user base, interlibrary loans is a resource that can quickly supplement existing materials on hand and help libraries maintain their value to their community.

Holdings – Less Physical, More Digital

As mentioned previously, circulation is currently one of the key measures of library relevance. In fact, in the library sector, circulation is a key measure that affects everything from funding and budgets to space allocation and staffing levels. Details on how holdings have changed in the ensuing years gives a clear indication of how libraries are changing their most significant asset to meet community needs.

Similar to circulation numbers, active cardholders and titles have a strong, positive relationship. Taking the dataset as a whole, cardholders and reference titles have a correlation of 0.87 while circulating titles have a correlation of 0.91. With Toronto libraries removed, the calculated correlations are not as strong

at 0.65 for reference titles and 0.87 for circulating titles but both still point to a positive correlation. Periodical titles do not show any correlation to active cardholders, with or without Toronto.

Perhaps the biggest effect technological innovations have had on libraries is the move from physical books and materials to the digital realm. With declining circulation, the total titles per cardholder have, not surprisingly, been also declining for both reference and circulating holdings, periodical titles however, have been increasing over that same period of time. The average number of reference titles in a library dropped from 1,596 in 2011 to 1,285 in 2015. For circulating titles the average dropped from 50,408 in 2011 to 48,894 in 2015. The average number of periodical titles, as they do not correlate to either active cardholders or circulation, rose from 201 in 2011 to 555 in 2015.
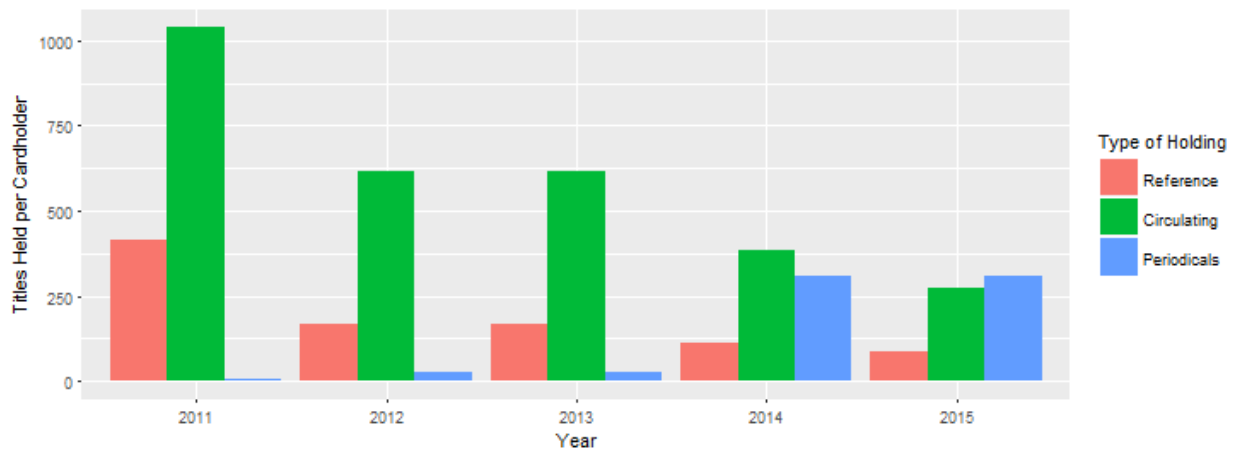

