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# **BUSINESS STRATEGIC MANAGEMENT: PROPOSAL OF A MODEL OF INFORMATIONAL MONITORING IN THE ERA OF BIG DATA**

GESTÃO ESTRATÉGICA EMPRESARIAL:  
PROPOSIÇÃO DE UM MODELO DE MONITORAMENTO INFORMACIONAL NA ERA DO  
BIG DATA

GESTIÓN ESTRATEGICA EMPRESARIAL:  
PROPUESTA DE UM MODELO DE MONITOREO INFORMATIVO EM LA ERA DE BIG DATA

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**JITA:** LP. Intelligent agents.

**RESUMO:** Este trabalho tem como objetivo propor um Modelo de Monitoramento Informacional que possa subsidiar a gestão estratégica empresarial, de modo a identificar ameaças e oportunidades e forças e fraquezas, propiciando a obtenção de informações importantes para a elaboração e acompanhamento do Planejamento Estratégico Empresarial. Sobre o aspecto metodológico, trata-se de uma discussão de natureza teórica, fundamentada na pesquisa bibliográfica que procura recuperar conceitos relacionados a Big Data e Agente de Software Inteligente, identificando características que, se automatizadas, podem contribuir com o processo de busca e análise de dados e informações relevantes para a elaboração e acompanhamento do Planejamento Estratégico Empresarial. Por fim, demonstra-se que na interseção desses conceitos é possível observar que um Sistema de Inteligência Organizacional e Competitiva pode ser ampliado e evoluído ao utilizar as características de Big Data e Agente de Software Inteligente, resultando no Modelo proposto.

**PALAVRAS-CHAVE:** Gestão Estratégica. Inteligência Organizacional e Competitiva. Agente de Software Inteligente. Big Data.

**ABSTRACT:** This paper aims to propose an Informational Monitoring Model that can support the business strategic management, in order to identify threats and opportunities, and strengths and weaknesses, providing the obtainment of important information for the preparation and monitoring of the Business Strategic Planning. Under the methodological aspect, it is a theoretical discussion based on literature that seeks to recover concepts related to Big Data and Intelligent Software Agent, identifying characteristics that if automated, can contribute to the process of search and analysis of relevant data and information for the preparation and monitoring of the Business Strategic Planning. Finally, it demonstrates that in the intersection of these concepts is possible to observe a system of Competitive Intelligence and Organizational that can be expanded and evolved to use the features of Big Data and Intelligent Software Agent, allowing one to build as a result of the discussion, the model proposed.

**KEYWORDS:** Strategic Management. Organizational and Competitive Intelligence. Intelligent Software Agent. Big Data.

**RESUMEN:** Este estudio tiene el objetivo de proponer un modelo de Monitoreo Informativo que pueden apoyar la gestión estratégica de negocios, con la finalidad de identificar las amenazas y oportunidades, y las fortalezas y debilidades, proporcionando la obtención de información importante para la preparación y monitoreo de el plan estratégico corporativo. A la luz de los enfoques teóricos que se hace referencia en este estudio fue posible recuperar conceptos relacionados con Big Data y el Agente de Software Inteligente, la identificación de las características que si automatizado, puede contribuir al proceso de búsqueda y análisis de datos e información relevantes para la preparación y monitoreo de un plan estratégico de negocio. Los resultados señalan que con la intersección de estos conceptos un Sistema de Inteligencia Competitiva y Organizacional se puede ampliar mediante el uso de las características de las funciones de Big Data y el Agente de Software Inteligente, que le permite construir el modelo propuesto.

**PALABRAS CLAVE:** Gestión Estratégica. Inteligencia Organizacional y Competitiva. Agente de Intelligent Software. Big Data.

## 1 INTRODUCTION

Strategic Business Planning (SBP) and Information and Communication Technology (ICT) are subjects that have been much discussed in the technical and scientific literature for several years. Many papers that explore these concepts were and will still be presented with the purpose of ICT adding value to business strategies, seeking to bring advantages or competitive advantages to organizations.

When one thinks of SBP, it is known that it is directly related to the strategic management of an organization, since it is from it that one has the definition of the Institution's Vision and Mission, the setting of the Goals and Strategies to be used for this end, as well as the indication of the necessary Resources, whether Financial, Material or Human, everything for the organization to become competitive (THOMPSON et al., 2008).

In this context, seeking to enhance the effectiveness of strategic management, studies on intelligence in organizations gained depth contributing to the emergence of concepts such as Organizational Intelligence (OI) and Competitive Intelligence (CI). The first, Organizational Intelligence, according to Starec, Gomes and Bezerra (2005) refers to the strategic management of information, providing answers so that decisions can be taken almost instantaneously. The second concept, that is, that of Competitive Intelligence, Oliveira (2004) defines as the one that monitors the external environment in search of threats and opportunities in order for the organization to achieve a competitive advantage over its competitors.

Thus, in the light of this, and considering the elaboration of the SBP, a question that can be asked is whether Organizational Intelligence and/or Competitive Intelligence only care about external information when analyzing threats and opportunities, not looking at important internal information for the discovery of strengths and weaknesses. Valentim et al. (2003, p. 8) respond to this questioning when they say, for instance, that Competitive Intelligence seeks to research "the environment where the company is inserted, in order to discover opportunities and reduce risks, as well as diagnose the internal organizational environment, aiming at the establishment of strategies for action in the short, medium and long term".

