From Barriers to Enablers: The Role of Organizational Learning in Transitioning SMEs into the Circular Economy

Preprint · December 2020

DOI: 10.20944/preprints202012.0800.v1

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Article

From barriers to enablers: The role of organizational learning in transitioning SMEs into the Circular economy

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Abstract: To contribute to small and medium enterprises (SMEs) sustainable transition into the circular economy, the study proposes the activation of organizational learning (OL) processes – denoted here as multi-level knowledge creation, transfer, and retention processes – as a key phase in introducing circular business models (CBMs) at SME and supply chain (SC) level. The research employs a mixed-method approach, using the focus group methodology to identify contextual elements impacting on CBM-related OL processes, and a survey-based evaluation to single out the most frequently used OL processes inside Italian construction SMEs. As main result, a CBM-oriented OL multi-level model offers a fine-grained understanding of contextual elements acting mutually as barriers and drivers for OL processes, as possible OL dynamics among them. The multi-level culture construct – composed of external stakeholders', SC stakeholders', and organizational culture – identify the key element to activate CBM-oriented OL processes. Main implications are related to the identification of cultural, structural, regulatory, and process contextual elements across the external, SC, and organizational levels, and their interrelation with applicable intraorganizational and interorganizational learning processes. The proposed model would contribute to an improved implementation of transitioning into the circular economy utilizing sustainable business models in the construction SMEs.

Keywords: organizational learning; circular economy; small and medium enterprises (SMEs); business model; supply chain; construction; Italy; barrier and enabler

1. Introduction

Organizational sustainability is a multifaceted concept that "implies a simultaneous focus on economic, social, and environmental performance" [1] (p. 21) of organizations [2] to create value consistent with the long-term preservation and enhancement of financial, environmental, social and human capital [3] (p. 39).

Sustainable organizations should balance this triple bottom line [4,5] across all the relevant activities at both intraorganizational and interorganizational level. In fact, several studies focus on organizational sustainability in relation to internal management – i.e. to corporate social responsibility (CSR) strategy, as a way to contribute to "brand,

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image, reputation, cost reduction, risk management and access to capital" [3] (p.41), - as well as to the supply chain (SC) management – for example, with the analysis of environmentally sustainable practices such as green logistics [6] and green product design [7], - as to relationship management towards external stakeholders, oriented to meeting their expectations [8].

A recently proposed practical application of sustainability-oriented development is identified within the circular economy (CE) approach [9,10], which gives a specific focus on sustainability as the reduction, reuse, recycle, and recovery of materials and waste along supply chains [11] as opposed to the linear economy. As in the general sustainable approach, CE envisions environmental, social and economic benefits [12] at organizational, interorganizational and external level, such as resource optimization and minimization of waste and emissions, supply chain and logistics efficiency, and social development [13].

Organizations might become sustainable by implementing circular business models (CBMs), however a limited understanding of the related definitions, practical applications, and evaluation tools is quite evident from the literature [14-18], thus prospecting a difficult application of CBMs at the intraorganizational and interorganizational level.

Accordingly, we propose that organizations, and particularly SMEs, need to activate organizational learning (OL) processes [19,20] with a specific orientation towards CE to fruitfully implement CBMs. OL processes should encourage organizational sustainability supporting the CE transition from context-specific barriers to the related enablers with the activation of knowledge dynamics among key actors at intraorganizational and interorganizational levels. Thus, intraorganizational and interorganizational learning activities appear to be essential for two main objectives: first, to overcome specific CBM-related barriers that might hinder their implementation; second, to detect and capitalize on CE-oriented enablers in specific contexts for the practical application of CBMs.

Considering the importance of SMEs in the European (EU) landscape [21], and the peculiar characteristics that influence the related learning processes [22] and CE application [23], the study focuses on this type of organizations, specifically in the context of SC management. In addition, we concentrate on the construction sector, in order to offer an in-depth analysis of a specific industry which has a major impact on the environment [24]– thus a prominent need to perform a transition towards sustainability-oriented activities [25] – inside an advanced country in terms on CE application: Italy [26]. In particular, the Italian construction sector shows a significant number of SMEs, which represented 95.3% of all firms in 2018 [27].

In sum, the paper offers multiple contributions. First, the study offers an original theoretical perspective in the analysis of CE which is based on OL theory, as we propose learning processes to represent the key step in CBM implementation in a specific context; second, the analysis singles out a set of contextual elements that might act as barriers and drivers for CBM-oriented OL processes in a particular industry; third, the paper points out the role of OL processes in supporting CBM use with the development of a CE-oriented OL-model, offering an enhanced understanding of the interrelation among contextual elements and OL processes, and possible CBM-oriented OL dynamics; and, finally, it identifies a set of OL processes that could be activated by SME

 doi:10.20944/preprints202012.0800.v1

managers to prospect a simplified intraorganizational and interorganizational implementation of CBMs in specific contexts.

2. Theoretical background

The OL theory encompasses different theoretical approaches that focus on the understanding of the learning phenomenon, moving across the individual, group, organizational [28] and interorganizational levels [29]. Actually, a consensus on what learning is and how it occurs is not at present reached [30,31] and a shared multilevel theory is still missing [32], even though the multilevel nature of the phenomena is a common knowledge [33].

Here, we conceive OL as a set of knowledge creation (KC), transfer (KT), and retention (KR) processes [19,20] that enable learning across the different OL levels. In this conceptualization, learning processes encompass interrelated cognitive and behavioral changes in individuals [34] and might be institutionalized through "non-human repositories such as routines, systems, structures, culture, and strategy" [35] (p.154) at the organizational level. Going beyond the organizational boundaries, learning might also occur among different organizations through several interorganizational configurations, such as alliances and networks [36-38] that provide contexts for interaction. This conceptualization capitalizes on the alignment to knowledge management (KM) theory [35] – in particular with the organic view of KM which "emphasizes the role of people, group dynamics, social and cultural factors, and networks" [35] (p.156) – to complement the understanding of the processes and instruments through which knowledge is created, transferred, and retained to create value [39]. Recent publications have identified taxonomies of KM practices related to SMEs that are aligned to the abovementioned OL processes (KC, KT, and KR processes) [40-42], confirming the fruitful union of the two research fields for the enquiry as discussed in this paper.

Moving to the concept of CE-oriented – thus, sustainable – business models, CBMs are defined in this study as the way companies "create, capture, and deliver value with the value creation logic designed to improve resource efficiency through contributing to extending the useful life of products and parts (…) and closing material loops" [16] (p. 12) in collaboration with related SC actors. In particular, CBMs suggests to adopt circularity along two major dimensions at the same time: firstly, in the "customer value proposition & interface", that identify the organizational-level product or service designed to deliver value to stakeholders in a circular approach, also through the internal activities; secondly, in the "value network", that identify the activities and structures developed among the organization and related SC actors oriented to collaboratively contribute to the "closure of the loop" at a SC level [43].

Several types of CBMs are presently discussed among scholar [14, 18] also in specific relation to sustainable business models [44], however a univocal understanding is not actually available [10,16] and a limited number of frameworks are at disposal for CE practical application and evaluation [17, 45]. In this context, organizations on the one hand, need to identify, adapt and implement industry-specific CBMs (with an unclear academic's and/or consultants' guidance), and, on the other hand, are asked to face the intraorganizational and interorganizational barriers that could be encountered in relation to CE in the process [46], especially small and medium enterprises (SMEs) [23]. In

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addition, SMEs should identify and exploit contextual elements that might encourage specific CBM implementation at both intraorganizational and interorganizational level [47] to prospect a more successful outcome and, thus, to reach organizational sustainability.

Under this conceptualization, the role of OL processes inside SMEs for the implementation of CBMs is highlighted while addressing the main contributions of OL literature in relation to KC, KT, and KR processes at the intraorganizational and interorganizational levels. The three processes are not linearly sequential, but are commonly assumed to be interrelated in a dynamic manner [48]; in addition, the three processes might be overlapping and thus conceptually included under different definitions according to the theoretical perspective used. However, for the clarity of exposition of the theoretical background of this study, and using the conceptualizations offered in relevant previous OL studies, three separated clusters of KC, KT and KR are presented in the analysis.

Starting from knowledge creation (KC) processes, some studies emphasize the relevance of OL activities oriented to create new knowledge inside SMEs both from external sources as well as internally. As for the external sources, benchmarking activities among competitors [40-42], the use of consultants [49,50] and of professional service firms (or PSF, [51]) identify possible KC activities as stimulators to create specific knowledge through an indirect contact with external competitors and partners. For the intraorganizational sources, internal brainstorming [52], simulations [53-54], job rotation [55], and learning-by-doing activities [56] are commonly used to generate ideas, to frame proposals, and to explain internal processes. In relation to CE and CBM application, the creation of context-specific knowledge regarding those concepts appears to be essential, especially in relation to the complexity related to the construction sector [57], and to the intraorganizational and interorganizational challenges that CBMs demand.

After the creation of CE and CBM-related knowledge, the adaptation of CBMs to the organizational context and the related value chain is required to practically apply the chosen models. This phase requests dynamic confrontations among internal and external organizational actors, thus for KT processes. Several configurations of organizational groups might contribute to individual, team-level, organizational and interorganizational learning processes to occur. In particular, the community of practice (CoP) [58-60] might stimulate KT, as it represents a groups of people characterized by trust and common identity, who share concerns and problems, and who deepen their knowledge by interacting on a regular basis. This community might be found also in virtual configurations (i.e. "virtual" CoP, or VCoP) [61], and sometimes appears to be aligned – but not limited – to formal working groups [28] and project teams [62], which represent other contexts for KT. A recent contribution from Nicolletti et al. [31] underlines the importance of CoPs in the intraorganizational understanding in the context of sustainability and climate concepts, impacts and adaptation actions, thus envisage a beneficial effect also in the CE-oriented transition. Especially in the construction industry, CoPs, and single and multi-project teams are particularly important; in fact, the typical construction organizations' project-based structure asks for recurrent confrontations among workers, physicians, architects and sub-contractors through verbal interactions and interpretation of formal documents and instructions for specific projects development [63]. As additional KT activities, such as

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coaching and training [64], focus group [40-42], seminar and meeting [65] are widely used to spread specific knowledge across organizational actors, both within and beyond organizational boundaries.