On a micro-level, the decrease in titles is a response to the lowering demand for circulating material. As can be seen in the following graph, total weekly circulation per cardholder saw a steep drop-off after 2012. Digital circulation has increased but not to the level of non-digital materials.
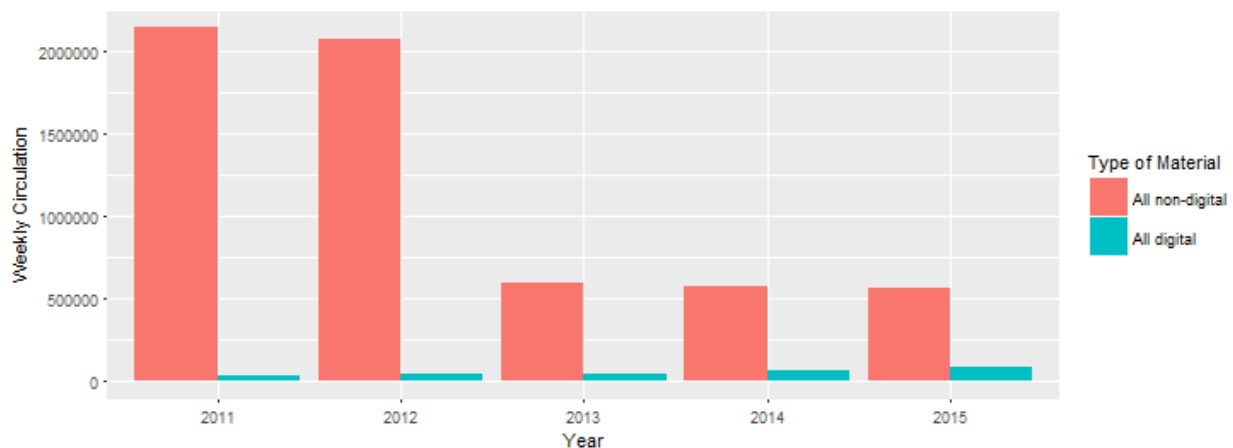

Corresponding to the increase in digital circulation is the increase in digital materials available at libraries. By far, e-resources (includes e-books) comprise the largest part of the digital materials and it is also the category of digital material that has seen the largest increases in titles. The following graph illustrates how growth in e-resources titles has outstripped increases in any other category.
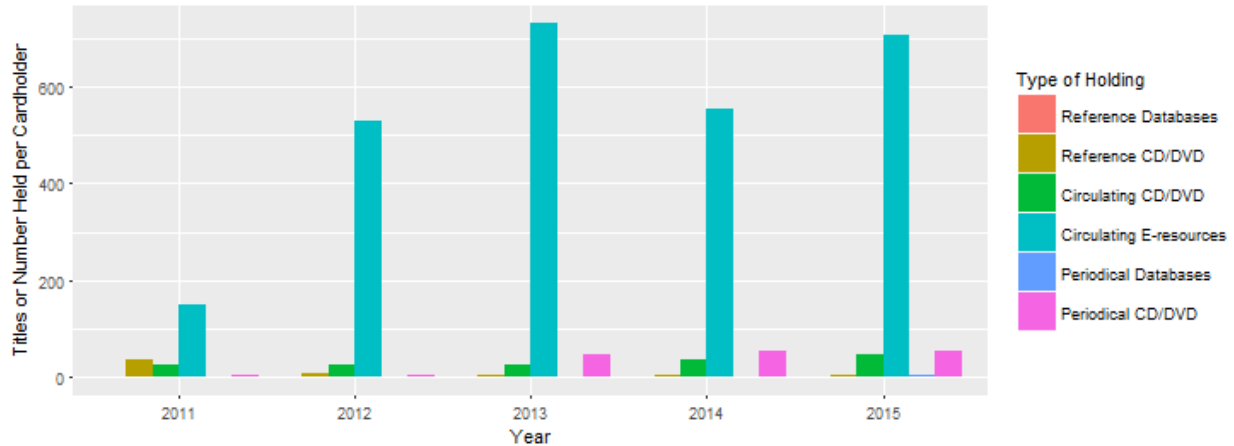
