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Innovation in e-commerce: contributions from engineering and management knowledge

Innovation in e-commerce: contributions of engineering and knowledge management

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Summary
The objective of this article is to contextualize the innovation of products, processes and services in Electronic Commerce - CE, in addition to analyzing the contribution of Engineering and Knowledge Management as a fruitful field for this innovation. Integrating Knowledge Engineering - CE processes and tools with CE favors the search for solutions and minimizes risks and barriers to innovation. This is a bibliographical research, which takes into account CE as a current and constantly evolving theme, which requires innovative strategies in customer relationships, in the use of new techniques and tools provided by CE.
Key words:E-commerce. Innovation. Knowledge management. Knowledge Engineering.

Abstract
The aim of this article is to contextualize the innovation of products, processes, and services in EC, besides the contribution of Engineering and Management of the World as a fruitful field for innovation. Integrating the processes and tools of Knowledge Engineering - EC to the Ce favors the search for solutions and minimizes risks and barriers to innovation. It is bibliographic research, which considers the EC as a current and constantly evolving theme, which requires innovative strategies in the relationship with customers, not the use of new techniques and tools provided by the EC.
Keywords: Ecommerce. Innovation. Knowledge Management. Knowledge Engineering.

1. Introduction

The purpose of this article is to analyze the CE scenario in the digital world, aiming to understand product innovation. cts, processes and services. Reflecting on the contribution of Engineering and Knowledge Management in promoting innovation is a way to help and minimize the risks and barriers to innovation in the CE.

The methodology adopted is bibliographical research based on theses, books, articles and magazines that deal with the themes of innovation, CE, Engineering and Knowledge Management. The time frame defined for choosing the bibliography took into account the current nature of the themes, taking into account the years 2015 to 2022.

To approach innovation in CE, concepts and their developments were researched over the last few decades. It appears from the research that the phenomenon of innovation has gained complexity over time and that, from the initial, conceptually restrictive perspective, focused mainly on technological innovation, the concept advances to an increasingly broader current vision. This expansion takes into account the application of innovation management processes, designing organizational architectures that stimulate continuous flows of knowledge construction.

The research demonstrated that EC is committed to the development of innovation, having in the formation of new capabilities for Knowledge Management – KM strategies that can reduce risks and uncertainty in the development of commercial activity.

The intersection of CE, innovation, CE and GC themes allows for different perspectives. One of them is the inevitable bond between innovation and digital communication and information technologies. Technological development is certainly decisive for the progress of new strategies in the CE, which currently brings together technologies such as the internet of things, 5G network, 3D printer, c*loud computing, non-fungible token.*Integrated, these generate significant transformations, particularly in trade.

The research also demonstrates that the explanation of this evidence will require technological conditions and training of people to work in the markets, given the conditions of emerging market countries. Bernardes and Borini (2018,

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P. 14-15) warn that

> A fundamental feature observed in innovation in emerging markets, such as Brazil, concerns technological asymmetries between the institutional gaps in the competitive environment, the degree of internationalization of the market and the patterns of evolution of companies' organizational learning. Inequalities in access to sources of knowledge and financing for innovation, long learning cycles marked by reduced technological complexity and knowledge intensity in the products, processes and services of these companies and the low performance of innovation diffusion rates are some of the adverse elements that make up the anatomy of these economies.

This scenario, revealed by international research, has highlighted innovations that are born in environments marked by uncertainty, market failures, social exclusion and severe institutional voids. Therefore, applying KM tools to CE conditions in emerging economies, supported by tools for product development, is a tangible way for the client to perceive innovation, constituting a field of research and practices for CE.

Studies on CE show that the established dynamics promote a migration of processes based on functionalities and services. These require appropriate and differentiated treatment. Therefore, old concepts of commerce, purchase, sale, consumer, among others, need to be renewed to try to define and frame the typologies arising from the CE in times of digital technologies.

