INFORMATION STRATEGY

PROJECT SUMMARY REPORT

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HOLY CROSS MINISTRIES

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Executive summary

We set out to create an information strategy for an nonprofit organization that can be utilized in close connection with the overall organizational strategy. An information strategy is defined as a holistic approach to information and data management that supports the goals and strategy of the organization[1]. Figure 1 depicts a common model used to assess the maturity of an organization in making effective use of analytics to drive decision making. This model focuses mainly on the technical aspect for maturity assessment. It constitutes of 6 maturity levels and uses a metaphor of human evolution: prenatal, infant, child, teenager, adult and venerable[2].
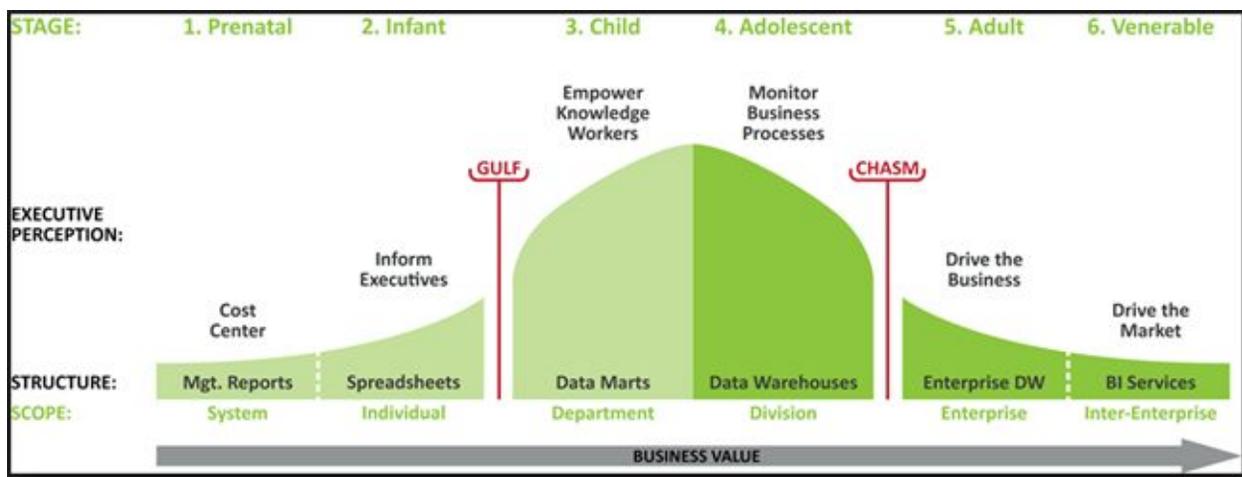
Figure 1: TWDI Information Analytics Maturity Model

Effective use of Business Intelligence can be a challenge for an organization. But it can also represent a potential large benefit. Understanding how to leverage Business intelligence investment and move to the next level of maturity is critical for any organization.This may be a challenge because of the nature of non for profit organizations and how they operate. Moreover, the sector is moving fast towards data driven strategic planning and we believe that an information strategy development project will benefit the organization significantly.

Holy Cross Ministries

Holy Cross Ministries is a nonprofit organization which serves low-income at-risk families with critical health, education, and legal immigration representation needs throughout Utah. The organization has a strong connection to the Sisters of the Holy Cross who arrived in Utah in

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[1] The Importance of an Information Strategy, Philip Howard. Accessed on 10/9/2015 at:
http://public.dhe.ibm.com/software/in/info/ibmsoftware/bloor-information-strategy.pdf
[2]TDWI Maturity Assessment accesed on 10/11/2015 at:
http://www.jamesserra.com/wp-content/uploads/2013/05/TDWI_BIMaturity0609_lettersize.pdf

1875 to establish a hospital to care of mine and railroad workers. By 1882 the efforts of pioneering sisters grew into a larger hospital that implemented and innovative prepaid health plan for workers of surrounding areas. The hospital grew into what was formerly known as Holy Cross Hospital, now Salt Lake Regional. The changing healthcare environment and delivery system led to the decision of moving from an acute hospital setting to a new and innovative way of reaching out to underserved communities in Utah. Through innovative services and programs, Holy Cross Ministries and its collaborative partners in the community, have been successful in delivering services and effective programming driven by the commitment to serve those in need.

The vision of the organization states that "Holy Cross Ministries will be distinguished by an unrelenting, adaptive focus on building and celebrating just, compassionate, sustainable, and inclusive communities made up of individuals who, through their life and work, contribute to the benefit of all."

The strategy of the organization consists of three domains; Strategic initiatives, organizational culture and organization sustainability. Strategic initiatives are agency wide goals that guide the organization towards achieving wide scope goals. Organizational culture describe the desired values and behaviors that make an effective organization. And organizational sustainability describes directives that guide the organization towards effective planning and management of resources.

