Change of Preference: Analysing UAC Applicants Behaviour

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Roadmap

• Motivation

• Background theory
  - Data, information, knowledge and data analytics

• Case study on change of preference by applicants of Universities Admissions Centre (UAC) in 2011-2013

• Conclusions
Motivation

• Understanding thoroughly the behaviour of UAC applicants

• Measuring the impact of Change of Preference (CoP) campaign

• Making well-informed student recruitment decisions
Background Theory

Data

Understanding relations

Information

Understanding patterns

Knowledge

For decision making

Mining the hidden gold
## Background Theory: An Example

### Data

<table>
<thead>
<tr>
<th>REFNUM</th>
<th>SEX</th>
<th>YEARNOW</th>
<th>PREFNUM</th>
<th>INSTCODE</th>
<th>SHORTNAM</th>
<th>SCHOOLVR</th>
<th>COURSE</th>
<th>CSTITLE</th>
<th>QUALYEAR</th>
<th>ATAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>A00001</td>
<td>M</td>
<td>2013</td>
<td>1</td>
<td>U01</td>
<td>Essendon Uni</td>
<td>CSL</td>
<td>4131161</td>
<td>B Philosophy / B Econ</td>
<td>2012</td>
<td>81.00</td>
</tr>
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<td>CSL</td>
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<td>CSL</td>
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<td>84.50</td>
</tr>
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<td>2</td>
<td>U07</td>
<td>Fremantle Uni</td>
<td>CSL</td>
<td>3400532</td>
<td>B Biodiversity / B Environment</td>
<td>2012</td>
<td>84.50</td>
</tr>
<tr>
<td>A00003</td>
<td>F</td>
<td>2013</td>
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<td>U06</td>
<td>Hawthorn Uni</td>
<td>CSL</td>
<td>6107001</td>
<td>B Science (Flexible)</td>
<td>2012</td>
<td>84.50</td>
</tr>
<tr>
<td>A00006</td>
<td>M</td>
<td>2013</td>
<td>1</td>
<td>U01</td>
<td>Essendon Uni</td>
<td>CSL</td>
<td>4134204</td>
<td>B Finance / B Statistics</td>
<td>2012</td>
<td>93.85</td>
</tr>
<tr>
<td>A00006</td>
<td>M</td>
<td>2013</td>
<td>2</td>
<td>U01</td>
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</tr>
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<td>Richmond Uni</td>
<td>CSL</td>
<td>5211741</td>
<td>B Engineering (Civil)</td>
<td>2012</td>
<td>93.85</td>
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<tr>
<td>A00006</td>
<td>M</td>
<td>2013</td>
<td>4</td>
<td>U08</td>
<td>Fitzroy Uni</td>
<td>CSL</td>
<td>6751601</td>
<td>B Engineering / B Commerce</td>
<td>2012</td>
<td>93.85</td>
</tr>
</tbody>
</table>

### Information

<table>
<thead>
<tr>
<th>Y-12 School Name</th>
<th>2013</th>
<th>2012</th>
<th>Diff 2013-2012</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Essendon Uni</td>
<td>Fitzroy Uni</td>
<td>Essendon Uni</td>
</tr>
<tr>
<td>Vikings</td>
<td>45</td>
<td>25</td>
<td>-18.20%</td>
</tr>
<tr>
<td>Cowboys</td>
<td>39</td>
<td>17</td>
<td>2.60%</td>
</tr>
<tr>
<td>Falcons</td>
<td>32</td>
<td>11</td>
<td>-17.90%</td>
</tr>
<tr>
<td>Panthers</td>
<td>19</td>
<td>19</td>
<td>-24.00%</td>
</tr>
<tr>
<td>Saints</td>
<td>85</td>
<td>8</td>
<td>-22.70%</td>
</tr>
<tr>
<td>Jet</td>
<td>27</td>
<td>19</td>
<td>22.70%</td>
</tr>
<tr>
<td>Total</td>
<td>247</td>
<td>99</td>
<td>289</td>
</tr>
</tbody>
</table>
From Data to Decision

