



Business Innovation Observatory

Creating Value through Data Analytics

Case study

Internal Market,
Industry,
Entrepreneurship
and SMEs

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Case Study

Creating Value through Data Analytics

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Contents

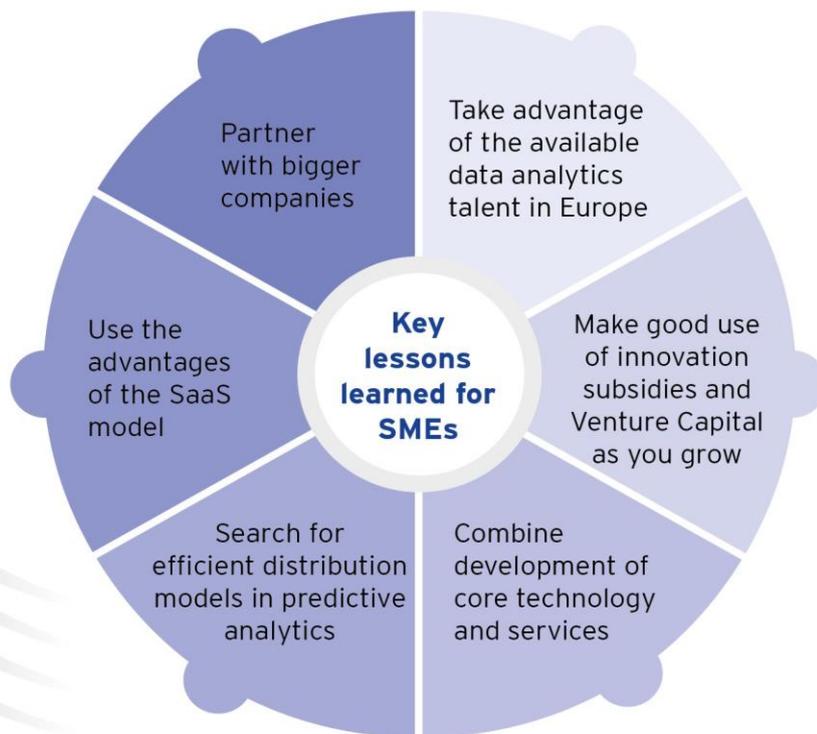
- Executive summary 2
- 1 Data analytics: from raw data to valuable intelligence..... 3
 - 1.1 The data analytics potential 3
 - 1.2 Predictive analytics and cyber threat analytics 4
- 2 European success stories..... 6
- 3 Drivers to innovation and company growth..... 9
 - 3.1 People and talent 9
 - 3.2 Access to finance and funding 9
 - 3.3 Business models 10
 - 3.4 Partnerships and alliances..... 12
 - 3.5 External risks 12
- 4 Conclusions 14
 - 4.1 Key lessons learned for companies 14
 - 4.2 Insights for business intermediaries and policy-makers..... 15
- Appendix..... 17
 - Interviews and websites 17
 - References 17

Creating value through data analytics

Key market figures

<p>37.3 billion € data analytics market (2015)</p>	<p>2.3 billion € predictive analytics market (2015)</p>	<p>2.7 billion € cyber security analytics market (2015)</p>	<p>206 billion € additional EU28 GDP by 2020</p>	<p>1.9% improvement of the European GDP by 2020</p>
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Overall benefits of data analytics



Use cases

<p>Predicting consumer behaviour</p>	<p>Social media crawling</p>	<p>Targeted telecom campaigns</p>	<p>Cyber security platforms</p>	<p>Real-time traffic analytics</p>
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Insights for business intermediaries and policy makers

- ▶ Support the adaptation of SMEs to the data protection legislation
- ▶ Increase awareness of the value of predictive analytics and cyber threat risks
- ▶ Further support access to finance at the early stages of data analytics companies
- ▶ Foster meaningful enterprise-academia links in the data analytics field

Executive summary

The exponential growth of data in recent years has created significant business opportunities. Solutions that use large volumes of data to drive business decisions, known as **data analytics**, address a growing market that was estimated at €37.3 billion in 2015. The use of big data is expected to contribute significantly to economic growth (1.9% in European GDP by 2020) and to have a positive impact on innovation and jobs.

This case study focuses on two growing strands of the data analytics market: predictive analytics and cyber threat analytics. **Predictive analytics** applies a variety of techniques such as statistical analysis, data mining, and machine learning, to analyse current and historical data in order to make predictions on future events and outcomes. The broad range of applications of predictive analytics is boosting the annual growth of its market, estimated at €2.3 billion in 2015. **Cyber threat analytics**, which involves the use of tools to gather valuable insights of likely cyber-related threats, has an even more promising market, which was estimated at €2.7 billion in 2015.

In view of the market potential of these two strands, it is important that companies, business intermediaries, and policy-makers leverage on the experience of successful innovative solutions and companies to support the development of these markets, and make the most of the identified drivers.

Insights from the management of the companies that developed the successful innovative solutions presented in this case study provide some guidance for other businesses. It is contended, in particular, that companies that intend to invest in these markets should:

- ▶ consider the possibility to address the challenge of scarce talent and skills not looking only for data scientists, but being open to finding **talent in other sectors** (e.g. financial analytics and banking);
- ▶ Increase the use of **machine learning** in data analytics, to harness its power and automate analyses;
- ▶ search for **innovation support schemes** when developing data analytics innovations, and later-stage **venture capital/debt** opportunities when reaching the growth phase, considering also that the latter continue to increase in the software sector;
- ▶ combine **core technology and services** for a sustainable business strategy, particularly in the cyber analytics sector, and rely on the “**Software-as-a-service**” (**SaaS**) **model** in the predictive analytics companies;
- ▶ **partner up with big companies** and focus on business clients rather than individual consumers at the outset.

Business intermediaries and policy-makers can support the development of innovative solutions by addressing some of the challenges highlighted in the case study. First, the **General Data Protection Regulation** and the overall attitude regarding data protection and ownership create uncertainty for data analytics companies. In this regard, greater support should be provided to SMEs in order to increase awareness of, and ability to adapt to, regulatory issues.

Second, the cyber threat risks are still largely underestimated by organisations in Europe. Some companies (especially SMEs) are sceptical about the value predictive analytics could bring to their business functions. This is why industry associations and policy-makers should endeavour to **raise awareness among businesses and society at large on cyber risks and the benefits of predictive analytics**.

