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ECOINOVATION PRACTICES AND THE SOCIOTECHNICAL TRANSITION IN CIVIL CONSTRUCTION: A CASE STUDY IN BRAZIL

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ABSTRACT

The world is sensitive to unbridled consumption that impacts on sustainability. Eco-innovation has been shown to be an approach that seeks to understand sustainable innovations as an alternative to the economic development of societies. The main contribution of this paper is to describe how the system of eco innovation practices was developed in the process of socio-technical transition to sustainability in a construction company. From a qualitative approach we describe how eco-innovation practices are developed in a construction company with socio-technical theory and social practice theory. This analysis allowed us to understand how eco-innovation practices are developed, considering points that delay or stimulate the transition to sustainability. The results showed some intersections with niche, regime and landscape, many of them stimulating sustainability and others slowing down. We also included an amplification of the theory by showing that the intersections that stimulate are more organized in practices, and those that delay find strong barriers in the regime.

KEYWORDS. Construction. Technological Change: Choices and Consequences. Diffusion Processes.

PRÁTICAS DE ECOINOVAÇÃO E A TRANSIÇÃO SOCIOTÉCNICA NA CONSTRUÇÃO CIVIL: UM ESTUDO DE CASO NO BRASIL

RESUMO

O mundo é sensível ao consumo desenfreado que impacta na sustentabilidade. A ecoinovação tem se mostrado uma abordagem que busca entender as inovações sustentáveis como

alternativa ao desenvolvimento econômico das sociedades. A principal contribuição deste artigo é descrever como o sistema de práticas de ecoinovação foi desenvolvido no processo de transição sociotécnica para a sustentabilidade em uma construtora. A partir de uma abordagem qualitativa, descrevemos como as práticas de ecoinovação são desenvolvidas em uma empresa de construção com teoria sociotécnica e teoria da prática social. Essa análise permitiu entender o desenvolvimento das práticas de eco inovação, considerando pontos que retardam ou estimulam a transição para a sustentabilidade. Os resultados mostraram algumas interseções com nicho, regime e paisagem, muitas delas estimulando a sustentabilidade e outras desacelerando. Incluímos também uma ampliação da teoria ao mostrar que as intersecções que estimulam são mais organizadas nas práticas, e as que retardam encontram fortes barreiras no regime.
PALAVRAS-CHAVE: Construção. Mudança tecnológica: escolhas e consequências. Processo de difusão.

INTRODUCTION

The construction industry is one of the sectors that most generates jobs in Brazil and one of the most influential on national economy. However, the growth of the sector is constantly associated with the environmental impacts resulting from the current practices. These impacts range from sound and visual pollution to waste generation that contribute to the accumulation of greenhouse gases and the use of natural resources in an unsustainable way. "However, with the recent concerns expressed, it would not be an exaggeration to say that the traditional model of construction will not be sustained for long, either from an environmental perspective or from an economic perspective" (CBIC, 2015, p.11).

Analyzing civil construction and finding economically sustainable models becomes a necessity for both, the sector and society. In this sense, we seek to understand how eco-innovations in civil construction are developed from two complementary theoretical approaches in studies of transition to sustainability: the Theory of Social Practice (SPT) and the sociotechnical theory of innovation

According to Schatzki (2010), cultural and social studies of technology have found that users have to tame new technologies to be assimilated in existing contexts. This process involves symbolic and practical work, in which users must integrate the artifact into their user practices and cognitive work. This approach fits into an emerging trend in innovation, science and technology studies where more attention is given to the role of users in innovation and technological development (Elsen et al., 2004). Therefore, studying how the actors/users and practitioners of the eco-innovation proposals behave regarding the development of their

respective practices can bring relevant responses to the development of eco-innovation in the construction industry.

Complementary to the sociotechnical theory, from the Multilevel Perspective (MLP) has studied sustainable innovation and its applications at three analytical levels: niches, regimes and socio-technical landscapes. The MLP proposes that transitions are defined as regime changes and occur through processes of interaction within and between these levels (Geels, 2010). Hargreaves, Longhurst e Seyfang(2012) recommend using both analyzes, MLP and SPT, respecting the differences between theories, regarding regimes and practices.

The methodology of this case study involved 11 in-depth semi structured interviews, written data analysis and a non-participant observation method including (notes and photographic) to answer the following research question: how does the system of eco-innovations practices drives the socio-technical transition towards sustainability in a construction company located in Curitiba?

The article is divided into five sections: this introduction, followed by the theoretical framework, in which we present the foundations of the sociotechnical theory of innovation and the Theory of Social Practice (SPT), followed by an analysis of the adjacencies between both; the third section presents the methodological approach of the study; followed by section four, in which we present the analysis of the data; inally, section five shows the main findings of the research and the discussion.

THE SOCIOTECHNICAL THEORY AND THE MULTILEVEL PERSPECTIVE (MLP)

Kemp and Rotmans (2010) argue that the environmental problem of pollutant accumulation increases on a large scale, a scenario that requires more comprehensive responses, involving a change in production chains, product-service systems, and the ways in which consumption is due. The authors argue that a system's innovation is needed, which goes beyond system improvement and that, to happen, changes in sociotechnical systems that include not only the technical components. Therefore, the innovation of the system is associated with new connections, new knowledge, different rules and roles, a new logic of adequacy, and even new organizations.

