

Developing the SMEs' Innovative Capacity Using a Big Data Approach

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This paper investigates the means by which Big Data could be a viable option for innovative SMEs. In the first part, in order to identify specific patterns involving the dynamics of SMEs' overall performances and the main sources of information for product and process innovation, we used the data collected from more than 1.700 enterprises from Romania. In the second part, we focused on Big Data software solutions that could help SMEs to develop their innovative capacity. Therefore, we have identified seven software solutions that meet SMEs' expectations and specific requirements (InsightSquared, Canopy Labs, Radius, QualtricsLabs, Sylectus, Swipely and Google Analytics) and analyzed them from a three-dimension perspective: Data Sources, Departments and Sectors. Our paper ends with conclusions concerning (a) the availability and affordability of Big Data software and (b) the specific premises needed for a better diffusion of Big Data usage in SMEs' innovative processes, such as the availability of data sources, the needed awareness among shareholders, managers and other stakeholders and the existence of proper human resources with specific knowledge, skills and competencies.

Keywords: Big Data, innovation, SMEs

1 Introduction

Big Data has become more of a buzzword in the business community, and is seen as the “next big thing” after business intelligence solutions. Although there is a great diversity in approaching this subject, one of the pragmatic definitions that can be found characterizes Big Data as “very large data sets (Volume) that are being produced at a tremendous speed by the growing digitization of the society (Velocity) and consists of data from all possible sources from structured to unstructured (Variety)” [1]. There are also different variations of this definition, for example, some authors assign a 4-th dimension to Big Data, i.e. Veracity – “the credibility of the data source as well as the suitability of the data for the target audience” [2]. Another important issue concerning Big Data consists in the way these processes are managed and integrated with the global informational system of an enterprise. In this sense, Big Data management (governance) could be described as “a part of a broader information governance program that formulates policy relating to the optimization, privacy, and monetization of big data by aligning the objectives of multiple functions” [3]. This definition succeeds in

emphasizing the strategic implications of Big Data, therefore posing a challenge from a management point of view. These implications were addressed in a less formal statement of Mark Troester (Global Product Marketing Manager at SAS) - “when volume, velocity and variety of data exceed an organization's storage or compute capacity for accurate and timely decision making. [...] Clearly, big data is a relative term. Every organization has a tipping point, and most organizations – regardless of size – will eventually reach a point where the volume, variety and velocity of their data will be something that they have to address” [4]. From a more business-oriented perspective, Big Data is credited to create value in multiple ways, such as: creating transparency; enabling experimentation to discover needs, expose variability, and improve performance; segmenting populations to customize actions; replacing/supporting human decision making with automated algorithms; innovating new business models, products, and services [5]. Some of the authors prove great courage and originality by assuming a projection for 2020, thus highlighting that small businesses will embrace significant changes and will re-

habilitate the importance of personal service [6]. They also point out that small businesses can anticipate customer behavior and meet its needs with less effort because “customers leave digital footprints when using the Internet, a credit card or posting on Facebook. These digital footprints reveal purchase patterns, lifestyles and interests - the same information that the traditional shopkeeper once gathered by personal contact” [6].

In our study we address a wide variety of factors in order to capture the real magnitude of the elements related to SMEs innovation in general, and Big Data in particular. After the analysis of the demand size (enterprises' needs, perceptions etc.), it is critical to investigate the supply component – i.e. Big Data software solutions that help SMEs to develop their innovative capacity. In this sense, we have identified seven software solutions that meet SMEs' expectations and specific requirements (InsightSquared, Canopy Labs, Radius, Qualtrics Labs, Sylectus, Swipely and Google Analytics) and analyzed them from a three-dimension perspective: Data Sources, Departments and Sectors.