Cleansed Data

Search Space

Superior Decision Alternatives

- = data analytics
- = relevant information
! = irrelevant information

Data Analytics
- Statistical analysis
- Network analysis
- Heuristics based
- Forecasting
- Optimisation
- Data mining
- etc
Searching for Solutions

• Iterative process
  ➢ Focus on the relevant
  ➢ Filter out irrelevant incrementally

• Various information/knowledge can be inferred from the data: low vs. high quality

• Operational Constraints
  ➢ Good vs. Quick vs. Cheap
  ➢ Pick 2
Finding the Right Analytics

• Determine and apply reasonable analytics to extract relevant information from data collection

• Require intuition, insights and better understanding of domain knowledge

Without Knowledge It’s Just Data
(Thomson Reuters)
Change of Preference Analysis:
Case Study Using UAC 2011-2013 Data
Past Work

• Using SATAC data of Flinders University
• Predicting commencing load
• An Application of Predictive Modelling of Undergraduate Student Intake (Seidel, E. AAIR-2011).
Donald Rumsfeld (June 2002)

- There are known knowns: there are things we know that we know
- There are known unknowns: there are things that we now know we don’t know
- But, there are also unknown unknowns: there are things we don’t know we don’t know
Data Analysis for Decision Making

Q

• Which data to use?
• Who is the Decision Maker?
• Which Data Analytic tools to use?

A

• UAC data
• Student Recruitment & Marketing Divisions
• Statistical and Network Analysis
The UAC data

• UAC processes applications for admission to most undergraduate (UG) program studies at participating institutions (mainly located in NSW and ACT).

• UAC-UG is for domestic applicants.

• Each applicant can choose up to nine program study preferences.

• Applicants can change their preferences as many times as they like.

• Good quality data
Size of UAC Data and Number of Applicants

• Data
  - UAC-2011: 453,157 records (319 MB)
  - UAC-2012: 478,242 records (335 MB)
  - UAC-2013: 469,319 records (362 MB)

• # Applicants
  - UAC-2011: 84,225 applicants
  - UAC-2012: 86,584 applicants
  - UAC-2013: 88,237 applicants
Using UAC Data

• Analysing historical data
• Predicting commencing load (EFTSL)
• During CoP period, generating reports using the preferences data. If the number of 1st preferences increases,
  we are ☑️ ☑️
  otherwise ☹️ ☹️
Changing Preferences: An Example

10 December 2012

12

11

10

7 January 2013
Cumulative Distribution of 1st Preference School Leavers with ATAR≥80 by Number of Schools in UAC 2013

ATAR = Australian Tertiary Admission Rank
Scatter Plot of Schools with Highest Percentage of UAC 2013 School Leavers with ATAR ≥ 80

- 75-79.95
- 80-84.95
- 85-89.95
- 90-94.95
- 95-99.95
- % ≥ 80

# Applicants

% Applicants with ATAR in the range of 80-99.95

School

0 50 100 150 200 250 300 350 400 450 500 550 600 650 700 750

0 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

0 20 40 60 80 100 120 140 160

# Applicants
Trends of Preferred Institution in 2012

As at 7 January
Change of Preference (CoP) Campaign

- Has objective
  - To maximise 1st preference enrolments

- Evidence based vs. Non-Evidence based
  - Well-defined target market
  - Efficient vs. Inefficient
Has U15 done a smart CoP campaign?
Change of 1st Preference from/to U01 in 2012
Change of 1st Preference in 2012
Change of 1st Preference: The Patterns – 1/2

Change of 1st preference to Program Study with lower cut-off

<table>
<thead>
<tr>
<th>Applicant ATAR</th>
<th>Program Name</th>
<th>Cut-off</th>
<th>1st Preference on 10 Dec 2012</th>
<th>Program Name</th>
<th>Cut-off</th>
</tr>
</thead>
<tbody>
<tr>
<td>94.45</td>
<td>B Arts</td>
<td>80</td>
<td>B Arts</td>
<td>78.00</td>
<td></td>
</tr>
<tr>
<td>97.50</td>
<td>B Engineering (Hon)</td>
<td>87</td>
<td>B Engineering (Mechanical)</td>
<td>74.05</td>
<td></td>
</tr>
<tr>
<td>96.65</td>
<td>B Medical Science</td>
<td>90</td>
<td>B Health Sciences</td>
<td>80.60</td>
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</tr>
<tr>
<td>91.20</td>
<td>B Medical Science</td>
<td>90</td>
<td>B Medical and Health Sciences</td>
<td>82.00</td>
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<tr>
<td>89.90</td>
<td>B Science</td>
<td>80</td>
<td>B Engineering (Flexible Entry)</td>
<td>80.00</td>
<td></td>
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</tbody>
</table>

