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Targeting Public Value in New Zealand

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Abstract

In support of Government initiatives to deliver better social, economic and fiscal outcomes for all New Zealanders, The Ministry of Social Development is implementing what has been called the "Investment-based Approach" that aims to improve social sector performance through better targeting. Social and fiscal outcomes can be better achieved through smart targeting using client centred evidence to inform strategic and case level targeted decisions.

This paper presents some of the drivers and rationale for implementing an approach that uses analytics at the centre of welfare reform. A wide range of methods are now being used to identify cohorts of interest and propensity models to support targeted campaign based initiatives on the basis of a level of risk. Return on investment is estimated through use of control and comparison groups and the capture of feedback to support model improvement (targeting) and organisational learning and attribution of value.

Introduction

In February 2011, the Welfare Working Group, which had been established in April 2010 to examine ways to reduce long-term benefit dependency for people of working age, produced its report back to the New Zealand Government. In all it included 43 recommendations.

The policy response to the report is driving major change. What is now called "Welfare Reform" will see a collapse of a large number of categories of welfare benefits collapsed into 3 primary categories: Job Seeker Support, Supported Person Support, and Supported Living Payment. Essentially these are payments to people in transition between periods of employment; payments to people as providing full time care to children or the disabled for a limited period, or payments to those with long term disabilities preventing them from being able to work.

It also led to an actuarial style valuation of the forward liability to the Government of the benefit system. This effectively establishes what funds would need to be set aside today to cover the on-going payments of benefit entitlements to all current beneficiaries through to age 65.

Alongside this emerged the concept of what is now known as the "Investment Approach" which focuses on identifying opportunities to intervene as early as possible to invest in changing the benefit dependent pathways that citizens are on.

The development of this policy response is predicated on developing techniques to identify cohorts of clients whose propensity (risk) of long term dependency is high and trialling new initiatives that have the potential to improve outcomes, do that quickly, see what works, and stop doing what does not.

Changing role of Analytics

Over a number of years, MSD has been applying analytics techniques to develop risk scoring models. The Welfare Working Group report has given traction to using these techniques to "target" our efforts based on level of risk, and to apply experimental design techniques to enable measurement of impact, and by doing so, demonstrate the value generated. Unless we do this, the central agencies that direct state funding allocation will always be able to say that as an agency we merely participate in the stories of the lives of our clients, and cannot demonstrate that we actually make a difference to the outcomes they experience.

In late 2012 a formal business case for funding was developed and what has been described since as the largest change to MSD's approach to welfare delivery got underway.

The first programme of work delivered a set of services focussed on youth. If a young person becomes a welfare recipient this has a high likelihood of becoming long term. That this happens at a young age means that the long term liability is high. To change this means that there are substantial social, economic, and fiscal benefits.

The system that has been developed is very much like a closed loop marketing application as is common in the private sector.

MSD has had a Data Warehouse since the mid-1990s and has main benefits payment history reaching back that far. We also have historical data from the child care and protection domain. (Child Youth and Family (CYF) is a business unit of the Ministry). That does put us in the rather luxurious position of being able to look at cohorts of clients as at today, and wind the clock back to look at what was happening for them in the past and model linkages between the past and today's outcome. Using a birth cohort from 1990 allows us to look at people who

are 22 years old today (in 2012). When you combine MSD with data from the Ministry of Education you have a rich source of data to model influences on pathways towards becoming welfare dependent.

Historical data from 1990 cohort of school leavers was used to develop a risk propensity model for youth exiting the New Zealand Secondary School system at age 15, 16, and 17 so that their likelihood of uptake of welfare could be scored. Based on this score, these young people are referred to Service Providers who are contracted to engage with them, providing programs that encourage them back into education or prepare them for work. Service providers are remunerated on the basis of progress (milestone payments) and on success (return to education or training) and ultimately not becoming welfare beneficiaries at age 18.