2 Highly Important Sources of Information for SMEs' Product and Process Innovation

When analyzing the high growth sectors of the economy, we see a major change in the way enterprises relate themselves to creativity and innovation. A major shift that is taking place consists in the transition of the organization's innovative capacity from the notion of competitive advantage to the one of key success factor, therefore emphasizing that innovation is “a must” for enterprises, especially for the ones operating in highly competitive markets. In pursuing the issue of private based innovation, it is critical to analyze the structure and distribution of the information sources for product and process innovation. As the Community Innovation Survey – one of the most prestigious and extensive surveys addressing the topic of creativity and innovation in the business economy, conducted by

Eurostat at European level – is not as frequent as we would like (the last edition refers to year 2010) and ignores a large part of the SMEs sector. Therefore, we will use the dataset of a recent (2013) study regarding the Romanian SMEs [7]. This particular study addressed not only the questions from the Community Innovation Survey, but also some additional ones, that will ensure that our analysis captures the real magnitude of the elements related to innovation in general, and Big Data in particular. The data we use was collected in March - May 2013 period from 1.718 enterprises from all Romanian counties, covering economic activities such as services, constructions, industry, transportation and tourism, therefore it can be concluded that the sample, as well as the results, are representative for the Romanian SMEs sector.

Regarding the most important sources of information SMEs use for pursuing their innovative processes (Table 1.), we have found that 56,9% of them rely on the information about and from their clients and customers, 32,9% - enterprise and enterprise group, 30,6% - scientific journals and trade/technical publications, 28,8% - suppliers of equipment, materials, components or software, 22,5% - conferences, trade fairs, exhibitions, 21,3% - competitors or other enterprises of the same sector, 16,4% - consultants, commercial labs or private R&D institutes, 7,3% - government or public research institutes, 1,7% - universities or other higher education institutes and 1,5% point at the information provided by professional and industry associations. In order to enrich the analysis, we will investigate if there are specific patterns involving the dynamics of SMEs' overall performances and the main sources of information for product and process innovation.

As we see in Figure 1, SMEs use an average number of 2.2 sources of information for product and process innovation, while the structure from the perspective of the overall performances presents significant variation.

Table 1. The correlation between the dynamics of SMEs’ overall performances and the use of the most important sources of information for product and process innovation

No.	Highly important sources of information for product and process innovation	The dynamics of SMEs’ overall performances					
		Much better	Better	The same	Worse	Much worse	Total
1	Clients and customers	42.9%	56.5%	55.4%	66.2%	37.3%	56.9%
2	Enterprise or the enterprise group	32.1%	32.5%	32.3%	35.8%	28.0%	32.9%
3	Scientific journals and trade/technical publications	57.1%	40.6%	27.9%	25.9%	24.0%	30.6%
4	Suppliers of equipment, materials, components or software	39.3%	37.4%	29.3%	18.0%	26.7%	28.8%
5	Conferences, trade fairs, exhibitions	64.3%	38.0%	17.5%	14.9%	21.3%	22.5%
6	Competitors or other enterprises of the same sector	57.1%	25.4%	22.9%	9.6%	24.0%	21.3%
7	Consultants, commercial labs or private R&D institutes	39.3%	24.1%	13.0%	15.5%	12.0%	16.4%
8	Government or public research institutes	17.9%	11.5%	6.8%	4.2%	2.7%	7.3%
9	Universities or other higher education institutes	7.1%	4.2%	0.9%	0.8%	0.0%	1.7%
10	Professional and industry associations	7.1%	3.1%	0.5%	1.7%	2.7%	1.5%

The enterprises with much better results use on average 3.64 information sources – 1.65 times more than the sample’s average, 1.77 times more than the firms with stagnant results and 2.03 more than the intensity encountered among the SMEs with much worse overall performances. Therefore, we may ar-

gue that the more successful an enterprise is, the higher is the intensity of using diverse sources of information for product and process innovation, thus suggesting a clear tendency towards diversification and complexity.

