Master's thesis

The role of tie variety in successful circular business model innovation

The moderating role of managerial tie variety on the relation between organizational inertia and circular business model innovation

Master's Thesis in Strategic Management (MAN-MSTTH)

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Integrating insights from the knowledge diversity literature into current theory on circular business model innovation, it is argued in this study that the level of variety of managerial ties is an essential factor in explaining the relationship between organizational inertia and circular business model innovation. A questionnaire was designed to gather data on circular business model innovation, organizational inertia and the level of variety of managerial ties of over 50 different organizations within the construction and infrastructure industry in the Netherlands. The results show that the level of variety of managerial ties explain a lot of variation in circular business model innovation of these organizations. The findings also indicate that the level of variety of managerial ties moderates the relationship between organizational inertia and circular business model innovation.

1 Introduction

Extant research has shown that circular business model innovation (CBMI) is an important type of innovation since there is a need for a new economic model involving circularity (EMAF, 2015; Geissdoerfer et al., 2017; Geissdoerfer et al., 2022; Markard et al., 2012; Meadows et al., 2018). This need for a circular economy (CE) is a result of many different problems in the world, the main of which are environmental problems such as climate change and the depletion of natural resources (Geissdoerfer et al., 2017; Meadows et al., 2018; Rockström et al., 2009; WWF, 2022). One of the greatest barriers of CBMI is organizational inertia. The concept of organizational inertia, and its counterpart organizational flexibility, is well examined within linear business model innovation (BMI) research (Bouchikhi & Kimberly, 2003; Huang et al., 2013; Moradi et al., 2021), but the effect of organizational inertia is amplified when engaging in CBMI. The reason for this is that the success of CBMI relies heavily on the receptivity of top leaders, their commitment to sustainability goals and the willingness of managers at every organizational level to change and adapt (Atasu et al., 2021). Therefore, resistance in relation to innovations regarding circularity is more common (Korhonen, 2018; Yamoah et al., 2022), which is why in this study it is argued that CBMI requires a different approach than typical BMI. Many attempts at CBMI fail, but there are also more and more success stories of CBMI (Hofmann & Jaeger-Erben, 2020; Linder & Williander, 2017; Lopez et al., 2019). This raises the question of why some organizations have success in CBMI , while others lack behind?

While research into important barriers of CBMI has vastly enhanced our understanding of CBMI success, recent studies touch upon an underexposed aspect of CBMI, namely the concept of managerial ties. Managerial ties are ‘managers’ personal connections with managers at other firms and officials in the government and industries, or other key external entities’ (Li & Zhang, 2007; Peng & Luo, 2000; Shu et al., 2012). According to social network theory, managerial ties provide firms with network opportunities which create external knowledge and resources. These enable organizations to seize more business opportunities (Peng & Luo, 2000). Research has shown direct and indirect effects of managerial ties on linear BMI. (Top) managers' ties not only lead to BMI (Guo et al., 2013), but managers should take full advantage of their managerial ties, and take action to transfer managerial ties into BMI (Wang et al., 2017). A study of Eikelenboom and de Jong (2022) showed the importance of managers' networking capabilities within the context of CBMI. Specifically, when a manager frames circularity as an opportunity, this will lead to a more smooth integration of circularity in an organization's strategy. Circular network interactions mediate this relationship in a positive way. Circular network interactions are the interactions with different stakeholders in order to involve them into creating a circular value chain (Eikelenboom & de Jong, 2022). A study of Triguero *et al.* (2022) found that managerial ties, and their contribution to a great diversity of knowledge, is key in circular innovations. The more different network partners an organization has, the higher the chances of developing circular innovations are (Triguero et al., 2022). Yet, besides these few recent exceptions, the BMI literature has had little regard for the effects of managerial ties in CBMI.

Researching the notion of managerial ties in CBMI is of increasing importance since approaching CBMI differs from approaching linear BMI. CBMI requires new knowledge which may not always be gathered inside the firm. In contrast to BMI, CBMI benefits more from collaboration with partners and other stakeholders (Khan et al., 2020). In fact, managerial ties are vital in CBMI since value creation and delivery is only possible through collaboration of multiple stakeholders (Bocken et al., 2018). This stems from the fact that organizations cannot close resource loops by themselves, but need partners for this, especially in the value chain (De Angelis et al., 2018). Additionally, there is reason to believe that managerial ties have not only a direct effect on CBMI but also an effect on the relationship between organizational inertia and CBMI. Fernández-Pérez *et al.* (2014) show in their study that the size of managers' social networks contribute to higher levels of organizational flexibility, the counterpart of organizational inertia. The size of managers' social networks is determined by the total number of information channels one person has. Therefore, the focus of this study is on the variety of managerial ties. This refers to the level of variety in groups or individuals that the manager connects through their ties. This is an important concept since the more different groups and individuals are being connected, the better the knowledge diversity of the manager is, which increases their innovative capabilities (Burt, 2004; Fleming et al., 2007; Rodan & Galunic, 2004; Sosa, 2011). In this study it is argued that the level of variety in managerial ties moderates the relationship between organizational inertia and CBMI. This is important, because if a high variety of managerial ties can contribute to organizational flexibility, this may mitigate the effect of organizational inertia on CBMI, organizations can use this to their advantage when engaging in CBMI. Therefore, the research question of this study is; *'How does organizational inertia influence circular business model innovation and how is this relationship affected by the variety of managerial ties?'*.

