

Phone Bill Analyser

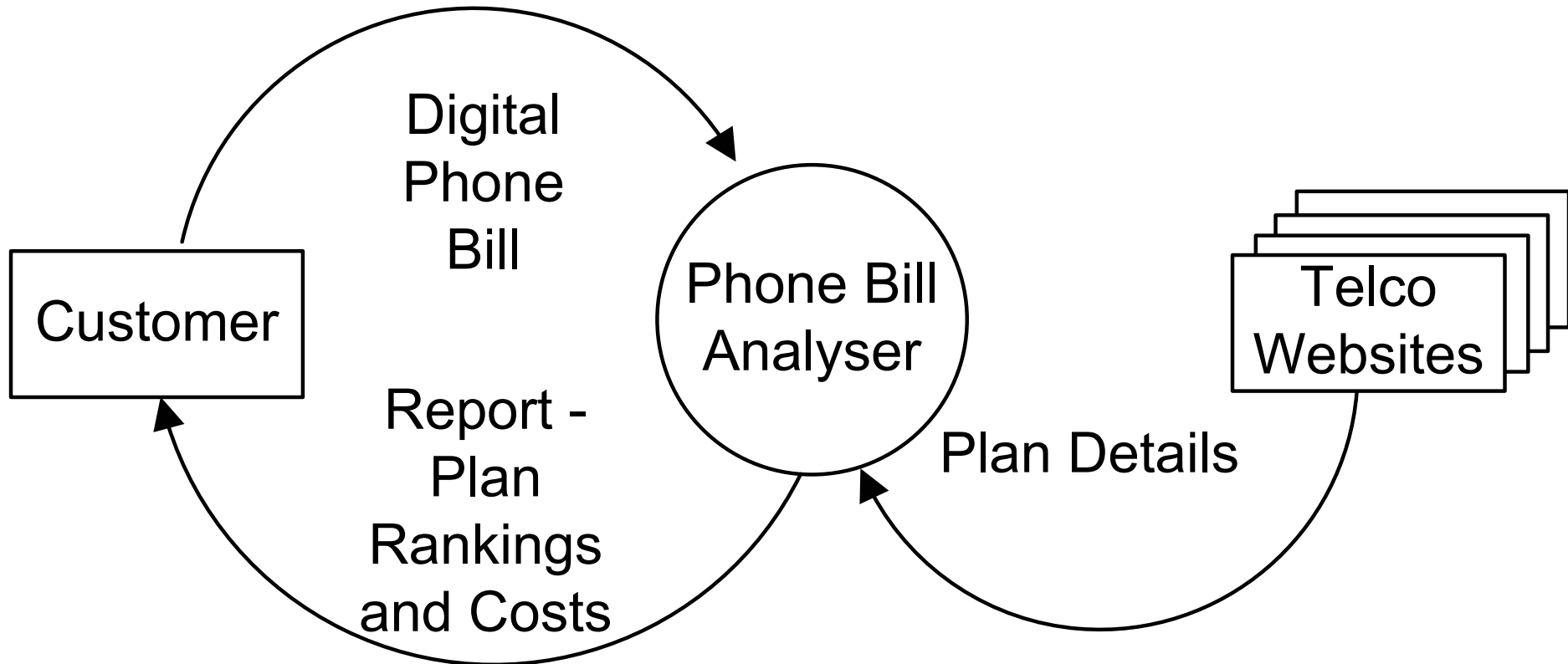
COMP8780 – Information and Human
Centred Computing Project

Implementation Project

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Project supervisor: Peter Christen