Further evidence of changing user habits can be seen the following graph where weekly transactions, when library users and librarians interact, is shown. The total number of weekly transactions, similar to weekly circulation numbers saw a considerable drop off after 2012. In a 2011 week, the average cardholder had about one standard reference transaction, by 2015 that number dropped to 0.41.
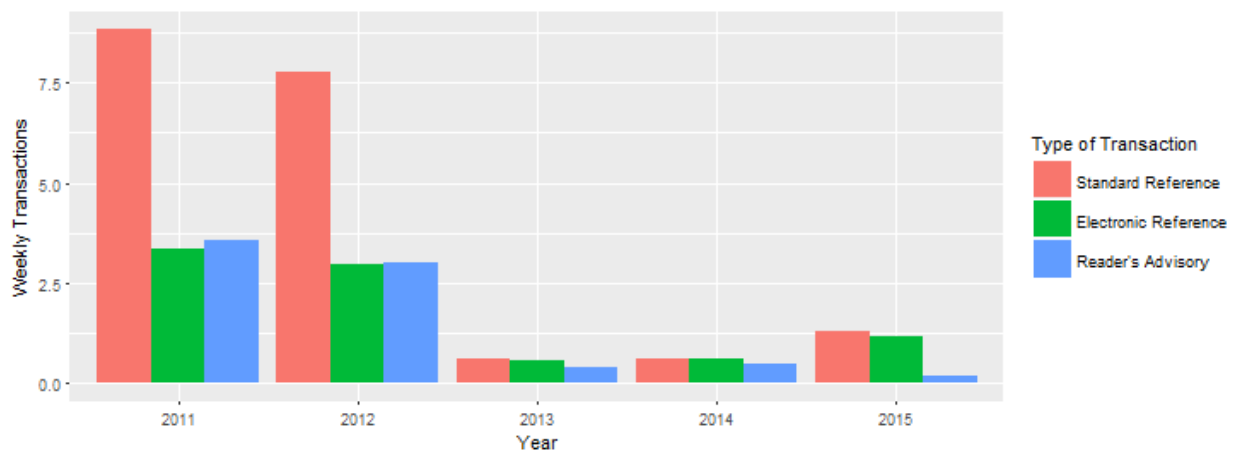
Downloading and/or streaming services information only started being collected in 2015 so no reliable trends can be discerned. However, the move to offer these services is seen by more than half of "Public or Union" libraries and the majority of "County" libraries have already adopted these services. Overall, the graph below shows that by 2015 about one third of the libraries in Ontario were offering downloading and/or streaming services.
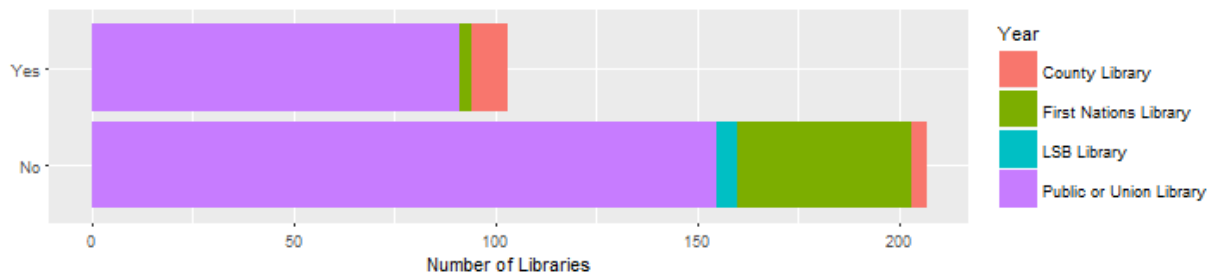
These changes in the types of titles and formats at libraries show a certain level of responsiveness on the part of libraries.

