ADVANCED ANALYTICS OR NOT?

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ABSTRACT

Joining the chorus on Data Analytics (DA), this study presents alternative terminology to DA, including applied terms like Business Analytics (BA). Those who use DA within the discipline of Information Technology/Science should really be described at Data Scientists. An Analytics field, defined by its methodological models, is commonly known by Management Science/Operations Research. Such models can be described across a continuum of sophistication, so this paper examines the higher levels, identified as "Advanced Analytics", using a case from Product/Service Production.

Keywords: Business Analytics, Management Science/Operations Research, Advanced Analytics, IOT

EXTENDED ABSTRACT

Data Analytics has arrived. Today, these analytical methodologies often serve *Internet of Things or Intelligence of Things,* information systems built on emerging *Sensor* technology providing *Big Data*, captured digitally, frequently, 24/7 and in real time. IOTs are computing systems challenged by massive data that must be collected, stored, manipulated (analyzed/displayed) and electronically communicated. Their objective is to provide results/recommendations to functional managers.

Yet this study argues Data Analytics (DA) is not the appropriate name. It is too general and often absorbed by IS/IT professionals within their field of practice. For about 70 years (nearly 50 for some of us) analytical methods have been invented and developed by disciplines known as *Management Science/Operations Research, System Analysis/Decision Theory, Quantitative Management/Quantitative Analysis*. These many titles are historically associated with a myriad of analytical tasks intended to model, analyze and improve product and/or service production systems.

Information managers design data/information systems, serving a **Data Science** responsibility to build computing/networking systems that collect, store, manipulate and present information. Data Science has a primary obligation to develop or provide programming/software to reap the benefit of computing: Conducting analysis in the face of large amount of data, complex mathematical calculations and need for fast processing. Analytics (or analysis) belongs to those with education/experience in models/methods of Systems Analyses. The system to be served is not an information system but a production system.

Further, **Operations and other Functional Managers** must be responsible for production process model building, selecting data requirements, applying the correct analytical method and interpreting the mathematical results. This responsibility should not be shifted to IT managers out of inattention or ignorance by operating managers. They must control/conduct the design of analysis/analytics. *Decentralized IT* can be considered to serve in functional units, then what role for Operations Analysts?

Ultimately, it is the functional manager's task to seek **valid process models** and **evaluate the credibility of analytical results** to accurately predict process behavior. When operations and other functional managers leave this responsibility to others, it is hypothesized the ability to control analytics will be decreased, conducted with less sophistication and provide less reliable results.

1. **Validity** implies models, both diagrammatic and mathematical, that are complete, not neglecting relevant variables or randomness present in the actual system. Obviously, invalid models are more likely to produce inaccurate and weaker analytical results. High abstraction models might also endanger results.

2. Credibility or reliability is the final test of any analysis, but this study uses the term **Rationality** of results/recommendations. Rational recommendations, if implemented, achieve the outcomes predicted. Rationality can be harmed by false assumptions about the environment and production design, or, as suggested before, when models and methods are mal-designed.

Functional managers need to internalize analytics in their academic offerings: *Business Analytics, Logistics Analytics, Health Analytics, Public Analytics or many other industries.* These managers are obligated to comprehend their production systems, providing the appropriate data, models and methods.

To understand production systems, analysts can prepare models of the entire production process as well as components or perspectives needing separate modeling. Besides the general approach of process models using *simulation/optimization* methods, separate views of production can benefit from *network, inventory, layout, capacity, queuing, quality and technology utilization* methods.

Authors frame these multiple methods as "descriptive", "predictive" and "prescriptive" analytics. A case from practice demonstrates a **Level of Sophistication** among available and relevant analytical methods. Both functional and information managers should select software to be utilized for analytics. Is it *self-developed* by coders and users or do we depend on *pre-established* software applications relevant to our system and competent to perform required analyses? Software selection does not relieve production managers from the choices described, they are still accountable for the outcomes of analytics.

Possibly soon we will need to ask the question whether **Artificial Intelligence and Machine Learning** applications are able to comprehend production systems, find appropriate data and select methods to rationally analyze systems and recommend resource allocations to improve performance. Maybe Artificial Intelligence (AI) will even revise and conduct operations, then who is accountable?

This research must examine the continuum of sophistication for **Advanced Analytics**. An additional observation is the extent or balance of Type I decisions and Type 2 decisions. Type I requires more intuitive decision-making, while Type 2 demands little intuition in decision making by functional managers. Some defend intuition, but intuition is also risky business, suggesting the advantage for rationality of more complex, powerful, advanced mathematical models – if we can achieve validity!

This discussion ends with the introduction of several research hypotheses to better understand the application of analytics. Finally, a choice for which there is much debate, is whether Analytics should be taught in *Computer Science, Engineering or Business*, not all three?

References available upon request from the author.