In an attempt to address this question, the present study creates a theoretical model based on different yet embedded research streams. Theoretical research is conducted to create this model. There are three relationships in the model that are put to an empirical test using the concepts of CBMI, organizational inertia and managerial ties. First, the main effect of organizational inertia on CBMI is examined. This should confirm that organizational inertia has a negative impact on CBMI and that organizational flexibility has a positive impact on CBMI, as this is the case in linear BMI. Second, the direct effect of the variety of managerial ties on CBMI is studied by looking into different types of managerial ties. And third, the moderating role of the variety of managerial ties on the relationship between organizational inertia and CBMI is examined. This empirical test is focused on organizations in the construction and infrastructure industry. A questionnaire is conducted amongst this population to test the hypotheses of this study. By demonstrating that the level of variety of managerial ties influences the effect organizational inertia has on CBMI, this study makes two main contributions.

First, this research question has scientific relevance, since there is ample research on the impact of managerial ties on CBMI. In this study there is being built upon the research of organizational inertia and managerial ties in the BMI literature. Thereby contributing to theory by researching these concepts in relation to CBMI, since this type of innovation is becoming more and more important as the linear economy is moving to a CE. Furthermore, resistance in relation to innovations regarding circularity is more common, since CBMI requires a large personal commitment to sustainability from management (Korhonen, 2018; Yamoah et al., 2022). With a few exceptions, this research field is largely underexposed. Secondly, this research question has practical relevance, since the outcomes will contribute to our knowledge of how managers impact CBMI. As we could use this to positively influence CBMI. If a high level of variety of managerial ties can mitigate the effect of organizational inertia on CBMI, organizations can use this to their advantage. Organizations that want to be more successful in CBMI could use this knowledge to improve their circular development. Either by focusing more on managers with the managerial ties needed to impact this relation in a positive way or by supporting managers in developing ties with many different external entities. This could create the networking opportunities needed in order to transition traditional business models (BMs) to circular business models (CBMs).

2 Literature review

In order to comprehend the most important concepts of this thesis, this chapter will discuss these in depth. The concepts CBMI, (the variety of) managerial ties and organizational inertia will be defined in this chapter.

2.1 Circular business model innovation

BMI is a relatively new concept in literature. The concept has existed for about two decades. Throughout the literature on BMI, there have been multiple definitions of BMI (Foss & Saebi, 2017; Morris et al., 2005; Zott et al., 2011). Most of the literature agrees that BMI is changing the value proposition for the consumer (Bocken et al., 2014). However, Amit and Zott (2012) argue that BMI is not only changing the product or service offerings of the organization, but changing the way an organization does business. Foss and Saebi (2017) built upon that notion as they define BMI in their review of its literature as ‘designed, novel, nontrivial changes to the key elements of a firm’s business model and/or the architecture linking these elements’.

Foss and Saebi (2017) have defined four research streams on BMI. The first of which is the conceptualization of BMI, as the precise definition of the term is a big issue in this literature (Morris et al., 2005; Zott et al., 2011). Classifications or typology of BMI are a part of this literature too (Christensen et al., 2016; Taran et al., 2015). The second research stream is about the process of BMI. The focus in this stream of literature is on the capabilities, leadership types and learning mechanisms that successful BMI requires. Such as the research done by Berends and Smits (2016) that distinguishes two types of process patterns for BMI, ‘drifting’ and ‘leaping’. The process of ‘drifting’ starts with an emphasis on experiential learning, and the process of ‘leaping’ starts with an emphasis on cognitive search. Therefore, organizations should consider which of these processes is the most effective in their organization. The third research stream is about BMI as an outcome, such as examining where and when new BMs emerge. For example, the emergence of new BMs in a specific industry, such as tourism (Souto, 2015) and electric mobility (Abdelkafi et al., 2013), or business model innovations for certain target groups such as low-income markets (Sánchez & Ricart, 2010). The last stream consists of research that examines the consequences of BMI, such as the impact that different BMs can have on organizational performance (Zott & Amit, 2007, 2008). The current study will contribute to the second stream of research, as it focuses on the processes that lead to successful BMI.

BMI has repeatedly been found to be positively related to organizational performance. Because through BMI, organizations develop the capabilities for innovation, with which they are able to create a competitive advantage, which increases organizational performance (Huang et al., 2013; Zott & Amit, 2007). Pohle and Chapman (2006) argued that organizations can achieve optimal benefits of reduced costs and strategic flexibility through BMI. Zott and Amit (2007) discovered that this positive relationship between BMI and organizational performance is remarkably stable across time, and even under changing environmental regimes. Furthermore, organizations that thrive in innovation often have corporate cultures that have a focus on organizational learning and development (Hurley & Hult, 1998; Hult et al., 2004).