- With the drop in circulation and transactions, reference and circulating titles in libraries saw a considerable decline.
- Circulating e-resources titles have grown to answer the need for more circulating digital materials.
- Streaming and downloading services are being added to the media mix at libraries as more library users are accessing materials and services from their own devices.

While holdings are currently a library's largest asset and the prevailing perception of libraries is that they are a place for borrowing books, the pattern of changes in Ontario library holdings may be an emerging by-product of the different ways libraries are now being used.

Where Once There Were Only Books

How libraries have changed to accommodate shifts in usage and the interests of their respective communities is also reflected in the space and equipment libraries offer. In the five years between 2011 and 2015, the total number of workstations per cardholder in Ontario libraries has decreased from a high of 1.5 in 2011 to 0.5 in 2014. Over that same five year period, laptops and mobile devices saw an increase then a gradual decrease in the latter two years. The changes may point to the effect of a greater proliferation of technological devices in more recent years.
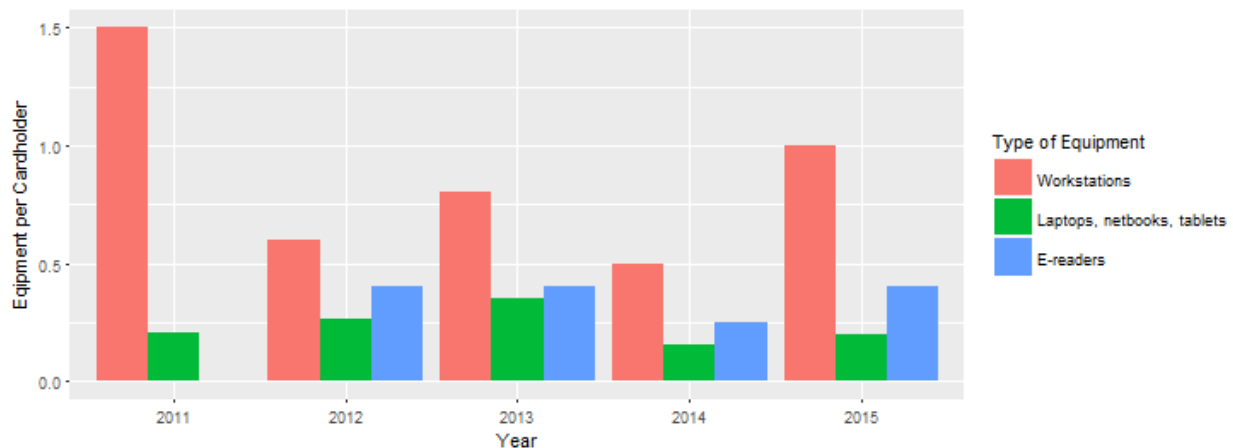

As libraries adjust to the new reality of in electronic equipment and devices, the pattern above may suggest the following scenario:

- In 2011 mobile devices made up a small portion of the equipment available in libraries.
- The following year with the introduction of different types of equipment libraries provided fewer workstations.
- Slight adjustments and increases occur in 2013 but largely remained the same as devices introduced the year before are still relatively new and libraries are building up their inventory of items on offer.

- By 2014 the consumer market for mobile devices is such that library users have their own devices and libraries find that equipment bought just a years ago are near obsolete or the fragility of devices are such that they are not able to withstand the rigours of general public use.
- Finally, in 2015 as libraries begin to introduce new programs that cater to and increasingly tech hungry user base more investment is made into workstations and e-readers while fewer is made in personal and mobile devices. As the two graphs below indicate, libraries are starting to bring newer technologies and ideas into the library space. About 50 public and county libraries are leading way by providing 3D printers while a significant portion of public and smaller portion of First Nations libraries are seeing the potential of maker spaces. In fact, these technologies and spaces are so new that the information collected was only available for 2015.

3D Printers (2015)
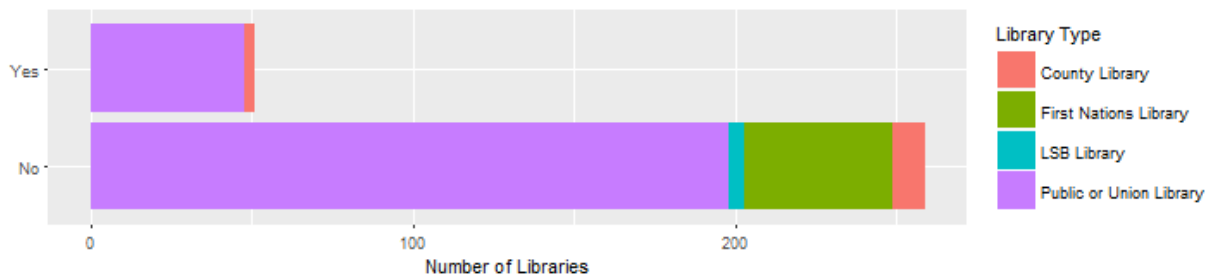
Maker Spaces (2015)
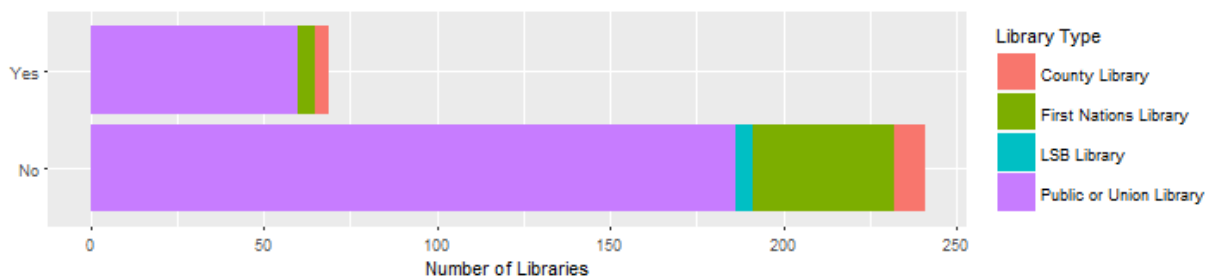
The integration of technology into the very core services that libraries offer means that libraries have to make decisions not only on materials to purchase and programs to provide but will also be asking:

- How are users accessing the material?
- What formats are materials being consumed in?
- What type of technologies and equipment are needed to maintain user-base interest?
- Are users interacting with libraries in different ways and what are they using for these interactions?