Analyzing the transition to sustainability requires an expanded vision, in which one must analyze beyond the technical, the technological, but also the social, to the rules in an extended context. Kemp and Rotmans (2010) justify that a management process is needed to make the transition. In this case it is worth using the concept of a transition instead of system innovation, because the transition analyzes: the final state (new equilibrium); the path to the

final state, composed of different phases; the transition problems generated by the transition process, and the wide range of internal and external developments for a particular system that shapes results.

The great challenge among researchers when analyzing the transition system for sustainable innovations, according to Smith, Vob e Grin(2010), is to find an analytical perspective on innovation that seeks to understand the processes of innovation that lead to transformations in sociotechnical systems. The authors defend two strands: a theory for large-scale changes in technology and society, and another that considers problem-oriented thinking of sustainable transitions.

Sociotechnical theory involves studies that focus on the transitions to sustainable innovations, as is the case of this research. These approaches analyze, in addition to technological changes, the "social and technical" transformations at different levels. For this analysis, Geels and Kemp (2005) present the Multilevel Perspective that stems from three-level analysis that interact in the process of change, which are, socio-technical systems: tangible elements necessary to fulfill social functions; Social Groups: refinement of sociotechnical elements; Rules (regimes): guide and guide group activities.

Smith et al. (2010) argue that sociotechnical theory has its origins in the literature on transitions that defends largely models of change, following the Neoschumpterianos. The authors argue that a given regime can give rise to new challenges, which if successful, can be followed by stabilization of a new far-reaching regime. Periods of general stability alternate with periods of regime change. Two processes of change stand out: variation within regimes; and changes in regimes.

Geels and Schot (2007) argue that the MLP understands transitions as results of alignments between developments at various levels. The typology is based on multilevel variations and interactions, considering three levels: the niches of innovations; the sociotechnical regimes; and the sociotechnical landscape, which are widely discussed by the main authors of the transition theory, such as Elsen et al. (2004), Geels (2002, , 2005),Geels and Kemp (2007), Kemp and Rotmans (2010) and Geels and Schot (2007). Innovation niches, where incremental or radical innovations are incubated, can break with the regime and multiply. Here are the startups, educational institutions, and innovative companies. Sociotechnical regimes involve the level of norms and regulations. The regime can be developed in the trajectory of technology and involves Government institutions, federations, unions, and associations. Sociotechnical landscape refers to an exogenous environment that can influence the regime for technological developments or inspire technological niches. The landscape is the reality the *status quo* of society and current regimes. In the next section we will discuss the practices and in the sequence, relate the connections between regimes and practices in the sociotechnical transition for eco- innovation.

SOCIAL PRACTICES THEORY AND ECO-INNOVATION

According to Reckwitz (2002), study the theory of social practices, is a way that dialogues with the Scottish philosophy of the late eighteenth century, from which modern social theory developed three fundamentally different ways of explaining action and social order. The first form, which was that of the Scottish utilitarian's, is a theory oriented to the purpose of action. The second form, which Durkheim and Parsons presented as an appropriate perspective on sociology, was a rule-oriented theory of action. These two classical theoretical-social perspectives can be considered opposing concepts and were challenged by a third approach that emerged as a result of the "culturalist" revolutions of twentieth-century social philosophy.

These "cultural theories" are rooted mainly in structuralism, semiotics, phenomenology, hermeneutics and the philosophy of Wittgensteinian, where there is no normative consensus (Reckwitz, 2002). The author also suggests that theorists of practices can be considered successors of Max Weber's sociological tradition. Practices form structures of action are, somehow, treated by all kinds of social theories stemming from the tradition of action theory. In the 1970s, a movement known as Practice Turn began. This envisages a connection with daily life and the world of life, from a qualitative perspective, influenced by social, cultural or interpretive theories, and on the basis of philosophical reference in Wittgenstein and Heidegger (Reckwitz, 2002). For Schatzki (2001), the Pratice Turn is a movement of social theories that he calls social ontology, which contemplates corporeality, materiality (posthuman components such as artifacts and non-human objects) and their intersections with practices organized around shared knowledge.

For Nicolini (2009), the language of practice theory offers a new way of understanding social and organizational phenomena, complementing and offering alternatives to many non-traditional approaches to organizational study. Every practice, according to Schatzki (2002), is linked to ways and routines of doing. In addition, Corazza and Fracalanza (2004) point out that the notion of routine is central, especially in the Neoschumpeterian approach, based on the behavior of agents, and in particular of organizations.

Organizations have standard and routine behavior, whose routines are defined as persistent characteristics that determine their likely behavior. These routines are followed until you have some reason to think about changing them, such as unsatisfactory results, or even if, from time to time, the entity engages in the analysis of what is being done and why, with intent to think about revisions and even radical changes (Nelsson & Winter, 1982). This study addresses eco-innovation practices in construction and development for sustainability, which we detail below.

