Attachment A | Crown Model

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## Introduction and methodology

The objective of the Crown Model is to build a predictive model that identifies patrons who exhibit potential problem gaming behaviour based on data obtained from patron historic gaming activity and some demographic information.

There were a total of ~1100 self-excluded patrons between July 2012 and December 2016, which were split evenly between model build and validation.

	Model Build Dataset	Model Validation Dataset
Number of self excluded patrons	560	559
Number of randomly selected patrons from database	5,000	5,000
Total number of Patrons	**5,560**	**5,559**

Two separate models were built (Table Games and Gaming Machines) due to the different nature of the two gaming products.

A combination of patron demographics and gaming behaviour (18 months up until the point of self-exclusion) were used, and over 200 variables were analysed, out of which the 50 best were chosen to build the models. The 50 are based on machine learning algorithms which are designed to identify the best features.
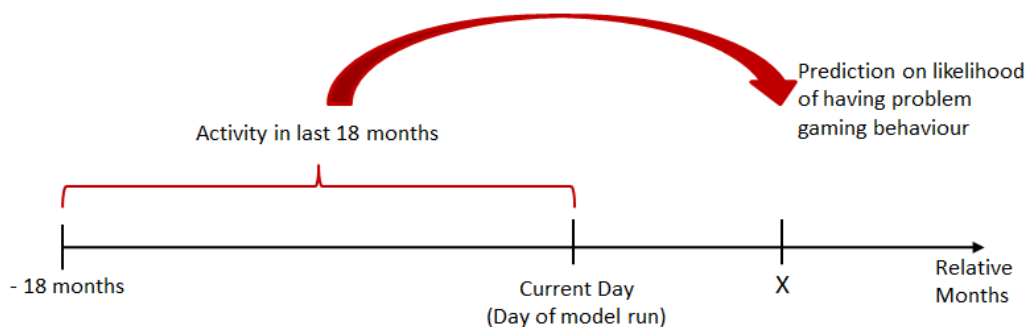
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Model validation results

Model validation results show a capture between ~35% and ~52% of all self-exclusions dependent on model threshold, and also identify patrons who are potentially showing problem gaming behaviour, but did not self-exclude.

Total TG self exclusions in validation set: **418 Patrons**

	60%	70%	80%
Model Threshold			
Correctly predictied to self exclude	219	200	175
% of self excluded patrons identified by model	52%	48%	42%
Self excluded patrons **not** captured by model	199	218	243
% of self excluded patrons **not** identified by model	48%	52%	58%
Incorrectly predicted to self exclude	27	20	10
% of patrons **wrongly** identified by model	11%	9%	5%

TG results at 70% model threshold:
- Model is able to identify 48% of all self-exclusions (200 out of 418)
- In total the model identified 220 patrons, of which 20 patrons did not-self exclude, but potentially displayed problem gaming behaviour

Total GM self exclusions in validation set: **141 Patrons**

	60%	70%	80%
Model Threshold			
Correctly predictied to self exclude	73	61	50
% of self excluded patrons identified by model	52%	43%	35%
Self excluded patrons **not** captured by model	68	80	91
% of self excluded patrons **not** identified by model	48%	57%	65%
Incorrectly predicted to self exclude	28	17	7
% of patrons **wrongly** identified by model	28%	22%	12%

GM results at 70% model threshold:
- Model is able to identify 43% of all self- exclusions (61 out of 141)
- In total the model identified 78 patrons, of which 17 patrons did not-self exclude, but potentially displayed problem gaming behaviour

Summary

In order to validate results, time would be required (as a prediction is made regarding a future event). It is important to note that **potential** problem gaming behaviour is identified, and not everyone identified would experience problem gaming.

Building this model has been technically difficult. With more time and additional information obtained from the model run on the current active patron database, further enhancements could be made in order to increase the accuracy of predictions.

As this would be a live model trial, for best outputs continued analysis and enhancements may be required to form a final view on accuracy, usefulness and reliability.

The Crown Model would be an additional tool in the very robust Crown Melbourne Responsible Gaming framework, where observable signs are viewed as an effective means of identifying potential problem gaming behaviours and staff are trained to refer patrons who display these signs or request assistance to Responsible Gaming Liaison Officers.

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