In addition, specific KT process take place in more or less structured interorganizational contexts, where partners gain benefits from the exploitation of complementary competences, shared resources, and supplementary structures. In this orientation, the concept of interorganizational CoPs is particularly relevant as it includes several configurations, such as "interorganizational consortia, relationships with universities, professional associations, and learning networks of firms that collaborate on shared problems (..)" as the "ideal vehicles for realizing the knowledge potential that exists across firms" [59] (p. 223). Following Wenger [59], also other studies have focused on the professional association context as a possible configuration of a CoP [66], shedding light of the potential role of this interorganizational setting for learning scopes. Specific interorganizational learning processes are at disposal for organizations to evolve into a sustainable and CE approach, such as alliances and networks [67]; in addition, those interorganizational solutions appear to be specifically useful to minimize the structural limitations of SMEs as they might offer resource and structure sharing [68]. Other networking solutions for organizations are represented by the participation in research projects carried out by universities or research centers [69] or activated by partner firms [70] which could be related to the development of OL processes focused on specific industrial applications.

As last OL process, KR identifies those processes oriented to preserve and reuse knowledge at an organizational level, through specific processes that move across the OL levels, from the individual to the interorganizational level. In relation to CBM implementation, KR processes appear to have a double valence; in fact, organizational knowledge and process mapping [40-42] and social network analysis [71] could be useful in the identification and development of specific circular solutions in specific context, through the analysis of the internal and external organizational knowledge, processes and relations as a starting point. In this context, also problem-solving [72] and the use of lesson learned from the past (or LL, [54]), and internal and external best practices (or BP, [73]) would contribute to guide the definition of the most sustainable CE-oriented solution.

In sum, the above-mentioned OL processes could be activated in the context of CBM implementation, to envision CE-oriented knowledge creation, transfer, and retention processes among actors within and beyond organizational boundaries. Although those processes appear to positively impact the routine organizational activity, they gain more importance in the context of CBM introduction, as they could require disruptive changes in the interorganizational and interorganizational activities of a firm. In addition, the presently unclear scientific guidance in relation to the definition of CBM and evaluation frameworks, and the lack of practical best practices in relation to some industries – such as the construction sector – make the role of OL processes more relevant in CE application than in other contexts. In this sense, both intraorganizational and interorganizational processes might be envisioned to fully create, capture, and deliver value [16] to direct stakeholders and towards the value networks [43].

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Proposition 1: OL processes – denoted here as knowledge creation, transfer, and retention processes – need to be activated by SME managers as a preliminary step in view of CBM implementation, to understand how to create, capture, and deliver value at intraorganizational and interorganizational level under a CE approach.

Confirming the role of OL processes, specifically the intraorganizational and interorganizational learning processes (drawing on the academic OL literature [19, 20, 25, 37]), one of the objectives of the present study refers to the identification of the mostly used OL processes related to a specific context of analysis, which is the Italian construction sector. This research focus aims at identifying those OL processes that could be easily activated inside construction SMEs to sustain the CE-oriented transition. Considering the resistance of construction firms to innovation and organizational changes [74, 75], the activation of known learning processes would envision a more acceptable way to implement CBMs in this traditional sector. In addition, the analysis of CBM-oriented OL processes inside SMEs identifies a still uncovered gap in the literature in relation to CE and CBM application [18, 76]. As such, we propose RQ1 as follows:

RQ1: Which specific OL processes are mostly used – thus, could be easily activated for CBM implementation – by the Italian construction SMEs?

In addition, the understanding of the relative actual occurrence of KC, KT, KR processes could be useful for the construction's SMEs. It seems that the SMEs usually focus on verbal confrontations (KT) and learning-by-doing activities (KC) "through embodies interactions (..) rather than various forms of decoded and written forms (KR) and computer-mediated learning" [63] (p.83). In this sense, RQ2 specifically analyze this aspect, comparing the three clusters of KC, KR and KT processes in the Italian construction SMEs.

RQ2: Which OL processes are comparatively used more – among KC, KT and KR processes – by the Italian construction SMEs?

As last specific focus for the quantitative analysis, the relative evaluation of intraorganizational and interorganizational learning processes would complete the understanding of the customary attention to OL processes implemented within the organizational boundaries, and those developed in collaboration with external partners. This aspect is particularly important in the context of CE, considering that CBM implementation requires the joined actions of SC actors in order to fully convey the expected environmental, economic, and social outcome [9, 14, 74, 77]. Therefore, RQ3 comparatively confront intraorganizational and interorganizational learning processes utilization inside Italian construction SMEs.

RQ3: Which OL processes are comparatively used more – among intraorganizational and interorganizational learning processes – by the Italian construction SMEs?

The occurrence of the described processes, and the potentially-related organizational benefits, are related to the influence of specific OL

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contextual elements, such as the external environment, organizational features, and organizational culture [78] referred to the multiple levels involved in OL processes (e.g., 28, 33). Here, we build on seminal contributions on OL contextual elements [78] to propose specific factors that influence the occurrence of CBM-oriented OL processes, and thus the organizational sustainability inside SMEs: external environment, supply chain context, organizational features and a multi-level notion of culture. Some of the above-mentioned contextual elements are aligned to the barriers and drivers highlight from recent literature as influencing CE implementation and sustainable transition inside organizations [46, 68], and particularly SMEs (e.g., [23]).

In particular, following the OL and CE literature [23, 28, 45, 68, 78], we suggest that the proposed contextual elements might act at the same time as barriers and drivers for CBM-oriented OL processes; in this context, the activation of knowledge dynamics among organizational and external actors could contribute to transform the contextual elements acting as barriers into potential enablers for the organizational sustainability under a circular approach.

Starting from the Fiol and Lyles' external environment [78], this dimension generally influences on the activation of OL processes in relation to the pressure related to external stakeholders, such as customers, competitors, and institutional bodies [79]. Expanding this conceptualization, we propose to identify two different dimensions relatively to the environment in which a SME is inserted in: the general external environment, and the supply chain context. In fact, CBM implementation is not limited to the organizational-level application of CE principles, but it requires the engagement of SC stakeholders in the design, development and implementation of this type of sustainable business model [14]. Thus, in a CE-related study, it appears significant to analyze the supply chain context as a separated dimension deferential from the general external environment.

The external environment is here conceived as the macro-level environment composed of external stakeholders, ranging from institutional bodies to customers and competitors, that represents the dimension in which both supply chain and SMEs are embedded in. In the context of CBM implementation, the external environment gains importance as the stakeholders might ask for or refuse circular practices in relation to the level of diffusion of environmental culture and awareness in relation to CE [80], thus mutually acting as external driver or barriers. In addition, the external environment includes institutional pressure from national, regional and local regulatory bodies that might enable or constrain CE application at the supply chain and organizational level. This aspect is particularly relevant for SMEs and the construction sectors, as they are actually under the pressure of new environmental regulations at a EU level [57, 81], and at a national level (i.e. Italian regulation [82]).

Proposition 2: the external environment – composed of cultural and regulatory factors related to the included stakeholders – represents a contextual element that influence intraorganizational and interorganizational CBM-oriented OL processes occurrence both as a barrier and as a driver.

Although embedded in the external environment, we address here distinctly the supply chain context, here defined as "a network of

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connected and interdependent organizations mutually and co-operatively working together to control, manage and improve the flow of materials and information from suppliers to end users" [83] (p.4) as a separate dimension of contextual factors. The definition of this dimension is sustained by the need to collaboratively manage a sustainable-oriented supply chain, under a CE approach [84]. Specific components of this dimension might act as barriers and enablers of CBM implementation, such as the collaborative culture of SC actors that might be established among the different actors, that might envision or constrain the identification and development of shared CBMs and generally sustainability initiatives along specific supply chains [85]. Together with the collaborative culture, the lack or presence of collaboration structures (e.g., virtual interorganizational CoP, [59]) and interorganizational processes (e.g., interorganizational R&D projects, [70]) might hinder or facilitate the collaborative development of CE-oriented learning practices beyond the organizational boundaries, with a particular relevance for the construction sector [74].

Proposition 3: the supply chain context – composed of collaborative culture, structures, and processes among the supply chain stakeholders – represents a contextual element that influence intraorganizational and interorganizational CBM-oriented OL processes occurrence both as a barrier and as a driver.

At the organizational level, embedded in both the supply chain context and external environment, some specific element related to SMEs might mutually act as barriers and drivers in relation to CBM-oriented OL processes implementation. First, the organizational culture – which in SMEs might be aligned to the top-management culture, as it usually has a major impact in new business strategies and product development [86] – largely influence the hindrance or occurrence of specific OL processes, especially in relation to innovation processes [87], as it stimulates the overall organizational capacity of acquiring new knowledge [88], and of opening up the organization towards external collaborations [89]. Second, the availability of dedicated internal organizational structures influences the activation of OL processes, mainly in relation to of the scarce economic, IT resources and personnel [90] that could be allocated to OL-related activities. This aspect represents a typical SME limitation [91], with a specific relevance in CE-oriented innovation [23]. The importance of the organizational features is underlined also in the conceptualization of organizational resilience [92], which highlights how the resourcefulness of internal personnel and the redundancies of structures [93] are able to enable organizations to redesign SCs and adapt BMs to radical and disruptive situations. As third element, the available processes might positively or negatively influence the development of CBM-oriented OL processes, such as organizational routines and internal operations [94]. Especially in CBM implementation, the available internal processes might propose a more or less adaptability of the SME in a CE approach, thus influencing also the related OL processes.

Proposition 4: organizational features – i.e. organizational culture, structures, and processes among organizational actors – represent contextual elements that influence intraorganizational and

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interorganizational CBM-oriented OL processes occurrence both as a barrier and as a driver.

As last contextual element, a multi-level concept of culture [95] is presented to identify a critical element as in the OL process implementation [96, 97], as in CE-oriented transition [23], and as a precursor for organizational sustainability [98, 99]. In particular, the three sub-dimension of external stakeholder culture in the external environment, the collaborative culture in the supply chain context, and the organizational culture at a SME level compose the three levels of a transversal cultural element that can positively or negatively influence the occurrence of interorganizational and intraorganizational CBM-oriented OL processes.

Proposition 5: the multi-level notion of culture – composed of cultural elements embedded in the external environment, the supply chain context, and the SME dimensions – represents a transversal contextual element that influence intraorganizational and interorganizational CBM-oriented OL processes occurrence both as a barrier and as a driver.

Figure 1 reports the CE-oriented OL model composed of the interorganizational and intraorganizational CBM-oriented OL processes, together with the influence of the proposed contextual elements (i.e. external environment, supply chain, organizational features, and the multi-level cultural factor) and the related sub-element on the processes.