In addition to the organization's agency wide strategy each functional area has its own objective and goals. Some programs have clearly defined goals with effective strategies, while others have some goals and a semi-functional strategy. In the education department for example, the objective is described as follows; "families participate in the education of youth and students excel in school." The goals are to 1) support parents as they care for their children, 2) improve access to quality early care and educational opportunities from preschool through elementary school and 3) ensure basic needs of children and families are met. The education department operates an independent preschool program for low income, mostly immigrant families in Park City and three after school programs for elementary school age children.

Business Intelligence and Analytics Maturity at Holy Cross Ministries

In order to effectively assess the business analytics maturity of the organization we used an eleven question survey. The survey was administered to the organization's leadership which consists of the executive director and five department directors (Appendix A). The survey is derived from a research paper titled "Assessment of Business Intelligence Maturity in the Selected Organizations[3]". The focus of the paper is on the level of Business Intelligence maturity in organizations. Specifically, paper addresses two questions; 1) what are the possibilities of BI systems for organizations and 2) how does one measure and evaluate the maturity of an organization? Celina Olszak, the papers author, concludes that BI systems may

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[3] https://fedcsis.org/proceedings/2013/pliks/139.pdf (last accessed on 10/5/2015)

be triggers for making effective decisions and improving business processes and business performance.

Based on the feedback from the survey we determined that while the organization indicates having a strong information management competency in terms of having the tools to collect, store and manage data, observations suggest that it can benefit from improving data collection strategies. The organization would benefit from improving data quality and developing key performance indicators that directly measure points that link strategies to objectives across the department.

The organization indicates having staff skilled enough to take advantage of business intelligence, moreover, the information systems, which also handles information analytics consists of one individual with a heavy workload in other areas in the organization. As indicated by qualitative data on the question that ask what are the failures of business intelligence and by one director who indicated not being motivated to use business intelligence the cultural and leadership environment is not ripe for Business Analytics. Moreover, the support of the executive director and board of directors is key and can be leveraged to rally the support of supervisory staff and in turn of lower level staff. In general the BA maturity of the organization is on the low end. Based the maturity framework presented by Laursen and Thorlund in *Business Analytics for Managers*[4] we determine the Business Analytics maturity level of Holy Cross Ministries to be 1-2. In focus areas and characteristics there is no focus on Business Intelligence and while the organizations has large amounts of data, it has small amounts of information. The informations system are fragmented into data islands. In the organization's departments there are few power users and information is difficult to access. While many have access to lag information only key people access it on a regular basis. The dedicated analyst spends most of his time pulling ad hoc reports. There is no data warehouse and there are varying IT competencies within the organization, particularly within leadership.

An Information Strategy for Holy Cross Ministries

In the nonprofit sector data driven, data analytics, and data-informed are hot and trendy words often used with little context and just because it's cool to do so. The truth is that many nonprofit agencies have done very little to adopt business intelligence and analytics. The main reason is budget and BI would have to be on the books as an administrative cost. Often you'd see nonprofit taunt how little they spend on administrative costs because it's assumed that little investment in administrative costs is indicative of an efficient organization. That is the conundrum in which non-for-profit agencies find themselves in, however, more and more the sector is finding that investments in BI yield significant returns as they are able to use information and knowledge previously not known to improve delivery of services, demonstrate efficacy and leverage funding from donors, grantors, foundations, and state agencies.

Holy Cross Ministries has come along way in adopting information analytics. First, in 2009 the organization invested in a client information management system. And in 2011 and administrator for the system was hired. Over the past four years it has continued to invest in

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[4] Laursen,Gert H.Nl. *Business Analytics: Taking Business Intelligence Beyond Reporting*. New Jersey, Willey, 2010.

information management competency, analytics competency and in the culture and leadership of the organization to support an information analytics strategy but with little success. Effective use of Business Intelligence is quite a challenge for any organization. But as we have learned it also represents a potentially large benefit, which most often cannot easily be proven. Our task with Holy Cross Ministries is to understand how to leverage Business intelligence and analytics investment and move the organization to the next level of BI maturity.

Information Strategy

Business analytics is about creating value for the organization through the analysis of data. The reasoning is that analysis of data yields information and knowledge that leads to better decisions. In turn better decisions reduce costs, reveal opportunities and allocate resources in more effective business areas[5]. BA maturity is a function of where the organization stands in three main areas; Information management competency; Analysis competency; and Culture and Leadership. An information strategy for Holy Cross Ministries consists assessing the position of the organization in the context of the three pillars of business analytics and proposing goals goals to improve current standing in each pillar over a period of time. Table 1 below summarizes the Information strategy proposed for Holy Cross Ministries.