Guide to the case study

This case study was developed under the Business Innovation Observatory. It describes the market and socio-economic potential of data analytics, focusing on predictive and cyber threat analytics. It showcases six successful European companies that responded to business and technological challenges using data analytics. Based on the experience of the companies, the case study describes the main drivers for innovation and growth in the data analytics market, which can serve as an inspiration for other SMEs and as a useful insight for policy-makers and business intermediaries.

1 Data analytics: from raw data to valuable intelligence

Data analytics is the activity of developing and using insight based on the extensive use of data. Building on the statistical and quantitative analysis of big data, it drives fact-based business decisions and actions aimed at improving performance. By transforming processes and making accurate predictions about future events or customers' propensity to buy, or engage, data analytics is an innovation catalyst and change enabler, which broadens opportunities to businesses (EY, 2014).

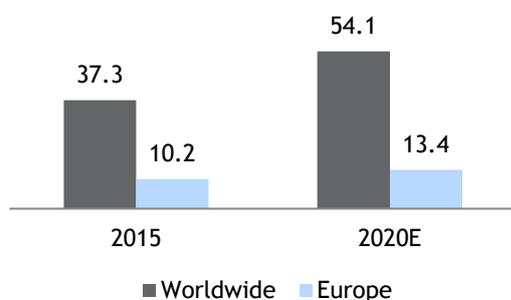
This case study focuses on two growing strands of data analytics: predictive analytics and cyber threat analytics.

1.1 The data analytics potential

Market potential

The value of the global data analytics market was €37.3 billion in 2015 and is poised for an annual growth rate of approximately 8% (IDC, 2016). Europe accounts for nearly 27% of this market (Figure 1).¹

Figure 1 - Worldwide and Europe business analytics market (€ billion)



Source: IDC, 2016

Focus on the European market

- ▶ By the end of 2016 approximately 66% of the CEOs of the Financial Times 500 enterprises in Europe are expected to put digital transformation at the centre of their strategies.
- ▶ The segments of the business analytics software market with the fastest growth in the period 2015-2020 are expected to be: advanced and predictive analytic tools (8.1%), customer relationship management tools (7.7%), and workforce analytic applications (10.2%). Other segments, such as analytic data management software (5.3%), or production-planning analytic application software (5.8%) are also expected to grow, but at a slower pace.
- ▶ Germany was the largest and the fastest growing (6.3% annually) market in Europe in 2015.

Source: IDC, 2016

Socio-economic potential in Europe

The socio-economic benefits of data analytics in terms of impact on GDP growth and jobs created are huge. It is estimated that by 2020 the use of big and open data can improve the European GDP by 1.9% (with a potential annual value to the EU economy of approximately €200 billion), and increase the per capita output of the EU28 region by €408 in 2020 (demosEuropa and Warsaw Institute for Economic Studies, 2014).

The use and impact of data analytics vary across sectors, depending on their relative size, distinct economic features, and technological characteristics. **Trade** and **manufacturing** are expected to have the highest potential to derive value from data analytics and contribute to growth in GDP. The **public sector** can significantly benefit from data analytics, by realizing operational efficiency savings, reduction of frauds and errors, and increase in tax collection. The **retail and consumer products** sector relies on data analytics primarily to deliver better in-store and online shopping experience and increase customer loyalty and satisfaction (Xerox, 2015). **Financial services** use big data analytics to both ensure regulatory compliance, and analyse historical customer data in order to identify fraudulent customer behaviour. Finally, European enterprises in the **manufacturing sector** primarily rely on big data analytics to ensure the safety of products and services and optimise the supply chain operations.

¹ The data for Europe refers to the following countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the UK. Estimate for 2020 based on average US\$/€ exchange rate in 2016.

1.2 Predictive analytics and cyber threat analytics

Predictive Analytics

The potential of the data analytics market is harnessed by predictive analytics. Predictive analytics applies a variety of techniques such as statistical analysis, data mining, and machine learning to analyse current and historical data in order to make predictions of future events and outcomes. With its forecasting capabilities, predictive analytics helps companies to optimize existing processes and better understand their customer behaviour and market opportunities, making them gain competitive edge and increasing efficiency. It has revolutionized several areas in recent years, such as customer relationship management analytics, fraud detection, direct marketing, retail analytics, and risk management (Digital Journal, 2016).

Gaining competitive edge

Predictive analytics is used to determine customer buying behaviour, preferences and responses and to promote up-sell/cross-sell opportunities. Predictive models help businesses to attract, retain, and grow their most profitable customers to gain competitive edge in the market.

Providing efficiency

Predictive analytics enables organisations to be more agile and respond quickly to market conditions. Many companies are using predictive models to forecast inventory and efficiently manage resources.

The worldwide predictive analytics market was estimated at €2.3 billion² in 2015 (Figure 2) and is expected to grow 12.4% annually by 2019 (IDC, 2015).³

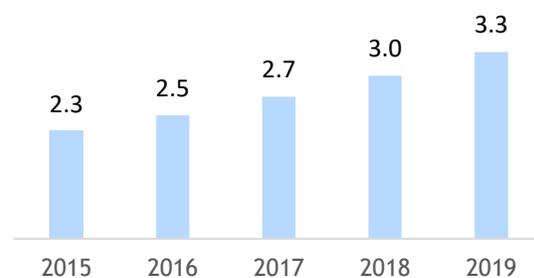
The Americas region (North and South America) represents 46% of the market, closely followed by the Europe, Middle East, and Africa (EMEA) region with 41%, and the Asia/Pacific region with 13%. The Americas region is also expected to have the highest annual growth (10%) over the 2015-2019 period.

The predictive analytics market is poised for growth, expansion, and democratisation in the future.

Predictive analytics tools and techniques are expected to become more broadly available, economically accessible, and more easily understood by a broader business audience. In addition to that, the number of qualified data scientists is growing, although many business domains still struggle to find them.

Also Europe is expected to witness growth in the predictive analytics market. As shown in Figure 3, revenues in Europe are expected to reach €1.09 billion by 2019 (IDC, 2016). A multitude of factors are expected to fuel this growth and the need to structure complex data is playing a key role.