Finally, to address innovation in the CE, anchored in the CE and supported by the GC, the content is structured as follows: in part I, we address the CE and innovation, assuming the digital revolution as a way of meeting technological challenges and humans; in part II, we make considerations about the contribution of CE and GC in organizing the innovation process. At the end, we present general conclusions.

2 CE and Innovation

2.1 Electronic Commerce: brief notes

The development of CE in Brazil began in the 1990s, mainly as a result of the advancement of the Web and internet marketing. Pioneering companies in sales*online*were Submarino, Grupo Pão de Açúcar and Lojas Americanas. Initially, only small, low-value and tangible products were sold, such as books, CDs, DVDs, etc. We currently have a wide variety of products and services, from the simplest to luxury items. The figure below highlights the main companies, as well as their participation in the CE, with Mercado Livre being the leader in the Brazilian market.

Figure 1.*Market Share*(market share) of the CE in Brazil

Empresa	Ativo	Market share
Mercado Livre	MELI34	33%
Lojas Americanas	BTOW3	16%
Amazon	AMZO34	11%
Casas Bahia	VVAR3	10%
Magazine Luiza	MGLU3	10%
Outras	–	20%

Source: The Capital Advisor (2021) in Costa (2021) et al.

Mata (2021), in research on CE data in Brazil, highlights its rapid growth, stating that at the end of 2020 retail sales*online*in Brazil they represented more than 8% of all retail sales in the country, double the 4% observed two years earlier, at the end of 2018. Almost 43 million people purchased*online*at least once in Brazil, during 2020. This represents 36% more than the 31.4 million buyers*online*in 2019.

The author states that, in 2020, the CE in Brazil generated revenue of R$126.3 billion. Compared to the revenue of 75.1 billion reais reported in 2019, there was a growth of 68%, which is expected to increase by approximately of 18%, exceeding 149 billion reais. The figure below demonstrates CE penetration in Brazil, where the growth trend is constant.

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Figure 2. CE potential in Brazil



Source: Atlântico Report: Digital Transformation in Latin America 2020 in Costa (2021) et al.

Despite continued growth, Cruz et al (2021) highlight that the sector in Brazil only stopped being deficient in 2015, with the increase in the number of Internet users in the country. The determining factor for advancement was the widespread use of *smartphones*, which grew after the second half of the second decade of the century. XXI. With *smartphones*, the strategies of *marketplace* became more efficient, with mobile commerce emerging. In addition to these, the expansion and popularization of internet networks and the impacts of the Covid-19 pandemic were decisive.

This growth was also noted in the field of research on the topic. Costa (2021) *et al* carried out a systematic review of the literature in article bases available on the CAPES Periodical Portal, which indicate that the topics covered regarding CE in Brazil, between the period 2011 and May 2021, have grown and research on consumer behavior and the types of business stood out in Brazil.

The research indicated that the context of consumer behavior focuses on issues of personal data security and trust in purchases *online*. Such aspects are the same as those highlighted by the WTO and OECD standardization bodies and are, therefore, a sensitive topic for the success of companies *online.*

Regarding data protection, it is clear that, as it is a right for everyone, as provided for in article 8 of the Charter of Fundamental Rights of the European Union, it is a constant concern in the EC. The regulatory framework for the EC in article 8 of this Charter states that "data must be subject to legal processing, for specific purposes and with the consent of the interested person or with another legitimate basis provided for by law, everyone has the right to access the collected data that concerns them and to obtain the respective rectification". The European Union, despite advances, still does not provide for the standardization of rules clearly in the EC. The objectives of the debates on the topic are to bring balance to new relationships between companies and consumers, as well as between companies and competitors, mainly in relation to the security of personal data.

Brazil took an important step in 2018, by approving its General Personal Data Protection Law (LGPD) Law No. 13,709, of August 14, 2018. The law is ground zero in building a new relationship of trust between users and companies. This law will help regulate the data of millions of CE users, whose numbers indicate revenue of US$2.9 billion in Latin America in 2021. In 2023, it should reach US$8.5 billion. Brazil is the country with the highest revenue in the region, with 46.7% of the total. It should be noted that all CE companies must comply with the legal determinations emanating from this legislation.