Table 1: Summary of Information Strategy					
Title	**Primary Maturity Level Target Area**	**Description**	**Impact**	**Approach**	**Timeline**
Data Warehouse	Information Management	Consolidate Data Islands with Data Warehouse	4	Inventory data sources and assess usability, access, and quality	next 3 - 6 months
Executive BA training and awareness	Analytics competence	Develop leaderships' and board of directors skills in BI and BA	3	Start with executive director to ensure proper understanding and buy in.	next 2 - 6 months
Transform insights into action	Culture and Leadership	Coach supervisory staff and managers on using knowledge and insights.	2	Once data warehouse and leadership are on board instill data-culture.	next 6 - 12 months

We are proposing and information strategy to strengthen all three pillars of Business Analytics in the organization. The first point of departure is information management competency consists of the state of information infrastructure (Application Data Mart, Data Warehouse, ETL processes, Data Protection Policies, Data Quality Management, etc.) Information management competency is not very strong at Holy Cross Ministries. There is a

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[5] Laursen,Gert H.Nl. *Business Analytics: Taking Business Intelligence Beyond Reporting*. New Jersey, Willey, 2010.

client data management system that is utilized across the organization. There is no data warehouse and no policies are in place to protect data and ensure data quality. In order to strengthen the information management competency pillar, the organization needs to implement a policies to ensures data protection and enforce the monitoring of data quality. Secondly, the organization needs to build a data warehouse to consolidate data silos and facilitate analytics and data access. The data warehouse can help with data management and data quality as well.

In information management Holy Cross Ministries should invest in evaluation data sources and infrastructure for a data warehouse for reporting and analysis of data. The data warehouse will function as a central repository for data from various sources and will help with data security and quality issues. Information management competency also involves drafting policies and procedures to guide data protection and quality. A data warehouse will also allow for the decompartmentalization of data. Many organizations have data that is segmented in to "data silos" making it difficult to access, analyse and manage.

Analytics competence consists of the state of analytical processes. How effective is the organization in conducting analysis of the data it already has? What platforms is it using to conduct analysis and how strong is the BI team. As mentioned earlier Holy Cross Ministries hired a part-time data analyst whose role examine the data collected in each department and assess the extent to which programs are achieving their goals. We recommend that the role of the data analyst be clarified to align with business intelligence and to increase the position to full-time. Furthermore, we recommend that leadership staff continue to develop analytical skills so as to be able to make effective decisions from information and knowledge provided by the analyst.

In analytics competency Holy Cross Ministries should invest in increasing competencies of directors, decision makers and supervisor in areas related to utilization of knowledge and information derived from data. This can be a simple as understanding what a dashboard is communicating to making complex decisions based on predictive models derived from historical data. Similarly, to be able to make effective use of data being collected and to address gaps in information management Holy Cross Ministries needs to grow the analyst position into a full-time and define clear expectations.

Culture and Leadership consists of the state of the perception, understanding and use of analytics in an organization. Organizational leadership consume information, knowledge and insights extracted from data and in order for decisions and other actions stemming from the newly acquired knowledge to occur leadership have to be effective consumers of business intelligence and analytics. At Holy Cross Ministries the culture and leadership perception of Business Intelligence is not very strong but we believe that it is a result of a lack of an effective information strategy. Part of an information strategy is to educate and inform key organizational leadership and staff on how analytics help the organization as a whole at the strategic level but also how it helps on the functional level.

Summary of the prioritized BA projects

Table 2: BA Project Prioritization Summary						
BA Project	Priority	Organizational KPI Support	Actionable (1 - 5)	Potential Impact	Analyst Investment	Additional Context
Client Intimacy Analysis	High	Strategic Initiative (100%)	4	High	medium	The objective is to understand clients stated and latent needs now and in the future
Long Range Intimacy Analysis	Low	Strategic Initiative (100%)	3	Medium	High	The objective is to find trends in changing needs of clients over time
Social Media Activity Analysis	Medium	Organizational Culture (100%)	5	Low	High	The objective is to understand social media audience.
Donor/funder Intimacy Analysis	Low	Sustainability (100%)	5	Medium	High	The objective is to understand donors and funders and conduct campaigns to appeal to diverse funders

Client Intimacy Analysis

We decided to conduct a client intimacy project where we analyse the historical data from the organization's client management system. This is primarily an exploratory analysis. Client intimacy involves better understanding, anticipating, and fulfilling stated and latent clients needs[6]. The objective of the intimacy analysis is to help Holy Cross Ministries get a solid understanding of the populations that are receiving the services the organization is providing. The ability to capture clients' needs and tailor programs and services accordingly is a critical success factor for any organization.

Long range analysis

In the client intimacy project, for the sake of time, we only analyzed two years and 10 months worth of data. The organization has data as far back a 2008, while not much, it is worth analysing it. We proposed a longer term client intimacy analysis. This will yield significant historical trends that may not be visible in the short term client intimacy analysis.

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[6] "How Customer Intimacy Is Evolving To Collective Intimacy, Thanks To Big Data" Accessed on 10/21/15 at http://www.forbes.com/sites/joeweinman/2013/06/04/how-customer-intimacy-is-evolving-to-collective-intimacy-thanks-to-big-data/

Social media activity analysis

Many organizations have begun to use social media as sort of grassroot marketing strategy. In recent years Holy Cross Ministries stated to utilize social media a tool to bring awareness about its services in the community. Over the past two years the number of followers has grown drastically with at least 2 or 3 new followers every week. Social media has become an important part of the organization's communication strategy. In order to maintain the growth its worth looking into social media data to analyze patterns. We can answer questions like who are the people engaged in our social media activity and how can we appeal to other audiences? What are the keywords that generate the most likes? What type of publications have the biggest reach? Answers to this questions can help strengthen the communications strategy.

