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Defining analytics maturity indicators: A survey approach

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ABSTRACT

The ability to derive new insights from data using advanced machine learning or analytics techniques can enhance the decision-making process in companies. Nevertheless, researchers have found that the actual application of analytics in companies is still in its initial stages. Therefore, this paper studies by means of a descriptive survey the application of analytics with regards to five different aspects as defined by the DELTA model: data, enterprise or organization, leadership, targets or techniques and applications, and the analysts who apply the techniques themselves. We found that the analytics organization in companies matures with regards to these aspects. As such, if companies started earlier with analytics, they apply nowadays more complex techniques such as neural networks, and more advanced applications such as HR analytics and predictive analytics. Moreover, analytics is differently propagated throughout companies as they mature with a larger focus on department-wide or organization-wide analytics and a more advanced data governance policy. Next, we research by means of clustering how these characteristics can indicate the analytics maturity stage of companies. As such, we discover four clusters with a clear growth path: no analytics, analytics bootstrappers, sustainable analytics adopters and disruptive analytics innovators.

1. Introduction to analytics maturity

Being able to derive insights from data and use them in decision-making has become more and more important in the last few years, as emphasized in a recent special issue of MIS Quarterly on transformational issues of big data and analytics in networked business (Baesens, Bapna, Marsden, Vanthienen, & Zhao, 2016). However, it is unclear to what extent companies are already applying analytics, also referred to as data science, nowadays as there are still a lot of challenges. Moreover, how does this influence the level of analytics maturity in companies?

One of the most well-known analytics maturity models was developed as early as in 2007 by Davenport and Harris (2007), who composed five consecutive stages of analytical competition. Their analysis is focused on analytics as a driver for competitive advantage. In 2010, this was complemented with the DELTA framework (Davenport, Harris, & Morison, 2010) which stands for accessible, high-quality *data*; *enterprise* orientation; analytical *leadership*; strategic *targets*; and *analysts*. The authors developed several general guidelines per success factor to transition from one stage of analytical competition to the next. Saxena and Srinivasan (2013) propose a maturity model with three dimensions: capability, culture and technology. They note that companies often excel in capability but lag with regards to technology. All three dimensions should, however, be in balance. In their work, Cosic, Shanks, and Maynard (2012) aim to develop a business analytics capability maturity model. They define sixteen business analytics capabilities spread out over four capability areas: governance, culture, technology and people. Comuzzi and Patel (2016), on the other hand, developed a model specifically for big data maturity consisting of five domains with each six levels, namely strategic alignment, data, organization, governance and information technology. Other researchers aim to define maturity levels based on survey research. As such, LaValle, Lesser, Shockley, Hopkins, and Kruschwitz (2011) define three levels of analytical capability: aspirational, experienced and transformed. Finally, Ransbotham, Kiron, and Prentice (2015) propose three maturity levels: analytically challenged, analytical practitioners and analytical innovators. All models try to classify the stages of analytics maturity and are based on experience and interpretation of survey and interview research. Furthermore, maturity models exist concerning the related topics of data warehousing and business intelligence. Frequently, these models are developed by companies such as AMR Research (Hagerty, 2006), Gartner (IBM, 2009), and HP (2015). For an overview, the reader is referred to Muller and Hart (2016).

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Table 1
Description of the companies' profiles for the first questionnaire.

Sector	Publicly listed	(Partly) governmental	Market	Regions	Globalization level
Consulting: 11% Financial services: 37% Government: 5% Healthcare: 7% Marketing & communication: 3% Technology: 7% Telecommunication: 5% Utilities: 3% Other: 14% Not specified: 8%	Yes: 49% No: 41% Not specified: 10%	Yes: 18% No: 70% Not specified: 12%	Offline: 77% Online: 64% Both online & offline: 56%	Asia: 33% Africa: 19% Europe: 60% North America: 41% Oceania: 18% South America: 23% Not specified: 23%	Local: 10% National: 19% International: 37% Global: 25% Not specified: 10% *(Note that local refers to companies active within specific regions of a country, e.g. only one city or state.)*

We aim to complement previous research by reviewing how analytics is currently applied and how these findings impact analytics maturity. For this purpose, clustering on questionnaire data was performed in order to expose underlying maturity levels.