Context Diagram





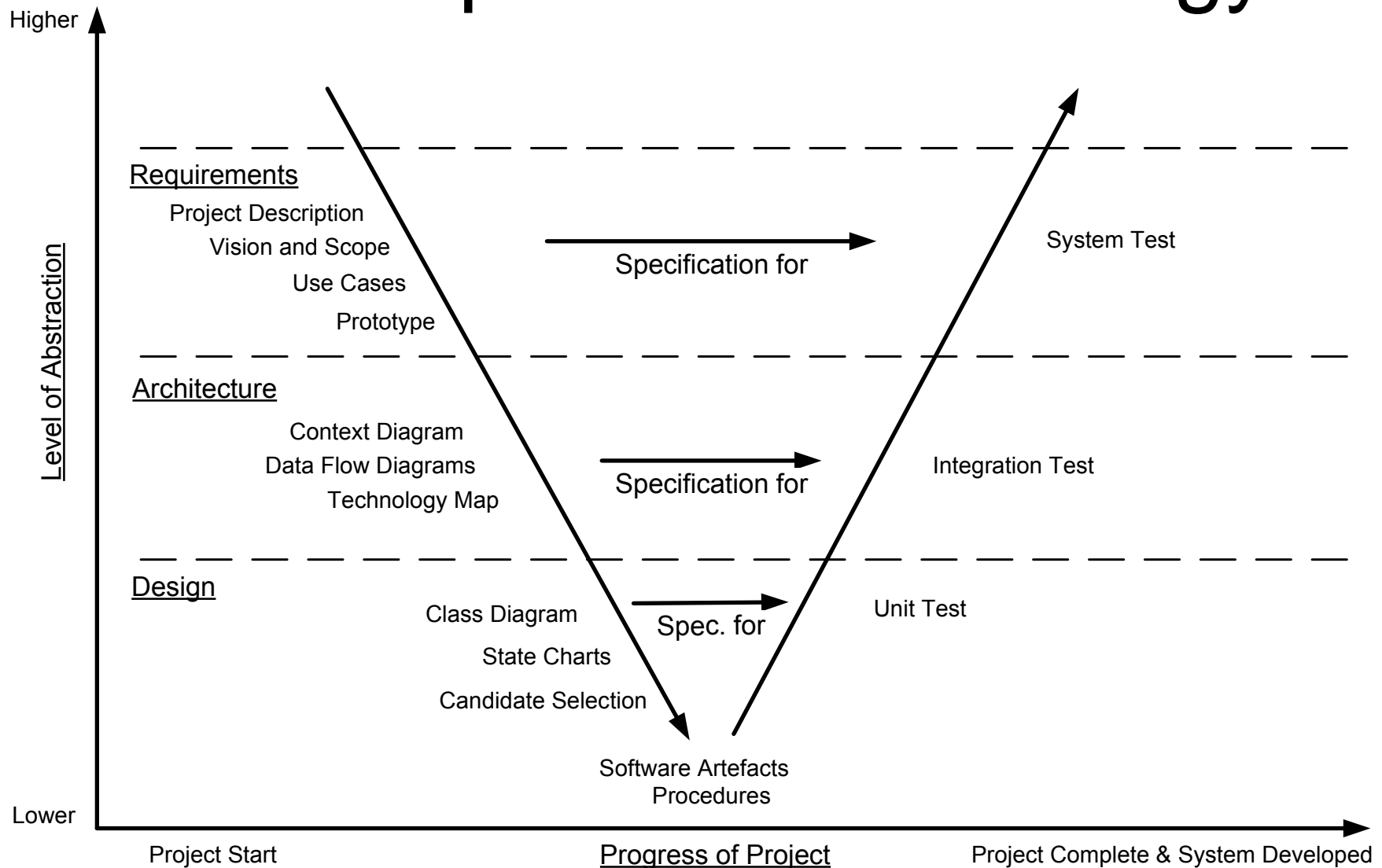
Problems Finding the Best Plan

- Too many options
 - 302 Australian telephone service providers^[1]
 - Assuming 5 plans per service provider, 1,510 plans
- Too many calculations
 - Assuming 50 calls per month, ~75,500 calculations
- Problem is even worse when plan combinations are considered
- Limitations of existing systems
- Unclear/ tricky conditions

