

# GAINING COMPETITIVE ADVANTAGE THROUGH BUSINESS ANALYTICS

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## Abstract

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The industry for business analytics within the BI sphere is growing significantly and the distinction in organizations between transactional information systems and decision-oriented systems breaks down. Firms need to understand both the opportunity and the potential of business analytics. Reporting, which is getting a handle on what happened in organizations, is complemented by analytics that is rather explanatory and predictive. Leveraging business analytics means to use analytics applications in order to analyse business problems and produce related business recommendations to improve business process performance. Business analytics must but be a part of a value creating process operating together with other systems and organisational factors in a synergistic manner, including people, processes, knowledge and relationship assets, culture, structure, and policies. In order for companies to be efficient, they need to automate processes, workflows and make rules. Effectiveness, on the other hand, is about making better decisions, perhaps using the same data that their competitors may have. What matters is not necessarily the technologies deployed, but emerging competence that the firm uses to support its business. A specific “mindset” needs to be installed for companies to invest into business analytics. Organisations need to better understand how best to exploit their data and convert them into information and sense-making capabilities. Business capabilities can be enhanced not only by exploitation of analytical tools, but also by the sophisticated use of information. This leads to a truly sense-making capability or “analytical mindset”. The primary data covers 398 data sets, where firms have been asked about the specifics of their information management. The data is used as input to statistical tests and the value of business analytics is being analyzed in an empirical way.

business intelligence, business analytics, predictive analytics, big data, competitive advantage, business objectives, enterprise performance, value creation, analytical capabilities

With the emergence of ‘data warehousing’ in the nineties (Inmon, 2005), organizations began to create centralised data repositories for their historical data. Data became more accessible and flexible with the use of information technology that support a particular decision making process (Arnott and Pervan, 2008). However, these data warehouses were often built without a clear analytic objective as to how this data was to be used, i.e. data mining (Han and Kamber, 2006).

Data mining is covered in a large area in business analytics research (Jourdan, Rainer and Marshall, 2008) but it represents just one family of statistical technique. It consists of different algorithmic approaches to draw inferences from data or discover relationships. The majority of data mining

research is focused on algorithm development (Subramanyam and Goswami, 2005) and the attention of most researchers draws on technology-oriented topics (Jourdan *et al.*, 2008; e.g. Kovalerchuk and Vityaev, 2008). This research primarily focuses on the benefit side of analytics, not how to apply data mining to specific business problems (Melville *et al.*, 2004).

In 1989, the term Business intelligence (BI) was proposed as an umbrella term by Howard Dresner of the Gartner Group to describe “concepts and methods to improve business decision making by using fact-based support systems” (Power, 2007). The use of analytic data coupled with analytical tools to solve business problems, literally “intelligent business”, seems to be the common definition

for several studies around decision making and BI (Arnott and Pervan, 2005). However, it can be discussed whether the aspect of a more “reactive component capable of monitoring the time-critical operational processes to allow tactical and operational decision-makers to tune their actions according to the company strategy” (Golfarelli, Rizzi and Cella, 2004, p. 597) is missing here.

There does not appear to be a generally accepted definition of business analytics, which might mean different things to different groups within enterprises. Analytics generally is a combination of organizational and technological capabilities that allows people to use information to support business processes (Howson, 2006). Much of the research related to analytics is spanning organizations and technical processes (Jourdan *et al.*, 2008). Kohavi, Rothleder, and Simoudis refer to the need of “automated analysis techniques and human effort to give business users strategic insight about the activity on their sites” (2002, p. 45). Evelson (2008, p. 2) defines analytics as a “Set of methodologies, processes, architectures, and technologies that transform raw data into meaningful and useful information used to enable more effective strategic, tactical, and operational insights and decision-making.” Therefore, business analytics as a mainly practitioner driven initiative (Howson, 2006) may be considered as an overarching concept that includes people, processes as well as specific techniques and applications (Gartner, 2010). For the literature reviewed, it may be summarized that business analytics for enterprises means to use analytics applications (analytical technologies and data stores) in order to analyse business problems and produce related business recommendations to improve business process performance which finally may lead to competitive advantages.