Theory of Social Practices in Eco innovation

The concept of sustainability has been addressed in several publications since the 1970s, when the debate on the topic began with the publication of D.H. Meadows' Limits to Growth, followed by many concepts studied, many even conflicting. It is argued that sustainability must meet the needs of the present society without compromising the ability of future generations. Current organizational models and their manufacturing processes represent a critical impact on the environment, causing damage and jeopardizing sustainability. So, the companies are invited to participate in the design of solutions from the factory point of view, evaluating and rethinking the environmental impacts (Carrilo-Hermosila et al., 2009).

According to Aloise, Nodari e Dorion(2016), in 1987 studies on innovation became relevant in the economy and business management from the Report Our Common Future produced by the World Commission on Environment and Development (WCED) and coordinated by Gro Brundtland. Such approaches consider the more rational and efficient utilization and use of natural resources from innovation in the development of new products and processes. The results of this new approach not only impacted economic, technological and organizational variables, but also brought a concern for the environment, giving innovations a new dimension: social responsibility.

Innovations focused on sustainability issues are called, in the international scientific environment (Wagner, 2010; Reid & Miedzinski, 2008), as: eco-innovations or ecological innovations; environmental innovations; sustainable innovations; green innovations. Boons and Lüdeke-Freund (2013) argue that the terms eco-innovation and sustainable innovation can be used interchangeably by researchers from different areas, since both have the same meaning.

Current reality requires a conscious approach to issues of economic development and environmental balance. In this sense, Azevedo et al. (2019) emphasize the need to develop or modify new products, processes, techniques, practices and systems to avoid or reduce environmental damage and thus promote business sustainability. The management of innovation for sustainability, also understood as eco-innovation, follows this approach.

This line of thinking is reinforced by Pegels and Altenburg (2012) in arguing that global warming and other immense environmental problems require a new technological paradigm. Therefore, there is urgency in the development and implementation of technological solutions involving several actors, among them governments, to ensure that the next generations of technologies are actually developed and implemented, which is achieved through social practices.

REGIMES AND PRACTICES IN THE SOCIOTECHNICAL TRANSITION FOR ECO INNOVATION

According to Hargreaves et al. (2012) sustainability is a challenge that, in order to be assimilated by society, requires innovation, considering a systemic level to fundamentally change the way things are done, as well as respecting the needs of society. They also defend that, considering the nascent field of innovation studies for sustainability, attention is focused on two theoretical approaches, both sharing concern with the change of the socio-technical system, which are the MLP and SPT. For Shove (2003) are different ontologies, but that can be used in parallel, aiming at a complementarity between regime and practice. They further argue that their intersections can generate valuable insights for processes that may hinder or contribute to the transition to sustainability.

Watson (2012) characterizes Practice Systems as a system that aims to simultaneously capture how new practices are incorporated into systemic relationships. He also believes that through systemic elements - including infrastructures, technologies, rules, norms and meanings - these practices constitute and sustain themselves in a system. He argues that the Systems of Practice can be understood as the Socio-Technical System, in an analysis of both ontologies.

Dutra and Tudor (2016) believe that complexity lenses generated from the two theoretical approaches, the MLP and the SPT provide a paradigmatic analysis to review oppositions as complementarities. Through expanded perspectives, the fundamental analytical and operational characteristics of each approach can be examined with potential synergies between them.

Shove (2003) points out that many transitional researchers focus on a vertical dimension only, (involving multilevel, multi-phase, multi-layered), which weakens the perception of other developments found from a horizontal view, involving the epistemology of SPT. This perception is in line with Schatzki (2010), whose observations point out that the researchers will focus on analyzing the debates on the governance of sustainable social arrangements, analyzing sociotechnical regimes. This analysis is related to the practical context, to look at how society can be moved towards a more sustainable trajectory.

The civil construction sector has a complexity that involves many interests and actors, which demands to rely on a robust theoretical approach which can involve the analysis of the contexts, how they are constructed and transformed, considering the movements of the niches and the transformations of regime that impact on landscapes. Such approaches consider the relationship of regimes to practices, the development of practices, in which knowledge and desires can be integrated or not in a transition movement towards sustainability that aims at the development of eco-innovation practices.

Shove (2003) argues that, in looking at the relationship between horizontal and vertical dimensions, the transition to sustainability will depend not only on systems innovation but also on the integration of this system. This means that for innovations to be truly assimilated and diffused, it is necessary for systems to be assimilated by other systems. In civil construction, the waste transportation system must be adequate to have processes and ways of collection and disposal aligned with the Sustainable Construction System.

For Hargreave et al. (2012) the relationship between SPT and MLP, is related to the horizontal nature of relations between practices in contrast to the hierarchical and vertical relations of the MLP. The MLP makes it possible to examine the emergence of novelty through interactions between the vertically ordered levels of niche, regime, and landscape, while SPT focuses attention on the horizontal dynamics of practices that cut across multiple regimes and follow their reproductive circuits.