Movement of applicants both within and between institutions
Change of 1st Preference: The Patterns – 2/2

• Accommodation
  ➢ Stay close to home is one of the reasons
• Experiencing life in big/small city
• Flexible modes of study
• Changing program study
  ➢ Single to Single
  ➢ Single to Double
  ➢ Double to Single
  ➢ Single to Vertical
  ➢ Honours to Double
• Others
## Trends of Preference to Field of Study

<table>
<thead>
<tr>
<th>Field of Study</th>
<th>Diff Pref-1 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2013-2012</td>
</tr>
<tr>
<td>Agriculture, Environmental and Related Studies</td>
<td>7.60%</td>
</tr>
<tr>
<td>Architecture and Building</td>
<td>-11.42%</td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>-10.16%</td>
</tr>
<tr>
<td>Chemistry</td>
<td>10.26%</td>
</tr>
<tr>
<td>Communication and Media Studies</td>
<td>-3.70%</td>
</tr>
<tr>
<td>Earth Sciences</td>
<td>-19.23%</td>
</tr>
<tr>
<td>Economics</td>
<td>1.04%</td>
</tr>
<tr>
<td>Education</td>
<td>-4.64%</td>
</tr>
<tr>
<td>Engineering and Related Technologies</td>
<td>5.22%</td>
</tr>
<tr>
<td>Health</td>
<td>6.43%</td>
</tr>
<tr>
<td>Information Technology</td>
<td>6.87%</td>
</tr>
<tr>
<td>Language and Literature</td>
<td>-8.07%</td>
</tr>
<tr>
<td>Law</td>
<td>-1.61%</td>
</tr>
<tr>
<td>Management and Commerce</td>
<td>1.23%</td>
</tr>
<tr>
<td>Mathematical Sciences</td>
<td>0.84%</td>
</tr>
<tr>
<td>Medical Studies</td>
<td>4.24%</td>
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<tr>
<td>Mixed Field Programs</td>
<td>-0.35%</td>
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<tr>
<td>Music</td>
<td>-6.62%</td>
</tr>
<tr>
<td>Natural and Physical Sciences</td>
<td>5.40%</td>
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<tr>
<td>Other Creative Arts</td>
<td>-7.23%</td>
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<tr>
<td>Performing Arts</td>
<td>-1.68%</td>
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<tr>
<td>Physics and Astronomy</td>
<td>-12.50%</td>
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<tr>
<td>Psychology</td>
<td>0.41%</td>
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<tr>
<td>Society and Culture</td>
<td>4.50%</td>
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<tr>
<td>Visual Arts and Graphic Design</td>
<td>-2.33%</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>1.63%</strong></td>
</tr>
</tbody>
</table>
Contribution to Load Planning

Static Model
- Historical Commencing Data
- Historical Resource & Other Data
- Historical Continuing Data

Load Planning Process

Allocated Loads

Dynamic Model
- Student Recruitment & Marketing
- Resource Divisions & Others
- Student Attrition/Retention

Load Planning Process

Continuing Data

Allocated Loads
Stable Marriage Problem

Old marriage at Plac Kaszubski in Gdynia, Poland
The Nobel Prize in Economic Sciences 2012

• They improved the way people are matched with limited resources
  ➢ How people and companies find and select one another in everything from marriage to school choice to jobs to organ donations. (Rampell, 2012)


• Prize motivation: for the theory of stable allocations and the practice of market design.
Conclusions

• We did market research using UAC data.
• We analysed the behaviour of UAC applicants.
• The results can be used for
  – Improving CoP Campaign
  – Well-informed Student Recruitment and Marketing
  – Improving Commencing Load Planning
References


• UAC. http://www.uac.edu.au/general/
Thank You

&

Questions