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Viewpoint || **By Irv Lustig**

O.R. & data science: a complicated relationship

Survey: Analytics community weighs in on technology and industry trends and their impact on operations research.

It should come as no surprise that a large percentage of the analytics community agrees that technological trends will greatly impact the analytics profession going forward, according to an informal survey of attendees at the INFORMS Conference on Business Analytics and Operations Research earlier this year in Orlando, Fla. However, opinion is mixed regarding key concerns about perceived limitations on operations research specialists in business environments, as the number of other types of analytics practitioners and data scientists continues to grow.

The survey, conducted by Princeton Consultants, produced the following findings:

- The trends of algorithm markets, cognitive computing, the Internet of Things, machine learning and big data are widely expected to make a large or transformational impact on analytics in the next four years.
- There's modest concern that operations research is being subsumed by analytics and data science, and that O.R. is slowly becoming irrelevant – a provocative claim that was first published in 2010 in OR/MS Today.
- There's modest agreement that operations research professionals are too often pigeonholed within the execution phases of analytics.
- Opinion is evenly divided about the claim that the rapid increase in citizen data scientists is making it harder for O.R. professionals to make an impact.
- There's a broad distribution of roles and functions within analytics groups at businesses.
- Businesses deploy and manage analytics practitioners in a variety of ways, with no dominant framework.
- Practitioners are evenly divided about whether they should be centrally organized or organized by industry and/or application area.

About the Survey

Seventy-seven self-selected individuals participated in the survey. Of those, 74 percent were practitioners, 20 percent were students and 6 percent were professors. The majority of the practitioners work at big companies. Specifically, 57 percent work at companies with more than 5,000 employees, 9 percent work at companies with 1,000-4,999 employees, 9 percent work at companies with 100-999 employees, and 25 percent work at companies with less than 100 employees (includes sole practitioners).

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Is the rapid increase in citizen data scientists making it harder for O.R. professionals to make an impact?

The nonscientific “snapshot” survey was divided into two sections:

1. Practitioners were asked about the composition, function and organization of their analytics group.
2. All participants were asked about the role and importance of operations research as the number of other types of analytics professionals increases significantly, and about their views of the potential impact of current trends.

Figures 1, 2, 3 and 4 relate to the practice of analytics, specifically the size, composition, function and organization of the respondent's respective analytics group.