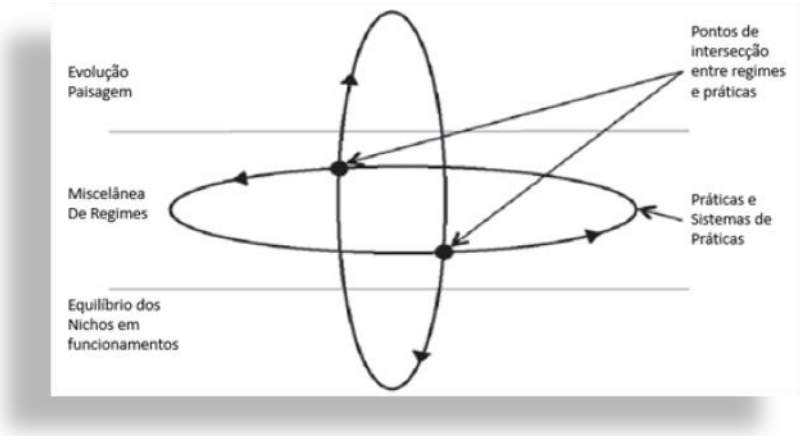
Geels (2011) and Smith et al. (2010) argue that it is possible to address regimes such as the stabilization of routine practices and niches as more emerging practices. For Hargreaves et al. (2012), a respective effort is required to make vertical vision horizontal and horizontal vertically, which are valuable steps to combine the insights of both approaches. They call attention to be careful to follow the distinct contributions made by these different ontologies. While the MLP is concerned with transitions in regimes, the SPT looks at transitions in practice (Shove, 2005). Consequently, the integrations of these approaches potentially merge in a complementary way.

The researchers using this theoretical encounter of both theories are more robust and have greater reach than when the analyzes are used alone. Research based on multilevel MLP) and practice theory (SPT), can reveal more than one track, analogously are two paths with parallel or perpendicular dimensions, which interconnect and have dependence. Regime and practices are seen as overlapping and closely interlinked entities that support each other and coevolve (Hargreaves et al., 2012).

Hargreaves et al. (2012) also suggest that niches, regimes, and landscapes in particular systems, their interactions and impacts on daily practices, and how practices and systems of practices intersect with the dynamics between niches, regimes and landscape. An interesting way to do this monitoring is to look at the intersections defended by Shove (2003) from his Intersection Diagram (see Figure 1).

FIGURE 1

COMBINING THE MLP (MULTILEVEL PERSPECTIVE) AND SPT (SOCIAL PRACTICE THEORY)



SOURCE: SHOVE (2003, P. 193)

This research seeks to understand how eco-innovation practices are developed in a construction company, where several actors and numerous practices are involved in a highly regulated context. In the next section we present the methodological strategies adopted for data analysis and interpretation.

METHODOLOGICAL APPROACH

This research applies a methodology of case study, qualitative, with longitudinal perspective and sectional cut. Geels (2005) argues that studies of innovation have a qualitative nature, since they have bases in the investigation and interpretation of the facts. Complementarily, Stake (2011) argues that adopting a qualitative position involves different forms of interpretive thinking.

The analysis time cut used in this study was between 2010 and 2017, chosen because of the approval of the Solid Waste Law in 2010 (Law 12,305 of 2010), anchored in the National Solid Waste Policy (PNRS). This period was marked by a strong presence of public policies, among them the PBQP-H[1].

Data collection was based on two sources of information: 11 in-depth interviews; and identification of written data with the various actors in the system, including manufacturers, distributors, users and associations, councils and unions in the construction sector.

[1] Brazilian Habitat Quality and Productivity Program, which refers to an instrument of the Federal Government to fulfill the commitments entered into by Brazil at the signing of the Istanbul Conference (Habitat Conference II/1996). Its goal is to organize the construction sector around two main issues: improving habitat quality and modernizing production.

The interviews followed the assumptions of Merriam (2009), with open, flexible and exploratory questions, using exploratory conversion techniques. Field notes and observation were also collected.

The criterion of selection of interviewees followed the relevance of the actor in the process of decision-making in eco-innovations of the company and the innovation system. The selection also considered professionals from the different areas of the construction of this case study, as well as actors from the construction sector, including regulatory, regulatory and innovation startup institutions, as shown in Table 1:

TABLE 1

LIST OF INTERVIEWEES

Interviewee Code	Position
E01	Coordinator of new products of the company
E02	Director of the company I
E03	Safety technician
E04	Construction Engineer
E05	Construction coordinator I
E06	Project Manager
E07	Technical Director of the union
E08	Director of the company II
E09	Marketing manager
E10	Construction coordinator II
E11	Owner of a startup

SOURCE: THE AUTHORS

Secondary data involved sector reports, data from regulatory and regulatory institutions such as Brazilian Chamber of Construction Industry (CBIC) and Union of Civil Construction Industry in the State of Paraná (SINDUSCON-PR), as well as the survey of public policies disclosed and served in the media.

The interviews and field notes, recorded by the observation technique, were transcribed and analyzed with the support of the Atlas TI Software, version 7. We used narrative analysis and thematic categorical analysis to highlight the meanings associated with the theme, especially the interpretation of narrative. We used narrative analysis, which according to Kuabara, Rese e Villar(2015) occurs from five fundamental points, which guided this research: the temporal sequence; the focal actors; the identifiable narrative voice; the reference standards for evaluation; as well as indicators of content and context. In the next section we will present the results.