According to Falsarella et al. (2014), the recognition of the importance of Organizational Intelligence and Competitive Intelligence is determinant in the management of organizations. The authors understand that they complement each other in their propositions and favor the organizations in obtaining competitive advantage, constituting, then, a broader concept called Organizational and Competitive Intelligence (OCI).

The OCI can be decisive for Corporate Strategic Planning in monitoring the internal and external environment of the organization, contributing, when necessary, to the correction or change of its strategies. But for this to happen, it is essential that the context changes where the

institution acts are quickly observed. More than that, for Demirkan and Delen (2013) in the business world, organizations need to be able to respond quickly to changing market needs.

Data and information are thus becoming primary assets for many organizations, making most of them seek to collect and process them as quickly as possible, regardless of the current challenge of managing large volumes of data. According to Begoli and Horey (2012), in recent years, large amounts of data are increasingly available in significant volumes (petabytes or more). They come from many sources such as: social networks; social media; Calls from mobile devices; Scientific activities; Simulations; Experiments; Environmental sensors; Among others, in addition to, of course, traditional sources.

Ji et al. (2012) exemplify this fact when they affirm in a study conducted earlier this decade that Facebook provides 570 billion Web pages and stores 3 billion new photos every month, as well as managing 25 billion pieces of content. Faced with this enormous and growing volume of data and information, a major problem is outlined: how organizations can make a constant and continuous observation of their environment, in order to reduce the latency of the decision process, given the large volume of data and information currently produced?

It is in this context, as a response to this situation, that a broader concept called Big Data emerges in the scientific and business literature. For Han et al. (2012), Big Data are the data that must be analyzed by the companies, but which were not analyzed through the current technology because of its volume.

According to the authors, in the use of Big Data, in addition to the collection and analysis of an expressive volume of data/information, it is also possible to work with a wide variety of formats (images, sounds, texts, etc.). The results of the information obtained are presented in a sequenced way, helping decision making, for example, in the organization.

According to Agarwal et al. (2013), to extract insights from large volumes of data, the information needs to be correlated or harmonized to a common level of granularity. The authors add that much valuable information is only found when it comes from external sources and is integrated with the internal information that resides mainly in relational databases.

Thus, returning to the statement of Falsarella et al. (2014) that OCI can contribute to the elaboration and follow-up of Strategic Business Planning, within the context of strategic management, the concepts Big Data and OCI are directly related and are complementary to each other. Together, they can contribute to the SBP by seeking and providing relevant data and information, as well as insights in monitoring and observing the internal and external environments of an organization, in the search for strengths and weaknesses, as well as threats and opportunities.

From this association, and due to the fact that it is related to the aforementioned concepts, another concept stands out that should also be added to this discussion: Intelligent Software Agent. Defined as a computational entity, with characteristics of mobility and intelligence, among others, the Intelligent Software Agent has the purpose of navigating the computer network at the request of its user, searching and collecting data and information, analyzing and identifying the ones that are relevant.

Maes *apud* Duan *et al.*(2012) reinforce that

[...]The emergence of the intelligent software agent as a concept and a technology is one of the solutions to reduce the information overload problems faced by contemporary business organizations because they are entities that perform a set of activities on behalf of a user or another program, with a degree of independence and autonomy, employing some knowledge or representing the objectives and desires of the user (MAES *apud* DUAN *et al.*, 2012, page 5535, our translation).

Thus, in the face of the discussion made up to now and in view of the large amount of data and information that needs to be constantly monitored, this study is developed with the goal of proposing an Informational Monitoring Model that can support strategic business management in order to identify threats and opportunities and strengths and weaknesses, extracting important information for the elaboration and monitoring of the PBS.

## 2 METHODOLOGIC PROCEDURE

For the development of this theoretic study, bibliographical research was used, since it contributes to a reflexive thinking that allows to discover new facts and relations in any area of knowledge (LAKATOS and MARCONI, 2007). The existence of several national and international works on the topics addressed in the work, namely, Strategic Business Planning (SBP), Organizational Intelligence, Competitive Intelligence, Big Data and Intelligent Software Agent contributed to this choice, whose main parameter was the period of publication.

The concepts of SBP and OCI addressed in this discussion were retrieved from a previous bibliographical research, whose already published work is the basis of present research's continuity. These concepts were used in this work in the discovery of possible relations with the concepts of Big Data and Intelligent Software Agent.

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For the Intelligent Software Agent (ISA) we selected specifically the publications about the subject covering the years 1999 to 2005, a time during which this concept appeared more

frequently in the literature. As for the concept of Big Data, being a current subject, the period of the survey comprised recent publications, that is, from 2011 when the first references on the subject appeared.

In the present work, a discussion about Big Data and Intelligent Software Agent is presented, describing the main concepts and characteristics. Subsequently, in order to reach the objective of the work, that is, to propose the Informational Monitoring Model, the relationships of these concepts and characteristics with the Organizational and Competitive Intelligence and the elaboration and monitoring of the Strategic Business Planning are detailed.

### 3 BIG DATA

Driven by the growing popularity of social networking, e-commerce, and a growing increase in collaborative business, a burst of data is occurring. It is in this context that Big Data emerges as an important concept in the strategic management of organizations. For Begoli and Horey (2012), Big Data refers to the

[...] practice of collecting and processing large sets of data associated with systems and algorithms used to analyze these massive data sets. Along with the discovery of knowledge; The movement of large amounts of data offers many unique opportunities for organizations to benefit (in relation to new business ideas, optimizations, etc.) (BEGOLI, HOREY, 2012, p. 215, our translation).