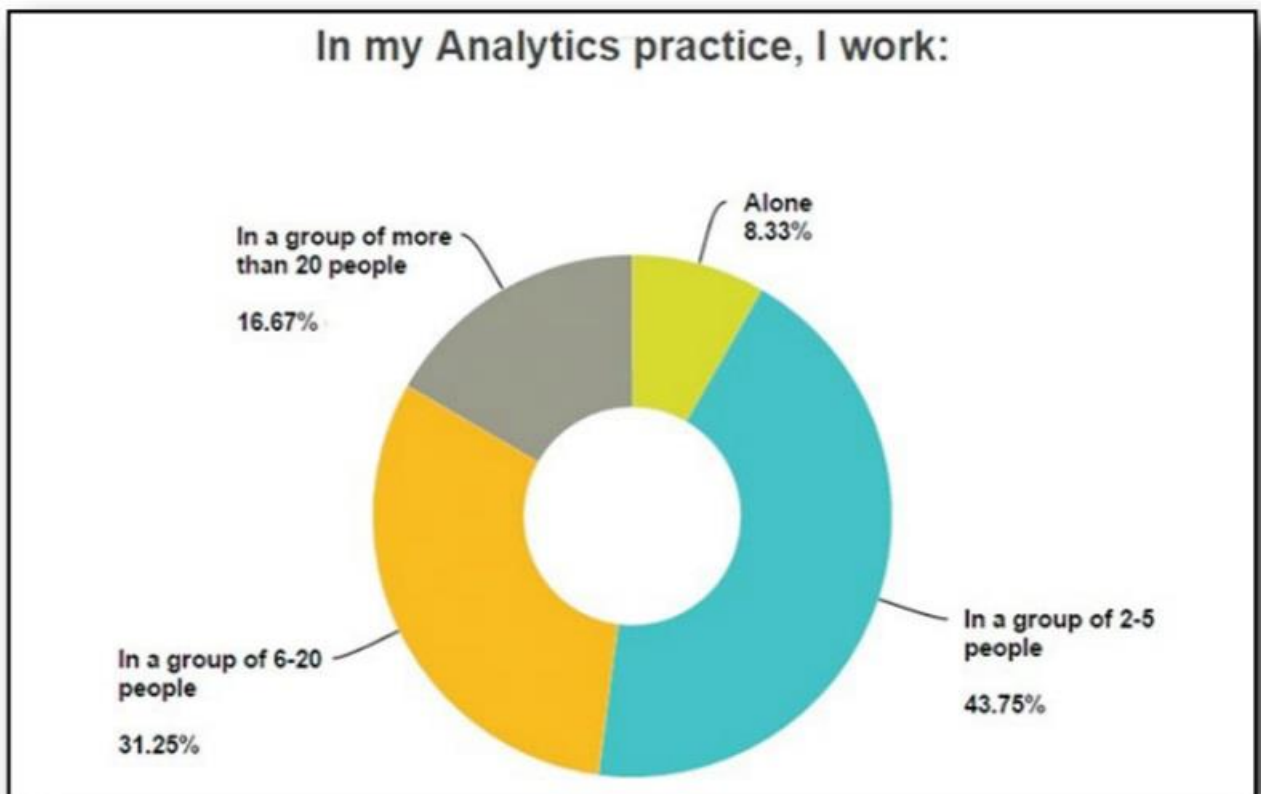


Figure 1: Size of the analytics group.

My Analytics group is comprised of personnel with the following titles (check all that apply):

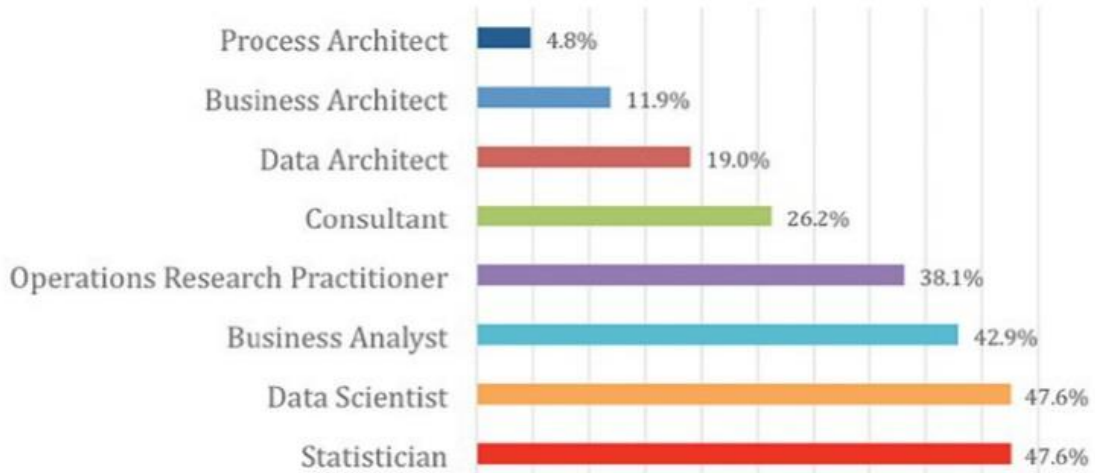


Figure 2: Composition of the analytics group.

Regarding Figure 2, it should be noted that other work titles submitted by participants, none of which received more than two mentions, included: analytics manager, analyst, applied technologist, business intelligence analyst, data technologist, decision science, engineer (2), management scientist (2), product management scientist, project engineer, reporting and analytics analyst, reporting and analytics senior database developer, research engineer, senior analyst (2), and systems engineer.