MAIN FINDINGS AND DISCUSSION

The Civil Construction Sector and Case Presentation

In 2014, construction companies carried out construction, works and services worth approximately 382 billion reais (PAIC, 2014), with a 6.2% share of the Brazilian GDP. By including construction material production, a sector denominated construbusiness, the sector accounted for about 11.3% of Brazil's GDP in the same year, according to Bradesco Department of Economic Research and Studies (DEPEC). The civil construction and infrastructure industry was marked in the last ten years by periods of strong growth, especially since 2010, when there was a boom in the sector.

The productive chain of civil construction has a new agenda to be fulfilled, based on a less exploratory and, consequently, more sustainable practice. Climate change and the scarcity of natural resources require new forms of business and political organization. The model to be sought by the sector involves human development, technological innovation and the balanced use and reuse of available resources as well as recycling. Such a transformation requires changes in terms of regulation, market, pricing of products and inputs, changes that will become a reality when we begin to face the challenges of the production chain of construction no longer under a logic of costs, but of opportunities.

CBIC launched the Sustainable Construction Program in 2009, considering a level of maturity of the civil construction production chain for the theme and aiming to promote harmonious, responsible and integrated development. The program foresees an agenda, with proposals and actions for issues considered critical and, therefore, priority, which are presented as objectives of the Sustainable Construction Program. These objectives guide the implementation of the Sustainable Construction Program, involving the various actors that are in the three levels of the multilevel perspective. In the technological niche, the productive chain; in the sociotechnical regime, the regulatory institutions; and in the sociotechnical landscape, the productive chain and the regulatory agencies stabilize in the context, drawing a reality.

This case study involves a traditional construction company from the city of Curitiba, located in the south of Brazil. The company has 21 years of history and has positioned itself in the market as a company of reference in sustainable constructions in the sector of buildings. The company is part of a family group, with a robust presence in the southern region of Brazil. The family has been working for over a hundred years in areas of food, real estate (construction and incorporation), investment and commercial real estate administration. Currently, the family business involves incorporation, construction, logistics, hotels and infrastructure.

The builder's portfolio includes high-standard office buildings and retail properties, very well located and located, for the most part, in Curitiba. The company also works with custom

designs through built to suit[2] leasing. According to the marketing manager of the construction company, the company is guided by social and environmental responsibility, becoming one of the companies with the largest number of Green Building seals in Brazil.
Today it is considered a sustainable company, according to several communication vehicles and certification bodies, among them the Green Building Council (GBC). In Brazil, only four projects have LEED Platinum certification for commercial spaces, but with lower scores than that achieved by the construction company in Building 2820. The interviewee E09 believes that this performance in sustainable innovations is related to the way the company thinks, according to with its organizational DNA, which can be perceived by mission, vision and values.
In the next section we present an analysis of the points of intersection between the social practice theory approach and the multilevel perspective in order to identify elements of the transition to sustainability.

SPT and MLP Intersections and the Transition to Sustainability

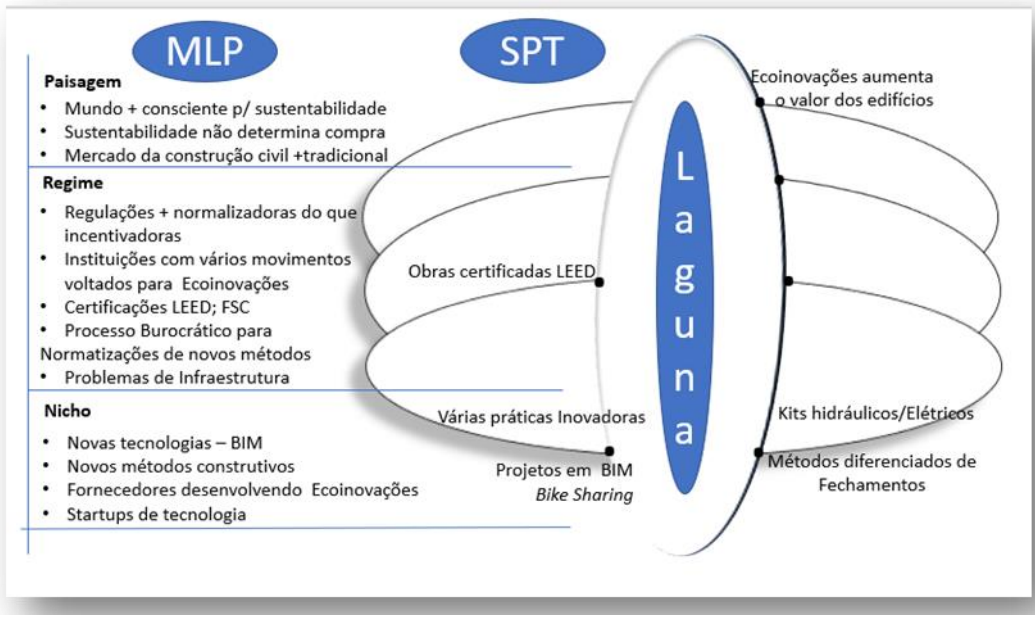
We analyzed the multilevel perspective to understand how the practices are developed in the technological niche, in the sociotechnical regime and in the sociotechnical landscape. The objective is not to analyze the change between levels, but rather the actions, facts, objects, artifacts, norms, regulations and forms of reality in relation to the practices that take place at those levels, as well as possible assimilations and transformations of the practices that impact the system.
We aimed to analyze how eco-innovations develop in the civil construction sector, a movement that has a strong connection with the transition to sustainability. Some theories have been used, among them SPT and Sociotechnical Transition with the MLP, which are defended by a range of researchers. Both the MLP and SPT theories regarding the transition to sustainability recognize the contemporary environmental and sustainability challenges that require fundamental system changes. Both theories acknowledge that transition processes involve multiple actors and follow nonlinear, coevolutionary and emergent trajectories (Hargreaves, Haxeltine, Longhurst, & Seyfang, 2011).
We sought to respect the proposals of each ontology and, according to Shove (2005), the MLP is concerned with transitions in the regimes and the SPT concerned with transitions in the practices. Allied to Watson's (2012) understanding that the sociocentric transition can also be understood as a transition from a system of practices, a flat ontology was respected. It is a fact that when looking at both ontologies it is important to find points of contact that boost