Borkar et al. (2012) say companies of all shapes and sizes are monitoring purchases, product surveys, and other information to increase the effectiveness of their marketing. Governments and businesses are tracking the content of blogs and tweets to conduct feelings analysis. Public health organizations are monitoring tweets and web to monitor the progress and trends of epidemics. Social scientists are studying tweets and social networks to understand how information spreads and how it can be most effectively used. It is in this context that powerful analytical tools can help companies deal with complex decisions, offering new insights, creating a virtuous cycle (MITHAS et al., 2013).

In his studies on Big Data, Kaisler et al. (2013) state that this is an emerging phenomenon characterized by three "Vs": Volume, Velocity and Variety. Volume refers to increasing the amount of existing data that from terabytes passed to pentabytes and is reaching exabytes. Some experts are suggesting that zettabytes ( $10^{21}$ ) will be achieved in the next few years. Velocity relates not only to how quickly the data is accumulated, but also how quickly it changes. Variety, however, is restricted to structured or unstructured data.

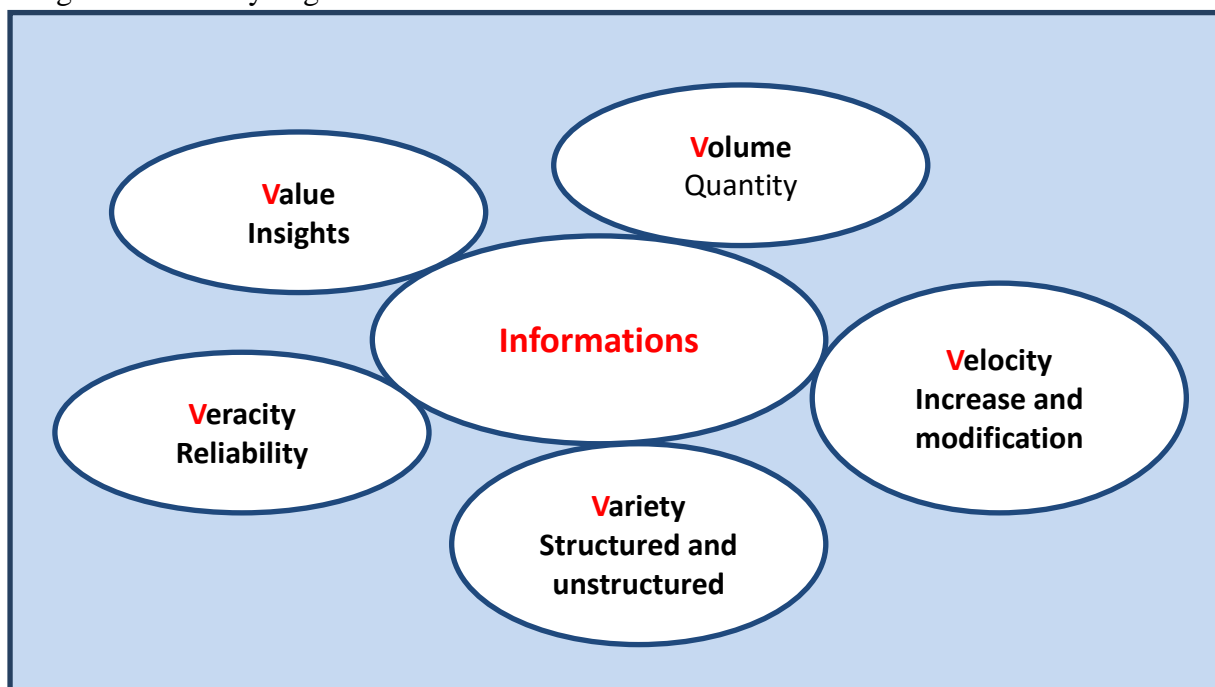
Beulke (2011) considers two more "Vs", that is, Veracity and Value. Regarding Veracity, the author describes that, since the volume of data is very large, it is certain that there will be among them some unreliable ones, which can distort any reasoning that one wishes to

do. With respect to Value it suggests the ability to extract data that adds value and makes sense for the business organization.

Singh and Singh (2012) complement the Value feature when they state that the data should be used so that its value is maximized for business, in which case the time for collection and analysis is very critical. The authors also affirm:

When a company takes advantage of all the information available on large volumes of data instead of just one of its subsets, it has a great advantage over competitors in the market. In this case, Big Data can help you gain insights, allowing the institution to make the best decisions. Big Data presents an unprecedented opportunity to create competitive advantage and better service delivery. It also requires new infrastructure and a new way of thinking about how business and ICT will be conducted. The Big Data concept will change the way we do things today (SINGH and SINGH, 2012, p. 1, our translation).

Image 1 summarizes the 5 Vs, relating: Volume to the amount of existing data; Speed to increase and constant change of data; Variety, to structured and unstructured data; Veracity, when extracting reliable data, discarding the unreliable ones; And Value to the generating of insights when analyzing the data collected.



**Image 1.** Big Data 5 Vs  
Source: the authors.

The set of characteristics expressed by the 5 V's is that it prints to Big Data its conceptual importance in data processing. However, because it is a concept, there is a need for tools capable of collecting data, analyzing them and making them available, in order to support

strategic business management. One of these tools may be the intelligent software agent that will be presented below.

## 4 INTELLIGENT SOFTWARE AGENTS

A software agent is a computer program that operates within computing environments. Software agent owners (users) can instruct their agents to navigate the network, access desired information by exchanging data with other agents or individuals, and deal with business and personal transactions (BARFIELD, 2006). According to Hickman (2010), an agent is a software entity capable of performing searches on storage units accessed through local or remote networks.