To assess the differences between BMI and CBMI, the four phases of the BMI process will be taken into account. These phases are initiation, ideation, integration and implementation (Frankenberger et al., 2013). The biggest difference between 'typical' BMI and CBMI is in phase one, that of initiation. This is the phase in which the need for innovation is initiated. Typical BMI is initiated by a linear economy and CBMI is initiated by a circular economy (CE) (Geissdoerfer et al., 2020). The linear economic model relies on the take-make-dispose method, which in simple terms is extracting resources, making products, using these products and discarding them when they no longer have a direct purpose (Yamoah et al., 2022). The economy has been mostly focused around linear BMs since the first industrial revolution. However, this method has proven to be unsustainable for the long term, as the earth has not enough resources to keep sustaining the linear economy (Ghisellini et al., 2016; Korhonen et al., 2018). Therefore, there is a need for a new economic model that considers circularity, the CE (EMAF, 2015; Geissdoerfer et al., 2017; Markard et al., 2012; Meadows et al., 2018).

The main reasons that there is a need for a CE are environmental problems such as climate change and the depletion of natural resources (Geissdoerfer et al., 2017; Meadows et al., 2018; Rockström et al., 2009; WWF, 2022). Depletion of resources occurs when natural resources become scarce as a result of them being consumed faster than they can recover (Geissdoerfer et al., 2017). In a CE none of the resources are being discarded, which reduces the negative environmental impact by closing resource loops (Circular Academy, 2016; COM, 2015; Reike et al., 2018). Innovating BMs aligned with the goals of the circular economy is vital in order to transition from the current, linear economy, to a CE (Geissdoerfer et al., 2018). The CE takes the reusability of products and materials and the conservation of natural resources as a starting point, while striving for value creation for people, nature and economy in each part of the system (Circular Academy, 2016; Reike et al., 2018). Hence, the essence of the difference between linear and circular economy is that the linear economy focuses on profitability whereas the CE focuses on sustainability. Which results in typical BMI to be profit focused whilst CBMI has an environmental focus (Frishammar & Parida, 2019).

In phase two of the BMI process the idea generation takes place, in this phase it transforms opportunities of the initiation phase into concrete BMs by doing research (Frankenberger et al., 2013). In this phase BMI and CBMI differ the least, in both processes information is gathered to build BMs, despite the BMs being for different purposes. In phase three, the integration phase, the BMs are being integrated into a broader context and stakeholders are being involved. Both BMI and CBMI benefit greatly from having a wide range of involved stakeholders (Siebold, 2021), however, for CBMI the stakeholders are vital. Since CBMI can only be successful through collaboration of multiple stakeholders while BMI can be successful within the organization (Bocken et al., 2018; Khan et al., 2020). This will be explained further in paragraph 2.3. In the last phase, that of implementation, the fully developed BMs need to be implemented. This involves risks because this typically takes huge investments (Frankenberger et al., 2013). Usually, there are more financial constraints involved with CBMI than with BMI (Sharma et al., 2021). Since CBMI often has a longer pay-back period and is not only focused on creating economic value, but also environmental and social value (Marques & Manzanares, 2023). Furthermore, it is more difficult to implement a CBMI than a BMI since there is more resistance within the organization when it comes to innovations regarding circularity (Korhonen, 2018; Yamoah et al., 2022). This will be explained further in paragraph 2.2.

Geissdoerfer *et al.* (2020) have defined CBMs based on their review of the literature. They define CBMs as 'business models that are cycling, extending, intensifying, and/or dematerializing material and energy loops to reduce the resource inputs into and the waste and emission leakage out of an organizational system. This comprises recycling measures (cycling), use phase extensions (extending), a more intense use phase (intensifying), and the substitution of products by service and software solutions (dematerializing)'. In this definition, four generic strategies for CBMs are included. The first is 'cycling', which means the recycling of materials and energy through reuse, remanufacturing, refurbishing or through recycling. The second strategy is 'extending', which implies the extension of the life-span of products, through repair, maintenance or long-lasting design. The third strategy is 'intensifying', which means that the use of products are intensified through solutions such as the sharing economy (Belk, 2014; Hamari et al., 2016; Kathan et al., 2016). And the last strategy 'dematerializing' is used to maximize the product utility through substituting physical products for online service and software solutions that have the same functionality (Geissdoerfer et al., 2020).

Many definitions for CBMI are somewhat simple. Since CBMI is often defined among the lines of ‘shifting from a linear to a more circular business model’ (Bocken et al., 2018; Linder & Williander, 2017). But Geissdoerfer *et al.* (2020) define CBMI through analyzing different definitions, as ‘the conceptualization and implementation of circular business models (CBMs), which comprises the creation of circular start-ups, the diversification into CBMs, the acquisition of CBMs, or the transformation of a business model into a circular one. This can affect the entire business model or one or more of its elements, the interrelations between the elements, and the value network’. Geissdoerfer *et al*. (2020) also distinguish four types of CBMIs in literature. The first is ‘circular start-ups’, which means that the organization currently does not have a business model, but a new CBM is being created. The second is ‘CBM diversification’, where there is a current linear business model, and an additional CBM is being created. The third is ‘CBM transformation’, which transforms the current business model into a CBM. And the last is ‘CBM acquisition’, where an existing CBM is integrated into the organization. Organizations can also choose to mix these strategies, for example, an organization can both transform their current business model into a CBM and acquire a CBM to integrate into the organization (Geissdoerfer, 2020).

2.2 Organizational inertia

One of the greatest barriers of CBMI is organizational inertia. In this paragraph the concept of organizational inertia will be explained first, whereafter it is argued why organizational inertia is such an important barrier in CBMI.