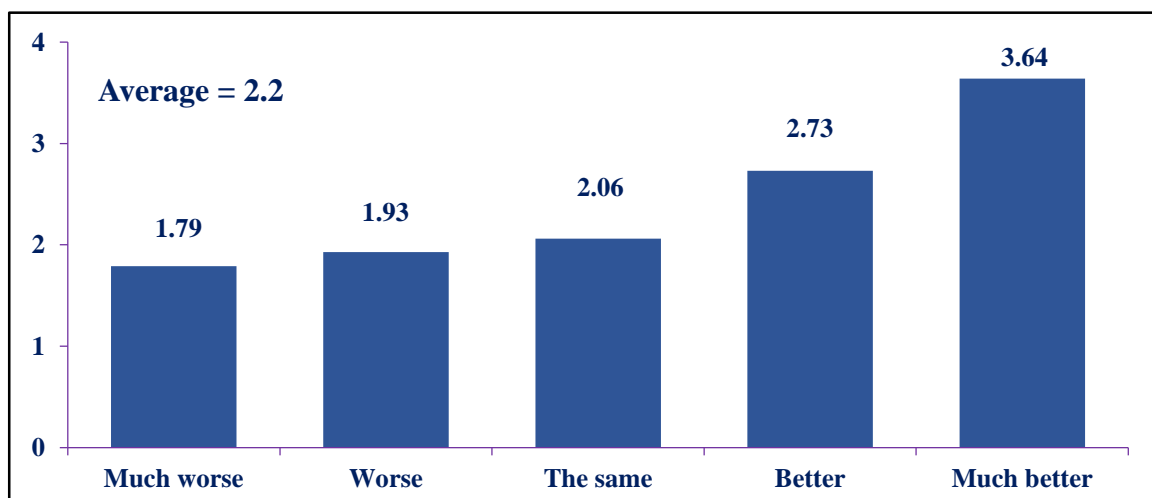


Fig. 1. The intensity of using different sources of information for innovation

If we look more closely to the main sources of information that SMEs use for product

and/or process innovation from the perspective of obtaining and using them, there can be

delimited two main groups: (1) know-how transfers and (2) data analytics potential.

The information obtained mainly through know-how transfers (scientific journals and trade/technical publications, conferences, trade fairs, exhibitions, consultants, commercial labs or private R&D institutes, government or public research institutes, universities or other higher education institutes, professional and industry associations) has the following attributes:

- have a high degree of generality, thus demanding adaptation and customization;
- are less novel – they consist mainly in the transfer of the best practices;
- are best suited for large companies;
- do not value the enterprise's information capital of qualitative and informal nature;
- are less dynamic – the process of enriching the innovative capacity of the organization is not continuous;
- it poses a challenge from a competition stand point – this type of expertise and know-how is not exclusive.

On the other side, the information sources used in innovative processes that has data analytics potential (enterprise or the enterprise group, clients and customers, suppliers of equipment, materials, components or software, competitors or other enterprises of the same sector) and is best suited for Big Data has the following characteristics:

- it is specific for a certain enterprise, and sometimes even for a unique business line – these information sources are the main manifestations of an organization's uniqueness;
- have a high degree of novelty;
- have the capacity to capture the specificity of an organization;
- are dynamic – developing the innovative capacity is continuous, sometimes the feedback is in real time;
- are more customer-oriented;
- have the potential to bring a new competitive edge.

A very important finding is that the overall performances of SMEs are positively correlated with the incidence (proportion) of using the information sources from the first group

(know-how transfer type) thus generating a counterintuitive reaction. On one side, the novelty and potential contribution to success of Big Data should make it more frequent in the case of innovative enterprises, and on the other side, our data shows that better results are obtained through mainstream methods. In this sense, the main reasons consist in the fact that Big Data in order to be applicable and effective has to benefit from certain organizational conditions. Regardless of the type of innovation (product and/or process), it is clear that a Big Data approach has the potential to bring in a new competitive edge for businesses, but only in the case some basic requirements are met:

- the availability of data sources;
- the needed awareness among shareholders, managers and other stakeholders;
- the existence of proper human resources with specific knowledge, skills and competencies;
- the number, quality and affordability of IT solutions.

3 Software Platforms Based on Big Data that Uphold Product and Process Innovation

Any company, regardless of its size, processes and stores daily a considerable amount of data. Thus, any information may become useful in the decision making process. Even SMEs are processing a large amount of data considering their size. Big Data is a relative term and refers, in particular, to the amount of data that could be transformed into useful information compared to the size of the organization. There are three main characteristics that define the Big Data term: volume, velocity and variety. When the level of these three characteristics exceeds the capacity of storage and computing that guarantees a rapid and accurate decision making process, then the company feels the need to efficiently use and organize all the available data. At some point in time, all the companies, regardless of their size, will eventually reach a point where the volume, variety and velocity of their data will be something that they have to address.