Even with all these opportunities, we need to be aware that in an increasingly digital society, Trust is a commodity that becomes progressively scarcer. Anyone who knows how to build trusting relationships with their customers, suppliers, partners and society as a whole will occupy a privileged position, including from the point of view of business and the promotion of innovation. Today it makes more sense to segment consumers by habits and lifestyle, unlike the old parameters that identified them only as users.

Researchers, such as Patrocínio (2022), Bernardes (2018), Dantas (2016), Mata (2021), Cruz (2021) and Almeida (2016), when analyzing innovation and CE, state that the influence of new perspectives does not comes more from the top of the pyramid. It flows on all sides and is transversal. The new consumer is completely aware of their rights, is linked to values and strongly considers the opinion of their network of contacts. He wants to be surprised by brands and taken to new territories. In common, everyone wants to be served efficiently and cordially, whether in the store, on the cell phone, at notebook or on the phone.

To make the most of the current CE context, aspects such as inventory management, cutting-edge technology and people training are essential points. To this end, breaking paradigms such as, for example, production, distribution, marketing, sale or delivery of goods and services electronically, is an integral part of this new scenario. Thus, innovation strategies create competitive advantages for companies and open windows of opportunities related to the benefits of meeting customer needs.

By establishing a parallel between traditional commerce and the CE, Almeida and Martins (2017) *apud* Patrocínio (2022) describe the main elements that make up traditional commerce. Are they:

i) Exchanges between parties – generally products and consumers;

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ii) profit-making purpose;

iii) habituality and business continuity.

These elements in the CE have undergone profound evolution. Exchanges occur between multiple parties. The purpose, although aimed at profit, brings together other factors, such as customer satisfaction and data security; the habituality and continuity of the business is a consequence, like aggregate innovation, as a result of the quality of service provision.

Conceptual developments have a profound impact on *modus operandi* sweet. The World Trade Organization (WTO), in line with this new paradigm, calls CE the production, distribution, marketing, sale or delivery of goods and services by electronic means. A CE transaction can be between companies, families, individuals, governments and other public or private organizations.

To apply this concept in practice, it is necessary to properly use communication and information technologies. In this sense, the use of virtual assistants in customer service is increasingly an example of good use. Despite seeming like a cold and unfriendly practice, artificial intelligence has made *chatbots* increasingly friendly and humanized. They can now maintain dialogues while answering questions and suggesting products, both on digital platforms and over the phone. Its evolution towards a more humanized service is notable and the technological investments in its evolution demonstrate good results, especially for large retailers, who need to offer support *in full time*. In this case, robots prove to be efficient in reducing costs, converting sales and retaining customers.

By way of illustration, CE data shows that in 2020 85% of interactions with consumers were managed by artificial intelligence. Additionally, at least 30% of all B2B companies (*business to business*) employ this technology to augment at least one of their core sales processes. For Rachid (2022) from Embratel, counting on the *cognitive bots* on the front line of service is essential in operations *omnichannel*[1]. Integrating the possibilities provided by digital technologies favors business flexibility, indicates that the company must remain focused on customer needs, as well as helping with the speed and reliability of delivery. They also improve the quality of the service provided.

Therefore, a window of opportunities opens for CE, the appropriate application of which will add a differentiator to the development of good business *online.*

For Bernardes et al (2018), companies that survive increasingly competitive markets in a globalized economy need to constantly implement innovative strategies that are not restricted only to products, services and processes, but concern the innovation of their business models, whose value and reproduction design is difficult to imitate by its competitors.