## METHODS AND RESOURCES

The term ‘core competencies’ is used by organizational research to describe distinctive capabilities possessed by an enterprise to provide a sustainable competitive advantage on organizational level (Prahalad, 1993). A more dynamic, intra-firm framework suggests that competence is learned by an organization over time and identifies two antecedents, comprehension and deftness, that are necessary to develop competence

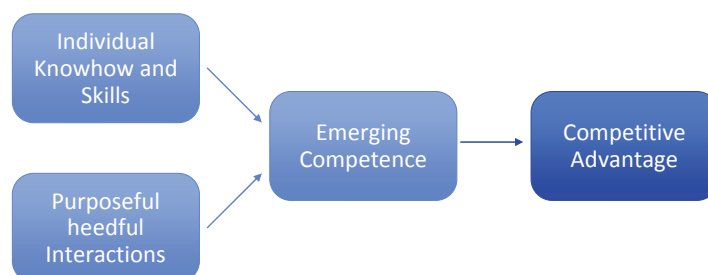
(McGrath, MacMillan & Venkatraman, 1995). Reclaiming this construct, Dhillon (2008) used this model to specifically understand the competence necessary to exploit information systems (Fig. 1).

The value of business analytics for enterprises will consist of the ability to improve effectiveness of core business processes that drive business performance (Williams, 2004). Business capabilities are the primary driver of value (Kohli and Grover, 2008). In their business-centric framework, Williams and Williams (2006) mention three value categories of how analytics can be used to create value:

- Management Processes (Planning, Budgeting, Performance Monitoring, Process Improvement, Cost Analysis, Optimization etc.)
- Revenue Generating Processes (Customer Segmentation, Campaign and Channel Management, Sales Management etc.).
- Resource Consumption Processes (Product/Service Development, Order Management, Operations, Supply Chain, Purchasing etc.)

Evelson (2008) suggests that a business needs to be efficient and effective in order to optimize their business. In order for companies to be efficient, they need to automate processes, workflows and make rules. Effectiveness, on the other hand, is about making better decisions, perhaps using the same data that their competitors may have. If companies can cleanse the data or segment customers better, and make the same decision faster than competitors, then they are much more effective.

According to Kohavi *et al.* (2002) the value of analytics is measured in terms of progress towards bridging the gap between the needs of the business user and the accessibility and usability of analytics. Melville, Kraemer and Gurbaxani (2004) state that the appropriate measures depend upon the perspective of whoever is evaluating the benefit of analytics. Another major aspect is that analytic solutions have to produce results that are actionable in order to achieve the greatest possible business value, along with ways to measure the effects of key changes (Kohavi *et al.*, 2002). Therefore analytics can be able to manifest itself at many levels to support sales, marketing, price optimisation, and work force analytics or through improvements in supply chains or innovation (Rai, Patnayakuni and Patnayakuni, 2006). Davenport, Harris and Morison (2010)



1: Competence model for harnessing IT (Dhillon, 2008, p. 298)

|         |             | Chronology                                                           |                                                         |                                                                                         |
|---------|-------------|----------------------------------------------------------------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------|
|         |             | Past                                                                 | Present                                                 | Future                                                                                  |
| Subject | Information | <b>What happened?</b><br>(Reporting)                                 | <b>What is happening now?</b><br>(Alerts)               | <b>What will happen?</b><br>(Extrapolation)                                             |
|         | Insight     | <b>How and why did it happen?</b><br>(Modeling, experimental design) | <b>What's the next best action?</b><br>(Recommendation) | <b>What's the best/worst that can happen?</b><br>(Prediction, optimisation, simulation) |

2: Analytical Questions (Davenport et al., 2010, p. 7)

| Strategic Benefits    | Informational Benefits  | Transactional Benefits       |
|-----------------------|-------------------------|------------------------------|
| Competitive Advantage | Information Access      | Communications Efficiency    |
| Alignment             | Information Quality     | Systems Developm. Efficiency |
| Customer Relations    | Information Flexibility | Business Efficiency          |

3: Organizational Benefits of Analytics (Mirani & Lederer, 1998, p. 833)

summarise analytical questions stating that it is the insight that counts (Fig. 2).