We have identified seven software solutions that will meet SMEs expectation previously presented, as follows:

InsightSquared – is a Big Data-based application that offers analysis and support for SMEs. It is the first product that uses Salesforce CRM platform to extract and analyze data. This software solution offers five major products for different sectors: Sales, Marketing, Financial, Staffing and Support Analytics.

Canopy Labs – is offering software products for tracking, reporting and predicting customer activity. This company is focused on the customer activity by helping businesses increase their sales using customer behavior prediction.

Radius – is offering a Big Data-based software that is targeting businesses by industry, location, company size, reviews & ratings, prices, etc. Basically, Radius is helping businesses to target their leads using multiple sources, including web and social media like Facebook, Twitter, Google and more. The objective of this software is to identify new market segments.

QualtricsLabs – are offering multiple products which are based on customer Satisfaction surveys or Employee surveys. All their solutions are using traditional inputs for the analysis, but some of them are compatible with Salesforce.

Sylectus – is a transportation management software for Fleet Management. This network interconnects hundreds of trucking companies and helps them fulfill all of their orders by renting trucks or by offering available trucks to other company in need of fast transportation.

Swipely – is specialized in analyzing customer behavior using credit card information. This software offers also a complete solution for gaining new customers and maintaining the loyalty of their customers. It covers almost all sectors: services like bars, restaurants and retail and even ecommerce.

Google Analytics – is monitoring web and social content and provides analytics about customer behavior. Using AdWords integration, this web-based software offers a pub-

licity analysis that includes ROI (return on investments).

These software solutions were evaluated using 3 main characteristics: Data Sources, Departments and Sectors. These characteristics, as well as the weights reflecting the relevance of each of them:

- **Data sources** (50%) refer to the number of sources from which the application is retrieving the input. Some of them are using CRM, ERP software, but other solutions are using web and social media or results from search engines.
- **Departments** (33.33%) are referring to the number of departments in which this application can be used. For example, a software solution may have a module for Sales, one for Marketing and one for Operations.
- **Sectors** (16.67%) are referring to the area in which the customer operates.

The scales used in assessing these three dimensions, in order to obtain the final results are presented below:

- **0 - 30** = a limited number of data sources, or one sector in which the software is having an impact, or one department that can use the software.
- **40 - 70** = an average number of data sources, or two sectors (one being Retail), or two departments (one being Sales or Marketing).
- **70 - 100** = multiple data sources, or many sectors covered (Retail, Services), or many departments involved (Sales, Marketing, HR).

The diagram shows that the software solution with the highest score is InsightSquared with a score of 90. This means that this software platform offers the possibility to load from as many types of data sources as possible. It also provides software solutions for five departments: Sales, Financial, Marketing, Staffing and Support. These activities can exist in almost all economic sectors like retail and services. The next software received score of 80, is called Radius and brings something new: it mining web and social media content to collect and analyze data. The purpose of this application is to target the leads, so it is

limited only for the Marketing department. Google Analytics is a reach for most companies because it is free (standard version). This web application uses the Google database to perform queries and monitor web activity on companies websites, thus relies solely on web and social media content. Therefore, it obtains a score of 77. Qualtrics application uses online surveys and Salesforce as input and can be used in departments such as Human Resources, Marketing and Sales. Thus, it received a score of 73. Swipely software is for all types of businesses (retail, services and ecommerce) because it relies on the POS systems to collect data. Once it collects the data about a customer orders, purchase date and time, etc., a company can determine patterns and custom-

er behavior, so they can develop retention strategies. Therefore, this software platform obtained a score of 68. Canopy Labs software platform can be used only in Sales department because offers sales analysis. An advantage of this application is that it can be used in all sectors and offers compatibility with more financial and CRM data sources. So, it has a score of 67. Sylectus is a very useful application for companies active in the transport of goods. This online community interconnects a variety of shipping companies that offer or require trucks for transportation. Because it is a community, there are no custom data sources. Therefore, the only department in which can be used is Operations, so it received a score of 32.