My Analytics group performs the following functions (check all that apply):

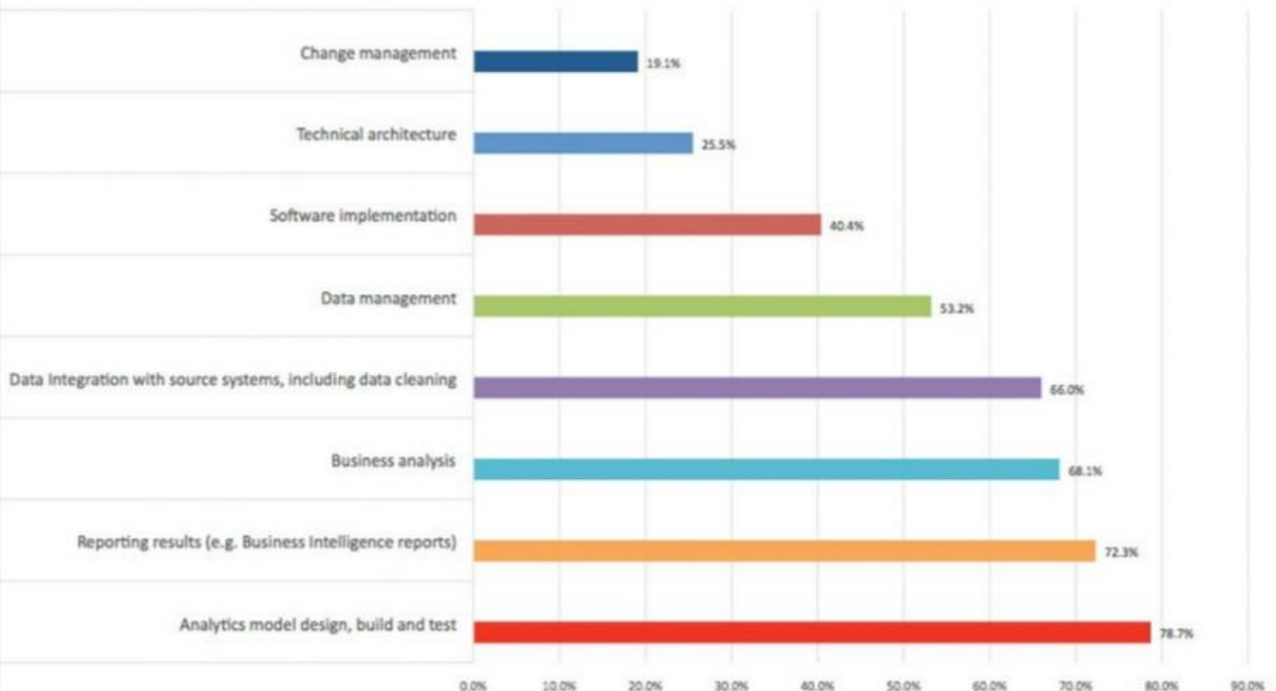
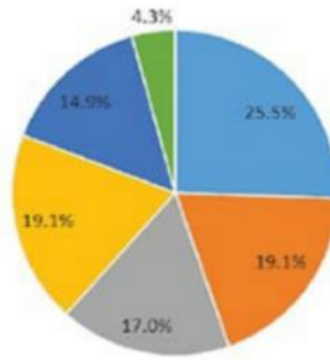


Figure 3: Function of the analytics group.

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Regarding Figure 3, other functions entered by participants included algorithm development and methodology. Regarding Figure 4, other descriptions entered by participants included: 1) central staff in R&D responsible for high-impact opportunity identification, problem framing, model/methodology/algorithm development including invent and pilot testing and validation. Collaboration with business units and other staffs for “productionization” (e.g., IT) and business use (decentralized teams). Team does internal consulting when aligned with high-impact opportunities or closely related to new/developing areas; and 2) sole practitioner.

My Analytics group is best described as follows:



- Centralized in one unit that sets my company's analytic direction, and is funded as a central service to my company.
- Center of Excellence, with analysts decentralized, residing in business units or functions, and all analysts are members of the CoE for knowledge sharing.
- Consulting, in which all analysts are members of one analytics organization, and business units "hire" analysts.
- Functional, where analysts are primarily located in one business unit or functional area, such as finance or marketing.
- Decentralized throughout the business, with no corporate consolidation.
- Other

Views on O.R., Analytics & Tech Trends

Question 1: Consider this excerpt from an article published in OR/MS Today more than five years ago [1]: “The analytics process spans project initiation (problem identification and process analysis), planning (requirements gathering and data needs/analysis), execution (data visualization, assessment analysis, predictions and trends and optimization/simulation) and conclusions. Whether right or wrong, business largely sees O.R. residing only in the execution phase (and only in part of that phase).”