Mirani and Lederer (1998) identify 33 specific benefits for enterprises being categorized into nine clusters (Fig. 3). Next to better customer relations and products as well as enhanced competitiveness it is key from a strategic perspective that firms are well aligned with stated organizational goals and respond quickly to change. Informational benefits imply that information management improves in various aspects. The transactional dimension is pretty much about efficiencies through saving money by avoiding costs or increased speed in developments or transactions (shorter cycles).

Business analytics can not be expected to support all of these benefits, in particular because some applications are not focused on transaction processing, thus not expected to provide transactional benefits.

Given the complex and varying definitions and value categories, this research will decide on models to saturate the question of which competitive advantages may be directly linked to the use of business analytics. The models of Kohli and Grover (2008) and Mirani and Lederer (1998) provide a reasonable set of benefits. Both perspectives will sum up to strategic objectives that may be pursued by business analytics:

- Operating Enablement
- Cost takeout and efficiency
- Revenue protection and growth
- Competitive differentiation.

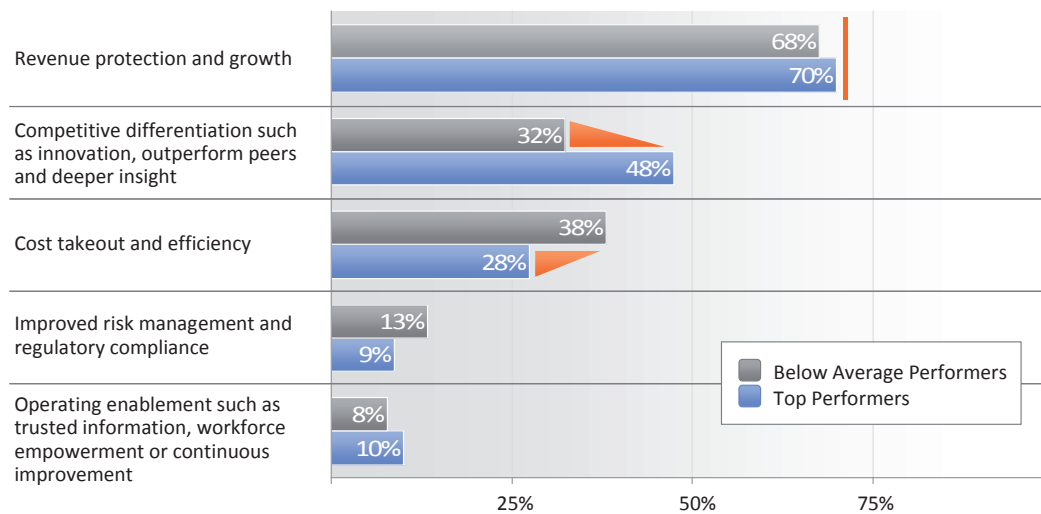
## RESULTS AND DISCUSSION

The aim of a quantitative analysis is to investigate representative samples of client data and to test whether business analytics can bring competitive advantages to enterprises. The quantitative data set covers 398 data sets, where firms have been asked about the specifics of their information management agenda. A structured questionnaire has been used to capture the company's self-evaluation about the following subjects:

- Business objectives and expected benefits of analytics projects
- Business activities that benefit from analytics and where gaps cause impact on the enterprise
- Activities and capabilities when embarking analytics, i.e. drivers for analytics.