[2] "Built to suit" involve constructions that have real estate for commercial purposes. It is a contractual modality that originates in the United States (Harada, 2016).

or retain the transition to sustainability. In this sense, Shove (2003) used a matrix of intersections, which inspired this study to create a similar proposal regarding the multilevel perspective of the civil construction sector, in relation to theories of social practices in the company focus of the case study, as follows (see Figure 2).

FIGURE 2

INTERSECTION MATRIX SECTOR OF CIVIL CONSTRUCTION X CONSTRUCTION



SOURCE: THE AUTHORS.

When analyzing the intersection matrix we can see some relevant intersections to the transition. In the Innovations Niche there are many innovations happening in the industry, new technologies launched like BIM-Building Information Modeling, a 3D modeling that promotes greater assertiveness in the projects of buildings and allows several simulations to be done. This technology connects with a system of practices of the construction company, in which BIM was incorporated into the day-to-day of the projects and in the implementation in new works. In the interview and field observation this intersection was confirmed from the professional relationship with this practice, because all the computers in the technical area of the company have the BIM software installed. In addition, the professionals of the area highlighted the strong relationship of their professional practice with the use of technology.

This result confirms the relationship of humans and non-humans functioning in perfect balance and in a complementary way. According to Santos and Silveira (2015), practices involve multiple actions carried out by one or more people in certain (one or more) "scenarios" where, in addition to other "human beings", there are also material entities (non-human

actors). The intersection between MLP and SPT can give impetus to sustainability transitions as this eco-innovation begins to be used by a number of actors and other industry builders who will copy a leading company as the building block of the case study.

At the Niche level, another relevant intersection involves the movement of suppliers to develop eco-innovations precisely with the construction company acting with several innovative practices and open to eco-innovation. The fact of having suppliers walking in this direction gives to the construction company alternatives to implement new projects and, from these projects, to insert new sustainable practices. One example involves energy control, which requires multiple tests and glasses of various colors and thicknesses. Another example is the practices that seek a dry work: for this it was necessary to find at the niche level suppliers willing to develop new products and practices aimed at this purpose, such as modular concrete and hydraulic kits.

Such intersections also stimulate the transition to sustainability. In the LEED 2820 business building, the company's focus was on product/service eco-innovation. This is the parking for bikes and the creation of the service "Bike Sharing", which is the sharing of bikes to transit through the region, aiming at urban mobility. This eco-innovation was motivated from creating a means of healthy locomotion, helping reduce pollution of the environment and promoting the formation of ecological awareness of building professionals. Bicycles are always available, as well as a changing room with a shower. This was a pioneering initiative in the city and later copied by competitors.

In 2015, when this practice was launched, there was some adherence according to the available means of communication. However, this study did not identify this practice, and none of the interviewees mentioned it. In questioning the interviewee E01, she says she did not use and did not see anyone using the bike rack in the condominium. One of the probable reasons for the low adhesion to this practice of the bicycles is in the confrontation of this eco-innovation of niche with the regime. The infrastructure of the city of Curitiba is not fully adequate for bicycle trips, with cars being prioritized in urban mobility. In the region where the building was built there are few streets with bike paths for such transportation. In addition, the city of Curitiba has a colder climate, which may also inhibit this practice. We conclude that this was an intersection that did not contribute to the sustainable transition.

At the regime level, certification moves towards sustainable building practices, including the Leadership in Energy and Environmental Design (LEED) certification, are applied to practically every construction site. This practice demonstrates an intersection that drives the transition to sustainability because it is consolidated in the construction sector. Having a LEED certification means developing a series of new eco-innovation practices interlinked in works and projects. Hargreaves et al., (2011) argues that interlinked practices are grouped into a system of practices, which fit into all dimensions of Carrilo-Hermosilla et al., (2009).