In the model, the OL processes take place in the organizational context – represented by the SME dimension – and in the interorganizational setting – here specifically identified in the SC level. The identification of interorganizational learning processes as confined to the SC dimension is strictly related to the high relevance of SC collaborative solutions in CBM implementation, as CE requires the inclusion of the value network in the creation, development, and delivery of value towards stakeholders [43]. Thus, for the scope of this study, the proposed model comprises only the interorganizational processes that take place at the SC level.

The interrelation among the interorganizational and intraorganizational processes is clarified from the arrows inserted in Figure 1. On the one hand, intraorganizational CBM-oriented OL processes might be activated independently from the SC context or, in a top-down logic, as a dynamic result of CBM-oriented OL processes among SC actors. On the other hand, the organizational-level CBM-oriented OL processes might stimulate related SC interorganizational CBM-oriented OL processes in a bottom-up direction. The same logic applies to the interorganizational level, and might envision the identification of multiple patterns of OL processes inside and across the two levels.

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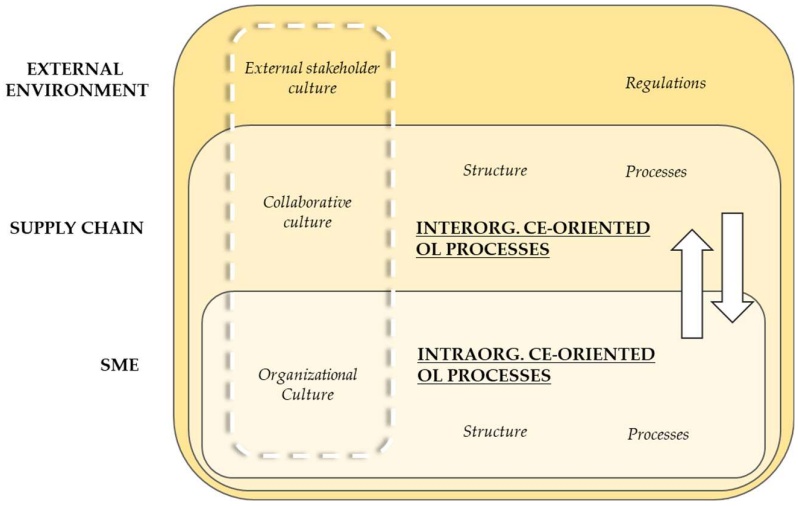

Figure 1. CBM-oriented OL processes and the related contextual elements

Source: Authors elaboration

3. Materials and Methods

To investigate the above-mentioned propositions and research questions, the study employs a mixed method approach, thus the collection, analysis, and integration of both qualitative and quantitative data [100] inside a wider intervention design oriented to propose OL processes aimed at implementing CBMs in the Italian construction sector.

Firstly, a qualitative analysis of industry-specific contextual elements in relation to CE-oriented OL processes implementation was carried out. Specifically, we performed the evaluation of a selected sample of SME managers from the identified sector, – construction, – inside a specific country, – Italy, – which holds one of the highest EU ranking positions in terms of CE implementation [26]. The use of a qualitative method is necessary to capture the detailed perception of contextual elements in a specific environment through the analysis of a specific sample – construction SME top managers – which is scarcely analyzed in relation to CE [77]. In addition, the identification of CE-related OL contextual elements requires a preliminary conceptualization of both CE and CBMs that is more concisely conveyed to the participants through a qualitative design. The top managers' evaluation is specifically required from the CE-related literature, as in SME they represent the essential link among the organizational and interorganizational level for reaching CBM goals [101].

In particular, the focus group methodology [102] was used to investigate the different perspectives on the topic and initiate in-depth conversations among informed participants [102, 104]. During the 2020 spring, four sessions, over two days, were arranged among four groups of six construction SME managers, to ensure an adequate discussion on the topic. The final sample of 24 managers was identified (following previous studies, [103, 104]), and balanced to ensure the representation of the whole national territory. The health emergency situation related to the COVID-19 pandemic influenced the planned data collection methodology, posing a relevant challenge over the research activity [105]. Nonetheless, the focus groups took place virtually on the Zoom

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platform, which allowed a fruitful video and audio interaction among the participants. One researcher was responsible to coordinate the sessions and moderate the discussion, while another researcher was responsible for providing technical support and managing time. Each session was conducted for approximately 90 minutes.

To gather the participants' perspective in relation to CBM-oriented OL contextual elements, the focus group discussion encompassed the evaluation of a list of CBM as proposed in the "BS 8001:2017 Framework for implementing the principles of the circular economy in organizations" [45] integrated with an additional CBM focused on the use of renewable energy [106], as proposed by earlier studies [43]. After the definition and presentation of each CBMs, the discussion focused on the possible implementation in the Italian construction sector, and the related OL processes and contextual elements that might support or hinder the application.

The full transcriptions of the sessions (i.e. primary data) were double-coded and interpreted by two researchers using the NVIVO 12 plus software. Informed by the logic of grounded theory [107], the primary data were in their original language (Italian) and then interpreted following a non-mechanical process [108] for in-context validation in terms of used terminology, words and expressions. The transcriptions have been analyzed to uncover deeper structures of meaning inspired by the research design oriented to simultaneously question theory and interpret data with the theory. Specifically, this interpretation process resulted in the identification of first-order concepts (Figure 2) in the light of the proposed OL and CE theoretical background. Subsequently, eight second-order themes were defined through the aggregation of the first-order concepts in wider structures of meanings, labelled in agreement between the two researchers. Finally, three overarching dimensions were identified by the grouping of second-order themes into main theoretical elements.

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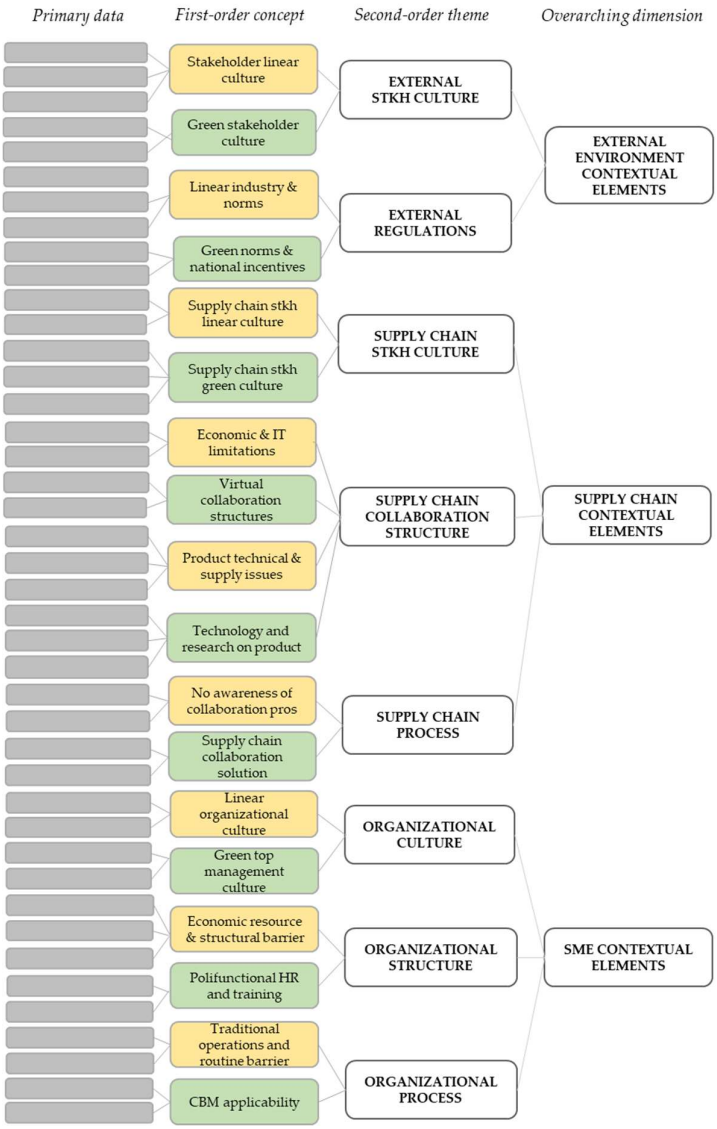

Figure 2. Qualitative data analysis.

Source: Authors elaboration. [In the boxes, STKH stands for "stakeholders"]

As second research method, a quantitative investigation of OL processes utilization at interorganizational and interorganizational level inside Italian construction SMEs was carried out through a close-ended survey administered on a national scale. The decision to use a quantitative method for the OL processes evaluation was related, first, to the need to draw conclusions from a larger numbers of participants in relation to KC, KT, and KM processes utilization, adapting from previous studies [70]. Second, OL processes are described using commonly-used terminology, thus prospecting significant results through quantitative methods due to the ease of communication. During April 2020, the survey was sent to 500 companies using the Italian building construction professional association (ANCE) territorial mailing list, selected to balance the coverage of northern, center, and southern Italy. The use of official ANCE channel was essential to guarantee a higher probability of managers' responses as from a known source. A final

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sample of 127 fully responded survey was used for the evaluation (25%), which represents a higher response rate in comparison with previous studies on SME managers (e.g., [109]).

The survey is composed by two main sections. The first part reports the questions related to the respondent and the represented SME, oriented to capture firm size, main organizational activities, area of activity, and the role covered by the respondent. Due to privacy restrictions related to the professional association internal rules, it was not allowed to ask for other personal information, such as age, gender, and firms' financial performance. The second section presents the questions on KC, KT, and KR processes utilization, evaluated by respondents using a 1-5 Likert scale. Table 1 and Table 2 specifically report the items included in the developed survey and the related references. The obtained results were analyzed through SPSS Statistics 20 and Excel 2016 software, in order to gather means and medians of OL processes frequency from the evaluated SME managers.

Table 1. Quantitative data analysis: OL processes evaluated and related references.