Inertia originates from the Latin word ‘*iners*’, which means ‘*lazy*’ or ‘*idle*’. Inertia is used to describe something that is inactive. Newton’s first law of motion states that ‘every object will remain at rest or in uniform motion in a straight line unless compelled to change its state by the action of an external force’. This tendency to resist changes in a state of motion is called inertia (Huang et al., 2013; NASA, 2022). Despite this definition emerging as a law of physics, this law is also applicable on organizations, as organizations can also remain stagnant in the face of external change (Kelly & Amburgey, 1991). Organizational inertia is defined in research as the organization’s inability to make internal changes as a result of external changes (Moradi et al., 2021; Tushman & Romanelli, 1985). These external changes are frequently described in literature as discontinuous changes. The precise definition of discontinuous change is external changes that require internal adaptation along a path that is nonlinear relative to a firm's traditional innovation trajectory (Christensen & Bower, 1996; Romanelli & Tushman, 1994).

The age of organizations is a factor that predicts the extent of inertia in organizations. Organizations often look at the past for guidance, more past experiences means that there is more history, organizational culture and tradition to conform to, therefore older organizations tend to be more inert than younger organizations (Francis & Smith, 1995; Hannan & Freeman, 1984; Kelly & Amburgey, 1991). In addition to age, size is an indicator for inertia too. As organizations increase in size, more structure is needed, such as regulations, procedures, hierarchies and other formalities. Which means that managers have even more 'rules' to conform to. This leads to predictability within an organization. Therefore, the resistance to change is higher, and the probability of innovation is lower as an organization increases in size (Hannan & Freeman, 1984; Kelly & Amburgey, 1991). Hence, age and size of an organization are seen in literature as stabilizers of an organization. The older and larger the organization, the more stable the organization, which in turn increases the probability of inertia in an organization. Which means younger and smaller organizations are more flexible, and therefore the probability of inertia decreases in those organizations.

Gilbert (2005) makes a distinction between two types of organizational inertia. Resource rigidity and routine rigidity. Resource rigidity occurs when the organization fails to change resource investment patterns. Routine rigidity occurs when the organization fails to change their processes that use those resource investments. Gilbert (2005) also argues that threat perception has an important effect on inertia, and that this effect differs for resource and routine rigidity. Specifically, a strong perception of threat helps managers to decrease resource rigidity, but at the same time this threat perception increases routine rigidity. Some authors also argue for different aspects of organizational inertia, such as insight inertia, psychological inertia, action inertia, structural inertia and economic inertia (Haag, 2014; Moradi et al., 2021). Insight inertia occurs when the organization does not understand the discontinuous changes in the environment. This interrupts the organizations' learning cycle. There is a lack of insight concerning the external and internal cues that ask for change. Psychological inertia occurs when the organization's workers strongly resist change, regardless of the necessity, and the impact of this change. The workers do not necessarily resist the change itself, but they resist the change because they are afraid of what might happen during the process of change. Action inertia refers to the management's execution delay when implementing change. This prolonged response is often the result of slow actions of the management, but can also be the result of insufficient information, not allowing management to take informed decisions (Moradi et al., 2021). Haag (2014) distinguishes two more types of organizational inertia, structural inertia and economic inertia. Structural inertia is similar to Gilbert's (2005) routine rigidity, since this type of inertia occurs when the organization can not change their internal processes. And lastly, economic inertia is similar to Gilbert's (2005) resource rigidity, since this type of inertia is related to the cost structures of the organization (Haag, 2014; Moradi et al., 2021).

Researchers find organizational inertia to be a substantial barrier when engaging in BMI (Bouchikhi & Kimberly, 2003; Huang et al., 2013; Moradi et al., 2021). Overcoming organizational inertia is difficult, despite the substantial triggers that call for BMI, such as the positive effect this would have on organizational performance (Matthyssens et al., 2006). Even very successful organizations struggle with adapting to new BMs due to organizational inertia. When organizations have had successful BMI in the past, they find it very difficult to change this business model again as a result of organizational inertia (Chesbrough, 2003). Santa-Maria *et al.* (2021) reveal that organizational inertia is one of the key barriers of the CBMI process that is yet to be studied, and that scholars should make it a priority to do so. With a few exceptions (Yamoah, 2022), there is ample research that examines organizational inertia within the context of circularity. However, organizational inertia can be a major barrier for CBMI. Managers' personal commitment to change is of great importance when engaging in CBMI (Atasu et al., 2021; Yamoah, 2022). When managers' personal commitment to (radical) change projects is low, this leads to organizational inertia (Huy, 2002). Resistance in relation to innovations regarding circularity is more common, because CBMI requires a significant personal commitment to sustainability from management (Korhonen, 2018; Yamoah et al., 2022). Research also shows that organizations with a deep rooted bureaucratic culture, siloed governance structures and lots of rules and regulations are difficult barriers to overcome when implementing innovations regarding the CE (Klein et al, 2022). For these reasons, it is expected that organizational inertia is a significant barrier when engaging in CBMI. Therefore the first hypothesis is as follows;

H1. Organizational inertia has a negative effect on circular business model innovation.