To what extent do you agree with this statement: O.R. practitioners are too often pigeonholed within the execution phases of analytics.

Comments from survey participants:

1. “Highly variable within my company. In some areas the O.R. team runs all phases (though the phases aren't linear as described in the cited article). In others, O.R. team supports different phases, varying based on needs of project and strength of internal collaborators/business partners.”
2. “The vision for my team was always to span the end-to-end analytics life cycle.”
3. “I see analytics as ‘smaller’ than O.R., which includes problem identification and formulation. In fact, both O.R. and analytics professionals are often so pigeonholed.”
4. “Starts with data cleaning and exploration.”

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Question 2: Consider another excerpt from that same article in OR/MS Today [1]: “There seems to be a stronger vertical industry alignment for analytics professionals than for O.R. professionals. For example, analytics professionals working in healthcare see themselves as healthcare professionals who happen to use analytics to help drive business decisions. Conversely, business seems to hold the view that operations research professionals, no matter the industry, tend to see themselves as operations researchers first and an industry professional second.”

To what extent do you agree with this statement: Analytics practitioners should be organized by industry and/or application area, and should not be centrally organized.

Comments from survey participants:

1. “Centrally organizing analysts, to at least some extent, allows for wonderful opportunities to share skills and knowledge and create a true community of practice. Learning the business is often easier than learning the technical skills. Analysts are always using data and techniques to guide the business. It’s not always the other way around.”
2. “I work in a healthcare org, and we don’t have vertical integration for analytics.”
3. “Both O.R. and analytics professionals need the so-called ‘soft’ skills of framing a problem well; that’s aided by domain expertise, but is a separable skill in its own right. I’d ‘strongly disagree,’ but I feel it’s critical for O.R. and only very important for analytics.”
4. “Both are good. Of course, O.R. and analytics persons are generalists, but most will specialize in certain areas.”
5. “Conflicting priorities without centralization.”
6. “Domain knowledge can be very important.”

Question 3: Consider this excerpt from an article published more than six years ago [2]: “Analytics will subsume OR/MS and many of our practitioners will work in analytics teams. We do not need to change our name or redefine our profession, but we do have to make an effort to reach out more broadly to the analytics community and address their professional needs. Will INFORMS reorient and scale to meet this challenge and subsume analytics, or will we be subsumed and rendered irrelevant by it?”

To what extent do you agree with this statement: “Operations research is being subsumed by analytics and data science, and O.R. is slowly becoming irrelevant.”

Comments from participants:

1. “My company still views uniquely O.R. skills (mixed integer programming, etc.) as really important. They recognize that your garden-variety data analyst can’t do these things.”
2. “The term ‘analytics’ is overly broad; it means different things to different people. It’s helpful to use the term in first stages of discussion – when people have only a vague notion of OR/MS and analytics – but it can be confusing when used to define an execution strategy. In my view, O.R. isn’t being subsumed by analytics.”
3. “O.R. always included descriptive, predictive and prescriptive.”
4. “O.R. clearly fits within analytics and data science.”
5. “I see analytics as ‘smaller’ than O.R., which includes problem identification and formulation. In fact, both O.R. and analytics professionals are often so pigeonholed. Also reflect on how the DSS (decision support systems) concept did not kill O.R., but rather enhanced our toolkit and ways to implement our tools.”
6. “Not sure where O.R. is going to be pigeonholed, but it will be very important.”
7. “It’s just different names. Marketing.”
8. “Good O.R. always had to deal with what is now called the analytics process. Data science is mainly about predictions to me; this is not typical O.R. O.R. will not become irrelevant.”

Question 4: In 2015, Gartner defined a citizen data scientist as "... a person who creates or generates models that leverage predictive or prescriptive analytics but whose primary job function is outside of the field of statistics and analytics" and predicted that, through 2017, the number of citizen data scientists will grow five times faster than their highly trained counterparts.

To what extent do you agree with this statement: "Citizen data scientists are rapidly increasing in number, and consequently O.R. practitioners are finding it harder to make an impact."