OL processes	Reference
Knowledge creation processes[1]	
Consultant	[49,50]
Professional Service Firms (PSF)	[51]
Simulation	[53, 54]
Job Rotation	[55]
Learning by doing	[56]
Brainstorming	[52]
Benchmarking	[40-42]
Knowledge transfer processes[1]	
Community of Practice (CoP)	[58-60]
Virtual community of practice (VCoP)	[61]
Coaching	[64]
Work Groups	[28]
Project Teams	[62, 63]
Meeting	[65]
Focus Groups	[40-42]
Seminars	[65]
Training	[64]
Participation in Alliance networks	[67]
Participation in Network partnerships	[67]
Participation in professional association	[66]
R&D project with universities/research centers	[69]
R&D project among Partner firms	[70]
Knowledge retention processes[1]	
Knowledge Mapping	[40-42]
Process Mapping	[40-42]
Problem Solving	[72]
Network Analysis	[71]
Best Practice (BP)	[73]
Lesson Learned (LL)	[54]

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[1] Respondents answered the question "How much does your organization use the following processes?" with a Likert scale from 1 (not at all) to 5 (intensively).

Source: Authors elaboration.

Table 2. Quantitative data analysis: respondent/company data.

Respondent/company data required	Possible answers
Firm size	Micro firm
	Small firm
	Medium firm
Main activity[1]	Building construction
	Street construction
	Services related to building
	Demolition
	Impiantistic service
	Waste management
	Building material commerce
	Other activities
Area of activity[1]	Northern Italy
	Center Italy
	South Italy
	Foreign countries
Respondent position	CEO
	Manager
	Board member

[1] Multiple answers possibly given to the question

Source: Authors elaboration.

The qualitative and quantitative data developed from the two research methods were used to contextualize and define the OL model proposed in the theoretical background in order to contribute to a comprehensive definition of CBM-oriented OL processes and contextual elements for the circular transition of Italian construction SME.

4. Results

4.1. Qualitative analysis

4.1.1. External environment contextual factors

From the qualitative analysis of the focus group discussions, out the main contextual elements related to CBM-oriented OL processes, three overarching dimensions were identified: external environment, supply chain, and the SME contextual elements. The three dimensions appear to be composed of cultural, structural and process elements, which might conjointly be interpreted as a barrier and as a driver for CBM-oriented OL processes.

The external environment dimension presents two main elements: the external stakeholders' culture, and the external legislation. In particular, external stakeholders – commissioners and customers – generally show resistance in relation to the use of CE products and processes in the construction sector, thus a more *linear* culture as opposed to circularity is expected [110]. Some specific stakeholder culture-related barriers are identified in the refuse of secondary material use (i.e. composed of a percentage of recycled material) for multiple reasons, such as the perception of a lower quality of the product, the related

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higher cost, and a greater trust in traditional products and procedures. About the processes, the stakeholder linear culture hinders the application of specific CBMs, such as the construction of modular buildings [110] or house renting solutions [106]. Contrarily to other countries, Italian customers appear to prefer tailor-made solutions and to consider traditional constructive techniques as more trustworthy.

'This kind of market [i.e., house renting solutions] in Italy is not only a utopia [but also] pure science-fiction. It would be impossible to sell it to the Italian people'. – Focus group 2, G., private building construction.

At the same time, some changes are highlighted in relation to customers' and commissioners' cultural approach towards CE. In fact, SME managers perceive an increasing sensibility towards bio-based materials and low energy buildings (i.e. with energy efficiency and renewable energy solutions, [111]), mainly as a consequence of the national incentives and the related application tools/processes that the Italian government has developed for building renovation activities. Thus, a growing cultural awareness toward the green aspects – here named as *green* stakeholder culture – related to products, building configurations and related processes might be interpreted as an enabler for CBM-oriented OL processes.

[National incentives] have a very important role, and the defining feature is to give [customers] the related tools. – Focus group 3, F., private building construction.

Regarding the Italian legislation, some contradictory norms hinder the use of specific types of secondary materials in construction operations. Generally, the use of recycled materials needs to be requested within the technical external documents linked to public tenders, with specific references to the precise characteristics of the required materials. Actually, a wide number of secondary materials are not included in the commissioners' technical external documents, thus hindering their use in the construction operations from those companies that work on commission. In addition, some advanced waste management solutions are recognized only by specific territories' regulations, thus discriminating firms to apply specific CBMs oriented to waste recycle [106]. All those aspects identify the current linear approach of some Italian regulations, which act as an external environment-related barrier to CBM-oriented OL processes. However, other regulatory aspects might be interpreted as drivers. In fact, as mentioned in relation to external stakeholders' culture, the Italian government has developed, on the one hand, green norms in relation to public procurements that force firms to use materials with a minimal percentage of recycled components [82, 112], and, on the other hand, national incentives for building energy efficiency operations, that require the use of green products [113]. Those aspects are able to boost an increasing transition of construction companies towards green products and CE practices among stakeholders, thus acting as an enabler for CBM-oriented OL processes.

4.1.2. Supply chain contextual factors

Transitioning to the second dimension, three elements compose the supply chain dimension: the SC stakeholder culture, the SC collaboration structures and the SC processes. As for the SC stakeholder culture, the discussions have highlighted the fundamental role of managers to develop CBM-oriented operations, and thus OL processes. In fact, SMEs' managers and external technicians generally refuse to apply CE collaborative solutions for the lack of understanding of CBMs, and of collaborative CBM benefits; and for a higher reliance on traditional solutions and routines. In addition, some regions show a strict individualistic approach of managers that hinders the development of collaborative solutions – such as machinery renting solutions – from a merely cultural point of view.

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'In Piedmont [a Northern Italy region], there is very little collaboration […] It is part of the companies' mindset […] You prefer to keep it [machinery] in the courtyard [rather] than renting it to your competitor'. – Focus group 4, M., public-private constructor, quarry extraction.

Nevertheless, SME managers perceive a growing interest in CE-oriented collaborative solutions at a SC level, due to an increasing number of positive examples and BPs related to CE-oriented networks in the Italian construction sector. In this sense, SME managers highlight a raising willingness to deepen the CE-related conceptualization and application through collaborative solutions, thus prospecting a wider interest in CBM-oriented OL processes development.

In this context, the main barrier for collaborative CBM-oriented OL processes is the affordability of their development, from an economic and practicality from the technical point of view. The lack of economic resources to be invested in innovation is a typical barrier related to SME, and to CE application inside SMEs [23]. Similarly, SME managers underlined in the focus group discussions that even the evaluation of CE-oriented collaborations would be blocked by the scarcity of economic resources to be dedicated to non-focal activities. In addition, a scarce interoperability of technical systems used inside construction SMEs appears to hinder SC collaboration on a practical level, thus leading firms to act independently from SC stakeholders.

At the same time, collaboration among construction stakeholders might contribute to lessening of the typical constrains related to SME, through resource synergies that could be activated among firms [114]. Thus, the availability of collaboration structures appears to be one of the essential enablers for SC collaboration. Some examples of available CBM-oriented Italian SC collaboration structures are the networks of suppliers that presents green certifications (e.g., LEED certification, [115]); national and private sharing platforms for CE products, services and stakeholder engagement (e.g., ICESP, the Italian circular economy stakeholder online platform, [116]); waste management and reuse platforms (e.g., the online platform, "Borsino rifiuti" for private, firms, associations and public entities, [117]).

Considering the general relevance of products in relation to SC operations, SME managers pointed out the importance of availability, certification and technical performance of products based on recycled components, that might contribute to the willingness to activate CBM-oriented OL processes. In fact, secondary materials with the adequate certifications and related technical evaluation are not available in the whole national territory, or present higher costs and minor performance than virgin materials; this aspect negatively contributes to the use of those materials in construction operations. However, the availability of advanced systems for recycling, and specific research activities of Italian universities and specialized centers on secondary materials development are contributing to enhance this aspect, thus envisioning a significant driver for the activation of CBM-oriented OL processes.

On a SC process level, the scarce awareness of the benefits related to a collaborative SC management appears to be the major barrier in relation to the activation of CBM-oriented OL processes. However, the promotion of available synergic processes – such as industrial symbiosis solutions [12] – might offer economic, technical, and competitive advantages to SC actors, stimulating the consideration of collaborative solutions at the SC level among actors.

'The first resistance I find in those colleagues we try to involve [in the collaboration] is "how much does it cost to me?" without really understanding the benefit […]. The involvement of other colleagues [in a network] is seriously very difficult. It is difficult for different reasons. First, economic [ones] […] the network operating cost'. – Focus group 3, F., scaffolding projecting and renting.

4.1.3. SME contextual factors

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The third overarching dimension – the SME contextual elements – identify the grouping of organizational culture, organizational structures and processes that negatively and positively influence the occurrence of CBM-oriented OL processes. In particular, as in the external environment and inside supply chains, also at the organizational level the cultural element is highlighted as a relevant factor for the activation of CBM-oriented OL processes, as already pointed out in the CE literature [46, 87]. In fact, a top-management linear culture - that generally shapes SME organizational culture [91] - might create an obstacle for the transition towards CE due to the managerial attitude to be conservative in relation to construction techniques and used materials, and the lack of understanding of the related benefits.

'Maybe it's a matter of knowing and not knowing because whoever has knowledge on how to manage a process with precise opportunities might think about [doing] it'. – Focus group 3, S., private building constructor.

In addition, internal employees appear to hinder the innovation of the internal operations and refuse, without an adequate stimulus from SME responsible persons and top managers. Thus in the CE transition, SME management culture might act both as a barrier and as a driver for the activation of those OL processes at intraorganizational level oriented to understand the most suitable CBM model and the related benefits. The organizational structures, as at the SC level, represent another main barrier to the activation of CE-oriented learning processes, identified in the limited availability of economic, HR, and structural point of view. However, the resourcefulness of SME personnel appears to be particularly relevant for the evaluation, development, and resilience of CE-related operations [93], thus acting as an organizational enabler. In fact, in construction, SMEs employees cover multiple strategic functions, and usually have internal and external training activities oriented to their competence development at disposal, thus contributing to the activation of OL processes.

As last sub-element, SME managers underline that some organizational processes related to traditional business models – such as commissioned work – practically hinder the perspective implementation of CBMs. In fact, construction SME are asked to strictly follow the technical external documents, and proposing the most economically convenient offer, which usually exclude a large use of green products to be competitive with other firms. However, the discussion highlighted that several CBMs proposed [45, 106] might be implemented inside construction SMEs even within the requirements induced from the technical external documents. In fact, some CBMs asks for dematerialization activities (e.g. the use of interorganizational virtual projecting, such as using Building Information Modelling software, [118]), or energy efficiency solutions (e.g. the use of green energy for internal operations; [106]) that are applicable at organizational level even within the constrains demanded from the commissioner. Thus, from the discussions the CE transition appears to require a feasible adaptation from traditional to innovative processes, while delivering an additional value to customers.