Resende (2003) presents an interesting taxonomy for the agents that are represented in four axes. They are:

- ✓ Cognitive – An agent can contain a model of internal representation of the environment, a rational decision model or act from a model of reactions to stimuli provoked by the environment;
- ✓ Focus—an agent can take on human behavioral similarities;
- ✓ Acting – an agent can act alone or interact socially with other agents;
- ✓ Environmental – an agent can act in desktop or a network (internet or intranet).

For Aron et al. (2004), with WEB-based technologies, it is possible for online sales companies to obtain accurate information about buyers and offer products and services that satisfy the individual preferences of each consumer. This is possible through the use of intelligent software agents, that is, computational entities that can evaluate and estimate buyer preferences, analyze purchase histories, and present customized marketing strategies taking into account price, product recommendation, among others.

Kvassov (2000) corroborates this statement when he emphasizes that the Internet contains potentially important data/information for an organization. Combined with intelligent recovery and management tools, this can provide a manager with insights into the business trends detected in the organization's external environment.

In expressing this understanding, the author refers to Intelligent Software Agents (ISA) as computer programs that can navigate in heterogeneous computing environments (computer and internet networks), with or without other agents, for the purpose of achieving a specific objective. According to Kvassov (2000), an agent can have the following capabilities:

- ✓ Independently collect data from different sources on the Internet;
- ✓ Change research parameters, in order to reach specific goals;



- ✓ Accomplish sophisticated searches, both with quality and quantity parameters;
- ✓ Choosing the data according to its content;
- ✓ Regularly check selected data sources;
- ✓ Track and extract changes over time;

For Jennings (2000), there are many points on the definition and construction of Intelligent Software Agents, which need to be respected. They are:

- ✓ The problem to be solved must be well identified and with well-defined limits;
- ✓ The environment where it will act must be defined. It acts on the environment through sensor received information, that is, in response to stimuli;
- ✓ It should be designed to serve a specific purpose, with objectives and goals to achieve;
- ✓ It must have autonomy, that is, control over both its internal state and behavior;
- ✓ It must be reactive to the environmental change and answer in a timely manner, able to predict future goals.

Software agents help reduce human work as tasks are executed faster and with greater accuracy in dealing with information overload because they can automatically filter large amounts of unstructured information available on the network (MUNTEAN; TOMA, 2009). Thus, considering mobility, the agents can be:

- ✓ Static - Executed in the place where they are installed by means of prior programming or environmental stimuli. For example, at the end of the day, at a predetermined time the agent checks the sales result and informs the user of the points of sale that did not meet the daily goal (prior programming). In the case of stimuli, one example would be the sales information that occurred above the average to be detected and informed by the agent to the user in real time, as new orders are entered into the system;
- ✓ Mobile – navigate the network at the request of their users with tasks to be fulfilled. For example, an agent who visits competitor sites for the purpose of comparing product prices.

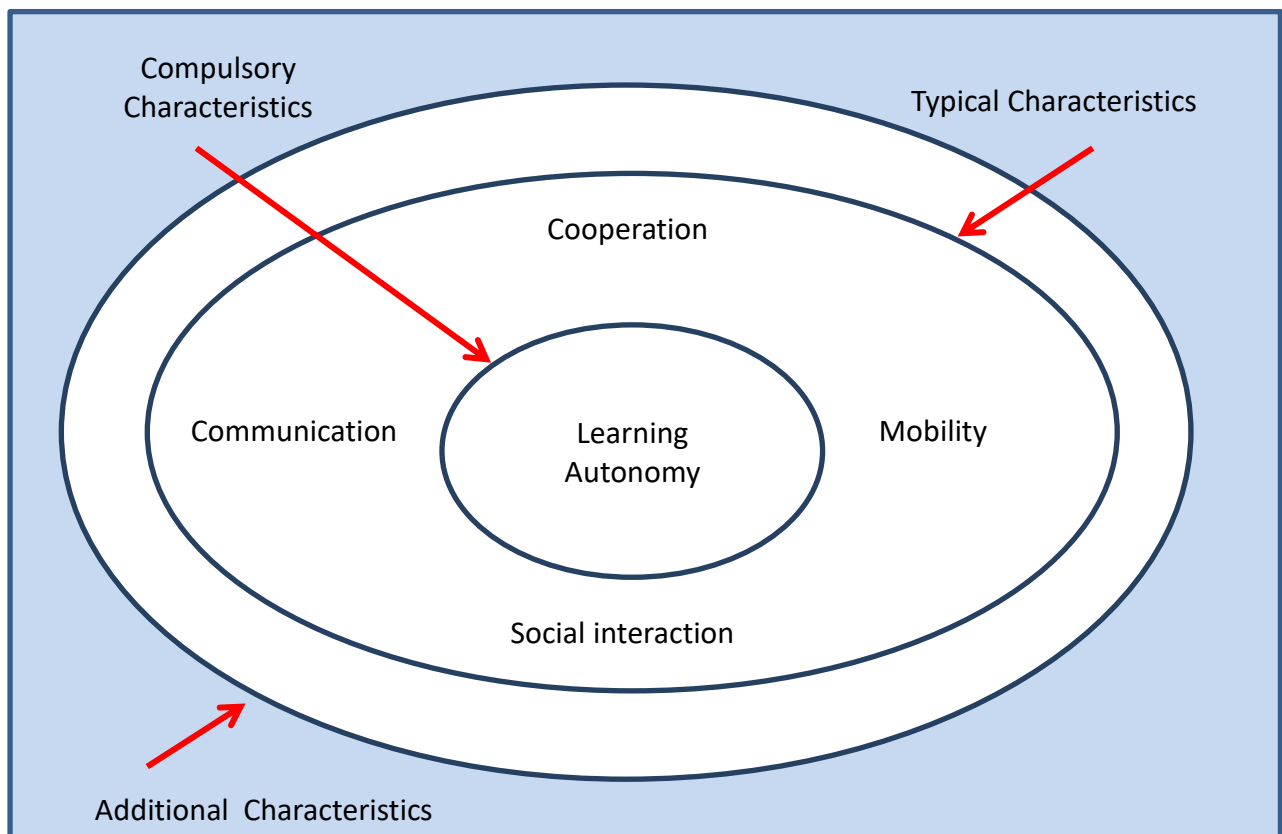
For Néri (2005), software agents can be considered programs to which tasks and decision-making power are delegated, such as defining the best purchase to make, which products are interesting to offer to a customer, etc. However, the author ponders that, like all software, agents are formalizations of human knowledge, encoded in computer language that, without good decision-making, will not be good decision-makers.