The data has been classified using grouped dimensions in order to analyse reasonable portions of each group via company size (i.e. segment), functional role (i.e. branch) and performance (i.e. out- or underperforming industry peers). The fact that firms rate their relative performance by themselves, objectivity can be put into question. However, this research decision is being accepted as an indicator for the competitive position is needed.

In order to start an analytics initiative there must be a reason, a strategic objective to invest in analytics. Firms have been asked what their main business objectives are over the next two years. Most firms expect revenue protection and growth from analytics. Beyond that, top performers are highly involved in competitive differentiation where as below average performers are more committed to cost takeout and efficiency goals (Fig. 4).



#### 4: Business Objectives of Organizations over the next two Years

##### I: Business Objectives resulting in Attitude

|                               | Revenue protection and growth | Competitive differentiation | Cost-takeout and efficiency | Better risk management | Operational enablement |
|-------------------------------|-------------------------------|-----------------------------|-----------------------------|------------------------|------------------------|
| Revenue protection and growth | 71                            | 97                          | 77                          | 21                     | 10                     |
| Competitive differentiation   |                               | 33                          | 16                          | 7                      | 9                      |
| Cost-takeout and efficiency   |                               |                             | 20                          | 10                     | 9                      |
| Better risk management        |                               |                             |                             | 5                      | 2                      |
| Operational enablement        |                               |                             |                             |                        | 8                      |

|           |      |          |          |
|-----------|------|----------|----------|
| Attitude: | bold | balanced | cautious |
|-----------|------|----------|----------|

##### II: Business Objectives by Industry

| Strategic Objective \ Industry                                                                    | Consumer Goods | Education | Energy & Natural Resources | Banking | Financial Serv. - Insurance | Financial Serv. - Investment Mgmt | Financial Serv. - Technology | Manufacturing | Pharmaceuticals & Biotechnology | Professional Services | Retailing | Telecommunications | Overall average |
|---------------------------------------------------------------------------------------------------|----------------|-----------|----------------------------|---------|-----------------------------|-----------------------------------|------------------------------|---------------|---------------------------------|-----------------------|-----------|--------------------|-----------------|
| Operating enablement such as trusted information, workforce empowerment or continuous improvement | 4%             | 13%       | 12%                        | 10%     | 7%                          | 18%                               | 6%                           | 6%            | 10%                             | 3%                    | 28%       | 12%                | 10%             |
| Improved risk management and regulatory compliance                                                | 0%             | 7%        | 16%                        | 43%     | 36%                         | 12%                               | 2%                           | 3%            | 20%                             | 5%                    | 0%        | 0%                 | 12%             |
| Cost takeout and efficiency                                                                       | 33%            | 13%       | 40%                        | 21%     | 43%                         | 24%                               | 26%                          | 52%           | 25%                             | 26%                   | 39%       | 41%                | 33%             |
| Competitive differentiation such as innovation, outperform peers and deeper insight               | 42%            | 73%       | 24%                        | 31%     | 21%                         | 53%                               | 55%                          | 27%           | 55%                             | 47%                   | 44%       | 41%                | 41%             |
| Revenue protection and growth                                                                     | 63%            | 60%       | 72%                        | 69%     | 79%                         | 71%                               | 75%                          | 73%           | 55%                             | 76%                   | 61%       | 65%                | 69%             |

Percent of average ■ greater than 150%  
■ less than 66%

Looking at the combinations, how firms indicated their objectives, different attitudes can be derived (Tab. I). One third of the firms have a bold attitude that is a revenue-driven, differentiated value focus whereas other organizations to a considerable extent are more cautious.