'[Virtual projecting] is very useful to make customers understand the space in which they would live, and the operations that are required, as to instruct them on how to use the building' – Focus group 4, N., technician.

4.2. Quantitative results

This section reports the results obtained from the analysis of the 127 usable surveys in relation to the utilization of KC, KT, and KR processes inside Italian construction SMEs. Table 3 summarize the data related to the represented company and the respondent. In particular, the survey mainly covered micro and small firms (with a cumulate percentage of 87%) rather than medium enterprises (13%), which correspond to the national statistics on construction firms [27]. In terms of main activities (a company may declare multiple activities), the major part of assessed managers represents building construction firms

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(80%), with the inclusion of street construction (28%), building services (19%) and demolition operations (18%). According to the research design, the survey was administered to construction managers in order to balance the representation firms working across the whole Italian territory. The final sample (a company may operate in multiple regions) shows results from SMEs with activities in the northern (63%), as in central (35%) and southern Italy (29%), and in foreign countries (4%). Finally, the position covered inside the SME is aligned to the qualification of top management (CEO, 43%; manager, 34%; board member, 25%), thus respecting the research design and methodology.

Table 3. Quantitative results: SME and respondent data.

Respondent/company data	Number of responses	% of responses on total respondents
Firm size		
Micro firm	51	40%
Small firm	60	47%
Medium firm	16	13%
Main activities		
Building construction	102	80%
Street construction	36	28%
Building services	24	19%
Demolition	23	18%
Plant engineering	20	16%
Other	10	8%
Waste management	6	5%
Building material commerce	5	4%
Area of activity		
Northern Italy	80	63%
Center Italy	44	35%
South Italy	37	29%
Foreign countries	5	4%
Respondent position		
CEO	55	43%
Manager	43	34%
Board member	32	25%
Total respondents	**127**	

Source: Authors elaboration.

Moving to the analysis of OL processes occurrence inside SMEs, the following sections reports the 1-5 Likert scale quantitative evaluations from SME managers on OL processes use. In particular, the descriptive analysis of the items was performed, showing mean, standard deviations, skewness and kurtosis (see Supplementary materials).

4.1.4. OL processes analysis: KC processes

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The results regarding KC processes (Figure 3) show the use of professional service firms (mean 3.86), learning by doing (mean 3.62), and consultants (mean 3.61) as the most used OL processes oriented to create new knowledge inside construction SMEs, followed by benchmarking (mean 3.27) and brainstorming activities (mean 3.20). Both simulation and job rotation processes report a mean inferior of 2.8, thus these processes are scarcely used in the analyzed context. Those results confirm the importance of the development of industry-specific knowledge, as via practical applications and attempts, as via external sources information acquisition.

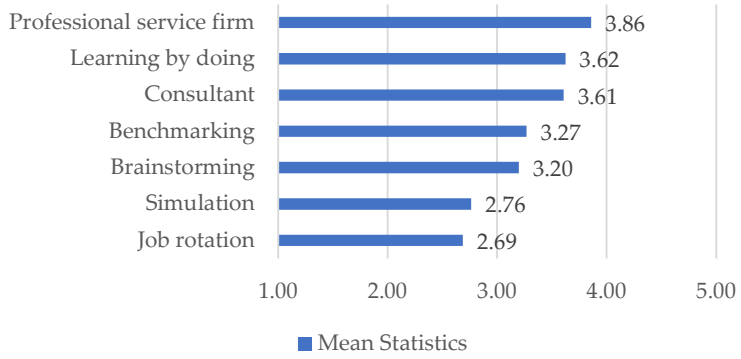

Figure 3. KC processes mean statistics.

Source: Authors elaboration

4.1.5. OL processes analysis: KT processes

The analysis of intraorganizational and interorganizational KT processes (Figures 4 and 5) show a relative higher relevance of internal processes, as the intraorganizational KT processes scored slightly higher than the interorganizational ones. However, the highest scores are related to training in both cluster (mean 3.05 for internal training, mean 3.20 for external training), confirming the importance of this specific KT process across the two levels.

Among the internal KT processes, the infrequent use of KT processes oriented to manage specialized knowledge (CoP, focus group, coaching, seminar and virtual CoP) highlights a minor importance of specialized learning processes among actors, hence promoting the discussion among the different technical figures that are required to the development of construction projects. In fact, the more frequent participation in meetings (mean 3.05), single-project teams (mean 2.94), working groups (mean 2.80) and multi-project teams (mean 2.62) underline the importance of the discussion among organizational actors inside construction SMEs, as already highlighted from the literature [63]. At the interorganizational level, a high evaluation is given to the participation in professional association activities (mean 2.83), alliances (mean 2.80) and network contract (mean 2.32), confirming previous studies on interorganizational learning processes [59, 67]. However, it is surprising that the collaboration with other partners, universities and research center for R&D project are rarely used for KT processes among construction SMEs.

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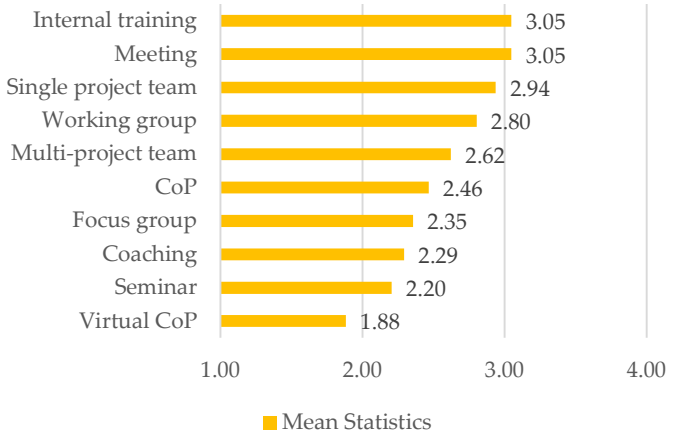

Figure 4. Intraorg KT processes mean statistics.

Source: Authors elaboration

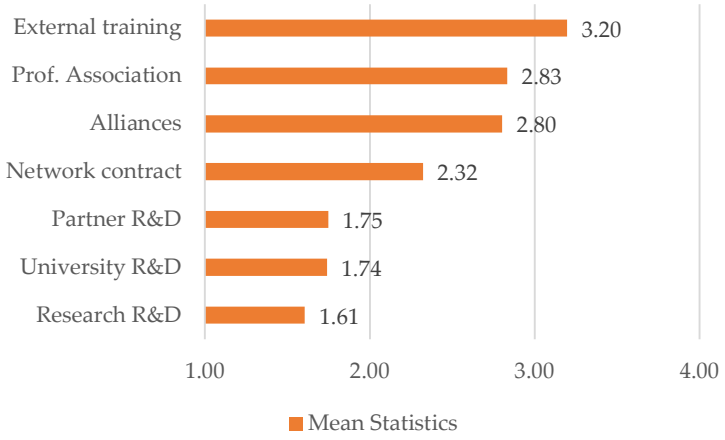

Figure 1 - Interorg. KT processes mean statistics .

Source: Authors elaboration

4.1.6. OL processes analysis: KR processes

The data analysis on KR processes (Figure 6) reports a relatively higher importance of lesson learned (mean 3.13), best practice (mean 3.08) and social network analysis (mean 3.03). This result is aligned as to specialized literature [119], and also to the other OL processes (see 4.2.1 and 4.2.2), as it highlights the importance of the practical application of construction activities and internal learning. Also problem-solving activities (mean 2.94) and knowledge mapping (mean 2.66) are KR processes used inside Italian construction SMEs, thus underlying a specific importance for the retention of organizational knowledge to carry on the normal activity.

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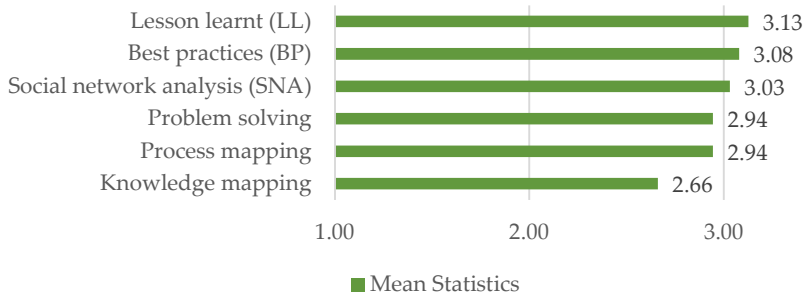

Figure 6. KR processes mean statistics.

Source: Authors elaboration

4.1.7. Comparative analysis of KC, KT, KR processes

In this section, a cumulative analysis of the KC, KT, KR processes evaluations is shown to propose comparative analysis of the resulted data. In particular, Figure 7 reports the mean statistics of the three OL processes moving from the processes with the highest evaluations to the lowest.

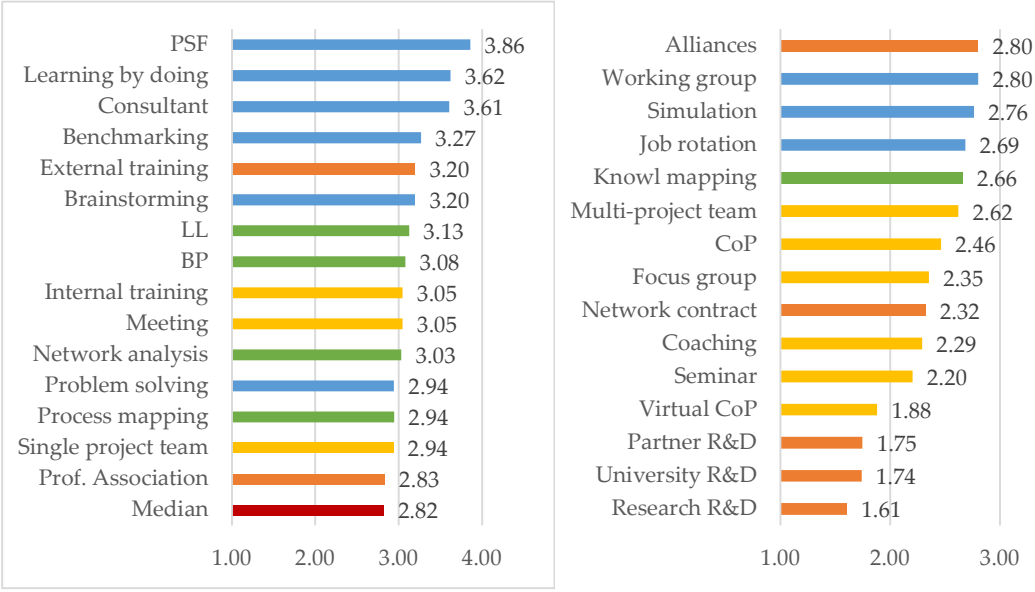

Figure 7. OL processes mean and median.