Another concept presented by Néri (2005) is the multi agent system, which contemplates many agents cooperating among themselves, so that the system as a whole can reach the

previously stipulated goal. According to the author, cooperation takes communication between those two software entities.

Anderson and Rönnbom (2009) present a series of characteristics that involve the software agents. From the understanding that different agents must have different learning capabilities, the authors classify these characteristics in three levels: compulsory, typical and additional.

For the authors, the compulsory characteristics refer to the agent's autonomy to decide whether to perform a task or not; The typical characteristics, in turn, refer to the agent's form of communication and cooperation; And finally, the additional characteristics represented by reliability, robustness, etc. The details of these characteristics are represented in Image 2 and described below:



**Image 2.** Software Agent characteristics.  
Source: Adapted from Anderson and Rönnbom, 2009.

- ✓ Learning – The agent must also be able to learn and use new knowledge to solve new problems. The author complements by stating that for them to be able to learn the agent is simulating an important human characteristic that is to be intelligent. Learning is a fundamental characteristic because the agent acts in an environment that is dynamic and constantly changing;

- ✓ **Autonomy** – The agent can act on his own and make his own decisions, freeing up his user to perform other more interesting tasks. According to the author, autonomy and intelligence are words considered synonymous for other authors. It defines smart agent as an entity that has a purpose and was created to help a user with a specific task in a specific domain.
- ✓ **Cooperation** – The agent may cooperate with other agents by exchanging information. In this way, complex tasks can be subdivided and carried out by several agents and are therefore easier to perform;
- ✓ **Mobility** – This feature allows the agent to travel through multiple computers on the network and perform their tasks locally on each of them. It is as if a user assigns a task to an agent, shuts down his computer and, when restarting it the next day the agent returns to the source with the task executed after visiting several websites on the WEB;
- ✓ **Communication**– is the ability the agent has of communicating and exchanging information with other agents;
- ✓ **Social Interaction** – Is the context of creating the illusion that an agent is capable of meaningful social interaction with human beings. Computer creation of this feature requires a wide variety of technologies, including voice recognition, natural language comprehension, animations, among others.

According to Sproule and Archer (2000), within the field of Information Systems (IS), software agents are related to the study of Decision Support Systems (DSS), as can be seen in Table 1.

**Table 1** – SAD and *Software* agent development.

<b>A SAD development must:</b>	<b>The development of a software agent must:</b>
Allow the segmentation of the decision process in minor components.	Has many representations dividing the problem and systems of thinking in minor parts.
Contemplate many levels of interaction with the user.	Allow the agente to: <ul style="list-style-type: none"> <li>✓ Learn from the user;</li> <li>✓ Treat factors and situations dinamicly;</li> <li>✓ Have a constructive search and choose behavior.</li> </ul>
Be na interactive process with tools that allow the user to adapt and personalize the system.	Personalize the agent to each user, necessity and application.

Source: Adapted from Sproule and Archer (2000).

A SAD relation to the software agents must be considered, since the agents may help users by providing information and tools to help in the decision making progress. In addition, the decision making process involves the search of relevant information available in the environment, where the institutions acts and the making of solutions and alternatives that allow the user to choose and make the best decision.

## 5 INFORMATION MONITORING MODEL

Returning to this study's objective, which is to propose an Information Monitoring Model, able to fund the strategic business management in order to identify threats and opportunities and strengths and weaknesses, important information for the elaboration and follow up on SBP. It is important to present the stages of the Organizational and Competitive Intelligence Cycle, described by Alves and Falsarella (2009) accordingly:

- ✓ Planning - In this step the field of interest that an organization intends to observe is defined, the demand and sources of information are defined with the purpose of identifying which data and information are important and which can provide subsidies to the analysis stage;
- ✓ Data and Information Collection - It begins after the identification of sources of information. At this stage the databases, whether internal or external, are accessed in order to get relevant and reliable information;
- ✓ Analysis - it is in the analysis of data and information through the search for relations that some intelligence is generated;
- ✓ Dissemination - it is this step that is concerned with delivering the treated and analyzed information to the end user, so that he can make the most appropriate decisions.

Although in the OCI Cycle, Computer Based Information Systems are an integral part of the process, it is important to highlight that the planning stage, according to Falsarella et al. (2014), is carried out by people, since only managers in the context of the SBP will be able to say what fields of interest the organization intends to observe, define the demands and sources of information and describe the needs and purposes. As examples of demands and sources of information that could be worked out by managers in the Cycle Planning stage of the OCI, the content adapted from authors such as Porter (2004) and Oliveira (2014), as indicated in Table 2, can be observed.