On the other hand, the bureaucratic process to standardize new methods and regulation that is more normative rather than incentive can inhibit or delay the innovative practices of the analyzed company and also the sector. At the level of the regime little is motivated and moved. On the contrary, the excess of regulations that aim at the quality and safety of the works slow innovation, which highlights a point of intersection in which the builders who seek to innovate are submitted a long way. As reported by the interviewee E07, Technical Director of SINDUSCON: "Imagine, I have to have 500 standards in my head to be able to build".

Still at the regime level, the user/client mental model makes it sensitive to sustainability, but it is not a sufficient factor to determine purchase. As reported by the interviewees E02; E06; E08; E10: working with eco-innovations requires high investments, which is passed on to the price of the property. We conclude that this is an intersection that can create another barrier in the transition to sustainability.

However, practices of institutions such as CBIC with the Sustainable Program, SINDUSCON working on the approval of several norms, among others allied to a sustainability-sensitive landscape and a niche with several eco-innovations happening, can generate a pressure on the regime and open windows of opportunity, according to Geels (2010).

CONCLUSIONS AND RECOMMENDATIONS

As previously discussed in this research, the world undergoes major transformations, such as the era of technology, information, production and accelerated consumption. This context is favorable to the economy, but delicate for the sustainability of the planet. In this scenario, many sectors begin to re-evaluate their processes and rethink their practices, seeking a more balanced and sustainable world from the point of view of production and consumption.

Reassessing paths, seeking to do something different, and changing have a direct connection to innovation. This research was built on a perspective of innovations that improve environmental performance as suggested by Carrilo-Hermosilla et al. (2009) that are based on developing sustainable and economically strategic innovations for organizations and for society, called eco-innovation.

The empirical locus was delineated from a sector of great relevance for the economy, but largely consuming natural resources and generating waste, which is the construction sector. From a case study, we sought to understand technically and socially, how to develop eco-innovative practices, using the Socio-technical theory in the multilevel perspective and the Social Practice theory. Both theories have been widely used in studies that seek to understand the transition to sustainability.

There are many understandings by the authors in the application of these perspectives. According to Hölsgens (2016, p.1) "...both approaches are promising: the multilevel perspective because it helps understand how innovations can grow from a small niche and the mainstream; social innovation because sustainable innovations often take the form of a different social practice". This is a theme that generates many debates in the academy. In a complementary way, Geels (2011) attempted to link the two theories, suggesting that the difference between MLP levels refers only to degrees of structuration and stability and that as such the vertical notion of a nested hierarchy could perhaps be abandoned. Smith et al. (2010) made an integration, arguing that the Theory of Social Practice recognizes different degrees of stability within practices, therefore has a "vertical" dimension.

Regarding this ontological discussion, Hargreaves et al. (2012) believe that, for the evolution of these theories, the discussion is healthy, but, on the other hand, there is a risk of devaluing the distinct contributions made by each theory. The fact is that there is a fundamental question among them since they approach different units of analysis. The MLP analyzes the transitions in the regimes and the SPT seeks to apprehend the transitions in the practices. Shove (2003) argues that the important thing about using both ontologies is to be able to pool the benefits of each approach and therefore to understand meaningfully and broadly the sustainability transitions.

This study did not pretend to enter a theoretical discussion about both theories, but to use in a non-exhaustive way, what both ontologies have of better to understand the transition to the sustainability in the civil construction sector. From an interpretative analysis in a case study, we have sought in Shove (2003) and in his matrix of intersections between MLP and SPT, to understand the intersections and their contributions in relation to the transition to sustainability.

Thus, this study was based on the Shove Intersections matrix (Shove, 2003), with support in Hargreaves et al. (2012) with its lens focused on the intersection of practices in the regime. The results found new points of intersection, which were based on Watson (2012), who advocates the possibility of seeing practices building relationships in both the regime and the niche. These practices expand into interlocking clusters of diverse practices integrated into larger systems, so-called systems of practices. The survey found some answers and several questions as reported below.

When researching the socio-technical landscape, the civil construction sector in Brazil was less developed than countries of America, Europe and Asia, with more traditional practices. A scenario that begins to change in large centers such as São Paulo and Rio de Janeiro. Curitiba still has predominant characteristics of a traditional sector, with sustainable movements in the hand of few builders positioned to a high standard. It is worth mentioning that Curitiba is the greenest city in the country and Latin America, according to the Green

City Index report, conducted by Siemens with the Economist Intelligence Unit (Sumner, 2015).

The consumer real estate user/client that has access to works of high standard sympathizes with eco-innovation differentials but does not have them as determinant of purchase. The construction company, the focus of the case study, has positioned itself in the market as a reference in differentiated and high standard works, has offered to the market LEED certified works and with numerous sustainable innovations: eco-innovations. But many of these eco-innovations leverage the sale price. And here is a point of intersection between the MLP and the SPT: an innovative eco-friendly work presents a higher selling price to competitors. The consumer likes and admires the proposal but does not yet understand eco-innovation as a determinant of purchase. According to interviewee E08, the customer searches for location and price. As the construction company is already in its third work with these characteristics means that this restriction is not impeding its sustainable movement and assimilation of various eco-innovation practices.