Colors refer to Figures 3,4,5,6 to highlight KC, KT, KR processes. Source: Authors elaboration

From the cumulative analysis of KC, KT, and KR processes mean values, it appears that KC processes are the mostly used in comparison with the other OL processes, covering the highest positions from professional service firm activities (mean 3.86) to brainstorming (mean 3.20), together with the external traning KT process (mean 3.20). In the following positions, the cumulative analysis shows KR processes (lesson learned, best practice, social network analysis and process mapping) together with some KT (internal training, meeting and single project team) and KC processes (problem-solving). On the opposite, KT processes at interorganizational level cover the lowest positions, in particular those related to the participation to R&D projects with partner firms.

 doi:10.20944/preprints202012.0800.v1

Considering the median value of the total OL processes evaluations (2.82; see Figure 7), the highest value of 3.86 reported by professional service firms, the above-the-median OL processes generally present a frequency of use which is close to the average value of 2,5 of the whole scale (Likert scale 1-5).

4.1.8. Comparative analysis of intraorganizational and interorganizational processes

As to the resolution to RQ3, we developed a comparative analysis of results related to two clusters of intraorganizational and interorganizational learning processes; some processes are included in both clusters, as possibly used as in the intraorganizatioanl context as across firms. In particular, Virtual CoPs and CoP can remain wihtin the organizational boundaries, or take place on virtual platforms or across firms, such as inside alliance and networks [59]. Also the analysis and collection of good practices might refer to the internal operations and routines of an SME, or refer to interorganizational contexts and actors [73]. The comparative analysis shows that both the mean and the median of intraorganizational learning processes (mean 2.89, and median 2.94; see supplementary materials) are higher than the interorganizational ones (mean 2.37, and median 2.39; see supplementary materials), thus underlying the importance of internal learning processes in this specific typology of SMEs as already highlighted from the qualitative analysis. In fact, the intraorganizational learning processes with the highest mean are PSF (mean 3.86), learning-by-doing (mean 3.62), consultants (mean 3.61), benchmarking and brainstorming activities (mean respectively 3.27 and 3.20), together with the use of lesson learned (mean 3.13), best practices (mean 3.08), internal traning and meetings (both mean 3.05), and network analysis (mean 3.03). At the interorganizational level, the highest scores are related to external traning (KT process with mean 3.20), and the use of best practices (KT process with mean 3.08), followed by the use of professional association activities (KT process with mean 2.83), the participation to alliances (KT process with mean 2.80), and the use of CoPs (KT process with mean 2.46). However, both the above-the-median OL processes generally present a frequency of use which is close to the average value of 2,5 of the whole scale (Likert scale 1-5). The tables reporting the two clusters, means, and medians are included in the supplementary materials.

5. Discussion

The qualitative and quantitative data analyses offer several insights on the role of learning processes and related contextual elements in the introduction of CE principles among construction SMEs. As first implication of the study, the presented results informed the development of a more refined theoretical model that proposes the interrelation among the identified CBM-oriented OL contextual elements and the actually employed OL processes within the Italian construction SMEs. In particular, the three overarching dimensions (external environment, supply chain, and SME) identify three progressively embedded clusters of contextual elements, and are composed by the sub-factors identified through the qualitative analysis (culture, regulation, structure, process). The second-order themes are arranged according to the sub-elements of the overarching dimensions to which they belong and inserted in the model as follows: the themes that represent CBM-oriented OL processes barrier are inserted in the left part of the model, while those referring to potential drivers are listed in the right part. In the central part, the OL processes that present above-the-median values (see Figure 7) are inserted in the SC and SME dimensions, as referring to interorganizational and intraorganizational learning processes identified with the quantitative analysis. Figure 8 graphically describes the proposed model.

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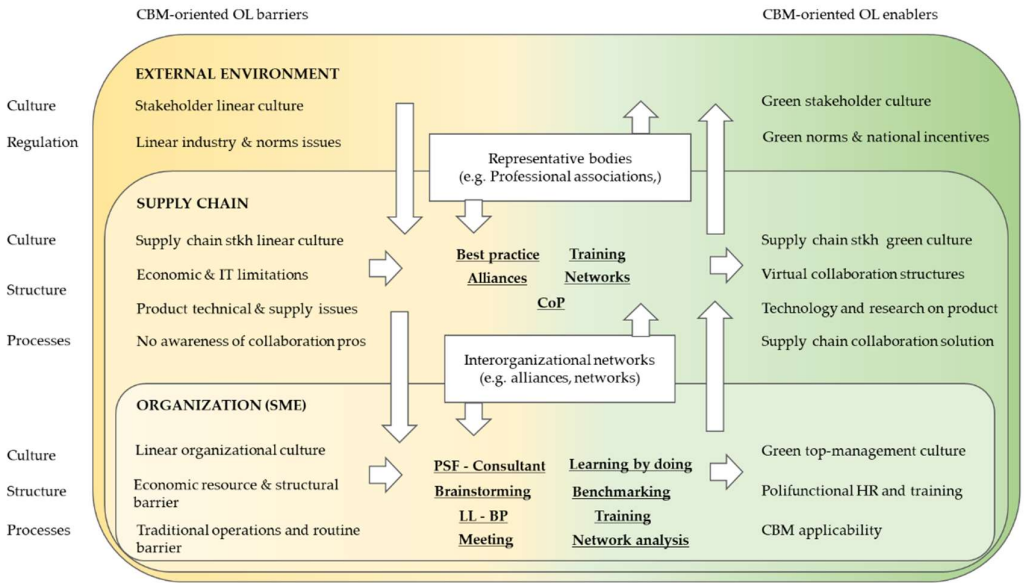

Figure 8. CBM-oriented OL contextual elements and processes.

Source: Authors elaboration

In fact, the analysis underlines that the recognition of CBM-oriented OL drivers appears possible only through the activation of intraorganizational and interorganizational learning processes, thus at both the SC and SME level. The partial understanding of CBM applications, the lack of univocal definitions and the limited knowledge of the related advantages appears to hinder the application from the start; Thus, the qualitative analysis fully supported the proposed pivotal role of KC, KT and KR processes in relation to CE and CBM, as important preliminary activities oriented to understand the related definitions, to develop applicable context-specific implementation, and identify the collaborative and organizational benefits of the related innovative solutions (*Proposition 1*). The activation of KC (e.g. knowledge-oriented confrontation among stakeholders), KT (e.g. training activities), and KR processes (e.g. the diffusion of CBM best practices) is fostering a wider evaluation and implementation of sustainable-oriented solutions, both within and beyond the organizational boundaries. Accordingly, the central position given to OL processes in Figure 8 – halfway through OL barriers and drivers – underlines the essential role of interorganizational and intraorganizational learning processes in transitioning barriers into enablers for CBM-oriented OL processes implementation, as illustrated by the qualitative analysis. Even though analyzed in a specific context, the essential role of CE-related OL processes might be potentially generalized in other contexts, as the lack of shared understanding on CE definitions (see for example the 117 definitions reported in [10]), CBMs conceptualization [14, 16, 18] and diffused evaluation frameworks [45, 57]; and the limited availability of construction sector's applications [15, 76] is an actual common issue across Europe. On a policy level, the development of specific OL processes – KC, KT, KR processes – oriented to a common understanding of accepted CE and CBM definitions across the key stakeholders might envision a coordinated and purposeful evolution of the whole construction sector in a circular economy perspective. Equally, from an organizational and SC perspective, SME managers that envisions the transition towards a sustainable management of a construction SME should consider the activation of specific interorganizational and intraorganizational learning processes that are oriented to identify, evaluate, and develop CBMs within and across organizational borders.

To contribute to the identification of interorganizational and intraorganizational learning processes related to the Italian construction sector, the quantitative analysis reports the actual higher intensity of OL processes use, thus possible learning solutions that would be easily accepted and, thus, implemented in this sector in the CBM use orientation

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(*RQ1*). From the survey results, OL processes generally appear not to be intensively used in the construction SME normal activity, with the highest frequency of use of 3.86 (for professional service firm activities), and a median value of 2.82, over a 1-5 Likert scale. This aspect appears to underline that OL processes are not extensively activated (without a specific stimulus from the external environment), in contrast with other organizations which usually invest in innovations and learning processes to maintain competitive advantages over competitors (e.g. high-technology firms, [120]). Additionally, among the highly ranked OL processes, professional service firm-related, and consultants activities, and external training underline the relevance of informed external source in KC and KT processes, in alignment with specific literature focused on construction SMEs [121]. However, the scarce use of other types of external sources and related interorganizational KT processes, – such as partners in network contracts, and collaborative R&D projects that present the lowest values, – hihglight a clear preference of "neutral" source of knowledge, in contrast with partner-based collaborative solutions.

Considering in details the comparative analysis of OL processes that present above-the-median values (Figure 7), the KC processes appear to be more frequently used in this context respectful to KT and KR processes (*RQ2*), thus applicable in relation to CBM implementation. This aspect is aligned with earlier literature, since the usual activity related to construction firms involves continuous confrontations among different figures, such as external professionals, institutional bodies, and generally stakeholders [63]. However, since the different OL processes might be possibly overlapping and closely joint, - e.g. KC processes activated from KT processes from external sources, or from knowledge related to internal and external KR processes – the comparative analysis appears useful to identify possible connections among mostly used OL processes. In particular, as the highly evaluated KC processes, – learning-by-doing, benchmarking, brainstorming, and problem-solving activities, – appear to be widely applicable at organizational level to develop specific CE and CBM-related knowledge. It would be fruitful to connect those processes with specific KR processes, - such as the use of CE-related best practice and lesson learnt, - and KT processes – i.e. internal and external training, and meetings – to fully benefit from OL processes. Also social network analysis and process mapping KR processes would be useful to explore possible applications of CBMs both at interorganizational level, - through the identification of key actors along the related supply chains and social network, - and at organizational level, - identifying and then adapting internal operations and functions to innovative CBMs requirements.