To check whether results are influenced by the industry characteristics, data has been analysed by

industries as well. However, not all industries could be interpreted due to failure of minimum quantities. It shows that almost all industries have a heavy focus on revenue protection and growth, but competitive differentiation is referred to education and as well as investment management, technology, and pharmaceuticals (Tab. II). Cost takeout and efficiency is pursued naturally by the manufacturing sector. It

## III: Popularity-Based Ranking of Business Activities

| Functional Role                         | General | Finance | HR  | Mktg | SCM | Ranking | Popularity |
|-----------------------------------------|---------|---------|-----|------|-----|---------|------------|
| Activity                                |         |         |     |      |     |         |            |
| Budgeting and resource allocation       | 1       | 7       | 1   | 2    | 3   | 1       | 95,6%      |
| Reporting & performance measurement     | 4 *     | 1       |     | 3 *  | 2   | 2       | 89,7%      |
| Customer segmentation and profitability | 2       |         |     | 1    |     | 3       | 88,7%      |
| Enterprise goal setting and alignment   |         | 8 *     | 5   | 3 *  |     | 4       | 87,3%      |
| Cost/expense management                 |         | 2       |     |      |     | 5       | 85,5%      |
| Career path & succession management     |         |         | 3   |      |     | 6       | 83,3%      |
| Fraud and financial risk management     |         | 4       |     |      |     | 7       | 80,6%      |
| Leadership development                  |         |         | 2   |      |     | 8       | 80,0%      |
| Demand forecasting and management       |         | 5       |     | 3 *  | 1   | 9       | 80,0%      |
| Channel performance                     | 7 *     |         |     | 4    |     | 10      | 79,4%      |
| Skills supply and demand matching       | 7 *     |         | 5   |      |     | 11      | 78,2%      |
| Knowledge management and training       |         |         | 3 * |      |     | 12      | 76,5%      |
| Evaluate and pay for performance        | 5       |         | 4   |      |     | 13      | 76,5%      |
| Product lifecycle management            |         |         |     | 6    | 5   | 14      | 76,4%      |
| Product/services market selection       |         | 6       |     |      |     | 15      | 75,8%      |
| Operations risk management              | 6       | 3       | 6   |      | 7   | 16      | 75,8%      |
| Capital asset management                |         | 8 *     |     |      |     | 17      | 74,2%      |
| Lead generation & pipeline management   |         |         |     | 4    |     | 18      | 74,2%      |
| Pricing and offer strategies            | 3       | 4 *     |     |      |     | 19      | 73,5%      |
| Branding and reputation management      | 8       |         |     | 5 *  |     | 20      | 72,6%      |
| Promotion and offer management          | 4       |         |     | 5 *  |     | 21      | 71,7%      |
| Global sourcing & supplier management   |         |         |     |      | 4   | 22      | 70,9%      |
| Employee retention                      |         |         | 7   |      |     | 23      | 69,1%      |
| Recruiting and sourcing                 |         |         | 8   |      |     | 24      | 67,3%      |
| Logistics and distribution management   |         |         |     |      | 6 * | 26      | 66,7%      |
| Fulfillment and inventory management    |         |         |     |      | 6 * | 25      | 66,7%      |
| Service, maintenance and repair         |         |         |     |      | 8   | 27      | 55,0%      |
| Asset and warranty management           |         |         |     |      | 9   | 28      | 53,3%      |