[1] Telecommunications Industry Ombudsman



Development Methodology

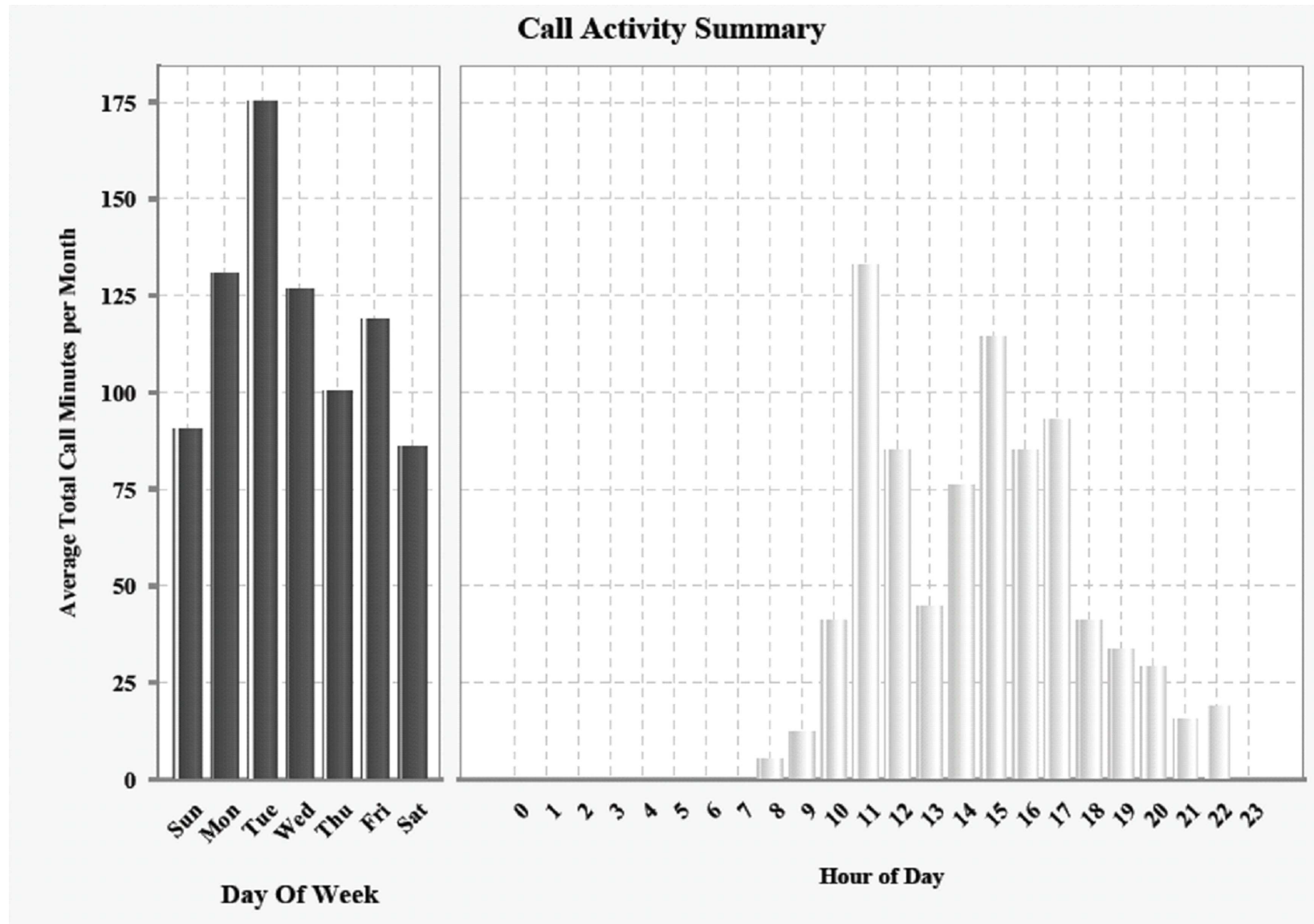




Example Report – Page 1

Cheapest Phone Plans - Based on Past Call Activity - 07:06:2009								
Customer Details								
Name: Smith J					Email Address: 1241586976.78213@anu.edu.au			
Address: 123 hello st, acton, ACT, 2600					Phone Number: 555-1234			
Cheapest Phone Plans								
Rank	Average Cost Per Month	Provider	Plan	Average Monthly Costs				
				Access Costs	Local Calls	13/1300 Calls	National Calls	Mobile Calls
1	\$443.49	Optus	Home Comfort Weekends	\$39.95	\$28.95	\$0.00	\$38.83	\$335.76
2	\$446.62	Optus	Home Comfort Weekends & Nights	\$49.95	\$24.13	\$0.00	\$36.78	\$335.76