Organizational flexibility is a contradictory term for organizational inertia in literature, and is often associated with efficiency and a higher performance. Organizational flexibility is found to be a driver of BMI (Bock et al., 2012). Organizational inertia and organizational flexibility manifest in different forms. Such as a higher or lower knowledge flow, (un)necessary rules and regulations and (in)flexible procedures (Boyer & Robert, 2006). So in this first hypothesis it is simultaneously expected that organizational flexibility has a positive effect on CBMI.

2.3 Variety of managerial ties

Apart from the fact that organizational inertia is not extensively researched in relation to CBMI, there is another important concept underexposed in this literature. Namely, the concept of managerial ties. Research indicates that managerial ties are important to consider when engaging in CBMI. As opposed to BMI, CBMI requires more collaboration with many different stakeholders, because CBMI requires knowledge which is not always available within the firm (Khan et al., 2020). Bocken *et al.* (2018) showed that networks are vital in CBMI since value creation and delivery in CBM is only possible through collaboration of multiple stakeholders of the organization. An organization cannot close resource loops by itself, it needs networking and collaboration in order to create value (De Angelis et al., 2018). Therefore, the knowledge diversity that is created through managerial ties is exceedingly important when engaging in CBMI. Triguero *et al.* (2022) found that a great knowledge diversity through managerial ties is positively related to developing circular innovations. When examining the role of managerial ties in CBMI, organizations can use this knowledge to develop their managerial ties to positively impact CBMI.

The most common definition of managerial ties in research is 'the managers' personal connections with managers at other firms and officials in the government and industries, or other key external entities' (Li & Zhang, 2007; Peng & Luo, 2000; Shu et al., 2012). So, this includes all the informal relations managers have with the external environment of the organization. Managerial ties improve networking opportunities in organizations (Shu et al., 2012). In most literature managerial ties are distinguished into business ties and political ties. Business ties are the managers' network activities with managers of other firms, such as competitors, suppliers, and other firms that are part of the value chain. Networking with customers are also business ties. Political ties refer to the networking relationships a manager has with the government. such as leaders in regulation, politicians and other government officials (Li et al., 2008; Peng & Luo, 2000; Shu et al., 2012). Some researchers also distinguish a third type of managerial ties, university ties. These are the connections managers have with universities and research institutions (Belderbos et al., 2016; George et al., 2002; Zhou et al., 2019). Managerial ties are also often called the social capital of managers (Guo et al., 2013). Nahapiet and Ghoshals (1998) definition of social capital is widely accepted in literature. They state that social capital is ‘the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit’. The theory that social capital is part of is called the social network theory. According to this theory, manager's social networks are critical for firm innovation (Zhang & Li, 2010).

The importance of tie strength, which includes the frequency of the contact, the extent of reciprocity and the extent of friendship, is widely researched in existing literature (Granovetter, 1983; Krackhardt et al., 2003; Nelson, 1989; Shu et al., 2012). Yet, the success of networks are not only based on the strength of managerial ties, but also on the variety of ties. A manager’s network should be rich in ties to otherwise unconnected individuals or groups (Burt, 2004). Hence, it is important for a manager to possess all three of the managerial tie types. Furthermore, the more groups and individuals that are being connected through those ties, the better the knowledge diversity is. Managers that have access to a lot of different knowledge pools, by connecting a variety of groups that are not otherwise connected, have access to more diverse ideas and are therefore likely to have more creative insights and ideas, which will improve their innovative capabilities (Burt, 2004; Fleming et al., 2007; Rodan & Galunic, 2004; Sosa, 2011). This is why in this study the variety of managerial ties are examined.

A concept closely linked to tie variety is tie diversity, which is a term that is more commonly used in network literature. The term tie diversity or network diversity is often used to examine the differences in a managers’ network based on gender, culture, religion, demographics or race (Ibarrah, 1995; Mitchell et al., 2021; Shen & Kram, 2011). As opposed to tie variety, which examines the different types of managerial ties. Variety is about a number of options or categories (Stirling, 2007). Since the number of different types of managerial ties are discussed in this study, the term tie variety is used.

Managerial ties promote CBMI in different ways. Through strong business ties, organizations will most likely have more chances of seizing the right opportunities, and get the most beneficial partnerships (Ma et al., 2011; Leung-kwong Wong & Ellis, 2002). Ties with competitors reduce uncertainty from competitive interaction and the exchange of knowledge improves production efficiency, controls product quality and improves product innovation (Gao et al., 2008). Through political ties technical knowledge is gathered. Agencies such as law offices can give advice to the manager when there are political ties between them. This advice can for example lower costs (Gao et al., 2008). When engaging in CBMI political ties are even more important since the government is likely to support CBMI by giving grants for circular initiatives, or through regulations. For example, the Dutch government installed a national programme called ‘Nederland Circulair in 2050’ in which it states that the Netherlands is aiming to have a circular economy by 2050. This is part of an international plan called PACE (Platform for Accelerating the Circular Economy) where over 40 countries work together. There is a realization that the Netherlands, or even Europe, cannot achieve circularity by themselves as value chains are international and often reach over borders (Rijksoverheid, 2023b). Through university ties, organizations can gather the latest scientific knowledge (Gao et al., 2008). Therefore, organizations that are connected to academic networks enhance their ability to innovate and can introduce new products or services quicker (Cassiman & Veugelers, 2006). This is especially important for CBMI, since circularity is a relatively new research field where new ways to engage in circularity are constantly being developed and researched (Corona et al., 2019).