Figure 2 - Global predictive analytics software revenue snapshot (in € billion)



Source: IDC, 2015

Figure 3 - European predictive analytics software revenue snapshot (in € billion)



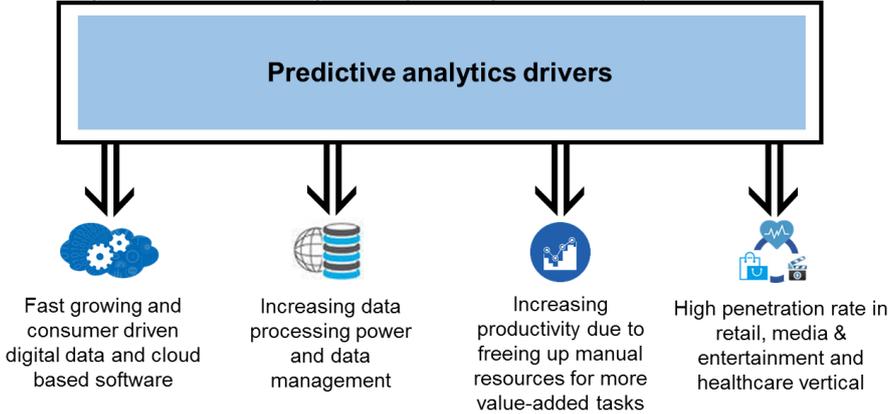
Source: IDC, 2015

Various factors are driving the adoption of predictive analytics tools and techniques, as presented in the following Figure 4.

² Forecasts based on average US\$/€ exchange rate in 2016.

³ Figures used refer to the heading 'Advanced and Predictive Analytics Software' in the IDC (2015) report, considering its overlap with the understanding of 'predictive analytics' of this case study: 'Advanced and predictive analytics are used to discover relationships in data and make predictions that are hidden, not apparent, or too complex to be extracted using query, reporting, and multidimensional analysis software' (IDC, 2015, p.8).

Figure 4 - Factors driving the adoption of predictive analytics in the market



Source: Authors' elaboration on IDC, 2015

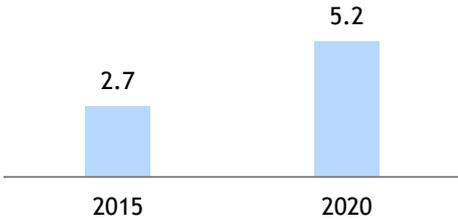
Cyber threat analytics

Cyber threat analytics involves the use of tools to gather valuable insights of likely cyber-related threats and to develop proactive plans to counter them. It enables companies and governments to fight cybercrime by identifying security gaps at an early stage.

With the growth in the digital economy, cyberattacks are becoming very sophisticated with far more malicious code and far-reaching vulnerabilities. With the cyber analytics tools, the voluminous data generated by the networks can be organized, contextualized, and analysed to identify the potential breach areas.

The global threat intelligence security market is expected to grow annually by 13.8% to reach €5.2 billion in 2020 (Figure 5). It is estimated that the demand for the cybersecurity workforce will rise to 6 million globally by 2019, with a projected shortfall of 1-1.5 million workers (Cisco, 2016).

Figure 5 - Cyber threat analytics market growth expectations (in € billion)



Source: Markets and Markets, 2015

The threat intelligence security market in the Europe, Middle East, and Africa (EMEA) region is expected to amount to approximately 30% of the global market with the UK being the biggest cybersecurity market within Europe, followed by France and Germany (Markets and Markets, 2015).

More than 80% of the companies in Europe experienced at least one cybersecurity incident in 2015 and the number of security incidents across all industries worldwide rose by 38% year-on-year in 2015 (European Commission, 2016). The European Union Agency for Network and Information Security estimates that the losses resulting from cybersecurity-related incidents are between €260-340 billion per annum in Europe (BMI Research, 2016).

The rapidly digitizing European economy, along with the growing adoption of the Internet of Things (IoT), bring your own devices (BYOD), and web & cloud-based business applications, are leading to increased focus of organisations and government on cyber threat analytics. The high risk of advanced persistent threats, cyber warfare, frauds, data breaches, and malware attacks has made cyber threat analytics a priority, necessary to adopt in order to gain competitive advantage.

2 European success stories

In Europe there are various innovative solutions in data analytics. Five of these solutions, implemented by six companies, have been selected as examples of success stories (Table 1).

Table 1: Selected innovative solutions

No	Innovative solution	Company	Country	Signals of success
1	A reviewing hub that uses data analytics to harness the wisdom of the crowd	SoundOut	UK	Market leading position in predictive testing in the music and fashion industry Appr. €8M private equity funding raised to date
2	Technology for real-time filtering valuable information out of social media data	DataSift	UK	2014 Europas Award for the "Best Enterprise, Software as a Service or B2B Startup" Total Equity Funding - approx. \$71.7M
3	A tool for smart telecom campaigns, based on big data	Real Impact Analytics (RIA)	BE	Red Herring Europe Award 2015 Secured €12M in first round of funding in 2016
4	Sophisticated cybersecurity platforms relying on data analytics and multiple sources	EclectiqQ	NL	2015 EU IPACSO Cyber Security Award Raised €5.5M in May 2016
		FoX IT	NL	A leading intelligence provider and specialized Managed Security Service partner outside the US Acquired by NCC for €133M in 2015
5	An improved DPI (deep packet inspection) for network security analytics	Qosmos	FR	Total Equity Funding - approx. \$43.45M Market leader for IP traffic classification and network intelligence technology

Each solution addresses specific business and technological challenges, as described in the following section together with a description of the solution.

Innovative solution 1: A reviewing hub that uses data analytics to harness the wisdom of the crowd

1

Business challenge: The complexity and resource-intensity of traditional consumer research puts it beyond the reach of smaller actors (e.g. SMEs and individual producers).

Technological challenge: Predicting the consumer behaviour in industries like music and fashion is very difficult as it requires quantification of the music/fashion 'taste' of large groups of people.

SoundOut (UK) has developed a reviewing platform (Slicethepie)⁴ where over 2,000,000 reviewers rate items 24 hours a day. The data analytics enabled platform allows marketing analysts to select a randomised crowd of reviewers, sound them out, and interpret their responses. Thus, it blends crowdsourcing, the wisdom of crowds, and big data analytics. Algorithms ensure the veracity of the reviews and weigh the opinions of each reviewer based on historic accuracy in predicting the broader view within each category of each vertical sector.

This predictive consumer research solution has the potential to bring professional market research to even the small-scale designer, or producer.