Since the application of CBMs requires the development of sustainable collaborative solutions across the supply chain [7, 77], the comparative analysis of intraorganizational and interorganizational processes has singled out the comparatively most used interorganizational learning processes, in the orientation of a wider utilization of those processes in a CE-oriented transition of construction SMEs. As already mentioned above, this evaluation highlights the clear prevalence of OL processes within the organizational boundaries (*RQ3*). This aspect is confirmed also from the qualitative analysis, as the internal employees' and managers' formation is underlined as a competitive advantage for SMEs, which need to invest on internal polifunctional figures to efficiently invest the limited economic resources at disposal (see par. 4.1.3). In particular, the above-the-median values of interorganizational learning processes reported by the comparative analysis (see par. 4.2.5) highlight that external training and the use of best practice appears to be the most probable KT and KR activities to be developed in a first transition towards CBM applications, followed by the exploitation of shared environments, such as professional associations, alliances, and generally interorganizational CoPs. In this sense, less formalized contexts appear to be preferred in contrast with formal solutions – e.g. network contracts, R&D projects -, thus the exploitation of informal interorganizational environment would envision a more effective context for the development of interorganizational learning processes.

As second implication, from the analysis of the Italian contextual elements in relation to the development of CBM-oriented OL processes, SME managers have highlighted the

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important role of the external environment, both from a stakeholder cultural perspective and from the governmental point of view. In fact, inside the external environment, the crucial role of national regulation is underlined, by SME managers' assessment, as one of the main barrier for the development and promotion of sustainable-oriented organizational and interorganizational solutions. At the same time, the pivotal function of governments is recently highlighted in the literature as they might act as "facilitators of value creation", shaping a "pro-businesses" environment where organizations and governments interact to "solving society's problems, and inventing new ways to create value for all their stakeholders" [122] (pp. 16-17) in a sustainable orientation. Furthermore, the interrelation among stakeholder-oriented incentive campaign and a fine-tuning of the developing and actual regulation on construction materials and operations appears to contribute both to the cultural openness of external stakeholders – customers, commissioners – as on a wider SC and organizational cultural acceptance of sustainable solutions, such as the CBM implementation. In this sense, governments have a decisive role in the promotion and support of sustainable organization-oriented policies, and in the development of awareness-raising campaigns within the society. This result, thus, fully supports our proposition (*Proposition 2*), identifying the influence of external environment on both the SC and the organizational level. In addition, the presented implication on the role of the external environment – even if developed in a specific country and sector – might be cautiously generalized in other contexts as probable CE barriers and drivers to be found at an external level, as it is aligned with – even tough partly expanding – on previous studies [23, 46, 80]. With a favorable external environment characterized by national and local CE-oriented regulations, SMEs might effectively contribute to an overall sustainable development of the sector, through the application of CBMs encouraged and accepted by the related stakeholders.

As third main implication, the triple sub-articulation of supply chain contextual elements – SC stakeholder culture, SC collaborative structures and process – refines the identification of those factors that influence the occurrence of CBM-oriented OL processes at a SC level both in a negative and positive way. In addition, the analysis supports the identification of the SC context as a relevant sub-articulation of the external environment where interorganizational CBM-oriented OL processes take place (*Proposition 3*). Specifically, a first cultural obstacle appears to identify the major barrier to the activation of collaborative CE-oriented OL processes across SC actors. The not shared understanding of applicable CE-oriented collaborative solutions and related benefits – mainly linked to the reliance on traditional solutions against innovations [25] – is capable of hindering the activation of CBM-related learning processes, thus prospecting a limited interorganizational cooperation inside the SC. Conversely, the proposed OL processes (mainly KC and KT processes) are highlighted as essential to knowledge diffusion, such as through the promotion of best practice, as the activation of sustainability-oriented practices and trainings to practically demonstrate the effectiveness of collaborative CBMs among potential partners. This series of OL activities would be possibly stimulated from representative organizations, such as professional associations, CE-oriented networks, unions, and institutional bodies. In fact, representative groups are capable of sustaining SMEs in the development of learning processes "endorsing local innovations and shaping their diffusion" [123] (p.58), and they might also act as interorganizational CoPs [59] offering a shared environment for professionals, managers, and employees for the activation of shared OL processes. In particular, professional association might prevalently "act more as lobbying or advocacy entities than communities of practice" through the development of beneficial activities reserved to the associates, "though they may include specialized subgroups that create practice-development relationships among members" [59] (p.44), in a looser form than formal alliances and networks.

Linked to the cultural formation of SC firms, the participation in sharing platforms would facilitate the activation of KC and KR processes oriented to virtually and practically explore CBM application at a SC level among the involved SC actors, as to share technological solutions and knowledge related to green products. Furthermore, the use of

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collaborative structures, such as virtual platforms and specialized networks for a joint development of activities, products, and knowledge would address the limited availability of human, economic, and IT resources, enabling the resource sharing in a synergic approach as already pointed out from the SME-related literature [124]. As mentioned above, also the exploitation of the mentioned structures might be envisioned only after the activation of stakeholder engagement activities inside the sector, such as through communication campaigns from platform developers, green marketing strategies by networks and alliances [125], and the sharing of best practices [73] and CE-related knowledge diffusion via representative bodies and CoPs [59, 66, 123]. Those promotional activities among key SC stakeholders are shown to be particularly relevant in the construction sector for the achievement of green business model transformation [126], and would contribute to obtaining the desired attention and related beneficial outcome from CE-oriented partnership and alliances [67]. Once a CE-oriented stakeholders culture is developed, and SC collaborative structures are exploited, the activation of CBM-related processes appears to be eased and practically applicable both at in the SC context and at organizational level in this specific sector (see for example, a multiple case study analysis from [15]), and thus also interorganizational CBM-oriented OL processes might be easily implemented (*Proposition 3*).

Fourth, the SME-related contextual factors identify important intraorganizational aspects that might act as a barrier or as an enabler for the activation of CBM-oriented OL processes under the influence of specific SC contexts, fully supporting our proposition (*Proposition 4*). In particular, the structural limitations in terms of economic resources, internal structures, and essential personnel appear to act as a relevant barrier to CBM-oriented OL processes development, together with the presence of strict traditional routines and processes that hinder the perspective implementation of CBMs. However, the perceived limitations could be reinterpreted as potential advantages, as the limited number of employees and managers might contribute to an easier confrontation oriented to a CE-oriented transition; additionally, the resourcefulness of HR might envision a creative evaluation, development, and implementation of CBMs, as related to the multiple functions covered inside construction SMEs. The CBM-oriented internal KC and KT processes identified from the quantitative analysis at intraorganizational level should raise the awareness of the applicability of innovative CBMs [15, 45, 106], overcoming the internal process limitation identified as a barrier. Also at the organizational level, the SME managers underline that the above-mentioned intraorganizational CE-oriented activities need to be envisioned from a green top-management cultural approach towards the organization, as the overall organizational culture usually follows [86]. In this sense, as already pointed out by earlier SME-related literature [68, 91], the role of top-management in the orientation of the whole organization from a cultural point of view gains even more importance in the sustainable transition towards CE, as the *deus ex machina* (i.e., the decisive problem-solver, from Latin) of the whole organizational evolution. As from the SC level analysis, to overcome of structural and process barriers through a green culture disposition appears to be proved and particularly emphasized also in the organizational context.

As last main implication, the cultural element appears to be pertinently included in all the three dimensions of the external environment, – i.e. external stakeholders' linear culture as a barrier, and green culture as a driver, – the supply chain context, - SC stakeholders' linear culture as an obstacle, and collaborative green culture as an enabler, - and the SME level, - organizational linear culture as a barrier, and green top-management culture as a driver. Among the structural and process contextual elements highlighted from the SC and organizational level, this multi-level cultural element appears to identify the key factor in the activation of CBM-oriented OL processes across the three dimensions, as proposed in the theoretical background (*Proposition 5*). In fact, the collaborative culture among SC actors is the decisive factor for both the structural positive elements – resource sharing to overcome economic and IT limitation, as the co-exploitation of technology – and the processes related to collaboration – industrial symbiosis, to show collaboration advantages. The lack of a cultural disposition toward innovative and collaborative

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solutions obstacle the CE transition from the very start. Also at an organizational level, the structural barriers – lack of economic resources, limited internal structures - and process limitations – limited applicability of CBMs along with traditional routines and operations – highlighted from the analysis appear to be overcome from a constructive cultural attitude of SME top management. In fact, top management is capable of positively using the polyfunctionality of its personnel to identify, adapt and introduce innovative CBMs that, indeed, are already applied in this sector, thus applicable at an organizational level. Even though it is outside the scope of the present paper, the analysis of the relative influences of the identified higher-level contextual factors on the lower ones (e.g. the external environment stakeholders' culture influence on the SC cultural element, or the effect of SC structures on the organizational ones, and vice versa) represents an important aspect that could be explored in further studies on the topic, to offer complementary viewpoints and thus enrich the presented analysis.

As additional implication of the study, possible dynamic patterns of OL processes in the perspective of CBM application are presented, moving from the SC level (Figure 9), and from the organizational level (Figure 10), in relation to the transition from the identified contextual elements acting as barriers towards the proactive enablers of CBM-oriented OL processes.

In the first scenario, CBM-oriented learning processes are stimulated by external environmental pressure, and firstly activated at a SC level. The development of CE-related OL processes might be proposed to the SC partners by the representative bodies (e.g. professional associations) or independently developed by the same SC partners, through the activation of CE-oriented training courses, alliance and networks, or the development of intraorganizational CoPs among the SC actors. Secondly, those processes might stimulate, on the one hand, additional CBM-oriented interorganizational learning processes at SC level, and, on the other hand, the activation of CE-related intraorganizational learning processes at a single SME level. The link among the SC and organizational level might be facilitated by the interorganizational networks through the exploitation of preexisting social relations, or might be directly realized by the specific SC partners in the SME social network. As explained in the previous paragraphs, the OL processes oriented to stimulate the cultural transition from a linear culture toward a green cultural disposition of SC managers, which might thus influence the respective single SMEs, identify the first essential learning process activated by the promoters, followed by the identification of the most useful collaborative structures and processes (Figure 9). This scenario presents a dynamic pattern of learning processes encouraged from the interorganizational to the organizational level in a top-down direction, underlying the relevance of SC level in CBM application in relation to the organizational level.