Hurdles

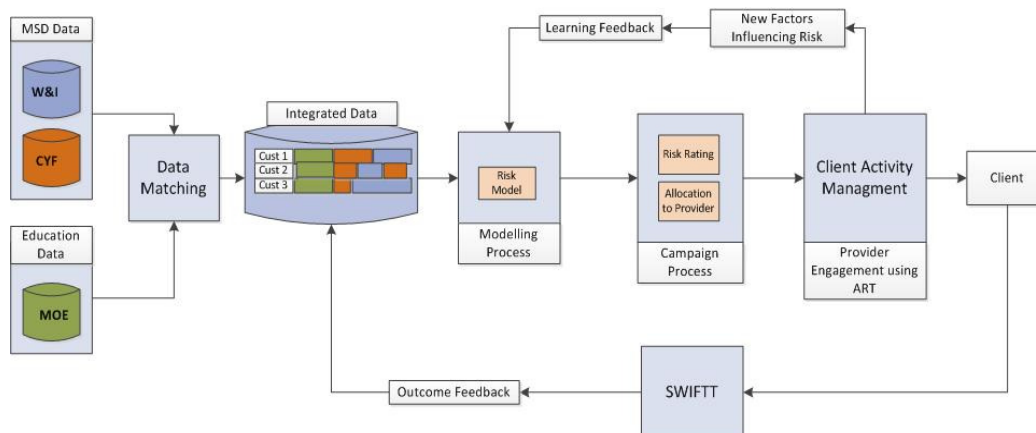
There are a number of hurdles that need to be considered which can be categorised as follows:

- Can we do this? A technical issue solved by data matching and B2B data transfer
- May we do this? The legal constraints on doing this (Acts of legislation that cover privacy, Welfare and Education Ministries)
- Would we do this? The practice implications of joining data from different client engagement domains
- Should we do this? The ethical considerations. (The aim here is a favourable outcome for young people (not an adverse outcome). Not to do this might be considered unethical)

There were legislative changes required to support this programme of work.

Platform

The platform for this system can be described by the following diagram:



Data about young people coming from the main benefits payment system and the child protection case management system (both MSD systems) together with data on school leavers supplied by the Ministry of Education is matched so that we have all the data pertaining to a single individual available. The risk score is then calculated before a campaign flow process allocates the clients to service providers. The risk rating, together with a range of client data is passed through to the application used by the providers to record their activity with these clients. What is not shown here is that the database under the ART application is also replicated back to the Data Warehouse so we see the behaviour and activity of Service Providers. Ultimately if young people who are participating in this programme end up on a benefit, that becomes evident in data in the Data Warehouse through the replication of the SWIFTT main benefits payment system.

The infrastructure software involved here is from SAS Institute. MSD has a long history as a SAS user and we have a comprehensive suite of Enterprise BI Server, Enterprise DI Server, Campaign Management, Model Management, Enterprise Miner, (including text miner), and Real Time Decision Manager.

Challenges

The technical challenges can largely be thought of as “integration” challenges

- Integration across and within organisations
- Software and solution integration
- Integration of people into teams

Another major challenge is the immovable time constraint imposed by a legislative imperative to get something in place by a date specified in the legislation. This does place a binding constraint on a project plan.

Data Structure

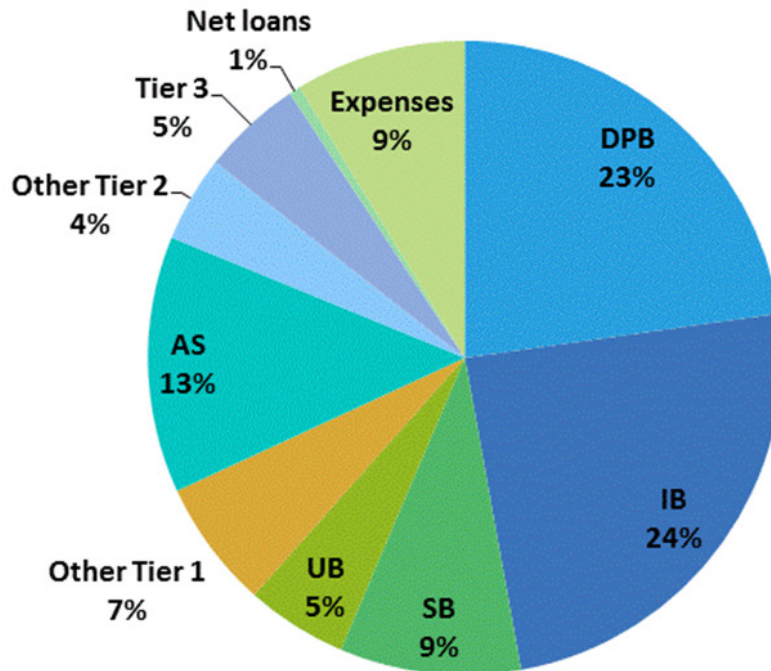
The “integrated data” object in this picture will be familiar to users of data mining tools. This is the usual one row per case structure that is typically built and used as the input to a logistic regression for example. This is what we