The solution gives customers insight on public reaction to their offerings - such as music, clothes or accessories - before they invest in their commercial launch. For each campaign, the process involves hundreds or thousands of online reviewers. A semantic analysis of their feedbacks is performed and reviewer specific adjustments are applied to de-bias/normalise them. This combination of intelligence for normalising behaviour and the size of the reviewer community is at the core of SoundOut's value proposition.

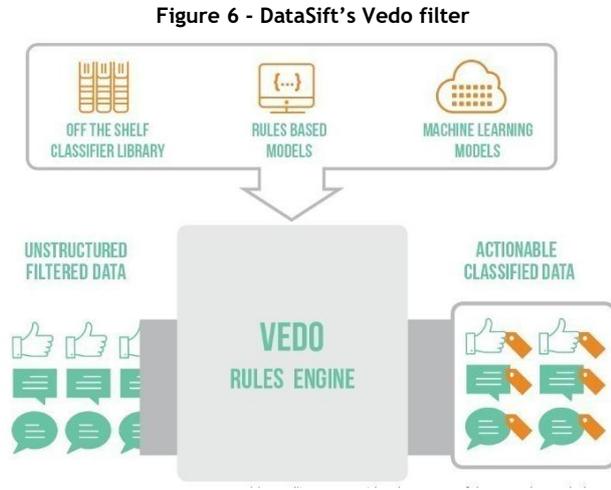
⁴ Available at www.slicethepie.com.

Innovative solution 2: Technology for real-time filtering valuable information out of social media data

2 **Business challenge:** Social media generate an enormous amount of data, which is too unstructured to be directly used for analyses and marketing.

Technological challenge: How to find algorithms for extracting/filtering the data generated through social media in real time?

DataSift (UK) was among the first movers in the social media data analytics that tackled the challenge of transforming social data into meaningful business insight. Their algorithm filters out signal from noise using a proprietary technology called “Vedo”, which provides three approaches: a classifier library, custom taxonomies, and machine learning (Figure 6). It extracts information from social media concerning human reaction to products and events and other matters of interest to specific customers. Due to the high volume and velocity of the data, the particular value of this innovative product is the provision of real time filtering. Through its products, DataSift enables social networks to build insights from their data and distribute those to agencies, applications, and marketers.



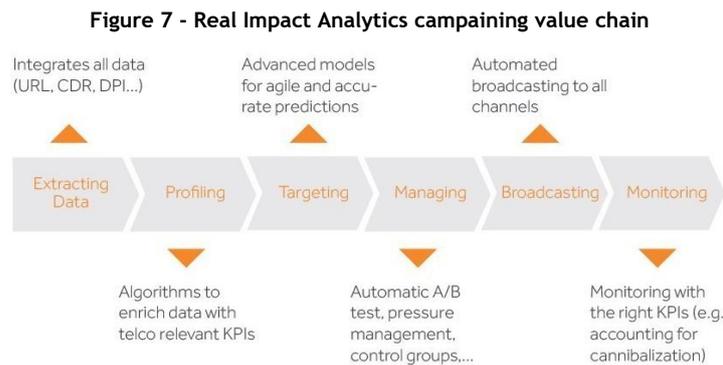
Source: www.datasift.com

Innovative solution 3: A tool for smart telecom campaigns, based on big data

3 **Business challenge:** The telecom mass campaigns, which are sent to their subscribers, are largely ineffective.

Technological challenge: How to customize mass campaigns to the individual needs of telecom subscribers?

Real Impact Analytics (BE) has developed a suite of applications that helps to solve the challenge of targeted telecom campaigns. Their product ‘One-on-One (O3) Campaigning’ uses data analytics in each campaigning step, from scoring subscribers with advanced propensity models and mathematical optimisations to automated control groups (Figure 7). It analyses big data and suggests concrete actions to the users. The solution is modular and allows for the separate acquisition of applications and their integration in the specific campaign environment. In a way, the whole process leads to ‘appifying big data’, i.e. making data actionable and accessible to end users who have no knowledge and skills in working with big data.



Source: www.realimpactanalytics.com

Innovative solution 4: Sophisticated cybersecurity platforms relying on data analytics and multiple sources

4

Business challenge: Malware is increasing at a staggering rate, with 430 million malware variants discovered in 2015, which poses a significant threat to businesses of all sizes (Ashford, 2015).

Technological challenge: The increasing level of sophistication of cyber threats requires an equally sophisticated technological response.

In order to provide an answer to cybersecurity threats, **Eclectiq (NL)** follows the notion that sophisticated cyber threat security systems should integrate and analyse intelligence from different sources. The threat intelligence platform, developed by the company, is powered by open standards STIX (Structured Threat Information eXpression) and TAXII (Trusted Automated eXchange of Indicator Information).

Another example of a cybersecurity threat platform is the Cyber Threat Management (CTMp) platform developed by **Fox IT (NL)**. The platform uses a hybrid model and allows customers to perform certain tasks themselves, while also relying on expert support from experts. The company combines intelligence capabilities as well as red-teaming, and forensic and incident response services to test and improve the detection capabilities of the platform. Thus, the platform capabilities are constantly validated and improved, not only through threat intelligence, but also by the latest real-world incidents focused on financial crime and (commercial) espionage.

Innovative solution 5: An improved DPI (deep packet inspection) for network security analytics

5

Business challenge: Cybersecurity companies need network intelligence in order to provide their cyber threat solutions.

Technological challenge: Even though Security information event management (SIEM) technology remains crucial for IT security, it is no longer considered new and there is room for significant improvements.

Security information event management (SIEM) consists of tools that collect, aggregate, filter, store, correlate, and display security-relevant data, both in real time and for historical review and analysis (Zimmerman, 2014). **Qosmos (FR)** provides a Deep Packet Inspection (DPI) software solution, which allows improving all of these SIEM processes. It uses well-defined grammar to describe network activity (L7 Protocols and protocol attributes over the life of the network conversation) in order to help analytics track changes in a conversation. In this way the solution improves the accuracy of machine-learning detection and alerting with a better dataset. In addition, the solution provides detailed, in-depth, real-time understanding of traffic that exceeds other DPI engines and open source DPI stacks.

3 Drivers to innovation and company growth

3.1 People and talent

Experts who operate at the frontier of analytics, where data sets are so large and intricate that less-skilled analysts using traditional tools cannot make sense of them, are a scarce resource (Accenture, 2013). Data scientists have been referred to as “unicorns”, because finding persons who combine coding, statistics, machine learning, database management, visualization techniques, and industry-specific knowledge can be extremely difficult (Marr, 2016).