Example Report – Page 2



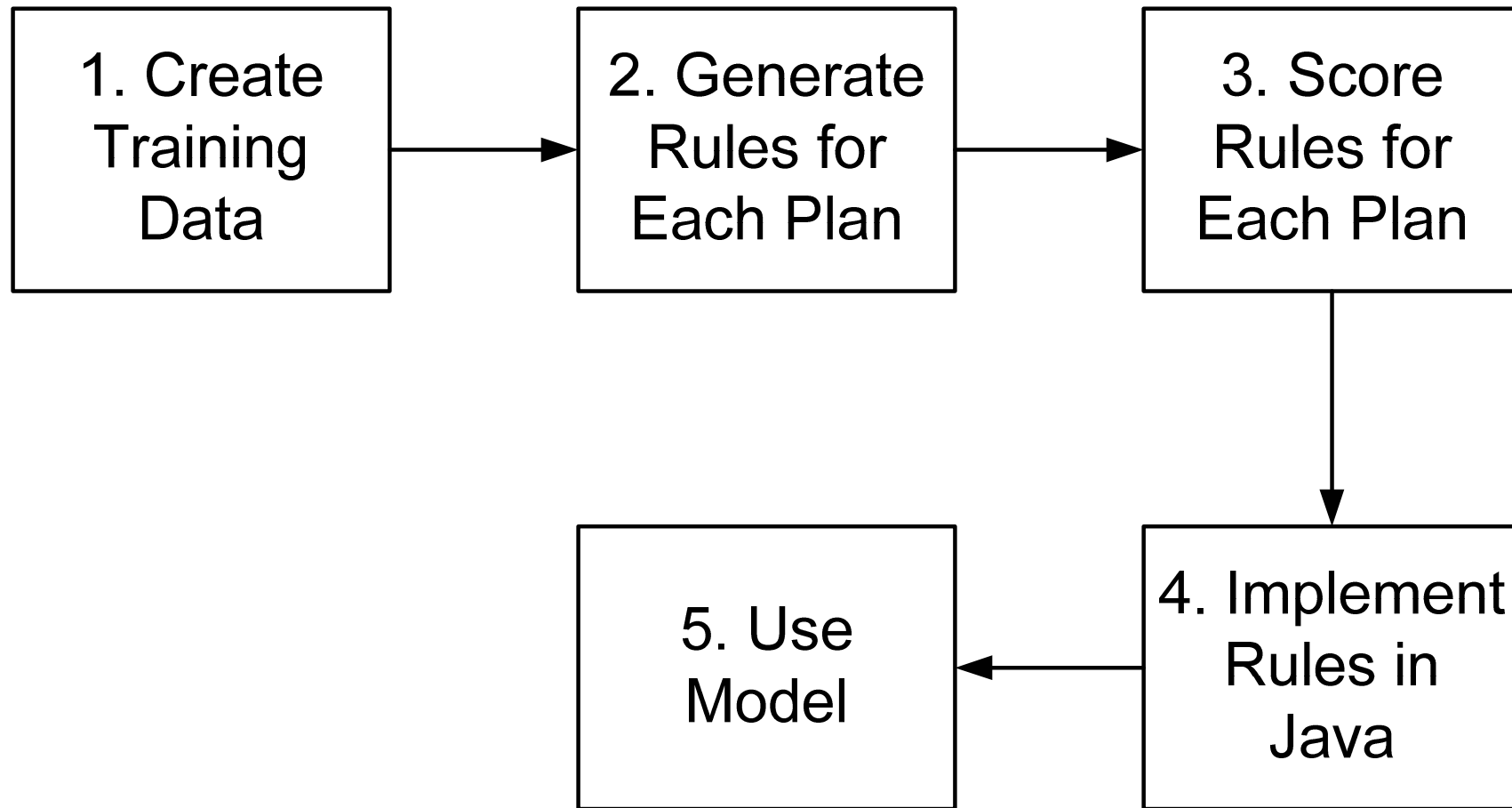


Still have a problem

- Still too many plans and plan combinations to calculate the customer's call costs on each plan
- The solution = a candidate selection model:
 - Select candidate plans for a customer based on a summary of their call activity
 - Consists of a set of rules of the form:
 - If <conditional involving call activity> then add plan X to the candidate set
 - The Phone Bill Analyser calculates actual costs for these candidates



Creating the Model





1. Create Training Data

Call Activity Summary		Plan in Candidate Set?	
% calls on weekend	# calls	P1	P2
10	100	Y	Y
20	100	Y	N
10	200	Y	N
20	200	N	N



2. Generate Rules

- Use Weka^[2]
- For each plan:
 - Import training data
 - Generate rules using “Part” rule generator
- Example rules (from above training data):
 - If (% calls on weekend) ≤ 10% then
 - P1 = “Y”
 - If (% calls on weekend) ≤ 10% & (# calls ≤ 100) then
 - P2 = “Y”



3. Score Rules for Each Plan

Actual Class	Predicted Class	
	Y	N
Y	0	1
N	0.1	0

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	Y	N
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Example:

P1 confusion matrix

10	2
3	11

P1 Total Cost = 2.3



4. Convert Rules to Java

- For each rule with target “Y”, add the plan to the candidate set if the conditional is true
- If there are insufficient candidates after all rules have been tested, then add plans in order of decreasing total cost, until there are enough candidates

5. Use Model

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Future Work

- Programmatic Weka interface
- Automate the extraction, correction and upload of plan data
- Extend testing and use
- Increase range of data mining techniques
- Research learning classification rules for multiple target attributes



Full References

- [1] Telecommunications Industry Ombudsman, 2009, *Search Members List*, <http://www.tio.com.au/aboutmembership/searchmembers.htm>, viewed 16 March 2009.
- [2] Witten, I & Frank, E 2005, *Data Mining: Practical Machine Learning Tools and Techniques (Second Edition)*, Morgan Kaufmann, San Francisco, California.



Questions?