Analytics Network - O.R. & Analytics

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The debate about the link between Operational Research (O.R.) and analytics has been discussed ever since analytics came to prominence a couple of years ago. Neither field is easily defined and, of course, that makes describing any overlap just as difficult. One thing is certain, however, and that is that there is a considerable area of commonality between the two fields.

Even if you decide to ignore the question of how synonymous the two are, analytics can learn and benefit from O.R. If analytics is to avoid the hype and realise its potential, it must be set in a wider context which recognises the need to understand what the numbers mean, how they relate to the working of the 'real world' system, and how changes in these systems might impact on their performance. This is the domain of Operational Research which has, over the 75 years since its inception, built up a body of knowledge, techniques and skills to tackle exactly these issues. O.R. can, therefore, add value in 'big data' analytics.

This is the basis for our claim that the O.R. Society represents a natural home for practitioners working in analytics and/or O.R.

Definitions

A quick search for a definition of analytics was the first, essential step to convince me that there was enough of an overlap in the O.R. and analytics 'spaces'. Not surprisingly, a Google search for the term returns plenty of hits for Google Analytics – if it were my company, I'd do the same! It does make it clear that analytics is a phrase well-established in the world of websites.

Wikipedia then tells me that the simplest definition of analytics is the 'science of analysis'. That doesn't expand on our understanding a great deal, but it does provide some reassurance that both O.R. and analytics have a scientific basis. It goes on to suggest that it's how a business arrives at an optimal or realistic decision based on existing data – and that sounds like a pretty convincing (although not exactly riveting) definition of O.R. It continues: 'Also, some people use the term to denote the use of mathematics in business. Others hold that the field of analytics includes the use of Operations Research, Statistics and Probability. However, it would be erroneous to limit the field of analytics to only statistics and mathematics.' It's sounding more and more like O.R. to me!

If you make the hop back to a definition of web analytics, but remove the references to the web or the internet, we arrive at a further, simple definition: the measurement, collection, analysis and reporting of data. Again, that sounds like O.R., especially if you start to add modelling into the mix. The difficulty of coming to a universally accepted definition is certainly something analytics and O.R. share. However they might be defined, it's not difficult to argue the two are closely intertwined.
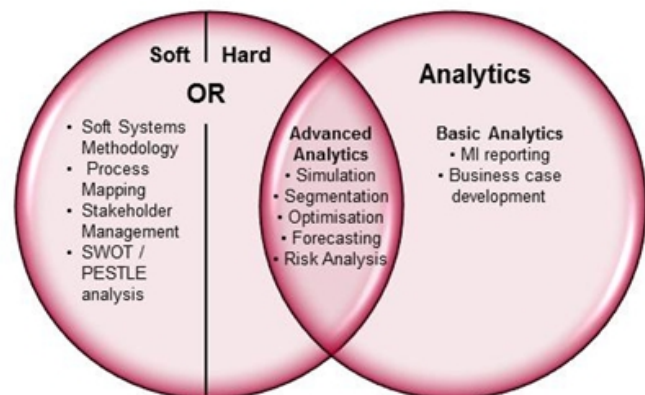
Research

In 2011, the Society commissioned some research on this very topic. An early conclusion of this work was not surprising, but at least it was reassuring: 'There is no clear definition of O.R. or analytics and both capabilities span a range of activities.' The commonality was represented pictorially in two ways, neither of which were entirely satisfactory.

A hierarchical pyramid might portray O.R. as superior in some way; that is certainly not the view.
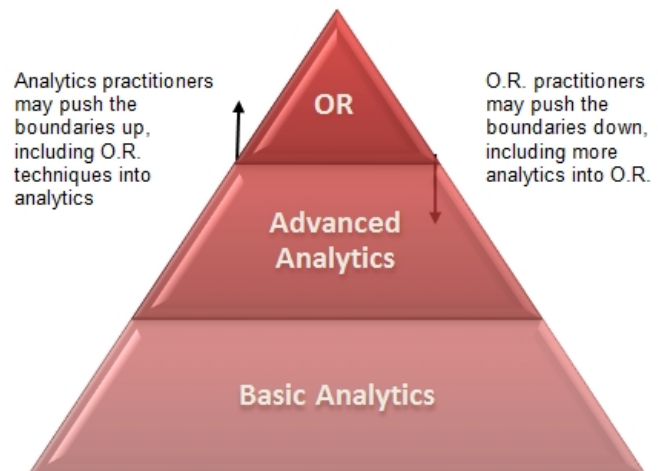
Similarly, a Venn diagram might start to clarify the areas of overlap, but a survey of the Society's members proved there was little agreement over the relative sizes of each set, nor the extent or even direction of the overlap.

The research suggested splitting analytics into three categories: descriptive, predictive and prescriptive.

Anyone familiar with O.R. might suggest optimisation and simulation as typical O.R. techniques, but those familiar with

practicing O.R. would recognise that the toolbag of the analyst or consultant would cover all of these three categories **(Figura al final de esta página)**.

Adding Value in Analytics

As mentioned in the introduction, rather than worry about whether the two disciplines are pretty much the same thing, it is helpful to consider how O.R. can add value in analytics.

The first task for analytics, too often neglected, is to consider the nature of the problem or system being addressed, to make sure that the questions being asked of the data are the key ones. Operational Research has developed techniques – problem structuring tools – that makes sure that this can be done in a disciplined and illuminating way and which involves the full range of key stakeholders.

The next task, which is often regarded as the core analytics task, is to combine and examine the data, typically using the standard tools of statistics, to identify patterns and relationships that can inform decisions. This process will be familiar to most sorts of analysts, not least operational researchers.

That can be illuminating but can take things only so far. To investigate the likely effect of different decisions some testing and learning is needed. Operational Research can support this both though observation and experiment on 'real world' systems and also through modelling these systems. Operational Research has at its disposal an armoury of predictive and prescriptive modelling tools which can address 'what's likely?', 'what if?' and 'what's best?' questions.

The contribution of operational research does not end there. The testing and learning is typically done in an iterative manner, often moving back and forth between the 'real world' situation to the modelled one, working with decision makers and other stakeholders, until the desired improvements have been achieved. That process can highlight differences in perspectives and values amongst different stakeholders; O.R. has tools (such as multi-criteria analysis or strategic choice methods) for addressing these in a disciplined manner and to assist reaching an agreed way forward.

In any such work Operational Research will pay attention to the wider systems in which any particular function or process is embedded, to ensure that the working of one part is not improved to the detriment of the performance of the whole. That forms part of the contribution of O.R. to the flip-side of analytics: synthesizing the results of analysis to create new designs for processes and even whole enterprises.

Categories of Analytics

Prescriptive Analysis

Optimisation
Simulation

Focus on decision making and efficiency

Optimisation is a problem solving technique where situations and constraints are modelled to arrive at the most optimal solution

Simulation is used to analyse complex systems to gain insight into the system's behaviour and identify issues

Predictive Analysis

Data Mining
Predictive

Focus on prediction of future probabilities and trends

Data Mining is the method of extracting patterns from large data set in order to provide insight and future forecasts

Predictive Modelling uses statistical techniques such as linear and logistic regression to understand trend and predictive future outcomes

Descriptive Analysis

Data Modelling
Visualisation
Regression

Analytics involved in preparing data for advanced analysis or for general day to day business intelligence

Data Modelling is used to collect, store and cut the data in an efficient way

Visualisation look at the creation of reports and presenting information in a meaningful fashion

Regression is used to find simple trend in the data