2.2 Innovations in digital commerce

Based on the above, studies on innovation have been based on intuitive perceptions, conventional wisdom and technical-scientific knowledge. When studying innovation, there are several different approaches. One of them is the personal vision of innovation, taking into account the human being as an innovative agent. Another may address the organizational structure and a third refers to the interaction between the previous two through people management and organizational structure. (Almeida et al, 2016 p. 17- 46)

However, experts state that, despite this diversity of interpretations, they all end up converging to produce something new, of a personal, business or institutional nature, objective or subjective, tangible or intangible, measurable or immeasurable. (Almeida et al 2016 p. 18)

For Pinheiro et al (2011), "innovation is where there is value perceived by people". Without this perception of value, there is no innovation. It depends on the perception of the values that are interesting and necessary to add to the innovative process. Innovating requires understanding technologies, consumers and being aware of competitiveness. Processes must align utility, price and cost gains.

All these characteristics of innovation also require the perception of risks and myths that gravitate towards innovative environments. Birkinsshaw, Bouquet and Barsoux (2011) apud Almeida (2016) et al (p.23) present some of the myths in innovation that serve as parameters for CE intervention. Are they:

*A*innovation emerges as a myth of genius and for that to happen you need to have geniuses in the company. *This is false!* It is increasingly evident that innovation is a process, capable of being stimulated and fostered and not a momentary flash. of ideas.

*A*Innovation is only achieved if there is a team of talented and well-trained employees. *False!* This is not a fundamental or absolutely necessary condition. Companies in which the culture of innovation permeates their processes and decisions can develop innovative ideas from a cohesive, well-trained team that works together and has combined talents.

*A*Innovation must be centralized in the research and development department. *False!* Customers and other co-dev workers in participating in the process of creating, improving and operationalizing new ideas.

1 The term omnichannel corresponds to the fact of using several channels of a brand at the same time. For example, a customer can consult the product sheet of an item on their phone and at the same time be present at the point of sale. Omnichannel allows you to meet the expectations and behaviors of consumers who are increasingly connected and dependent on the Internet. Increasingly, the term is replacing multichannel.

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*A*Innovation must come from "bottom up" within the organization.*Partial truth!*The process needs to be a two-way road, that is, traffic from bottom to top and top to bottom.

*A*open innovation is the way.*Partial truth!*It's one of the ways. Finding a balance between open and internal innovation is challenging and can provide unquestionable benefits to the innovative process.

These are some myths identified by the research. However, in the innovative environment, the existence of barriers is also present. Some of them are difficult to solve, but all of them can be overcome. In our research, we identified some of these barriers.

Financial -It is difficult to predict fixed and variable costs, estimate revenues and profits arising from the innovation project.

Technological–They include the scarcity of available technology, the high cost of the available technological base and existing try, as well as the development of new technology.

Cool -Legislation can stimulate innovation, but it can also be a barrier to its implementation. Legal complexity, institutional bureaucracies and requirements from regulatory bodies and agencies are examples of obstacles to innovation.

Cultural-They are significant barriers as they support different paradigms of people and organizations. These are situations in which the company invests a lot in innovation, but in practice is conservative and bureaucratic.

Personal -There is a huge lack of qualified people prepared for the innovation process. In general, the "do the same" paradigm, avoiding taking risks, ends up prevailing.

The research revealed that many behaviors, attitudes and corporate rules serve as barriers to the innovation process. An example of this is the lack of institutional decision-making on the part of company managers, evident in several sectors, as opposed to innovation.

Our research concluded that there is no innovation without risks. In addition to those described in this work, there are cases of innovation that do not adequately meet customer needs or that the result may be a mere product and not a solution for the customer. In addition to these, disagreement between the idea and the product is very common. There is also the risk of changes in customer behavior, which can directly interfere with the process as a whole, sometimes requiring its review. These and other risks, including interruption of the innovation process before completion, must and can be foreseen, aiming to minimize them.

An important resource to support companies in this minimization is the*OSLO Handbook*which, in its different versions, serves as a reference to provide parameters and subsidies to entrepreneurs so that they can invest and innovate. Based on standards, legislation and policies, the Manual establishes criteria for measuring the level of innovation carried out by the company, based on the indication of good practices in different commercial segments.