Comments from participants:

1. "Agree that data scientists are growing but believe they are making it easier for O.R. to make an impact."
2. "I agree that they are increasing in number, but I find that they often know just enough to be dangerous. I'm often asked to review and validate their work, which means my impact is still very meaningful."
3. "Not either-or, but both-and. Bound to be some problematic dances early on, but these close-but-not-identical skill sets should ultimately be complementary, not competitive."
4. "This is sad."
5. "Yes, citizen data scientists are rapidly increasing, but they make O.R. people more relevant, not less."

Question 5: What will be the impact (see Figure 5) of these trends on analytics by 2020?

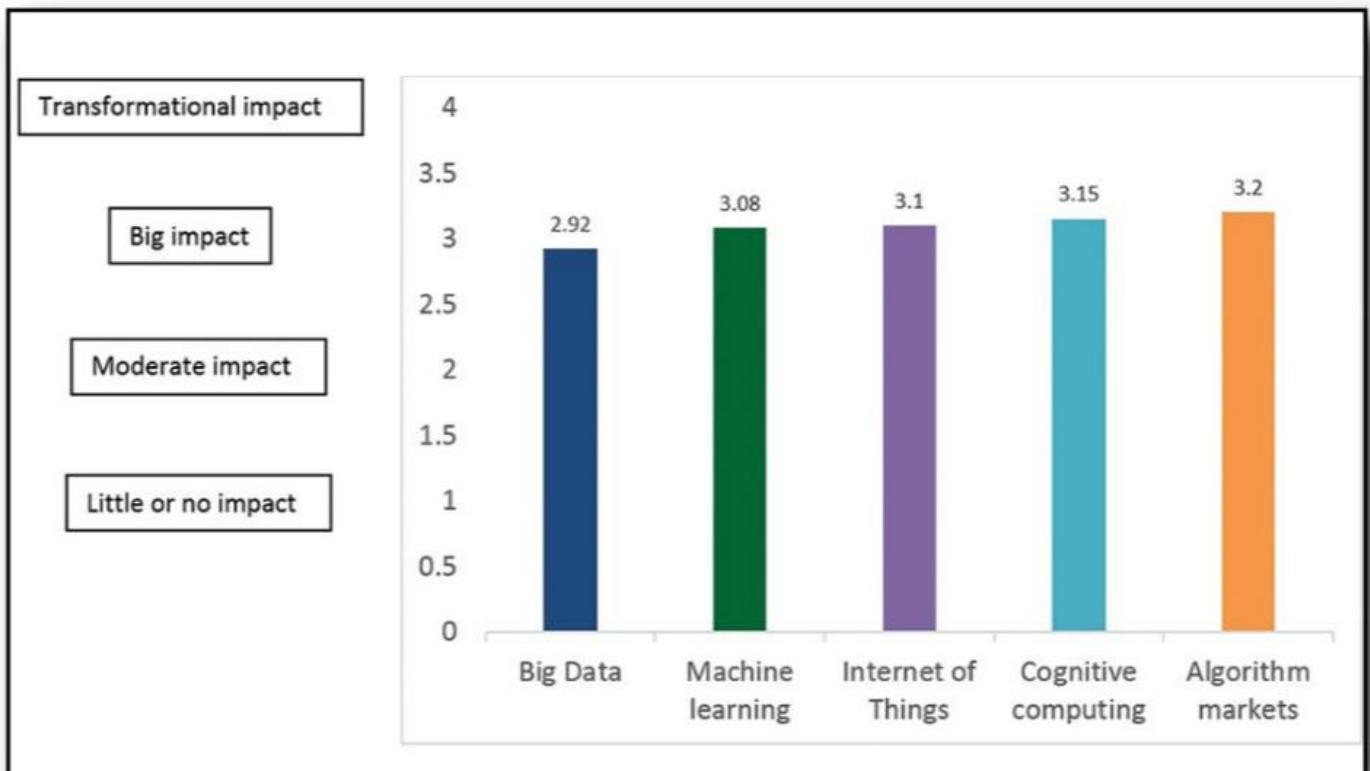


Figure 5: Five trends will have significant and nearly equal impact going forward according to the survey.

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References

1. Anne Robinson, Jack Levis and Gary Bennett, 2010, "[INFORMS to Officially Join Analytics Movement](#)," *OR/MS Today*, October 2010.
2. Rahul Saxena, 2010, "[As Analytics Subsumes O.R., will INFORMS Subsume Analytics?](#)," *OR/MS Today*, February 2010.