Thus, finding threats and opportunities and strengths and weaknesses, requires the managers responsible for the elaboration and following of SBP, indicate primarily which data and information should be observed, either internal or external, structures or not. Thus, as presented in Table 2, could be related to source, the instrument and information with the goal of describing where and which data and information should be collected.

**Table 2.** Published sources for environmental analysis.

SOURCE	INSTRUMENT	INFORMATION
SPECIALISTS AND SPECIALIST COMPANIES	<ul style="list-style-type: none"> <li>• Books/data base</li> <li>• Research report</li> </ul>	<ul style="list-style-type: none"> <li>• Industry studies</li> <li>• Statistic data</li> <li>• Market and technology analysis and trends</li> </ul>
COMERCIAL ASSOCIATIONS	<ul style="list-style-type: none"> <li>• Self publications</li> </ul>	<ul style="list-style-type: none"> <li>• Data on infrastructure, production, competition, etc.</li> <li>• Industry statistic</li> </ul>
SPECIALIST MAGAZINES AND COMERCIAL PRINTS	<ul style="list-style-type: none"> <li>• Prints</li> <li>• Electronic publications</li> </ul>	<ul style="list-style-type: none"> <li>• Events, vendors, distributors, companies, etc.</li> </ul>
GOVERNMENT	<ul style="list-style-type: none"> <li>• Governmental projects</li> <li>• Brands and patente records</li> </ul>	<ul style="list-style-type: none"> <li>• Business oportunities</li> <li>• Technologic advancement and new products</li> </ul>
COMPETITION	<ul style="list-style-type: none"> <li>• Explanatory balance sheets and reports</li> <li>• Interviews of the main executives</li> </ul>	<ul style="list-style-type: none"> <li>• Reveal socioeconomic situation and main projects</li> <li>• Reveal company’s priorities and goals</li> </ul>
JORNALS	<ul style="list-style-type: none"> <li>• Products and marketing campaigns</li> </ul>	<ul style="list-style-type: none"> <li>• Reveal production plans, new products and priorities</li> </ul>

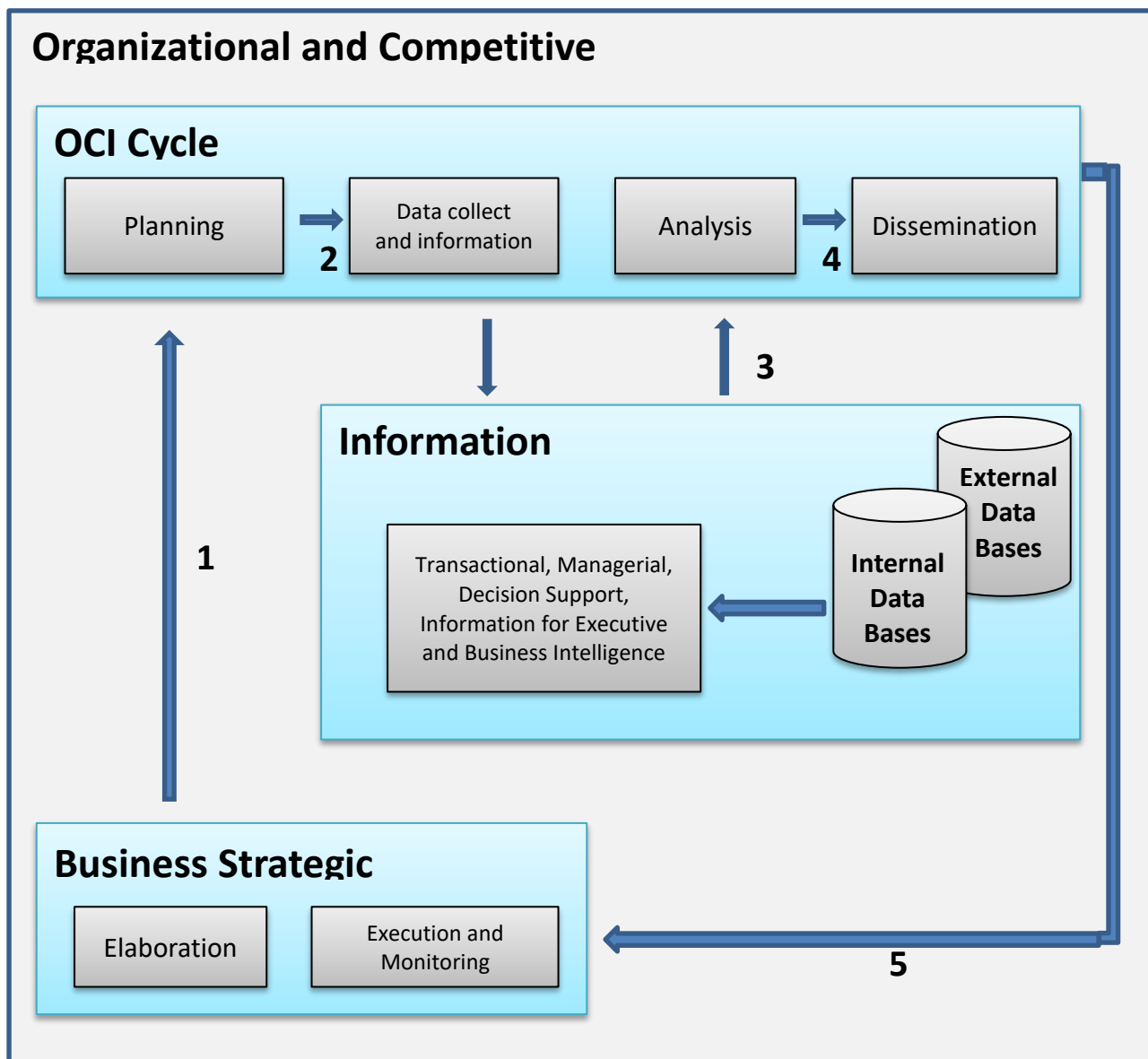
Source: Adapted from Porter (2004) and Oliveira (2014).