In what follows, we first describe our research methodology. In Section 3 our findings with regards to how analytics is currently applied, are presented. Then, in Section 4, we discuss how these characteristics can indicate a higher analytics maturity level. Finally, the findings are validated in Section 5.

2. Material and methods

In this study, we opted for descriptive survey research because this method is recommended for researching phenomena in their natural settings and it allows us to collect quantitative descriptions about the studied environment (Pinsonneault & Kraemer, 1993).

2.1. Survey development and validation

Two cross-sectional, world-wide surveys were developed, targeting medium-sized to large companies from all types of industries, e.g. financial services, healthcare, technology, telco, utilities, pharmaceutics and HR, and various levels of analytics maturity ranging from no applications to analytics embedded throughout the whole organization. The first questionnaire is an extensive study of the organizational characteristics of analytics in the responding companies and how they report to apply analytics and use the resulting insights. In order to improve uniformity across responses we started the questionnaire with the definition of Davenport and Harris (2007) for analytics, namely analytics is the "extensive use of data, statistical and quantitative analysis, explanatory and predictive models and fact-based management to drive decisions and actions". Before going live, this questionnaire was subjected to a pre-test by means of six interviews with analytics experts from the financial services, retail, real estate, telco and government sector. Each expert completed the questionnaire and provided extensive feedback and suggestions in order to test the survey. The findings from the first questionnaire were also validated by means of seven interviews with analytics experts from the financial services, retail, real estate and telco sector. A second, follow-up questionnaire was sent out one year later with the purpose of validating the previous findings.

During these phases, some measures were taken to improve *generalizability*. The respondents are analytics and IT experts from a variety of sectors, functions and countries which leads to a balanced and knowledgeable sample. For each question, they were given the option to select 'I do not know'. Furthermore, anonymity was guaranteed. These measures improve the external validity of the study. Nevertheless, some limitations remain. A larger sample size and better response rate would further ameliorate the generalizability.

Table 2
Description of the respondents' profiles for the first questionnaire.

Function	Functional domain	Personal involvement in analytics
Senior executive: 22% Executive: 23% Project leader: 18% Manager: 7% Data scientist: 14% Business user: 4% Other: 4% Not specified: 8%	No specific domain: 15% Business analytics: 29% Finance: 14% HR: 1% IT: 14% Marketing: 5% Operations: 7% Sales: 3% Other: 3% Not specified: 10%	Function in analytics: 69% No function in analytics but collaborate with data scientists: 12% No function in analytic but make decisions based on analytics: 6%

Furthermore, given the focus of the survey and the respondents targeted, the number of companies not applying analytics might be underestimated.

2.2. Data collection

Seventy-three responses were collected during the first survey[1] between March and June 2015 by contacting relevant profiles in information technology (IT) and analytics by means of e-mail (response rate = 9.27% out of 205 contacts) and social media (54 respondents). We reached a variety of profiles as summarized in Tables 1 and 2 for the companies' and respondents' profiles respectively. This information was gathered at the end of the questionnaire. Note that 5% of the respondents stated that analytics was not applied in their company and were thus excluded from analytics application analyses. The other responding companies either only apply analytics for specific projects or initiatives (16%), apply analytics actively in certain departments (52%), or have already integrated analytics throughout their company (26%). Moreover, 'only' 38% of our respondents reported that they have been applying analytics for 10 years or more. Fifty-six percent of them have been applying analytics for at least 5 years, and 76% for at least 2 years.

An additional 32 responses were collected for the follow-up survey[2] during July and August, 2016, by contacting chief-level executives in data and analytics (response rate = 18.93% out of 169 contacts). On a 5-level scale from no knowledge and experience to expert in analytics, they rate on average level 4. More details about the profiles of the respondents can be found in Table 3.

[1] The questionnaire can be found at online supplementary material.
[2] The questionnaire can be found at online supplementary material.