All three types of managerial ties are important when innovating CBMs. When a manager has ties in each of these three types, and additionally has ties to a variety of external entities, this will optimize their knowledge diversity. For example, when a manager has not only ties in each of the tie types, but additionally has university ties with both different universities and research institutions. It is expected that the more varied ties a manager has, the more successful CBMI will be. Therefore, the second hypothesis is as follows;

H2. The level of variety of managerial ties is positively related to circular business model innovation.

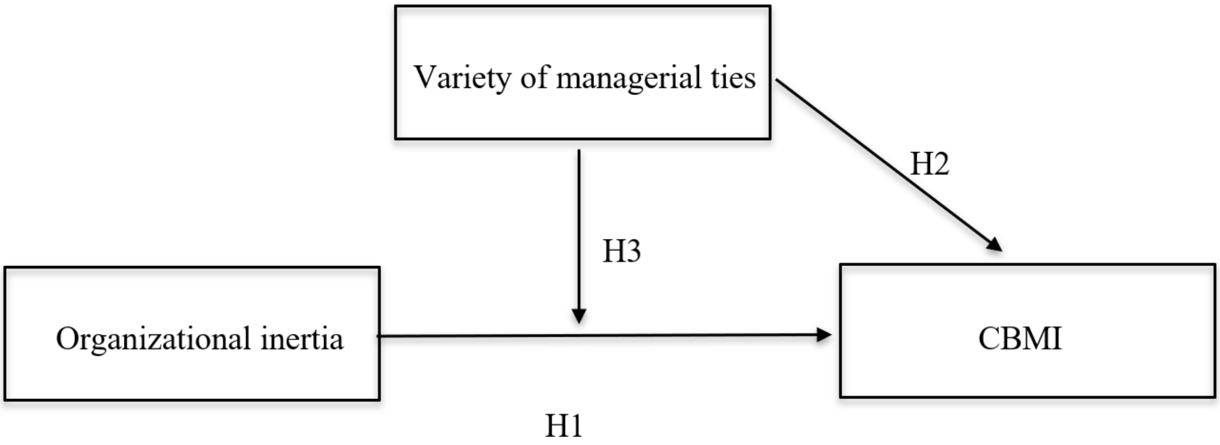
In the current study it is argued that the variety of managerial ties has an effect on the relationship between organizational inertia and CBMI since the success of CBMI relies heavily on the receptivity of top leaders, their commitment to sustainability goals and the willingness of managers at every organizational level to adapt (Atasu et al., 2021). As stated in paragraph 2.1 this involves the implementation phase of the business model innovation process. Findings in the study of Prieto-Sandoval *et al.* (2021) also reveal that the commitment of top management to circularity is key in circular innovations. Top management does not only have to commit to the circularity goals of the organization, but also needs to convey this to their staff in order for the organization to be less resistant to change (Prieto-Sandoval et al., 2021).

Additionally, Fernández-Pérez *et al.* (2014) show in their study that the size of managers’ social network ties contribute to higher levels of organizational flexibility, the counterpart of organizational inertia. The size of managers’ social networks is determined by the total number of information channels one person has. Their study also shows that managers are more incentivized to utilize their ties when there is a positive organizational climate to do so. This entails an organizational culture ‘in which employees are free of pressure and in which there is cohesion, management support and innovation’ (Fernández-Pérez et al., 2014; Teh & Sun, 2012). This is the opposite of a culture in which organizational inertia thrives, which is a culture that is suppressing emotions instead of acknowledging them and viewing new ideas as obstructive instead of constructive (Godkin & Allcorn, 2008). Furthermore, research shows that managerial networks are often affected by organizational inertia (Li & Rowley, 2002). When assessing partners for innovation, an inert organization will often choose an organization they have partnered with in the past, instead of going into new alliances. This allows managers to miss out on opportunities regarding innovation (Li & Rowley, 2002; Podolny, 1994). For these reasons it is expected in this study, that the effect of organizational inertia on CBMI is (partly) moderated by the variety of managerial ties.

There are four different situations that can arise within the conceptual model of this study. The level of variety of managerial ties, or tie variety, can be high or low, additionally, the level of organizational inertia can be high or low. When the level of organizational inertia is low, this means that there is a high level of organizational flexibility. In the first situation, the tie variety is high and the level of organizational inertia is high. In this case it is expected that the high tie variety will mitigate the negative effect that organizational inertia has on CBMI. In the second situation the tie variety is low and the level of organizational inertia is high. In this case it is expected that the low tie variety will aggravate the negative effect that organizational inertia has on CBMI. In the third case, the tie variety is high and the level of organizational inertia is low. In this situation, the expectation is that the high level of tie variety will increase the positive effect that organizational flexibility has on CBMI. In the last case, the tie variety is low and the level of organizational inertia is also low. In this situation it is expected that the low tie variety will mitigate the positive effect that organizational flexibility has on CBMI. These expectations result in the following hypothesis;

H3. The level of variety of managerial ties moderates the relationship between organizational inertia and circular business model innovation.