Back to the OCI cycle, for Falsarella *et al.* (2014), an important point that should be observed

[...] is that both the Data and Information Collection phase as the Analysis, because they are made with the support of information systems, should be automatized allowing, then, to evaluate a big volume of data and information available in the acting environment of the organization (FALSARELLA *et al.*, 2014).

Image 3, presented by Falsarella *et al.* (2014) and named the Organizational and Competitive Intelligence System (OCIS), represents the process of collecting data and information and analysis performed with the help of Information Systems (IS), in order to provide information to assist the decision-making process in the Elaboration and monitoring of the SBP. The authors describe OCIS in five steps. They are:

1. The field of interest the organization intends to observe and the information sources. Also should be identified the data and information that may be useful, taking on to new opportunities and threats, besides highlighting strengths and weaknesses (Planning);
2. The collection of data and information is performed. Information Systems and the internal and external databases that will be useful and which should provide the data and information should be related;

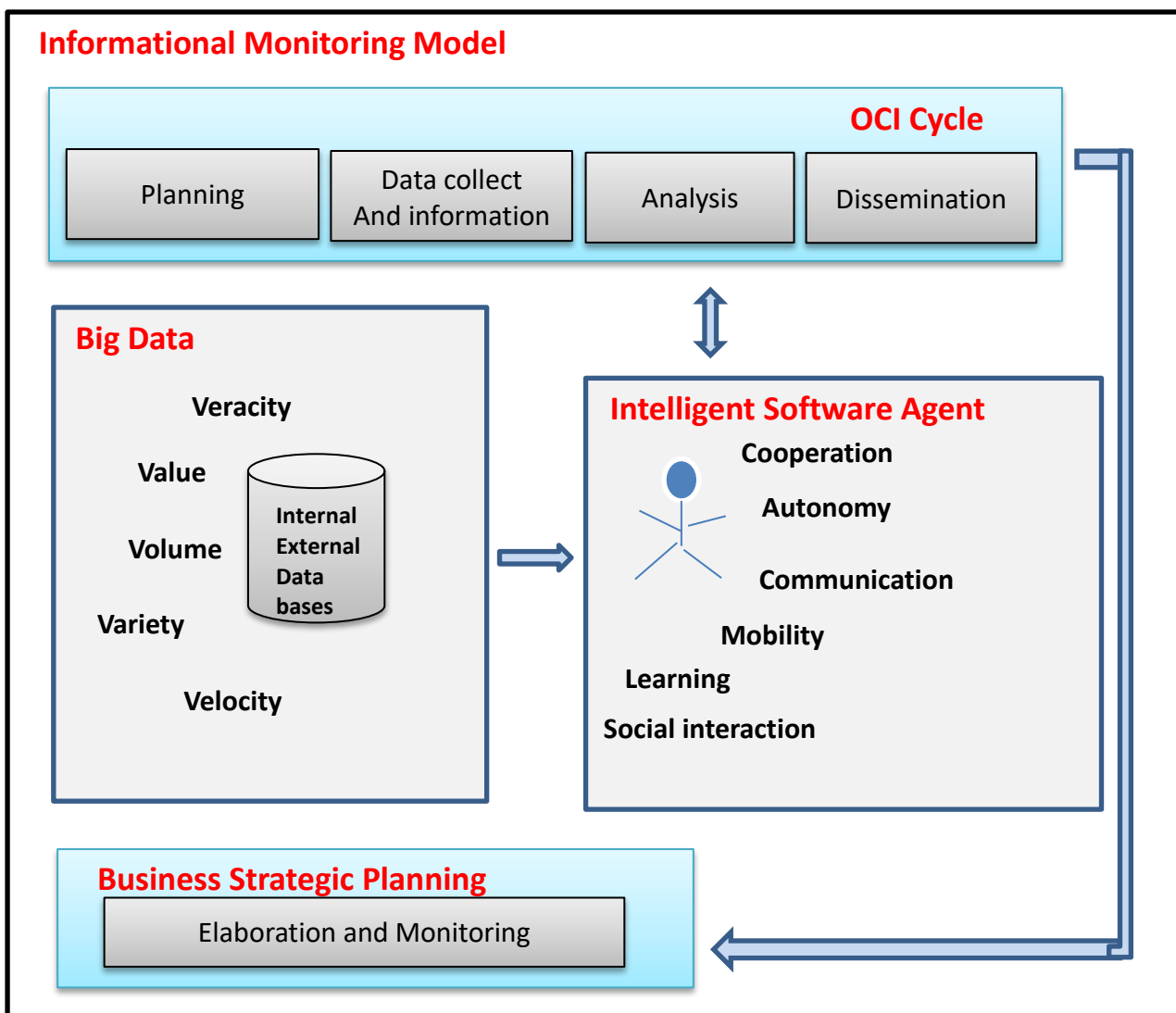


**Image 3.** Organizational and Competitive Intelligence System (OCIS)  
Source: Falsarella *et al.* (2014).

3. With the data and information, it is possible to initiate the OCI Cycle Analysis, where after the analysis and search for relations, there may be threats and opportunities and strengths and weaknesses;
4. The Dissemination is started, where treated and analyzed information will be delivered to users;
5. The most adequate decision is made contributing, then, with the SBP elaboration process.