According to the*OSLO Handbook*, innovation can be applied to products, processes and services. Furthermore, the application of innovation can involve people, marketing, sustainability, business models and supply chain. To understand the application of innovation in CE, we will emphasize the innovation of products, processes and services.

Per*product innovation*It is understood as the introduction of a new or significantly improved good or service, with regard to its characteristics or uses (OECD, 2005, p. 57).

In this case, to support the identification of product innovation in Brazil, the Brazilian Institute of Geography and Statistics (IBGE) released data that allows us to observe the degree of product innovation for the world, for the national market and for the company. Data from IBGE (2014) indicate that 18.3% of industrial companies launched new or improved products in Brazil and of these, 3.8% developed new products for the national market. In this sense, strengthening product innovation is a necessity to sustain business performance, creating competitive advantage.

Process innovation, according to (OECD, 2005, p.58) is the implementation of a new or significantly improved production or distribution method.

These include significant changes in techniques, equipment and/or software, in addition to the means of distribution that generate cost reductions linked to goods and services. It offers numerous advantages, such as: improved production control, inventory control, increased availability or distribution of the service or product, higher quality of the manufactured product, better manufacturing practices and cost reduction.

This type of innovation can be identified in large, small and complex companies. For process innovation to be consolidated, it is necessary, as in any successful project, that people's behavior favors the development of the innovative process.

Innovation in services, according to the Oslo Manual, is related to the concept of product (tangible good) and product innovation that occurs with the introduction of a good into the market, added with new characteristics, improvements. ments, components, materials, functional changes or even something completely new.

These changes may be linked to questions about what they are like in terms of efficiency, speed and, even quality. In the Manual, a characteristic of innovation highlighted in services refers to it being a type of continuous process, in which, over time, the service evolves and advances in terms of quality and competitiveness through small innovations, mostly incremental. .

In the context of CE, the application of innovation in products, processes and services is part of building a culture of innovation. Although diverse in nature, dimension, object, type and form, they must aim to produce something new, in the form of well-being for people and results for companies and organizations.

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3 Engineering and Knowledge Management: contributions to the innovative process

The emerging themes involving the relationship between KM and innovation fall on the absorptive capacity of prospecting, exploring and exporting knowledge (Vasconcelos, 2018).

In general, Knowledge Management encompasses learning processes that are linked to the exploration and sharing of human knowledge (tacit and explicit) using appropriate technologies and environments to improve an organization's intellectual capacity.

GC practices consider the following characteristics:

I) Are carried out regularly;

II) its purpose is to manage the organization;

III) are based on work standards; It is

IV) are aimed at the production, retention, dissemination, sharing or application of knowledge within organizations, and in their relationship with the outside world

Such characteristics, identified in several different digital environments, provide the perception of constructed knowledgein process . It is worth noting that there are other types of KM practices that can also contribute to the innovation process. We selected three typologies[two], to illustrate how activities can be fitted into the CE.

Typology 1: Davenport and Prusak

They classify Knowledge Management practices into six groups: 1) To capture and reuse structured knowledge, 2) To capture and share lessons learned from practice, 3) To identify sources and networks of expertise, 4) To structure and map knowledge necessary to increase performance, 5) To mediate and control the economic value of knowledge, and 6) To synthesize and share knowledge from external sources.

Typology 2: Fábio Ferreira Batista, Carlos O. Quandt, Flávio Pacheco and José Cláudio C. Terra.

They proposed a typology with three groups of practices**: 1)**Those related mainly to aspects of human resource management that facilitate the transfer, dissemination and sharing of information and knowledge. Examples: forums (in-person and virtual) / discussion lists, corporate education, Communities of practice or knowledge communities, Corporate university, Narratives, Mentoring and coaching**; two)**Practices linked primarily to the structuring of organizational processes that function as facilitators of generation, retention, organization and dissemination of organizational knowledge. Examples: Best practices, Benchmarking, Knowledge mapping or auditing, Organizational intelligence systems, Competency management system, Organizational skills bank, Individual skills bank, Organizational memory / lessons learned / knowledge bank, Intellectual capital management or management of intangible assets; It is**3)** Practices whose central focus is the technological and functional base that supports organizational knowledge management, including automation of information management, Information Technology (IT) applications and tools for capture, dissemination and collaboration. Examples: Collaboration tools such as portals, intranets and extranets, Workflow systems, Content management, Electronic Document Management (GED), Datawarehouse and Data Mining, among others.