Donor/funder intimacy analysis

Lastly we propose a data mining analysis project to analyze donor patterns. This maybe difficult because of the lack of data on donors and funders. It be possible to combine data sources to make the project feasible. It may be possible to combine data from individual donations, annual appeal campaigns, and newsletter open and click reports to gain insights into donors and design appeal campaign accordingly. It maybe possible to send personalized appeal campaigns to donors who are more likely to donate and generic appeals to donors who are less likely to donate. While the impact of the project can be significant we decided to assign a low priority as the potential impact may not be very high.

Client intimacy at Holy Cross Ministries

We decided to conduct a client intimacy project where we analyse the historical data from the organization's client management system. This is primarily an exploratory analysis. We started off with extracting a combined data set of client demographics from 2013 to date. Our sole intent was to conduct a clustering analysis of the clients to explore patterns that may reveal important insights. As we explored and processed the data we found that we could also produce some geolocation mappings to show the organization where the clients are coming from.

During processing and cleaning of data we were able to gather some interesting insights that the organization may benefit from. For example in 2013 the organization served 3137 unique individuals and of those clients 1614 where new to Holy Cross Ministries. In 2014 the organization served 3582 unique clients and of those 1786 were new to Holy Cross Ministries. Year to date the organization has served 2589 clients of which 1503 are new. The graph below summarizes the findings.

Client Intimacy: Clients Served
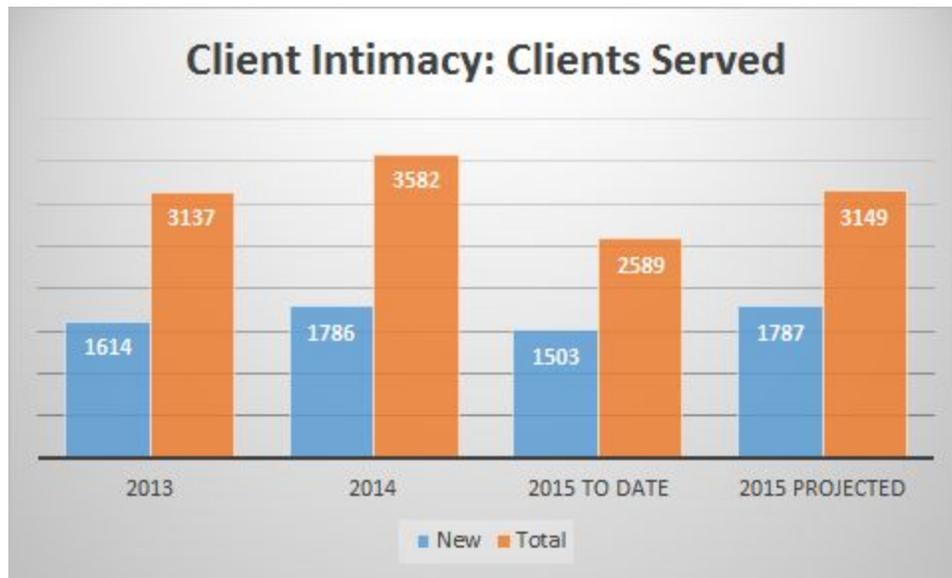
A couple of interesting findings visualized below are the breakdown of clients by the number of days they have been clients of Holy Cross Ministries.