Predictive analytics requires advanced skills for software deployment and sound knowledge of core principles of data analytics in order to provide accurate predictions and recommendations to customers (Accenture, 2013). Enterprises also face challenges in recruiting and retaining experienced **cybersecurity experts**, because the demand for cybersecurity professionals is outpacing the supply of qualified workers (Center for Strategic and International Studies, 2016).

“Our people are typically nerdy, curious, eager to learn. The company culture nurtures this and guides these characteristics into an attitude of continuous questioning on how we can do things better...people should feel comfortable, if their innovation projects fail in a quest to improve our offerings, as long as they learn from them. This takes away important barriers to bottom-up innovation.”

Fox IT

The global shortage of data analysts affects European companies, but overall **the availability of talent, education levels and costs of staff can be considered as competitive advantages for European companies in the field of data analytics**. As noted by DataSift, even though the US data analytics market offers numerous possibilities, the demand for data analysts in Silicon Valley is much higher than in Europe, which naturally increases development costs in the United States.

The demand for data scientists can be partially addressed by hiring people from other sectors, for example financial analytics. A solution to the data scientist shortage is cultivating “citizen data scientists”, i.e. people that may have some data skills, possibly from social science studies, and assigning them tasks of exploring and analyzing data. Gartner (2014) predicts that through 2017, the number of citizen data scientists will grow five times faster than the number of highly skilled data scientists. Furthermore, the experience of Real Impact Analytics and Fox IT shows that academic background and achievements do not guarantee successful selection of team members. Customized selection procedures and talent nurturing play a much more important role. Overall, the training of data professionals who can perform in-depth thematic analysis and derive insight from data is a crucial success factor, which is identified by both industry executives and policy-makers (European Commission, 2014).

New machine learning algorithms can autonomously analyze data and identify patterns. They can even interpret the data and produce reports and data visualizations, which might diminish the demand for data analysts (Marr, 2016). The advances in data analytics allow relatively small companies like SoundOut (approximately 18 people) to maintain global communities of millions of people. Machine learning is a solution that is being more extensively used also by DataSift.

While finding data analytics talent was not seen as a real challenge by the interviewed companies, some of them highlighted the need for more staff with entrepreneurial skills developed through good networking and interactions between universities and companies.

3.2 Access to finance and funding

The significant figures for capital raised by the companies in this case study (see Table 1) show that access to financing/funding can be seen as a driver in the data analytics sector rather than an obstacle to growth and innovation. There are, however, different ways to approach this important business question.

Fox IT did not make use of significant external financing, but **innovation support schemes** were very useful in the early development stages of the company. For example, support was provided to Fox IT by the Hague Security Delta Development Fund, which was available in 2014 and 2015. It aimed to financially support organisations’

innovative ideas to get through the phase between basic research and the development of a concept model.⁵ Financing was not a barrier for SoundOut either, and the company participated in lots of UK innovation based programmes (e.g. funding from the UK's innovation agency),⁶ which were instrumental for the success of the company. Real Impact Analytics was successful in self-financing for 6-7 years, but they also received financial and advisory support through the Shape and Rise programme of the Brussels Institute for the encouragement of scientific research and innovation (Innoviris),⁷ and a loan for the growth phase (from finance.brussels).⁸ Other existing support schemes that can be used by innovative companies in the sector include: the SME Instrument,⁹ which helps high-potential SMEs to develop innovative ideas; and the Enterprise Europe Network,¹⁰ which supports small businesses in sourcing new partners in Europe and accessing EU funding.

Naturally, financing needs depend on the development cycles and the overall competition on the market - the shorter the cycles and the bigger the competition, the bigger the needs of financing. In competitive and growing markets like predictive analytics and cyber threat analytics, innovation support may not be timely and sufficient for the expansion of the companies. Thus, companies turn their attention to venture capital (VC) in order to scale their businesses.

"The main challenge is making sure that the innovation you produce has value, and that you are able to bank that value. You need to ask yourself what drivers will motivate people to put extra-money in."

Real Impact Analytics

Venture capital can come from different sources. For example, DataSift acquired financing (including venture debt, which was considered as quite beneficial for their growth trajectory) only from US sources. The reason why DataSift did not consider seeking finance in the EU was their perception that the cost of this financing would be relatively high. European rates of venture capital activity are more than five times lower than in the US and the data analytics companies that participated in the present study also considered the US as a potentially easier alternative route to finance. There are signals of decreasing venture capital activities in the US in 2016 as compared to 2015, but the software industry continues to be on the top spot for money invested and number of deals among all industries (PwC, 2016).

European investors are often considered difficult to find, cautious, lending small amounts over protracted periods, and not always networked to other investors. However, contrary to the experience of DataSift and the general perception on the higher maturity of the US financing sources, for EclectiQ venture capital was relatively quick and easy to acquire in the EU. They considered US venture capital opportunities as tougher and incoherent with the culture of the company. Real Impact Analytics and Qosmos also managed to secure venture capital from European sources.

3.3 Business models

Many companies are developing new business models specifically designed to create additional value by extracting, refining, and ultimately capitalizing on data (Brownlow et al., 2015). While technology is a differentiator for the European success stories showcased in this case study, their strategies were the key success factors. Often IT people play down the importance of company strategy and mostly focus on the technological progress that they would like to deliver. Due to the increasing competition, data analytics companies can no longer be successful, if they do not have a strategy from their inception, and a clear understanding that technology is a means to an end.

The **combination of own technology and services** is a key feature of the strategy of data analytics companies.

"Combining in-house product development and services is an efficient way of using best practices, which ensures scalability."