Typology 3 - Asian Productivity Organization – APO

Classified KM practices according to the phases of the KM Cycle.**Phase 1:**Identify knowledge. Practices: Knowledge Cafés, Community of Practice, Virtual collaborative environments, Knowledge mapping and Mentoring.**Level 2**: Create knowledge. Practices: Brainstorming, physical collaboration environments, Knowledge Cafés, Communities of practice, After-Action Analysis, Knowledge Bases (Wikis, Repositories, etc.), Blogs, Virtual collaboration environments, Mentoring, Portal and Video sharing. **Phase 3.**Store knowledge. Practices: Knowledge Café, Communities of Practice, After-Action Analysis, Knowledge Bases (Wikis, Repositories, etc.), Blogs, Virtual Collaboration Environments, Portal, Video Sharing.**Phase 4**. Share knowledge. Practices: Knowledge Cafés, Communities of Practice, After-Action Analysis, Knowledge Bases (Wikis, Repositories, etc.), Blogs, Virtual Collaborative Environments, In-person Collaborative Environments, Corporate Portal, Video Sharing, Narratives, Taxonomies.**Phase 5.** Apply knowledge. Practices: Knowledge Café, In-person Collaborative Environments, Virtual Collaborative Environments, Communities of Practice, Blogs, Corporate Portal, Mentoring, Knowledge Bases.

Reading the CE context makes it possible to highlight aspects for the implementation of GC. In the case of CE, the essential link with technological evolution, the conceptual changes brought about by the digital revolution, the need to innovate, the need to relate the profile of users and the use of information and communication technologies open up spaces for implementing the tools of EC.

It is noteworthy that, in EC,*knowledge can be modeled independently of the implementation of solutions*, which allows you to identify, represent and shape it more effectively. Therefore, the recognition of the EC's contribution to EC innovation is in line with the argument pointed out by Pacheco (2010 et al), which reinforces the following

two Shared by the Institute of Applied Economic Research -IPEA.

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characteristics: CE's research and training object is interdisciplinarity, admitting different approaches to understanding and advancing knowledge in whole and in parts of its object.

The more advanced we are in understanding knowledge as an element that generates value in contemporary society, the more aware we are of the need to structure knowledge in organizational, methodological and pedagogical terms to adequately address its contribution to innovation.

The contribution of Knowledge Engineering and Management is to support the construction of learning organizations. These spaces are recognized for the accumulated knowledge arising from organizational knowledge, the network of relationships and professional experience, as well as the information security accumulated by companies and optimized by the EC.

Final considerations

Although the economic bias is linked to the origins of innovation, our research demonstrates that recent views expand the role of innovation with a view to public good, translated into improving services provided to citizens.

It is also identified that, through the use of digital communication and information technologies, companies are encouraged to create business models and the CE is an example of this. Regarding this aspect, although technology is a development facilitator, the business potential is increasingly focused on the relationships between the subjects of the value network and not just on technology.

Another aspect revealed by the research is that the CE increasingly aims to offer products with a competitive value proposition in relation to its competitors and with a focus on people, their safety and satisfaction.

Finally, it is a fact that the CE environment is constantly evolving. Aspects such as business conception, relationship with customers, the use of new techniques and tools for knowledge management, present themselves as great opportunities to innovate with the support of EC. In this sense, our research demonstrates that, observing the typology of each business, Knowledge Engineering and Management can promote openness to new forms of management in the CE organization with a focus on innovation.

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