2013 Client Boxplot
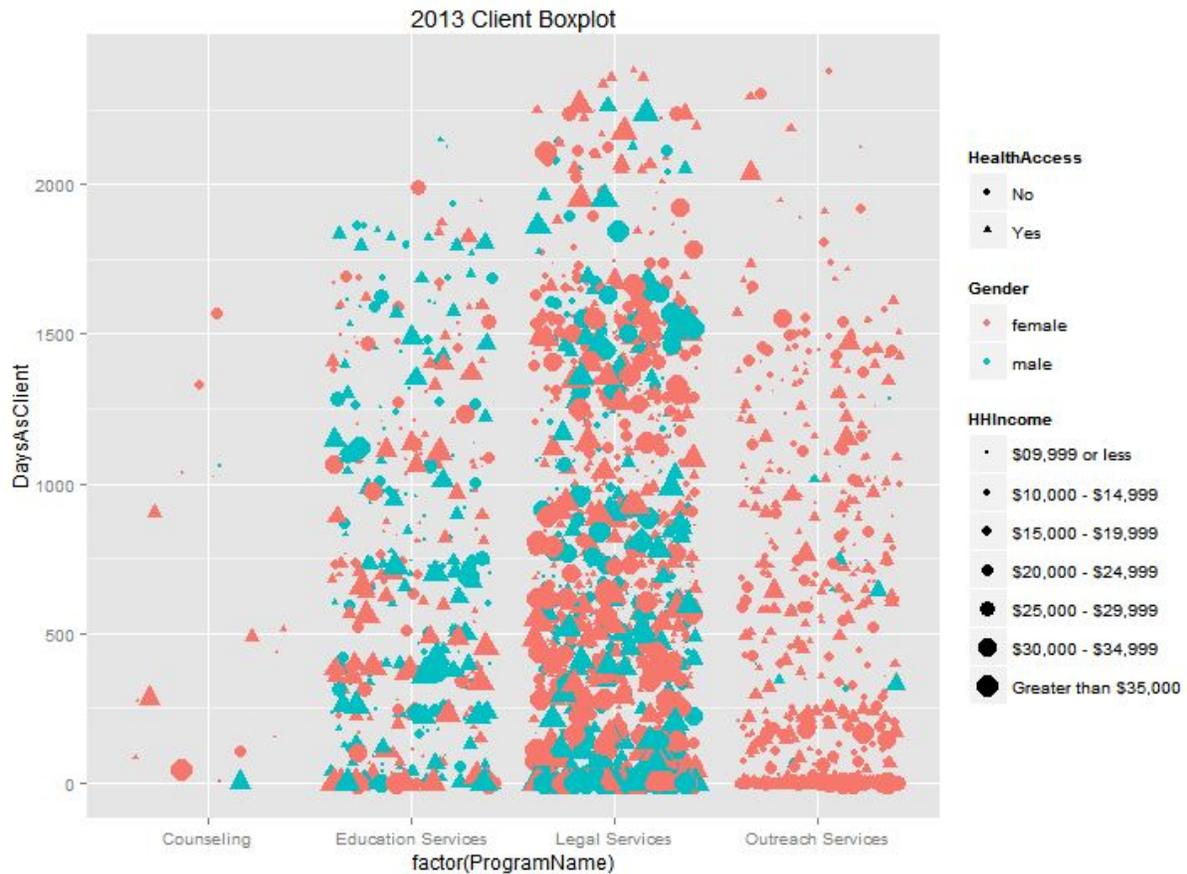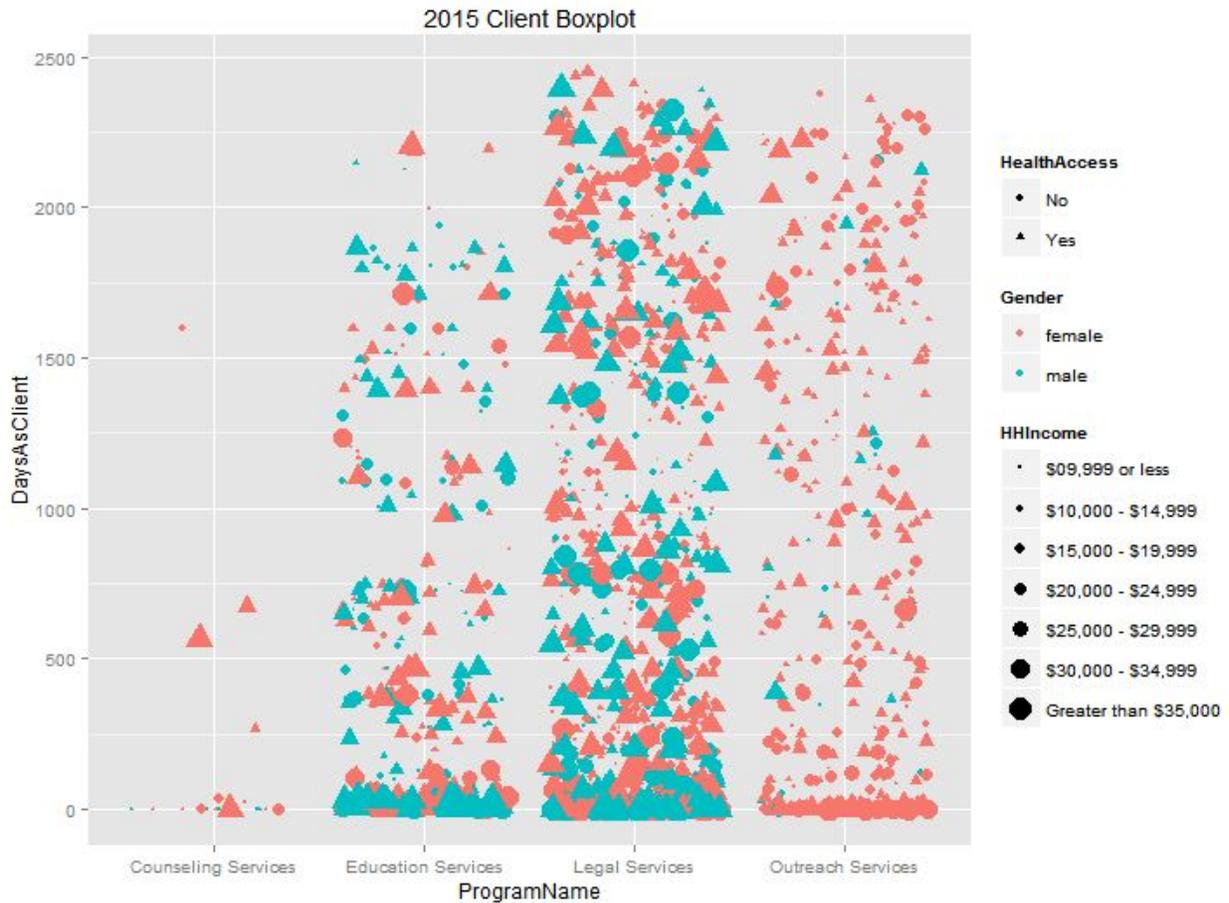
The triangle indicate access to health and the size indicates income. Notice that the there are bigger shapes in general in the legal services column. Also there are bigger triangles meaning that people with higher income have more access to health. In 2013 there are less triangles in the same column but still a general distribution of big shapes. Interestingly enough there are many little triangles in the outreach services column this an indication that either these clients already have access to health care as they seek our services or that Holy Cross Ministries helped them access health care. The former is more likely as outreach services personnel are situated, for the most part, in clinics.