2.4 Conceptual model



3 Methods

3.1 Research setting

In this study the following research question is examined; *'How does organizational inertia influence circular business model innovation and how is this relationship affected by the variety of managerial ties?'*. The population that is researched in this study are organizations in the construction and infrastructure industry, in particular organizations that are working on circular innovation and that are executing projects in the Netherlands. With the majority of these organizations operating in Noord-Holland. The reason that this population is being researched in this study is because the construction and infrastructure industry is one of the most important industries for the Dutch economy, and one of the industries that causes the heaviest burden on the environment (Rijksoverheid, 2023c). That is why it is one of the five industries that the Dutch Government wants to invest in order to make the Dutch economy become circular as soon as possible (Rijksoverheid, 2023a).

Due to unforeseen circumstances, the questionnaire is distributed via a multitude of channels instead of only through the contacts of the Municipality of Amsterdam. Therefore, the data is collected through contacts of the Municipality of Amsterdam, contacts of Wageningen University and Research, contacts of Radboud University, through Bureau van Dijk and through LinkedIn.

3.2 Data collection

In order to generalize the outcomes of this study for organizations, a measurement of a large sample is necessary. This is the reason why a large group of managers at different organizations in the construction and infrastructure industry are asked the same questions. This means that quantitative research is conducted in this study. To measure a large sample, a questionnaire was created. This questionnaire is the primary method of data collection in order to answer the research question. Since Dutch organizations are targeted to participate in this study, the questionnaire is conducted in Dutch. This will improve the validity of the study. The questionnaire will be available online and mostly distributed via email. Respondents complete the questionnaire on Qualtrics through a link in their email. Completing the questionnaire will take the respondents about ten minutes.

An introduction to the questionnaire will show respondents why the questionnaire was taken, and to what study they were contributing to. All respondents that took part in this study voluntarily chose to complete the questionnaire, and were made clear that they would remain anonymous in the interest of both their organization and themselves. The first question of the questionnaire was; *'Would you like to participate in this study?'*. Only respondents who answered this question with; *'Yes, I voluntarily agree to participate in this study, where my research data will be anonymized and securely stored according to Radboud University's research data management guidelines.'* continued to participate in the study. These measures were taken to ensure that the standards for research ethics are upheld. The questionnaire is available for five weeks, from the 15th of May 2023 until the 17th of June 2023. The organizations that participated in this study were selected based on their industry, and their interest in circular innovation, thus addressing the right target group. Due to the multitude of channels that were used to collect the data for this study, it is not entirely clear how many organizations were approached to take part in this study. Therefore, it is hard to say what the response rate is, it is estimated to be around 20% in total. There are 54 organizations that took part in this study.

3.3 Measurement

The questionnaire consists of 7 questions containing 28 items in total. The questionnaire starts with some general questions, these include the control variables of the study, such as the size and the age of the organization. Secondly, questions are asked about the extent of CBMI in the organization. After that, questions are asked about the level of organizational inertia. And lastly, questions about the variety of managerial ties are asked. To measure all the variables discussed in the previous chapters, different scales are being used. In this chapter examples will be given for each variable, the complete questionnaire can be found in the appendix.

3.3.1 Control variables

The measurement model includes several control variables to rule out alternative explanations to those that are hypothesized. The exclusion of these variables might influence the analysis. The two main control variables used in BMI research and managerial tie research are firm size and firm age. The firm size is measured in the number of employees (Peng & Luo, 2000; Zhou et al., 2014; Zott & Amitt 2007 & 2008). The firm age is measured in the number of years since the firm was established (Li et al., 2008; Zhou et al., 2008; Zott & Amitt 2007 & 2008). The control variable of industry is also widely used, as well in BMI, managerial tie as in organizational inertia literature (Huang et al., 2013; Zhou et al., 2014), but since our population is already narrowed down to the construction and infrastructure industry, there is no need to include a question about this in the questionnaire.

3.3.2 Circular business model innovation

To determine whether an organization engages in BMI, the scale of Zott and Amitt (2007 & 2008) is used. The items used in this study are based on this scale, but they are rewritten to include circularity in order to determine CBMI. Zott and Amitt (2007 & 2008) distinguish two types of BMI, namely novelty-centered BMIs and efficiency-centered BMIs. Most BMIs are not orthogonal, therefore they are both novelty-centered as efficiency-centered. Items of both novelty-centered as efficiency-centered BMIs are included in the survey. A few examples of these statements are ‘The organization is a pioneer in circularity through its business model’, ‘The circular aspects of the business model reduce costs for stakeholders’, and ‘The organization continuously introduces circular innovations in its business model’. The scale is based on the 7-points Likert Scale, where one means ‘extremely disagree’ and seven means ‘extremely agree’. A high score on this scale is considered an indicator for successful CBMI, and a lower score on this scale is considered less successful CBMI. In order to understand what type of CBMI strategies the organizations have, a question will be included about the four generic strategies of CBMI. These include cycling, extending, intensifying or dematerializing (Geissdoerfer et al., 2020).

In order to measure the reliability of the scales of all the variables, a reliability analysis is conducted. Cronbach's alpha is used to measure the internal consistency for CBMI, organizational inertia and for managerial ties. The value of Cronbach's alpha is acceptable if it is above .7, however values above .8 are considered good (Nunnally & Bernstein, 1994). In this study, the scale of CBMI has an alpha coefficient of .899, which indicates an excellent internal consistency of this scale.