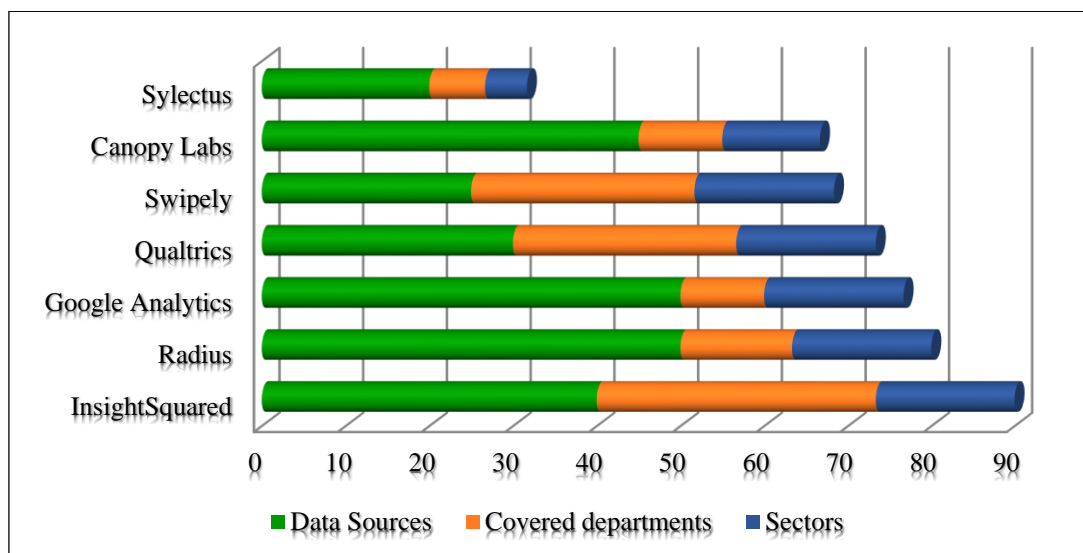


Fig. 2. Comparative analysis of Big Data software

Our comparative analysis guided us to the conclusion that there is a diverse supply of Big Data solutions that are suitable for SMEs, the most valuable being InsightSquared – a Big Data-based application that offers five major products for different sectors: Sales, Marketing, Financial, Staffing and Support Analytics. Although it looks that there are affordable options for SMEs, it is clear that these software solutions require more product development and better marketing in order to foster the “appetite” of SMEs to use Big Data in their innovative processes.

In this regard, we have found several methods in which software companies could raise their visibility on the market, as follows:

- **Product Development**

- the application should be customizable, so each client can add, modify or remove multiple indicators;
- the application should be in cloud, because the cost of using it is considerable lower than traditional applications that requires infrastructure (servers, database images, operating systems, etc.). The cost of using an application based on cloud would be the active connection to the cloud per minute or per hour.

No infrastructure is needed, only computers with Internet access.

- **Marketing**

- the best way to sell this type of software is by direct and online marketing. Software provides need to make themselves visible on the market and among potential customers.

They need to target small business from sectors that may need this type of solution for their businesses. Make sure to highlight the palette of features offered and the costs of it.

4 Conclusions

As the findings of this paper suggest, the more successful an enterprise is, the higher is the intensity of using diverse sources of information for product and process innovation, thus underlining a tendency towards diversification and complexity. Although it is a clear need for Big Data, this approach has not yet become an explicit option for SMEs in their innovative encounters, therefore it requests certain premises in order to bypass this situation: availability of data sources, awareness among shareholders, managers and other stakeholders, existence of proper human resources with specific knowledge, skills and competencies, qualitative and affordable IT solutions etc. There are several affordable options for small businesses that needs Big Data software and multiple ways in which software companies can promote their solution to encourage SMEs to adopt and use this type of technology. The key of promoting it is to emphasize the advantages of having this type of solution and the affordability of it.

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