The data exploration process also took us to tableau. Our intent was to discover the spread of services across the state of Utah using map visualizations. As the map below shows we were able to map services across the state layered with different variables. Starting with Health Access (which is an individual's capacity to access health care services) we can see that wasatch and Summit county have the highest rates of Health Care Access. The Program Name variable allows us to see where programs are providing services for example education and outreach are heavily focused on summit county and wasatch county while legal services are focused on Salt lake county and Utah county. In the marital status category we see that there is

high rate of single household families. And lastly in the income category we see that a pretty uniform income distribution across the map.
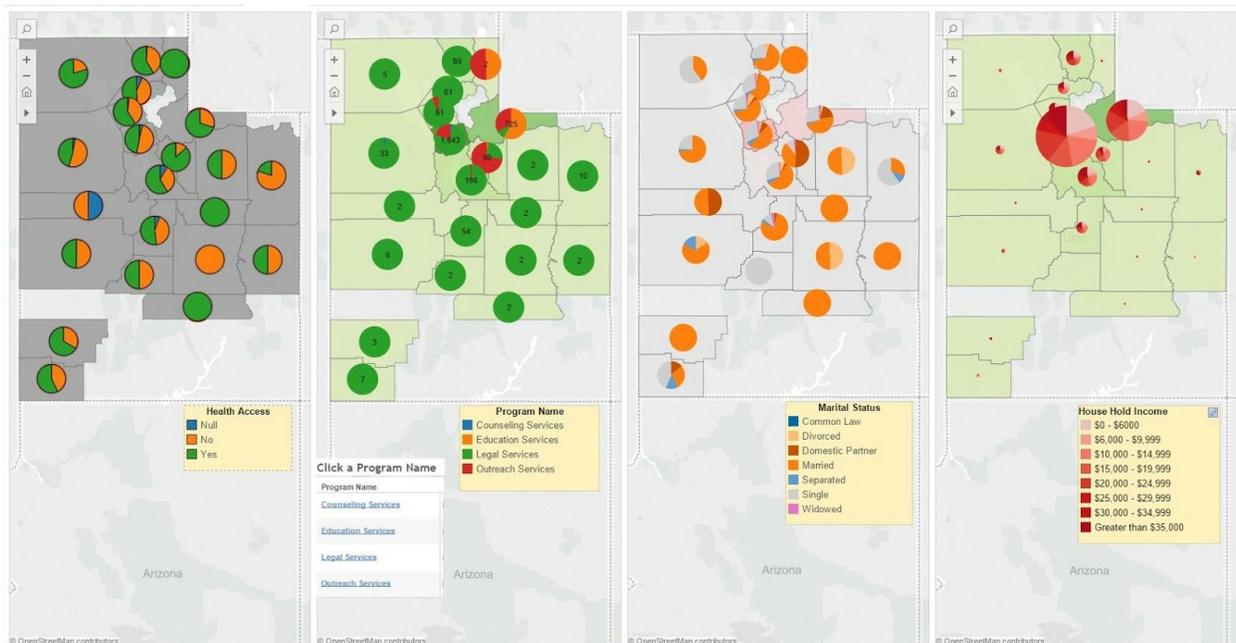
Using data mining techniques, we wanted to first perform an unsupervised analysis the 2013 client data. Our data presented a particular challenge because most of the variable are categories. In order to overcome this particular challenge, most of the categorical variables were changed to dummy variables. After some initial analysis we found that three clusters was ideal for the data set. Below is an output of the cluster model generated with the kmeans algorithm. As an aside, the R coded used for these analyses can be found as part of an appendix to this report.
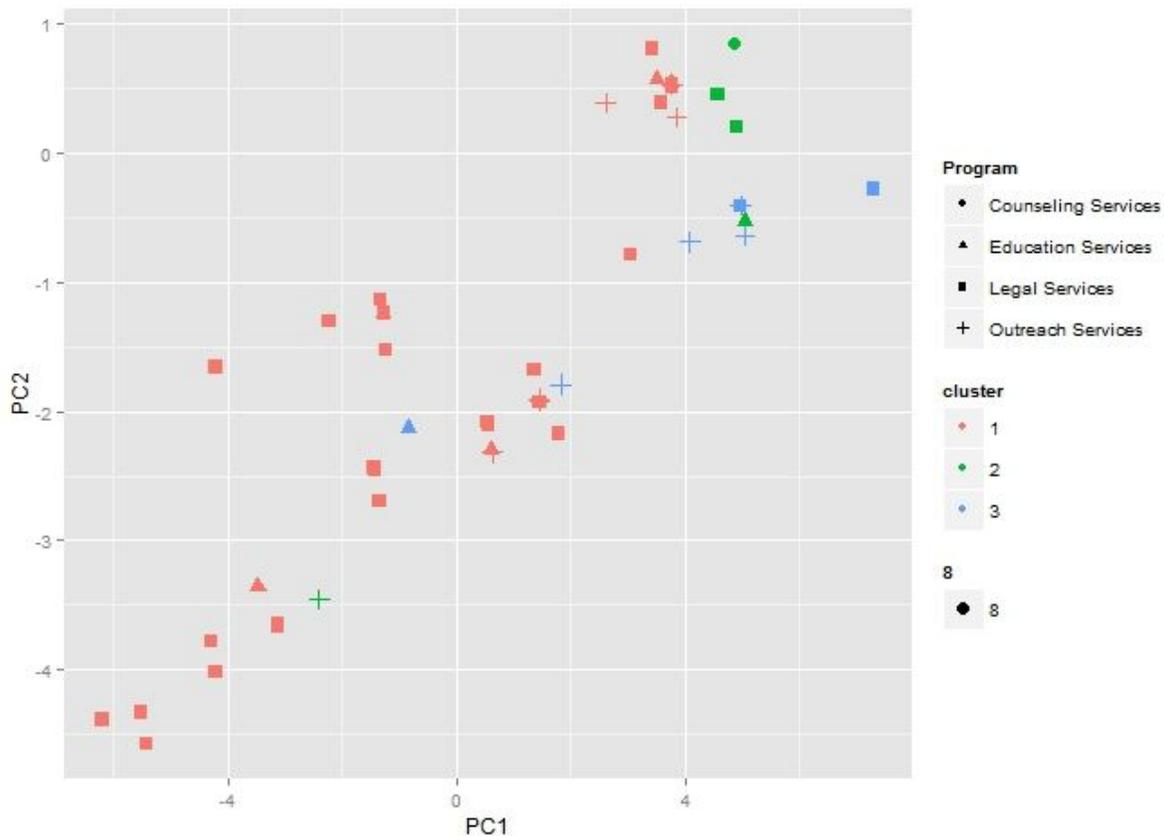
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         MultiProgram      Age HealthAccess EthnicityBlack.or.African.American EthnicityHispanic.or.Latino
1         -0.3162328 0.01867334  -0.02798209                        0.009433353               -0.0370281
2          3.1612109 -0.11682865  0.10920318                       -0.031058500                0.1285548
3         -0.2850450 -0.02685666  0.08144746                       -0.031058500                0.1177563