Real Impact Analytics

For example, in the cybersecurity sector, Fox IT operates as a 'living innovation lab', which ensures a much deeper understanding of the different issues as compared to competitors, who operate on (mostly US

⁵ For more information on the HSD Development Fund: <https://www.thehaguesecuritydelta.com/capital/hsd-development-fund>

⁶ For more information: <https://www.gov.uk/government/organisations/innovate-uk>

⁷ For more information on Innoviris: <http://www.innoviris.be/>

⁸ For more information: <http://www.finance.brussels/>

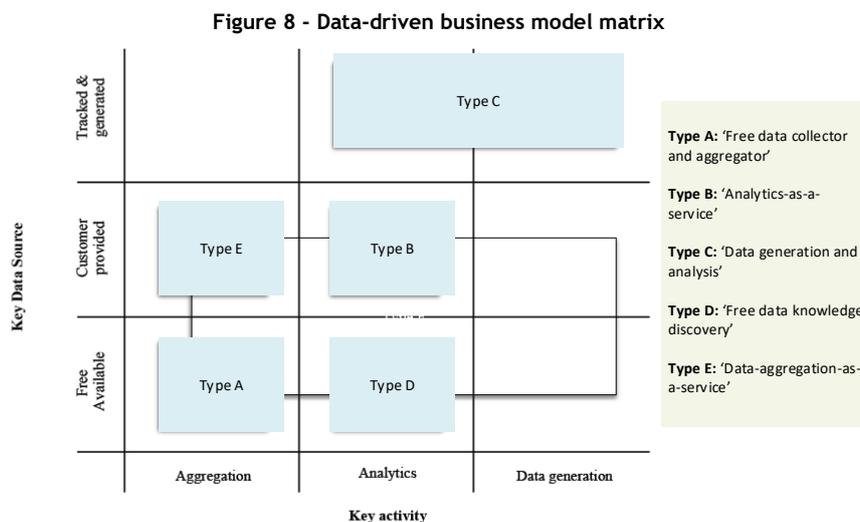
⁹ For more information: <https://ec.europa.eu/programmes/horizon2020/en/h2020-section/sme-instrument>

¹⁰ For more information: <https://een.ec.europa.eu/>

supplied) tools. Considering the sensitive nature of the cybersecurity analytics sector, some companies consider the application of non-European solutions as a threat in itself, because they are concerned about possible ‘backdoors’ in the solutions, which might reveal information to third parties. This perception increases the demand for European cybersecurity solutions and creates an advantage for European companies.

The combination of a technological solution and provision of services was also at the core of the success of Real Impact Analytics. The company identified the need for particular services for telecom operators and then developed several big data solutions to address those needs. Developing the predictive analytics tools in-house allowed them to grow on the basis of good practices and feedback from the end users. Alternatively, not having the technological abilities in-house would leave companies from the data analytics sector vulnerable to possible dictate of margins by technology providers, while not providing the services would cut their channels to the clients.

The strategic decision on which clients to address depends on the number and size of these clients, but also on the particular type of data-driven business model. A taxonomy applicable to data analytics start-ups is presented in Figure 8.



Source: Hartmann et al., 2014

The predictive analytics companies can be characterised as Type B and Type C companies. What is typical for these companies is that they **primarily target business customers with their solutions, rather than individual consumers** (Hartmann et al., 2014). This is confirmed by the companies included in this case study. The addressable market for predictive consumer research is incredibly broad, with a range of potential clients able to benefit from it (Berry and Linoff, 2004). However, reaching out to small/individual clients is not necessarily the best approach. For example, DataSift has a **very efficient distribution model**, which is the result of their decision not to sell to end marketers, but rather work with social media enterprises helping them to sell to end marketers. Thus, distribution costs are low, while scalability is high. After considering reaching out to fashion retailers, SoundOut forged a multiyear partnership with a fashion trend forecaster, facilitating access to 5,000+ customers at global level. Qosmos is not a vertical cybersecurity company that provides end-to-end solutions. Instead, they provide solutions to cybersecurity companies in order to allow them to perform in-depth traffic analysis.

The possible provision of **Software as a Service (SaaS)** is another important strategic choice for data analytics companies.¹¹ Providing SaaS requires additional infrastructure (internal or external), increased service levels, and a different approach towards customers. Like in any SaaS model, the start-up/development costs are substantial. The experience of DataSift, however, shows that this model grants benefits related to revenue stability in the long-run and increased proximity with customers. Annual subscriptions provide predictability and

¹¹ For further information on the growth of the SaaS market: Synergy Research Group (2016). *2015 Review Shows \$110 billion Cloud Market Growing at 28% Annually*. [online] Available at: <https://www.srgresearch.com/articles/2015-review-shows-110-billion-cloud-market-growing-28-annually>

consistency in revenues, which evens out revenue cycles and gives the stability that allows companies to invest in new people.

3.4 Partnerships and alliances

The data analytics companies in this case study forged different **partnerships and alliances with big companies**. In order to follow the distribution model described above, SoundOut needed to partner up with owners of the channels to the end customer. This is why the company partners with 75% of the music labels in the US and forged a multiyear partnership with WGSN, which is the world's leading trend forecaster for the retail fashion industry. The partnership with Twitter was very important for the start-up phase of DataSift, but it was not extended in 2015 as the company became a privileged partner of other social networks (e.g. Facebook, Tumblr, and Wordpress).

Real Impact Analytics had a very clear industry focus right from the start on telecom operators (their first client was a telecom operator in Africa). The same applies to EclecticIQ, as they focused on threat analysis for a mature group of clients, under the assumption that clients without threat intelligence background and acumen cannot use the product in a valuable way.

Fox IT forged a different type of alliance. They believed that organic growth was going to be too slow, which is why the company decided it would be better to ensure finance and scaling up, by being **acquired** by the NCC Group.

The partnership with the public sector was an important driver for EclecticIQ. The company is a member of the public-private Hague Security Delta, which is the largest security cluster in Europe. In this Dutch cluster, businesses, governments, and knowledge institutions work together on innovation and knowledge in the field of safety and security. The company also belongs to OASIS, a non-profit consortium that drives the development, convergence and adoption of open standards for the global information society.

3.5 External risks

Data protection regulation and attitudes

One of the main external risks in the field of data analytics relates to data protection regulation and the overall attitude regarding data protection and ownership. The new General Data Protection Regulation (GDPR) was

"If we were to ask for public support, it would be in developing a technology ecosystem, which will be impacted by the GDPR changes and e-privacy laws."

DataSift

adopted in April 2016 and will become fully effective in May 2018. The primary objectives of the GDPR are to reinforce data protection rights of individuals, facilitate the free flow of personal data in the digital single market, and reduce administrative burden (EY, 2016).

A risk associated with the GDPR is that it constraints SMEs to comply with the regulation to the same extent as large organisations.¹² In addition, many investors on the data analytics market in Europe are cautious, because they do not have sufficient clarity on the requirements of the regulation.