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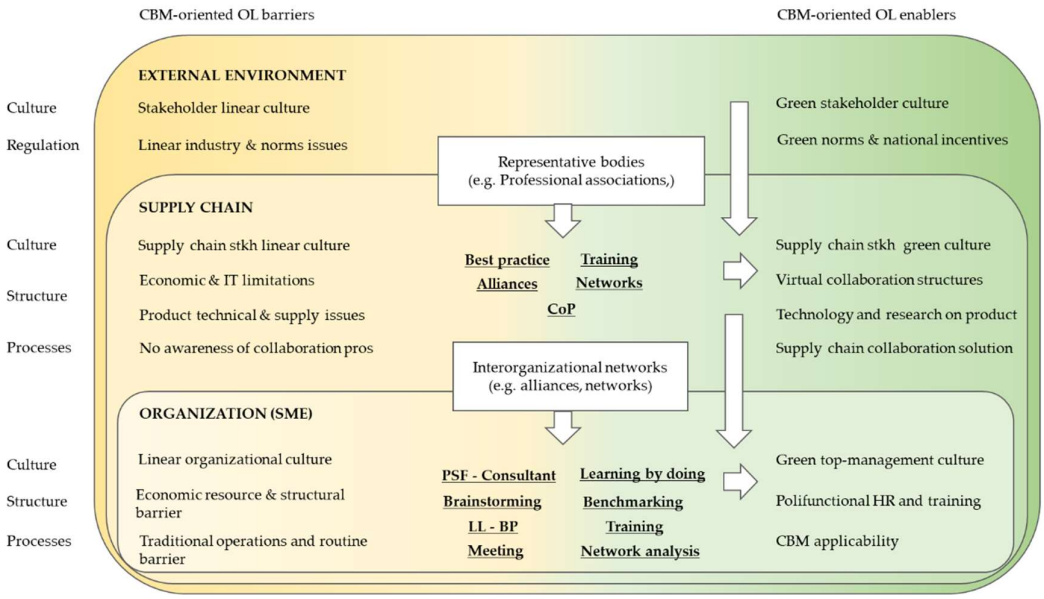

Figure 9. Top-down CBM-oriented OL processes pattern.

Source: Authors elaboration

Conversely, the SME level might act independently driven by a preliminary activation of interorganizational CBM-oriented OL processes. A second scenario (Figure 10) proposes possible OL dynamics that move from the organizational to the interorganizational level, following a bottom-up logic. In this setting, organizational level learning processes oriented to the identification, evaluation, and development of CBMs might be first activated by the SME actors, - more probably, by the top-managers, in view of the above-mentioned important role inside this type of organizations, - that would influence the internal personnel, structures, and processes in a circular perspective. The organizational level CE-transition would probably stimulate the engagement of SC partners, in order to ensure the full beneficial effect of this sustainable evolution [14, 84], starting from a cultural raising-awareness campaign, or other stakeholder engagement practices. The movement from the organizational to the SC level might be facilitated by the exploitation of existing interorganizational networks that include the relevant SC actors that would be involved in the identified CBM, as it might envision direct contact to the key actors. Also in this scenario, the cultural transition is essential to subsequently exploit collaborative structures and processes oriented to the development of specific CBM-oriented OL processes. As the CBM is fully implemented both at the organizational and interorganizational level, representative bodies should be useful to spread the related practices across the sector and other supply chains, to contribute to a wider understanding of CE-related implementations, as to stimulate other proactive actions in similar organizations.

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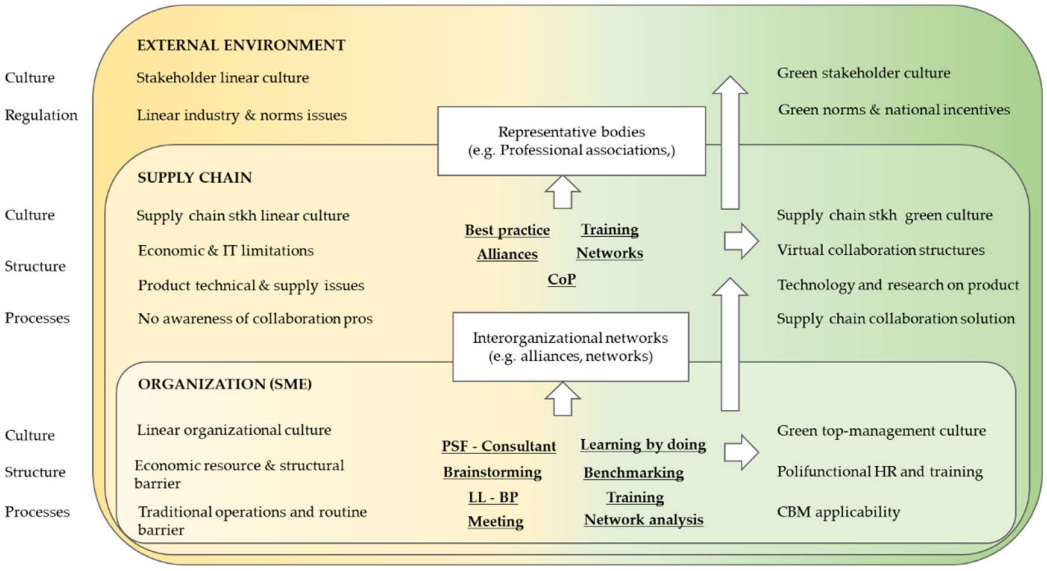

Figure 10. Bottom-up CBM-oriented OL processes pattern.

Source: Authors elaboration

5.1. Limitations and future research

The study has some limitations, first, the choice of a single context of analysis, the Italian construction sector. This decision was justified by the access that one of the authors had to the sector key constituents and also was informed by the relevant position covered from the Italian context in the overall EU CE-related ranking [26, 116], which prospected a peculiar environment to perform the analysis. In addition, the construction sector and SMEs are actually required to perform a considerably important transition towards sustainability [11, 24, 81], thus identify an important specific context of analysis. Second, the focus group methodology might limit the generalizability and replicability of results, as participants' possibly dominant positions in the discussion risk limiting the overall interaction [103, 127]. To manage this possible bias, during the data collection processes one researcher coordinated and moderated the participants' discussions, while another was responsible for providing technical support and time management. Similarly, this methodology envisioned a possible subjectivity bias of the interpretations; in this orientation, the iterative confrontation among the two researchers would contribute the study's methodological efficacy [102-104]. Furthermore, the use of the NVIVO software in the interpretation and coding processes would additionally reduce the intrinsic subjectivity of qualitative research.

Regarding the quantitative analysis, the use of descriptive analyses of the evaluated items, without the inclusion of other more refined methodologies and instruments, was strictly joined by the specific focus of the analysis, that was oriented to identify the mostly used OL processes in the sector, without the evaluation to specific related effects (e.g. on performance, or organizational factors). Further research would possibly use other quantitative methods to evaluate the role of OL processes in relation to the CE-related outcomes, that are the environmental, economic, and social effects related to organizational and interorganizational applications of CBMs. However, since the results inferred from the multi-method analysis are aligned – and partially expand – on previous conceptualizations and conclusions from CE-related and OL literature, the results might be, under specific assumptions, generalized to other contexts.

Further studies on the topic should deepen the analysis of the relative influences of specific OL contextual elements across the dimensions, as the variation in the relevance of OL processes in the specific setting of sustainable business model implementation. In this sense, action research designs and longitudinal studies are suggested as they offer the possibility to assure a real-time evaluation of learning-related conceptualizations and

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perceived contextual elements, as the long-term effects resulting from the applied theoretical approach.

6. Conclusions

The presented study offers the analysis of the processes oriented to stimulate a sustainable-oriented transition of SMEs, using an innovative theoretical background of OL [19, 20, 30]. The paper mainly focuses on the investigation of the role of OL processes and related contextual elements, contributing to a wider understanding of the preliminary phases of CE-related business models introduction [18] inside SMEs, as in the identification of intraorganizational and interorganizational learning processes that might support their sustainable evolution [13, 44, 67].

On the one hand, through qualitative evaluation of SME managers of the Italian construction sector of possible applications of CBMs [45, 106], and related OL processes, specific CBM-oriented OL contextual elements are identified as possible factors that could mutually act as barriers and enablers of the activation of sustainable learning processes. In particular, three dimensions – external environment, supply chain, and SME – identify progressively embedded dimensions that include all the relevant factors highlighted in relation of the analyzed context. Specifically, cultural, regulatory, structural, and process factors are capable to hinder the activation of OL processes inside the three dimensions, as to promote their development; The transition from the perception of contextual elements as barriers towards the related appreciation as drivers is proposed to be stimulated from the activation of intraorganizational and interorganizational KC, KT, and KR processes in top-down and bottom-up directions. The key role of the cultural elements is highlighted as the identification of the most critical barrier, and the most positive enabler. In fact, the decisive role covered from external stakeholders' culture at the external level, SC stakeholders inside the supply chain context, and from top-management organizational culture at single SME level for the hindering or activation of CBM-oriented OL processes, specifically points out the overall relevance of multi-level conceptualization of culture [95, 128].

On the other hand, the quantitative analysis identifies specific intraorganizational and interorganizational learning processes that would be possible activated inside Italian construction SMEs, to envision a full implementation of CBMs linked to the overcome of negative contextual elements, and the appreciation of positive CE-related OL processes enablers.

Through the reasoned merging of the qualitative and quantitative results, the study proposes a CBM-oriented OL theoretical model that includes possible intraorganizational and interorganizational learning processes, and OL dynamic patterns that would be developed to envision the circular transition of Italian construction SMEs. The proposed model could be cautiously applied in other settings under context-specific assumptions, as it is aligned and partially expand on previous conceptualizations of barriers and drivers for CBM implementation [9, 23, 46, 129], as possible sustainable-oriented solutions from SME transition [13, 25].

Supplementary Materials: The following are available online at www.mdpi.com/xxx/s1

Author Contributions: All authors have read and agreed to the published version of the manuscript. In particular, the following contributions are related to specific authors: Conceptualization, S.S., and M.R.; methodology, resources, formal analysis, investigation, data curation, visualization, writing—original draft preparation, project administration, funding acquisition, S.S.; validation, S.S. and M.R.; writing—review and editing, supervision, M.R., F.N..

Funding: This research was co-funded by a collaboration project among University of Pisa and ANCE (Italian association of building constructors).

Acknowledgments: We are grateful to Lucio Todisco for the support on the data collection and to the AIDEA Summer school of qualitative studies for the discussion on the methodological construction of the research.

Conflicts of Interest: The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

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