     EthnicityNon.Hispanic EthnicityWhite Genderfemale  Gendermale HHIncome.10.000....14.999 HHIncome.15.000....19.999
1              0.03727091   -0.004063932  -0.09598759  0.09598759               -0.003048098               -0.01948337
2             -0.14326608    0.084418265   0.15309458 -0.15309458                0.011841056                0.05655438
3             -0.10985298   -0.031058500   0.41795737 -0.41795737                0.008906177                0.06889717

     HHIncome.20.000....24.999 HHIncome.25.000....29.999 HHIncome.30.000....34.999 HHIncome.6.000....9.999
1                   0.01947085                0.02437214                0.01334611             -0.23469014
2                  -0.01445333                0.05628931                0.03688206              0.03785911
3                  -0.09516692               -0.16565251               -0.09450059              1.23238269

     HHIncomeGreater.than..35.000 HHIncomeLess.than..6.000 HHIncomeUnknown MaritalStatusCommon.Law MaritalStatusDivorced
1                      0.08323586               0.05971412      0.04028128             -0.01550224            0.02532747
2                     -0.22943844               0.09026988     -0.09004722              0.25453965            0.02579443
3                     -0.30195219              -0.37606032     -0.15925616             -0.07626167           -0.15168905


     MaritalStatusDomestic.Partner MaritalStatusMarried MaritalStatusSeparated MaritalStatusSingle
1                      -0.33196928            0.1615655            -0.02930732           0.04158272
2                      -0.05635442           -0.1288872             0.27748802           0.02107798
3                       1.81195866           -0.7840745            -0.01673227          -0.23573702
```

Once the clusters were defined, we did a brief analysis of the clusters and anecdotally found descriptors to describe each group. Each category assignment varies is mostly useful in terms of generalization. Therefore, generally speaking each cluster can be described as below.

Cluster 1:	Cluster 2:	Cluster 3:
Older	Younger	Has Health Access
Black	Multi-program	Hispanic of Latino
Non-Hispanic	Has Heath Access	Female
Male	White, Hispanic or Latino	Income: 6,000-9,999
Income: >20,000	Female	Domestic Partner
	Not Married	

Finally we wanted to be able to visualize the cluster model. Since this data set included over 3000 observations, visualization required us to sample the dataset for a readable output. The chart below includes a sampling size of 50 records. The three clusters are represented by color and the service that each client recieved is noted by the shap. The x and y axis were generated using the principal components function.

Some implications that we can infer from the chart are that cluster 1 is likely our largest cluster. Next, the chart shows that Legal Services and Education Services, the two most common services, are spread over all three clusters. We can also see that Outreach services is more common in Cluster 1 and cluster 3. Finally, counseling services is more common in cluster 2.

Conclusion

If the resulting information strategy, along with knowledge and insights gained from the business analytics project conducted on client intimacy is utilized at by the leadership of Holy Cross Ministries the organization can move the next level of maturity. For an organization like Holy Cross Ministries it is not necessary to strive for complete maturity (i.e. Level 4) because the industry to in the beginning stages of business analytics utilization. Moreover, it is critical for Holy Cross Ministries to continue to develop the Information Strategy and ensure coordination between the overall organization strategy. Understanding how to leverage business intelligence and analytics investment and move to the next level of maturity it's a worthwhile investment.

We conclude that the organization is somewhere between level 1 and 2 in terms of business analytics maturity. The information strategy we developed, the prioritized project list

and the client intimacy project should help the organization move to level 3. Level 3 is characterized by a focus on generating lead information, having significant amount of information and knowledge and some automation of analytic projects. Information systems ast level 3 are characterized by increased competency to generate lead information and automated distribution of lag information on demand i.e. through dashboards. Processes at level 3 of business analytics maturity are characterized by being supported by lead information and use of lag information for decision support. Lastly, at level 3 there is heavy analytical competencies with sound insights into the business.

Appendix A - Assessment of Business Intelligence Maturity Questionnaire

1. How do you define business intelligence (BI)?

The majority of the organization's directors were not aware of the what Business Intelligence implies. Three out of six indicated that it was the first time they had ever heard of BI. While

others indicated that it is defined as tools to manage information, data analytics, data warehousing, big data science, and or a new way of doing business.

2. What and/or how do you use data (select all that apply)?

As to how the organization uses data all directors indicated that it is used for reporting and the second most indicated use is for alerting. Analyzing, monitoring and predictive modeling were selected by only two out of six directors.

3. Does the organization have a Information Intelligence Strategy?

Four out of six directors indicated that they did not know what an information strategy is. One out of six indicated that the organization has a comprehensive information strategy, while the last director indicated that there a partial information strategy.

4. Does your department have defined metrics or key performance indicators? (select all that apply)

Four out of six directors indicated that their department has both KPI's and Metrics while the other two selected KPI Only and Metrics only each.

5. Asses the quality of the data used in your department in each of the areas below.

Department directors indicated that they have medium data completeness and medium to high data accuracy and correctness. Interestingly, in terms of consistency the rating was split evenly between low, medium, and high.

6. Are there staff skilled enough to take advantage of Information Intelligence systems?

Four out of six directors indicated that there is skilled staff to take advantage of Information Intelligence.

7. Do you use management dashboards?

Five out of six directors indicated that they have management dashboards.

8. Is Information Intelligence limited to part of the organization?

Four out of six directors indicated that Information intelligence is used organization wide.

9. Are you motivated to use Information Intelligence?

Not all directors are motivated to use information intelligence, only five out of six answered yes.

10. Describe some successes of using Information Intelligence?

"Quality of services, what can be improved, etc."

"Ensure that areas of focus are on target with mission and vision"

"We have uncovered interesting patterns characteristics on services provided"

"Increased accountability to funders and stakeholders"

"Has led to improved planning and provided organization with ability to acquire more funding"

11. Describe some failures of using Information Intelligence?

"It's hard for some people to understand what it means or what its potential is"

"The organizational culture is not accustomed to data driven management"

"We lack external data"

Based on this feedback we determined that while the organization indicates having a strong information management competency in terms of having the tools to collect, store and manage data, observations suggest that it can benefit from improving data collection strategies. The organization would benefit from improving data quality and developing key performance indicators that directly measure points that link strategies to objectives across the department.

The organization indicates having staff skilled enough to take advantage of business intelligence, moreover, the information systems, which also handles information analytics consists of one individual with a heavy workload.

As indicated by qualitative data on the failures of business intelligence and by the director who indicated not being motivated to use business intelligence the cultural and leadership environment is not ripe for Business Analytics. Moreover, the support of the executive director and board of directors is key and can be leveraged to rally the support of supervisory staff and in turn of boots on the ground staff. In general the BA maturity of the organization is on the low end. For reasons detailed above we scored at 4 out 10.

Appendix B - Course Materials Used

Throughout the project we used the slides to revisit course material. We used the textbook for references. And we also used the lab assignments particularly unsupervised mining and visualizations to help with the client intimacy analysis

Appendix C - Hours Spent by Team Members

Leonel E. Nieto
Meetings - 5 hours
Data Cleaning - 4 hours
Report Writing - 4 hours
Other - 4 hours

Donny Ford
Meetings - 5 hours
Data Mining and Clustering - 4 hours
Presentation - 4 hour

Mazen Bahsoun
Meetings - 5 Hours
Data Processing - 3 hours
Dashboard Creation in Tableau - 4 Hours
Research - 2 Hours