Data analytics companies need to have knowledge and capacity to meet all the security guidelines of this complex regulation. They have to establish a culture of monitoring, reviewing and assessing data processing procedures, aiming to minimise data processing and retention of data (Allen & Overy, 2016). This requires huge investments, which turn out to be disproportionate for small and medium players in the market, as start-ups and SMEs typically do not have the resources to research, interpret, and prepare for new regulation.

Awareness on predictive analytics and cyber threats

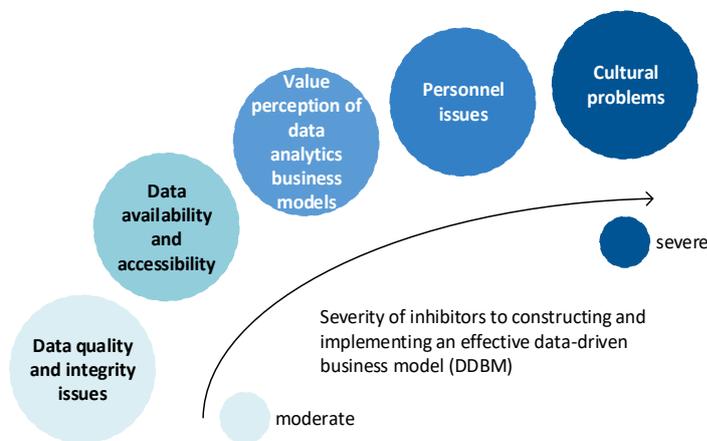
¹² For more on this topic: Christensen, L., Colciago, A., Etro, F. and Rafert, G. (2013). *The impact of the Data Protection Regulation in the E.U.* [online] Available at: http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/2013_data_protection_reg_in_eu_christensen_rafert_etal.pdf

Overall, the importance of data analytics in the improvement of innovation capabilities and productivity is recognised throughout Europe. The European Commission both developed strategic documents¹³ aimed at harnessing the potential of data-driven economies, and is currently funding a range of European projects¹⁴ in the field of data analytics. However, the information asymmetry between companies of different size impacts the value creation potentials for SMEs. A 2013 survey in the UK (SAS, 2013) showed that **larger organisations are better informed about big data analytics than their SME counterparts**, and, in general, respondents from the SME community have little, if any, knowledge of big data analytics, with very few willing to engage in the process of implementing such technologies/processes within their businesses. The general lack of awareness on the value added of investments in predictive analytics was also confirmed by the companies in this case study. ‘Soft issues’ such as company culture that is not conducive to constructing and implementing data-driven business models, and the low perceived value of data analytics, often inhibit its widespread application (Figure 9).

“We need to adapt to protect our customers. It is important to understand the mindset of cyber criminals and the way they work.”

Fox IT

Figure 9 - Inhibitors of data-driven business models



Source: Authors' adaptation from Brownlow et al. (2015)

time the average total cost of a data breach increases (Ponemon Institute, 2016). Furthermore, SMEs are often negligent about security as they believe that they are too small to be of interest to cyber-criminals, making themselves highly vulnerable. This is why cybersecurity investments are often delayed or decreased in favour of competing investments that offer more tangible benefits.

Cybercrime continues to be on the rise, but the awareness on the risks that cyber threat actors pose to European organisations is still insufficient (ENISA, 2016). Financial thefts are something people can relate to, but the general perception on espionage by organized criminal groups and state actors is quite different. Recently, this knowledge and experience gap is fading away, but the awareness of businesses and society on cyber risks should be further increased. The key problem for businesses is that security investments are a cost with few tangible benefits, while at the same

¹³ Examples of related EC strategic documents/studies are provided: EC (2014). COM(2014) 442 Final - Towards a thriving data-driven economy; EC (2011). COM (2014) 882 Final - Open data, an engine for innovation, growth and transparent governance; EC (2015). COM (2015) 192 Final - A digital single market strategy for Europe; EC (2016). COM (2016) 180 Final Digitising European Industry, reaping the full benefits of a Digital Single Market.

¹⁴ See related web-page: <https://ec.europa.eu/digital-single-market/en/node/72768>.

4 Conclusions

4.1 Key lessons learned for companies

In order to succeed, companies in the data analytics sector need to have flexible recruitment procedures and optimally use the available innovation support and venture capital/debt in the sector. Advances in machine learning may decrease the demand for data scientists while at the same time improving software solutions. The combination of core technology and services proves to be a sustainable business strategy particularly in the cyber analytics sector, whereas the increasing application of the SaaS model is an important opportunity for predictive analytics companies. Partnering with big companies and focusing on business clients rather than individual consumers is the preferred business strategy, especially in the start-up phase of data analytics companies.

► Take advantage of the available data analytics talent in Europe

On a global scale, there is a growing shortage of data scientists and cyber analytics experts. Finding staff with the needed experience and skills is challenging also in Europe, but this is a challenge that can be overcome, if

Key message

Do not look only for data scientists, but be open to finding talent in other sectors

companies adapt their recruiting strategies. Companies should be **open to finding talents from other sectors** (e.g. financial analytics and banking) and with diverse university background, not necessarily in the IT sector. A recent study by the Center for Strategic and International studies suggests that employers should relax degree requirements for entry-level cybersecurity positions and focus on professional certifications and hands-on experience for evidence of suitable skills (Center for Strategic and International Studies, 2016).

► Increase the use of machine learning in data analytics

IDC predicts that by 2020, 50% of all business analytics software will incorporate data analytics built on cognitive computing functionality (IDC, 2015). The companies showcased in this case study also confirm

Key message

Harness the power of machine learning and automate analyses

that machine learning is increasingly used particularly in the fields of predictive analytics and cyber threat analytics. The main reason for this is that these fields provide many **opportunities for automation** (Morgan, 2015). More and more companies realise that integrating data sources, harnessing machine learning and advanced technology for faster, more sophisticated analyses in decision-making ultimately improve business performance (MIT Technology Review, 2016).

► Make good use of innovation support schemes and venture capital/debt

Similarly to the availability of talents, access to financing/funding is also not seen as an obstacle in the data analytics sector. Innovation support schemes (e.g. Innovate UK, Innoviris, and the HSD Development Fund) can be very useful in the seed/start-up phase of data analytics companies, while as companies grow they can

Key message

Consider innovation support schemes when developing data analytics innovations and later-stage venture capital when reaching the growth phase

make good use of the available venture capital opportunities. This is in line with the overall venture capital trend in Europe, which shows that the amount of later-stage venture capital investments has continuously grown in the 2012-2015 period, whereas seed capital remained unchanged (Invest Europe, 2016).