have come to describe as an “integrated longitudinal view of clients”. This is the de-normalised structure that is required for modelling, and when the model scoring code is deployed, the cases fed into the scoring process are also one case per row.

A normalised view of this data can be described in terms of what we have come to call “Person, Time, Cost, Event” data. This might actually be structured as a series of related tables. What they provide though is all the data required to generate the de-normalised view required for modelling.

Focus

The direction that this “Investment Approach” has set has some interesting possibilities. A by-product of the development of valuation of the liability is clarity about what major segments of the liability are driven by. Historically considerable focus has been on Unemployment Benefits. This segment of our client base represents only 5% of forward liability. Funding the agency’s activity represents 9% of the forward liability.



When we start asking questions about these things, I am reminded of the Welfare Working Group discussions of “social, economic, and fiscal” outcomes. The state as a whole does need to appreciate that the role of a public servant is largely to make decisions about the allocation of resources that the community as a whole agree should be put in our hands to allocate to purposes we as a community also agree should be funded collectively. These are resource allocation decisions. It is a fundamental duty of agencies to optimise the allocation of these resources and the use of analytics (such as propensity modelling) and optimisation techniques from the Operations Research discipline are powerful tools that should be applied to exercising that duty. It could be considered a dereliction of that duty if we failed to do so.

In some areas of state activity there are decisions that are not resource allocation decisions, but have potentially adverse impact on citizens. The discussion here centres on the confusion matrix. What we do need to understand is even in a decision making environment where no analytical model is in use, models are in play. These are the models that professionals have developed through experience and application of their knowledge. These models do have their own matrix of true positives, false positives, true negatives, and false negatives and an associated ROC curve.

What needs to be understood is the cost matrix associated with the matrix of true positives, false positives, true negatives, and false negatives.

- True Positive = appropriate targeting
- False Positive = wasted effort or spending
- True Negative = appropriate elimination of wasted effort or spending
- False Negative = someone misses out

The cost implication might be that the choice of position on the ROC curve you operate from increases the frequency of death from abuse from 3 per year to 4 per year.

There are some common misconceptions to overcome. Sometimes analytical models are better at assessing propensity or risk than people are and sometimes they are not. They are almost certainly more consistent and explicit. Applying Analytics is about supporting our front line staff in making the best decision by augmenting their professional skills and knowledge with analytics.

Analytical models are not perfect (there is no single perfect model.)

Models are just models, even the models operated by front line staff (based on their professional experience and skill.)

What matters is the cost matrix in combination with the confusion matrix at the point on the ROC curve you are operating at.

The addition of CYF data to the Youth Services propensity model allows better targeting than without it because the resulting scores allow better targeting through a smaller percentage of the case load needing to be engaged with to reach higher risk clients, or a reduction in the number needed to treat.

Conclusion

As a result of the change in focus towards driving value we are now beginning to use analytics combined with optimisation techniques operationally which is appropriate in our role as stewards of public funding. The platform that has been put in place and is now operational for the Youth Services program is very similar in many respects to a private sector implementation of "closed loop" marketing.

We are on a path that will lead to organisational change and a change of culture within the organisation. It is an interesting road ahead.

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