Decision Management Community Challenge Apr 2019 Recreational Fees

Descriptive Solution using Decision Tables
(Bob Moore, JETset Business Consulting, 08 Apr 2019)

1 Problem Statement (from the web site)

A city has created a decision table to determine appropriate usage fees for its recreational facilities based on length of usage and when the usage occurs:

What recreational fee should be charged for use of facilities?	When does the usage occur?		
How long is the usage?		weekday	weekend during off hours	weekend during peak hours
	< 1 hour	$2	$3	$8
	1-2 hours	$3	$5	$10
	> 2 hours	$5	$8	$15

The city also has the following behavioral business rule:
A senior citizen must not be charged a recreational fee for use of facilities.

2 Approach

As James Taylor has pointed out[1] this is not a well-formed specification. If a senior citizen wants to use the recreational facilities, the decision table says he or she will be obliged to pay at least $2 and up to $15, while the behavioural business rule says they pay nothing. The city needs to make its mind up[2]!

But there are really only three possibilities:

- The decision table 'trumps' the behavioural business rule, and a senior citizen always pays the fee
- The behavioural business rule 'trumps' the decision table, and a senior citizen never pays the fee
- Something else happens and a senior citizen pays a fee which is possibly different to the one specified in the decision table, and possibly is a zero amount.

Let's look at all three.

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[1] See https://dmcommunity.org/2019/04/03/new-challenge-recreational-fee/#comments

[2] Note that the challenge is derived from an article by Ron Ross which far from ignoring the flaws in the specification is focused on how they arise and how to resolve them. See: http://www.brcommunity.com/a2019/b987.html

3   The decision table 'trumps' the behavioural business rule

This is really easy. All we need to do it just ignore the behavioural rule, so we just build a decision table which replicates the one in the problem statement[3].

Recreational Fees

U	Input +		Output +
	time_of_use	duration_of_use	applicable_fee
	string	integer	integer
1	"weekday"	< 1	2
2	"weekday"	[1..2]	3
3	"weekday"	> 2	5
4	"weekend off hours"	< 1	3
5	"weekend off hours"	[1..2]	5
6	"weekend off hours"	> 2	8
7	"weekend peak hours"	< 1	8
8	"weekend peak hours"	[1..2]	10
9	"weekend peak hours"	> 2	15

4   The behavioural business rule 'trumps' the decision table

There are several of ways of doing this. Keeping with the decision table approach, one way is to just add another column to the decision table to indicate if the person wanting to use the facilities is a senior citizen. If they are the fee is zero. Otherwise it is whatever the standard fee is.

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U	Input +			Output +
	senior citizen	time_of_use	duration_of_use	applicable_fee
	boolean	string	integer	integer
1	Yes ▾	-	-	0
2	No ▾	"weekday"	< 1	2
3	No ▾	"weekday"	[1..2]	3
4	No ▾	"weekday"	> 2	5
5	No ▾	"weekend off hours"	< 1	3
6	No ▾	"weekend off hours"	[1..2]	5
7	No ▾	"weekend off hours"	> 2	8
8	No ▾	"weekend peak hours"	< 1	8
9	No ▾	"weekend peak hours"	[1..2]	10
10	No ▾	"weekend peak hours"	> 2	15

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[3] The change to a horizontal style of presentation is a limitation of the technology used (see section 7) but it also simplifies the subsequent stages where additional inputs are involved.

More in keeping with my own personal view of how rules work, an alternative approach would be to use a rule of the form:

if   senior_citizen
then   recreational_fee = 0
else   recreational_fee = recreationalFeeDecisionTable()

With the rule defining whether the fees are applicable, and we just reuse the decision table shown in the previous section if they do. This second approach is broadly in line with the discussion in Ron's original article. However, for the purposes of the 'something else happens' option, the extended decision table is the better way to go.