Choices in these matters have wider ramifications than deciding which titles to include into the library collection or whether or not to organize a program for a particular interest group. The investment in equipment and staffing would require a careful selection to ensure the best use of limited resources.

As an example, how libraries are being visited shows the changing ways users are engaging with libraries. Shown in the following graph are the types of visits to libraries on a weekly basis. In 2011 the

dominant way users visited libraries was in person, with website visits being a healthy relative percentage. Weekly visits in 2012 decreased considerably and it seems libraries were going to go into a decline. A social media presence in 2013 brought visit numbers back up and website visits actually surpasses in person visits. After libraries established a social media presence in 2013, visits grow and by 2015 social media visits actually surpasses in person visits.
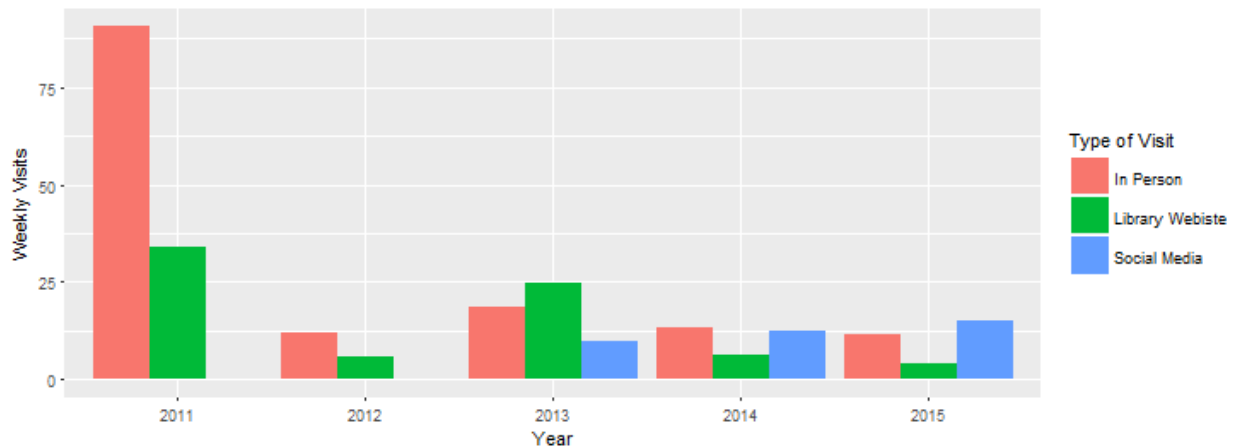
The implications of this changing pattern of library visits point to a shift in ways libraries are being used. Clearly visits on social media are not for borrowing books or to access in traditional library resources. The sharing of book reviews, factoids that mark certain important events or themed image/video collections has created a virtual community hub that extends libraries beyond their bookshelves.

The Big Picture and Future Possibilities

For comparison purposes many of the "per cardholder" numbers in this study were calculated in an attempt to normalize the aggregate values collected. If raw numbers were added the sheer size and number of "Public and Union" libraries would overwhelm the results and negate the data collected from other types of libraries. The overall picture that this study supposes that all libraries were part of a larger system that any cardholder in Ontario would be able to access. In reality the political and geographic subdivisions of the province limit access but the trends and numbers seen could act as benchmarks to provide all Ontarians equal access to library services. In the interim, future studies that focus on particular library types and systems may be beneficial in order to find ways in which to move towards a province-wide standard.

Active cardholder numbers are steady and showing increases meaning libraries are maintaining their level of importance and relevance in their communities. While a library's holdings are a mainstay, programming is taking on an increasingly more important role in drawing users to libraries. From military libraries to cultural centers, libraries in Ontario are now poised to become community spaces as they answer the needs of society time and time again.