In addition to venture capital, venture debt can also be very valuable. Its advantage is that there is no need to dilute and the time for acquiring financing is shorter. There are higher interest rates, but usually they come from a source that understands start-ups and technology. In most cases, this alternative funding tool is tied to particular financing projects (i.e. international expansion, or new product lines) that enable companies to reach additional milestones, hence increasing shareholders value (EY, 2015).

► Combine development of core cyber analytics technology and services

In order to remain innovative and at the same time provide great services, companies should have the capabilities to develop core technologies in-house. The synergy between capabilities and offerings results in a holistic service, which cannot be provided by purely service companies. This is particularly the case in the cyber security analytics

sectors. The preference for European solutions, instead of using off-the-shelf non-European software, can be turned into an advantage by cybersecurity analytics companies, which develop their own products.

► Search for efficient distribution models in predictive analytics

Even though the number of potential clients on the market for predictive consumer research is very high, trying to reach small/individual clients may not be the best approach to follow. Instead, partnering with owners of the channels to end users might decrease distribution costs and increase scalability. Business to business (B2B) models are dominating in data-driven start-ups, whereas established businesses lean more towards a combination of targeting businesses and individual customers (Bronlow et al., 2015).

Key message

As a data analytics start-up, target other businesses first and individual consumers at a later stage

► Use the advantages of the SaaS model

It is key for companies to define how they want to bundle their value proposition, e.g. license sales or Software as a Service (SaaS). In spite of the initial costs to build the infrastructure, the SaaS model provides revenue stability in the long-run. Overall, the adoption of big data analytics (BDA) technology in the cloud has lagged behind other enterprise technologies, such as those for customer relationship management, but it accelerated in 2015. Thus, IDC has raised expectations for growth in the adoption of cloud data analytics solutions from 3x to 4.5x faster than on-premises deployments (IDC, 2015).

Key message

SaaS is a growing trend in data analytics, which needs to be considered in business models

► Partner with bigger companies

Companies should regularly update their snapshots of the addressable market (by value and by number of clients) and their competitive position, and be ready for either stand-alone growth or integration with a bigger partner with market power they do not have. When considering the experience of the companies analysed through this case study, their success seems to depend on partnerships and relationships with bigger companies. Data analytics companies can usually "plug" themselves in the offering of big players. This is particularly valid also for cybersecurity analytics, because breakthrough technology in this field is complex and typically targeting mature users of such solutions.

4.2 Insights for business intermediaries and policy-makers

The importance of data analytics for the economy is increasingly recognised by business associations and policy-makers. Their support to SMEs in the sector is particularly needed for adapting to the complex requirements of the data protection legislation and increasing awareness of the benefits of data-driven decision-making and the corporate cybercrime risks.

► Support the adaptation of SMEs to the data protection legislation

Data protection has been a hot topic during the years of negotiation leading to the completion of the text of the new EU General Data Protection Regulation (GDPR). It brings new requirements, which are particularly complex for SMEs. This is why their awareness on the constraints implied by data privacy/protection legislation should be increased. In addition to awareness raising, support is also needed for the adaptation to the regulatory changes as smaller companies usually do not have legal teams, which they could use to interpret some of the obligations introduced by the GDPR (Allen & Overy, 2016). In this regard, it is recommended that national regulators: (1) educate SMEs on the new requirements; (2) follow a system of early warnings for potential breaches of the GDPR; and (3) establish dialogue structures with companies in the data analytics field.

► Increase awareness of the value of predictive analytics and the dangers of cyber threat risks

Despite growing markets and increasing expected benefits of predictive analytics, some businesses are still sceptical about the value it could bring to their business functions. This is especially the case for SMEs. This is why further examples of success business stories linked to predictive analytics should be showcased.

Malware attacks are increasing at a very high rate, but cybersecurity threats are usually played down by European businesses. This is why awareness raising campaigns can play a key role in incentivizing investments in cyber

threat solutions where and when needed. In particular, industry associations can help to build awareness and stimulate adoption of cybersecurity threat solutions.

► **Further support access to finance at the early stages of data analytics companies**

Access to finance is currently not considered as a particular obstacle in the data analytics sector, but the availability of funding and finance in Europe is much less mature than in the US, particularly when it comes to funding early stage technology. The approach and active seeking of innovative companies is considered as important as the actual financial services, because of the high costs of seeking finance in the EU. The experience of data analytics companies shows that while venture capital plays a critical role in scaling up a company, innovation support schemes may play a much bigger role during the start-up phase. Altogether, more focus is needed on promoting availability of venture capital and creating investor ‘clubs’ to foster joint investments (DIGITALEUROPE, 2016).

► **Foster meaningful enterprise-academia links in the data analytics field**

While in Europe there are many examples of projects aimed at improving the interaction between academia and enterprises, these actors still participate in such projects with separate agenda. The current approach rarely leads to the full utilisation of the synergy potential that exists between the different stakeholders, and few successful entrepreneurial initiatives come out of it. Closely looking at ecosystems such as MIT’s Media Lab and the Stanford office of technology licensing (OTL) may lead to new insights and offer guidance towards better alternatives for enterprise-academia collaboration in the data analytics field. Such collaboration is also expected to result in enhanced innovation/entrepreneurial culture, which is often considered relatively low in Europe.

“We very often talk about the need to improve university-business links, but in practice it does not really work so far.”

Qosmos

The general availability of talent with data analytics skills in Europe needs to be accompanied by an entrepreneurial mind-set, nurtured at all education levels. Industry associations can play a role in this process (Digital Europe, 2016) by ensuring that local entrepreneurial communities are able to communicate together thereby creating a network effect.

Appendix

Interviews and websites

Company	Website	Interviewee	Position
SoundOut	www.soundout.com	Rob Sisco	Vice president
DataSift	www.datasift.com	Tim Barker	CEO
Eclectiq	www.eclectiq.com	Pim Volkers	VP Business Development
Fox IT	www.fox-it.com	Jurjen Harskamp	Chief Strategy Officer
Real Impact Analytics	www.realimpactanalytics.com	Sébastien Leempoel	Chief marketing officer
Qosmos	www.qosmos.com	Thibaut Bechetoille	CEO
Digital Europe	www.digitaleurope.org	Alexander Whalen	Senior Policy Manager

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