Science of Social blog

Are Your Big Data Analytics Actionable?

BY MikeW
03-18-2014 09:50 AM - EDITED 09-02-2015 12:15 PM BY

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Alright, it's been a while since we have talked about big data and analytics. So it's time to come back to this topic. Previously, we talked about the need for sophisticated analytics to reduce petabytes of big data down to actionable bits. And there are 3 classes of analytics that could help us with this data reduction process:

1. Descriptive: Computing descriptive statistics that *summarizes* the existing data
2. Predictive: Building a predictive model and validating it, so it can be used to *forecast* data that doesn't exist yet
3. Prescriptive: Building an *actionable model* with feedback to *guide* the decision maker to the desired outcome

But what is an actionable model? Many analytics vendors claim to provide actionable insights or actionable intelligence, but what do they really mean? What precisely are actionable analytics, and what make an insight actionable? These are the questions we will address today.

Crucial Concepts for Actionability

There are three crucial concepts we need in order to understand what *actionability* really means.

1. Predictions vs. measurement
2. The predictive window
3. Reaction time

First, I must re-emphasize that *predictions* (i.e. *predicted data*) are not real data. If a weather model predicts tomorrow's temperature will be 75°F, this is an output of the model. It's NOT

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The second concept is the notion of a predictive window. I talked about this in an earlier post (see *Big Data, Big Prediction? – Looking through the Predictive Window into the Future*). The *predictive window* is the length of time into the future where the model's prediction is sufficiently accurate, where accuracy is determined by validation. No model can accurately predict the future indefinitely. Prediction accuracy falls off as we look further into the future. For examples, most meteorological models can only accurately predict future weather for about five days. Beyond that the weather prediction becomes unreliable. So the predictive window for most weather prediction models is five days.

Finally, we need to understand the concept of *reaction time*. This should be easy, because it's the time it takes for someone to act against the information and insights extracted from a data set. When using predictive analytics to extract information and insights from a data set, the result is typically the model's prediction. So reaction time is really just the time needed for someone to take actions against the model's prediction.

What are Actionable Analytics vs. Actionability?

All actionable analytics are predictive analytics, so they also make use of validated predictive models to make predictions. Although general predictive model are not constrained to make prediction in the temporal domain, predictive models in actionable analytics are strictly temporal. They make prediction about the future. And when these predictions are actionable, you have actionable analytics!

Simply put, actionable analytics are analytics that provide actionable predictions. Moreover, actionable analytics also facilitate the execution of action by making it easier for people to decide on a course of action. This is achieved by:

1. Making meaningful comparisons
2. Having few action choices: a maximum of 7±2 choices

Although we've defined actionable analytics, we still haven't defined what actionable really means. So what makes a prediction, actionable? An actionable prediction is one that gives you enough time to take action against it. It is a prediction whose predictive window is longer than the reaction time. This is the most important and the minimum criterion for actionability, and it is characterized by a simple inequality: *predictive window > reaction time*. I call this the *actionability inequality*.

actionability inequality:
predictive window > reaction time

If the reaction time is longer than the predictive window, then by the time you execute against a prediction from the model, that prediction is no longer valid. Whatever action you took would be ineffective. That means you can't affect the outcome based on the model's prediction. Then the model, the predictions, and the analytics would *NOT* be qualified as actionable.

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1. There is a difference difference between actual measure data vs. predictions that are derived computationally as the output of some models. Even those they look exactly the same—they are all just numbers, predictions (i.e. predicted data) are not real data per se, because they are not measured
2. Because no model can accurately predict the future indefinitely, *predictive window* is the length of time into the future where the model's prediction accuracy is acceptable
3. Finally, *reaction time* is just the time needed for someone to act upon the information and insights extracted from a data

The key to understanding actionability is summarized by the *actionability inequality: predictive window > reaction time*. This is the minimum criterion for any analytics to be actionable! If this condition is not met, then there is no way it can be actionable. However, it is important to note that satisfying this condition does not automatically guarantee actionability. There are additional criteria that contribute to actionability, and we will examine those next time.

For now, if you hear someone talking about actionable insights again, just ask him "what's the predictive window?" Then you can quickly tell if he's full of fluff.

Michael Wu, Ph.D. is Lithium's Chief Scientist. His research includes: deriving insights from big data, understanding the behavioral economics of gamification, engaging + finding true social media influencers, developing predictive + actionable social analytics algorithms, social CRM, and using cyber anthropology + social network analysis to unravel the collective dynamics of communities + social networks.

Michael was voted a **2010 Influential Leader** by *CRM* Magazine for his work on predictive social analytics + its application to Social CRM. He's a blogger on Lithosphere, and you can follow him @mich8elwu or Google+.

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