## IV: Priorities of Top Performers weighted by Value-Alignment

| Priority of top performer (value-alignment) | 27,5%                       | 70,0%                     | 8,8%                   | 10,0%                  | 47,5%                     |                 |
|---------------------------------------------|-----------------------------|---------------------------|------------------------|------------------------|---------------------------|-----------------|
| Strategic Objective                         | Cost-takeout and efficiency | Revenue protect. & growth | Better risk management | Operational enablement | Competitive differentiat. | Overall Ranking |
| Activity                                    |                             |                           |                        |                        |                           |                 |
| Pricing and offer strategies                | 4,8%                        | 29,5%                     | 0,8%                   | 1,3%                   | 16,1%                     | 1               |
| Customer segmentation and profitability     | 3,8%                        | 30,2%                     | 1,6%                   | 1,6%                   | 14,3%                     | 2               |
| Branding and reputation management          | 2,6%                        | 24,8%                     | 1,4%                   | 1,3%                   | 18,8%                     | 3               |
| Product/services market selection           | 3,9%                        | 29,4%                     | 1,4%                   | 1,6%                   | 11,4%                     | 4               |
| Lead generation & pipeline management       | 7,0%                        | 28,3%                     | 0,7%                   | 1,1%                   | 9,1%                      | 5               |
| Demand forecasting and management           | 6,6%                        | 24,6%                     | 1,7%                   | 2,3%                   | 6,6%                      | 6               |
| Promotion and offer management              | 4,9%                        | 23,6%                     | 0,3%                   | 1,5%                   | 9,9%                      | 7               |
| Enterprise goal setting and alignment       | 5,5%                        | 24,2%                     | 1,2%                   | 2,3%                   | 6,8%                      | 8               |
| Budgeting and resource allocation           | 12,2%                       | 20,7%                     | 1,4%                   | 1,6%                   | 2,4%                      | 9               |
| Logistics and distribution management       | 11,0%                       | 17,5%                     | 0,4%                   | 2,3%                   | 7,1%                      | 10              |
| Service, maintenance and repair             | 11,7%                       | 19,1%                     | 0,3%                   | 1,8%                   | 4,3%                      | 11              |
| Product lifecycle management                | 4,7%                        | 20,9%                     | 1,3%                   | 1,5%                   | 8,2%                      | 12              |
| Reporting & performance measurement         | 7,3%                        | 20,4%                     | 1,5%                   | 2,8%                   | 4,2%                      | 13              |
| Channel performance                         | 5,6%                        | 21,2%                     | 0,8%                   | 1,8%                   | 6,2%                      | 14              |
| Capital asset management                    | 5,3%                        | 17,9%                     | 1,7%                   | 2,8%                   | 7,1%                      | 15              |
| Knowledge management and training           | 3,1%                        | 11,1%                     | 1,8%                   | 3,6%                   | 14,0%                     | 16              |
| Fulfillment and inventory management        | 12,4%                       | 15,8%                     | 1,1%                   | 1,8%                   | 1,2%                      | 17              |
| Cost/expense management                     | 13,1%                       | 11,5%                     | 0,6%                   | 3,0%                   | 3,9%                      | 18              |
| Global sourcing & supplier management       | 10,9%                       | 9,8%                      | 1,8%                   | 0,7%                   | 7,7%                      | 19              |
| Asset and warranty management               | 6,0%                        | 15,3%                     | 1,6%                   | 2,2%                   | 3,0%                      | 20              |
| Recruiting and sourcing                     | 4,5%                        | 11,4%                     | 0,5%                   | 3,2%                   | 7,7%                      | 21              |
| Employee retention                          | 4,2%                        | 9,0%                      | 1,6%                   | 3,8%                   | 8,5%                      | 22              |
| Career path & succession management         | 3,1%                        | 8,0%                      | 2,2%                   | 4,1%                   | 8,6%                      | 23              |
| Skills supply and demand matching           | 3,5%                        | 10,4%                     | 1,1%                   | 2,8%                   | 7,6%                      | 24              |
| Evaluate and pay for performance            | 6,5%                        | 7,2%                      | 1,3%                   | 2,8%                   | 6,9%                      | 26              |
| Operations risk management                  | 4,9%                        | 10,5%                     | 3,7%                   | 1,6%                   | 2,8%                      | 25              |
| Leadership development                      | 3,5%                        | 3,0%                      | 1,5%                   | 3,8%                   | 11,1%                     | 27              |
| Fraud and financial risk management         | 3,7%                        | 4,0%                      | 5,0%                   | 2,1%                   | 2,7%                      | 28              |

can be concluded that the strategic objective does not follow service- or product-orientation.