5   Something else happens

"Something else" in this context means that senior citizens sometimes pay fees, but not necessarily according to the pricing schedule in the decision table. There are lots of ways this might work, but many can be expressed simply by expanding the decision table from the last section to specify a fee structure for senior citizens[4]. As an example, the city having recognised that what they have asked for doesn't make sense, might modify their behavioural business rule to read something like:

A senior citizen may be charged a recreational fee, but it must not exceed of $4 and can be no more than 50% of the standard fee.

This has the effect of acknowledging that senior citizens may pay recreational fees, but limits them while not nailing it down exactly how much the fees are. As an example, the solution shown below meets the criteria:

Recreational Fees

U	Input +			Output +
	senior citizen	time_of_use	duration_of_use	applicable_fee
	boolean	string	integer	integer
1	Yes	"weekday"	-	0
2	Yes	"weekend off hours"	-	2
3	Yes	"weekend peak hours"	-	4
4	No	"weekday"	< 1	2
5	No	"weekday"	[1..2]	3
6	No	"weekday"	> 2	5
7	No	"weekend off hours"	< 1	3
8	No	"weekend off hours"	[1..2]	5
9	No	"weekend off hours"	> 2	8
10	No	"weekend peak hours"	< 1	8
11	No	"weekend peak hours"	[1..2]	10
12	No	"weekend peak hours"	> 2	15

Here senior citizens only pay a fee at the weekend[5] and pay a flat fee regardless of how long they use them for.

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[4] Among many other alternative approaches, one would be for the city to only to waive the fees for senior citizens who can demonstrate they are city residents.

[5] When they perhaps they don't want to use the facilities anyway because of pesky kids!

Does this make sense? One of the nice things here is that fees for senior citizens are now to some extent discretionary. The city has fixed its policy but within that potentially the recreational facilities can adjust fees, for example as above, to encourage senior citizens to visit them at periods when they are likely to be under-utilised. And importantly they don't have to go back to city hall to get permission to do so.

6   Discussion

At heart, this is a flawed problem. The challenge asks for two mutually incompatible objectives to be met. At the point you find there a problem at the specification level, you should not be running off building an implementation. Because it is trivial, not only is the incompatibility obvious, it takes minimal time to build alternative solutions and go back to 'the city' and ask them: "Do you want this? or this?" If only things were that easy in the real world.

Ron's article on which the challenge is based was concerned with looking at how 'behavioural' and 'definitional' rules may conflict. The approaches above in section 3 & 4 broadly follow Ron's discussion as to how to resolve the incompatibilities reasonably closely (assuming the use of the 'rule-based' approach for the behavioural business rule 'trumps' the decision table option)[6,7]. However, I did find that's Ron's example was contrived to the point it detracted from the importance of what he had to say. As stated, we have a black and white situation, it's either like the one in section 3 or the one in section 4. Unless we go off into the flights of fancy outlined in section 5, we only have two choices.

The thrust of Ron's argument is based around the idea we can classify business rules into 'behavioural' business rules which might in some sense be construed as business aspirations, and 'definitional' business rules which express more rigid constraints (possibly based on regulatory or physical requirements). In this classification, there is an explicit expectation that sometimes 'behavioural' rules can be broken, but that 'definitional' ones cannot. My own thinking is that an example based around something reimbursement policies for travel and subsistence expenses for consultants working on site would probably give a more realistic feel. Most consultants have worked on at least one project where circumstances in the real world meant it was not realistically possible to follow the proscribed expense policy. An example in an area like this seems to me to allow a much richer exploration the kinds of conflicts which can arise between behavioural' and 'definitional' rules.

7   Implementation Note

Normally with a challenge I like to build up a fully executable solution, I haven't bothered here since the problem is so trivial. The decision tables illustrated were built using Camunda[8]

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[6] Adding the senior citizen into the decision table conflates the behavioural and definitional rules which is very different from what Ron discussed.

[7] One difference is that Ron explicitly relabels the outcome of the decision table as a 'suggested fee' to distinguish from the actual 'fee' charged (if any). It's an interesting point. In a decision focused approach to the problem the difference between the two ideas may well be ignorable, but it is not in a rule focused one.

[8] See https://camunda.com/