But for this to become an activity of the company, a number of other practices were adopted and brought together in a system of practices advocated by Watson (2012). Practices that begin by creating differentiated ways of communicating the customer, by explaining the sustainable benefits, not only for the environment and for society, but the resulting benefits for the buyer, while saving light, water and improving the quality of life, with cleaner air. Practices of team training, e-book creation and online communication were adopted. We can see a transition to sustainability, which is very important in the engagement of the professionals involved in these practices. This is the root of Schatzki (2010) in teleoafetive issues, in which people assimilate practices because they believe in it and are motivated to do so.

When analyzing the regime in Curitiba, this study was faced with a highly regulated environment, which is important to guarantee quality and safeguard the interests of the various actors that are related in a constructive process, as expressed by the interviewee E07. These regulations are more focused on regulating the sector than on encouraging development and sustainability. Some motivating initiatives were found in associations, federations, unions and regulatory institutions in the sector, such as the Brazilian Chamber of Construction Industry CBIC - with the Sustainable Construction Program, SINDUSCON acting with several movements that focus on the sector's balance, with technology, innovation and sustainability areas.

The constructor focus of the case study has innovated in constructive practices, finishing and services, which intersects with the practices of the regime in the search for homologation of new methodologies. On the other hand, such approvals are usually bureaucratic, as well as the standardization of the sector as a whole which may limit the activity of the construction

company. Perhaps this explains why eco-innovation practices are no longer widely used in the city of Curitiba.

Some national public policies focused on energy efficiency and quality are highlighted, such as the PBQP-h with the Ministry of Cities that brings together the whole chain, which must be certified, following standards of quality works. Other incentive initiatives are taking place from institutions such as the Green Building Council-Brazil (GBC), which does all the LEED certification, an award for building contractors who adopt sustainable practices in their works. It is a practice of the level of the regime that is strengthened in the intersection with the practice of the construction company focus of the study, both to adopt the certification and to take to other works the practices developed by LEED certification guidance. The intersection of LEED certification with the practices of the company under review occurs at the regime level but impacts at the niche level where these initiatives enable innovations to fit the certification.

The civil construction niche, despite the more traditional landscape and more austere regime, presents several initiatives taking place and others emerging. Startups in the construction industry are starting to be structured, such as Campestri, which acts with technology and sustainability in new products and services for civil construction. The suppliers of the sector, many multinationals, have several products and eco-innovative components, and practices for their penetration in the market, such as TECVERDE, which has an innovative methodology in Brazil, the wood frame, construction method with planted woods of legal origin. The universities and research centers also encourage the development of eco-innovations through events such as the Madeira Symposium, a national event that took place in Curitiba at UTFPR and brought together various industry players, construction companies, suppliers and students and professionals in engineering and architecture.

Despite all these initiatives, it is at the niche level that eco-innovation practices, implemented by the company, are gaining strength towards sustainability. Some of them encountered barriers at the regime level, for example, the intersection between the practice of renting bicycles at 2820 Building, which is LEED certified and the infrastructure of Curitiba designed for cars. These intersections indicate why this action has not become a practice and presents insight into what can be done at the regime level to change. For example, thinking about new forms of urban mobility, providing for new bike paths and awareness-raising among the population.

The practices of innovation and sustainability in the company focus of the study are organized in a system of practices of eco innovation because each of them involves several activities, artifacts, and routines among several actors, within several practices bundles. According to Watson (2012), everything is gathered in internal or external systems, called systems of practices. These intersections found in the field research drive the company in the

transition to sustainability and in the use of several innovative eco practices, which have been assimilated and multiplied.

The systems organization has generated insights at the niche, regime, and landscape levels and has helped the company to organize itself into practices and thus strengthen itself in this direction. Even at the regime level there are several practices that strengthen at the intersection, as is the case with certifications. New certifications are being created such as NET ZERO, a certification that directs a work to 100% energy efficiency. The company focus of the study already signals that his next work has chances of being NET ZETO according to the interviewed E08.

This study found that the civil construction sector in Curitiba and region has been developing along the path of a transition to sustainability, driven by the eco-innovation practices of some actors, among them, the company analyzed. The company presents eco-innovative practices in all dimensions defended by Carrilo-Hermosilla et al. (2009), which are assimilated by practicing man in harmony with several artifacts made available by it. This relationship also generates the creation of new eco-innovation artifacts such as "Lava Rodas". We have found a system of eco-innovation practices in the construction company that generates a virtuous circle, impacting and being impacted by the sociotechnical system.

This study also contributed to advance a line of research that combines the approaches of MLP and SPT, in addition to demonstrating to the sector of Curitiba that eco-innovations are happening and are possible to be implemented. From the simplest practices, be they wetting the work by breaking up rubbish in order to not to raise dust in order to maintain air quality, be they the most complex ones, as to promote energy efficiency.

As a recommendation for future research, we emphasize the importance of expanding the object of study, entering the popular works sector. According to the interviewee E07, the large housing deficit is in the lowest income sector, in which eco innovations are not a reality. We also recommend the deepening of the understanding of industrialized construction that appeared in the speech of eight of the 11 interviewees. One of the interviewees points to industrialized construction as a possibility to change an entire system at the level of disruptive innovation.

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