In parallel to the SBP execution, the monitoring phase of the plan begins, where SIOC can provide information and subsidies so that it can be verified by managers if the strategies adopted are working.

Analyzing the SIOC, it can be seen that it can be expanded and evolved and transformed into an Information Monitoring Model, especially if it is aggregated the concepts and characteristics of Big Data and Intelligent Software Agent (see Image 4).



**Image 4.** Informational Monitoring Model  
 Source: The authors.

For this expansion, evolution and transformation, the 5 Big Data "Vs", described in Image 1, will be associated with the IOC phases and with the characteristics of the ISA, so that the relationship presented in Table 3 may contribute to describe below the proposed Information Monitoring Model.

Once in the OCI Cycle Planning Stage, with the field of interest that an organization intends to observe defined, as well as the demand and the sources of information, the ISA can initiate the Data Collection and Information stage and simultaneously or later, the analysis.

Regarding the variety of information, the sites where ISA (static or mobile) should research and collect are defined in the OCI's planning stage, either the data or information, internal or external to que company, structured or not. With this, ISA will have autonomy to accomplish the task to it delegated, able even to communicate and cooperate with other agents.

**Table 3.**Big Data, OCI and Software Agent Relations

Big Data 5Vs	OCI Phases	Intelligent Software Agent Characteristics
<b>Variety</b>	Planning, Data and Information Collection	Autonomy, cooperation and communication
<b>Volume</b>	Data and Information Collection	Autonomy, cooperation and communication and mobility
<b>Veracity</b>	Planning and Analysis	Learning, autonomy, cooperation and communication
<b>Value</b>	Planning and Analysis	Learning, autonomy, Social interaction
<b>Velocity</b>	Planning, Data and Information Collection	Autonomy, Cooperation, Communication and mobility

Source: The authors.

With regard to the amount of information to be explored (Volume), since it is a software entity with autonomy, that can communicate and have the cooperation of other agents, including the mobility characteristic to travel through several servers of the network, this task will be performed by an ISA in much less time than a Human Being. So, without a doubt, this is a great advantage of ISA.

Veracity, in the sense of extracting reliable data and information, discarding the unreliable ones, of a very large variety and volume of information, is a rather difficult task to be performed by an ISA. However, this complexity can be reduced if we think that the normally structured internal information is reliable. In addition, in the Planning phase of the OCI, PBS managers can define search locations that are reliable.

In addition, considering the autonomy characteristic, the cooperation and communication with other agents can bring information from unreliable search sites,



contributing to the learning of the ISA, that is, once detected by several agents that a site is not reliable, it can use its Learning feature to avoid collecting information from that location.

Regarding Value and the consequent generation of insights when analyzing information, this is the most complex process for defining ISA requirements. However, in the possession of the data and information collected, one can think that this process is similar to a Decision Support System. Therefore, ISA can, as described in Table 1, be customized for each user and application, have different representations, divide the problem and reasoning systems into smaller parts, learn from the user, deal with factors and situations dynamically, and have a Search behavior and constructive choice, reinforcing the characteristics of learning, autonomy and social interaction.

As for the velocity with which data and information increase and change, the Planning phase of the OCI must provide new collection points that will be added to the existing ones, and the agent, that has the characteristics of autonomy, cooperation, communication and mobility, can quickly discover eventual changes that occurring in the environment where the company operates.

Finally, the ISA, when finalizes the Data and Information Analysis and Collection phases, the processed and analyzed information can be delivered in the Dissemination phase to the end user so that he can make the most appropriate decisions regarding the strategic business management.

## 6 FINAL THOUGHTS

The goal of this paper was to propose an Informational Monitoring Model to support strategic business management in order to identify threats and opportunities and strengths and weaknesses, and important information for the elaboration and monitoring of SBP. Therefore, we sought the association of four concepts, namely Strategic Management, Organizational and Competitive Intelligence, Big Data and Intelligent Software Agent.

In describing the concepts, it was possible to create the Model from the expansion and evolution of an Organizational and Competitive Intelligence System, where the characteristics of the 5 Vs found in the Big Data and the characteristics of the ISA, if automated, could contribute to the process of searching and analyzing data and information relevant to the elaboration and monitoring of the SBP.

Thus, aspects such as volume, variety, reliability of data and information, associated with the need to add some value to strategic business management, gains a new dimension when increasing the collection, recovery and analysis processes with an Intelligent Software

Agent. Because it can be built with characteristics that allow autonomy, learning, cooperation and communication with other agents, besides being mobile and interacting with people, ISA is more than a simple automation of processes. It is the use of intelligence to decisively subsidize the management and decision making in the organization.

It is in this context that the proposed Information Monitoring Model can serve several business segments and diverse situations. It can be applied, for example, to monitoring the organization's external environment (competition, new products, etc.); In monitoring changes and market trends; In billing monitoring; In the monitoring of consumer satisfaction index; among others.

Finally, it is worth mentioning that the structure of the proposed model emphasizes the importance of integrating the Big Data concept with the Intelligent Software Agent tool in the context of the Organizational and Competitive Intelligence Cycle, in order to add value to the Strategic Planning process of the organizations that aim to become increasingly more competitive.

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