It was also asked which activities organizations plan to undertake when initiating analytics projects. Relevant areas have been defined by branches (Tab. III). Maximum penetration of planned project determines the ranking and popularity of the most heavily engaged functions for analytics. When the same activity was asked to multiple functions, sample size was used to break ties (indicated with \*).

Expected benefits of these projects have been analysed next. If the incidence of projects by business focus is weighted by the attitude (i.e. strategic objective) of top performers, the result is a value-based ranking. It shows that market-oriented activities have priority. Functions such as pricing strategies, branding, promotion, market selection and pipeline management have priority, where formerly ranked at the bottom (Tab. IV).

In order to inform about the relationship between analytical capabilities and the overall performance of firms respondents have been asked how well they engage in the following areas:

- Gather and manage unstructured as well as structured information from people, processes and objects (i.e. being aware of the value of analytics)
- Connect internal and external processes in a way that is end-to-end, global and aligned with desired outcomes (i.e. being linked)
- Use only the most relevant information to support timely decisions when and where they have the greatest impact (i.e. being precise)
- Challenge the status quo to improve the business and create new opportunities (i.e. questioning what is going on)
- Enable and empower employees to analyse, decide and act
- Predict and prepare for the future by evaluating trade-offs proactively.

Looking at these drivers for business analytics a correlation to the overall performance of an organization cannot be determined. Regression analysis shows that a variation's maximum of 10%

can be explained. The driver of being precise about information shows the R square of only 8.8% as the coefficient of determination. The greatest R square with 9.5% validates an organization's capability of challenging or questioning the status quo to improve business by the means of analytics. Therefore it cannot be stated that analytical capabilities and the firm's overall performance point into the same direction. A residuum of over 90% must be explained by other factors.

Reliability of the results is reasonable in assuming that the consistency with which the questionnaire items were answered by firms would remain relatively the same when determined through test-retest. However, scores may change due to the characteristics of the respondents. Generalizability is moderate since there is a representative basic set of respondents. Further there was no possibility in the quantitative data set to draw conclusions on the outcome side of analytics, i.e. the question of whether expected benefits for the organization really become true or to say something on realised performance measures. To further enhance generalizability of the research results it is advised to interview practitioners and, of course, enterprises about their experiences with realised business analytics projects.

Models are needed to better understand the various positive manifestations of analytics because lacking that understanding results in underreported economic benefits. To allow more conclusions it is advised to develop a greater understanding and perform similar research activities on both, analytics project and business context oriented activities.

Important to note is that organizations still face challenges in information management and an orientation towards analytics will provide analytical capabilities. It is recommended that enterprises investigate what organizational impact analytics has on people, processes and culture. Providing analytical structures and assets might increase the performance, such as increased agility, flexibility and first-to-market benefits. In order to maximise the value of analytics, enterprises need to calibrate expected benefits and available capabilities.

## SUMMARY

There are signs that enterprises are looking for ways to use business analytics as a point of differentiating them, or they aspire to. The investments made in analytics can potentially yield to increased competitive advantage for the organization.

This paper shows that enterprises pursue business activities regarding the use of structured and unstructured data to create strategic advantages or even new markets. The major objective is to gain an understanding about relevant dimensions of the competitive advantage, but no investigation on specific organizational capabilities and measurable benefits. The paper contributes to the identification of value that business analytics brings to businesses to a degree that is limited by the theory and data available. Research confirms the existence of concrete expectations about analytical activities and that purposeful interaction of people, processes and systems lead to advantages.

Main conclusion is that top performers are highly involved in competitive differentiation where as below average performers are more committed to cost takeout and efficiency goals. Market-oriented activities have priority for top performers, such as pricing strategies and market selection.

To allow more conclusions how to create business value through business analytics it is advised to perform similar research activities that contribute to a greater understanding. Areas to investigate are especially technological and human driven changes in organizations that will support analytical activities and increase truly sense-making organizational capabilities.

#### Acknowledgement

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