3.3.3 Organizational inertia

Organizational inertia is measured based on a well-known scale that takes into account three important dimensions of inertia, which are insight inertia, action inertia and psychological inertia (Huang et al., 2013; Liao et al., 2008). This scale is based on the 7-points Likert Scale, where one means 'extremely disagree' and seven means 'extremely agree'. In the questionnaire, three different statements are presented per dimension of inertia. For example, for the dimension of insight inertia, a statement is 'Our company will utilize past information and knowledge to solve problems'. For the dimension of action inertia, a statement is 'Our company has a deep-rooted organizational culture'. And for the dimension of action inertia, a statement is 'Company employees like the current processes and do not change'. A high score on this scale is considered an indicator for organizational inertia, and a low score on this scale is considered an indicator for organizational flexibility.

The scale of organizational inertia has an alpha coefficient of .807, which indicates a good internal consistency. The analysis shows that by removing the first item, 'inertia1' this score would slightly improve to an $\alpha = .820$. However, there are three dimensions of inertia that together form the scale of organizational inertia, namely insight inertia, action inertia and psychological inertia. Therefore, the reliability analysis is conducted in order to assess the internal consistency of the three dimensions of organizational inertia too. Insight inertia has an $\alpha = .705$, which is acceptable, this score cannot be improved by removing any items. Action inertia has an $\alpha = .639$, which is slightly below acceptable, this score would not improve by removing one of the items. Lastly, the analysis shows the alpha coefficient of psychological inertia, this is $\alpha = .832$, which is considered a good value. This could be slightly improved by removing 'inertia9', but this difference is too small to remove an entire item for. Based on these analyses, all the items for the scale of organizational inertia are retained.

3.3.4 Variety of managerial ties

The measurement items of the variety of managerial ties is largely based on well-known scales used by many researchers (Li et al., 2008; Peng & Luo, 2000; Zhou et al., 2014). However these scales are mostly about business ties and political ties, therefore, these scales are extended by questions about university ties. This scale is based on a 7-points Likert Scale, where one means ‘very little’ and seven means ‘very extensive’. For example, for business ties the questions are as follows; ‘During the past three years, (top) managers at our firm have heavily utilized a variety of personal ties, networks, and connections with;

1. (Top) managers at buyer firms
2. (Top) managers at supplier firms
3. (Top) managers at competitor firms

The more types of external entities an organization has ties with, the higher the variety of managerial ties is considered.

The reliability analysis is conducted to assess the internal consistency of the scale of variety of managerial ties. The total scale has an alpha coefficient of $\alpha = .822$, which indicates a good internal consistency of this scale. This value could be slightly improved by removing ‘business2’ but this difference is deemed too small to remove an this item for. The scale of the variety of managerial ties also has three dimensions, business ties, political ties and university ties. The dimension of business ties has an $\alpha = .785$, the dimension of political ties has an $\alpha = .732$, and the dimension of university ties has an $\alpha = .929$. Although some of these values could be increased by removing one item, all the items have been retained. Since the removal of these items would have decreased the alpha coefficient of the entire scale and the values are already acceptable.

3.4 Analytical approach

The analyses in this study are conducted by using SPSS. First the data will be analyzed by a Pearson-correlation matrix in order to examine the correlations between all the different variables. The hypotheses will be tested by conducting a multiple regression analysis, as there are multiple metric independent variables and a metric dependent variable. The hypotheses are rejected when the significance level of $< .05$ is not met. The third hypothesis includes a moderator effect; ‘The level of variety of managerial ties moderates the relationship between organizational inertia and circular business model innovation’. To measure the effect of this moderator a new variable will be computed, which is the centered scale of organizational inertia times the scale of the variety of managerial ties. This will create an interaction variable, and by including this variable in the model for multiple regression, the interaction-effect will be measured.

A confirmatory factor analysis (CFA) leads to a three-component solution which explains a total of 61,9% of variance. The Kaiser-Meyer-Olkin value is .700, exceeding the threshold of .5 and Bartlett’s test of sphericity is statistically significant (p < .001), supporting that there are enough correlations to perform the CFA (Hair et al., 2021). The CFA also shows that all the items can be retained for further analysis, as the items have statistically significant factor loadings (Hair et al., 2021).

4 Results

4.1 Descriptive statistics

Table 1 provides the Pearson correlations for the most important variables included in this study. The most notable correlation for this study is the correlation between CBMI and the total variety of managerial ties, r = .538, n = 48, p < .001. According to the interpretation of Cohen (1988) this is a large correlation. Other remarkable correlations are those between the total variety of managerial ties and the number of employees, r = .460, n = 48, p = .001, which is considered a medium sized correlation (Cohen, 1988). Larger organizations tend to have more political and university ties than smaller organizations.

The organizations in this study have an average age of around 30 years in 2023. However, it is to be noted that more than half of these organizations were founded before 1970. The average number of employees of the organizations in this study is around 150. 25,9% of the organizations have less than 25 employees while 37% have more than 500 employees. A scatter plot shows that this relationship between size and age of the organization is quite linear, thus large organizations are generally older and small organizations are younger in this sample. This relationship is confirmed by a statistically significant Pearson correlation, r = -.522, n = 54, p < .001 .

Table 1 *Correlations*

Variable	Mean		1	2	3	4	5	6	7	8
1 WerknemersOrg	4,11	Pearson Correlation	1							
		Sig. (2-tailed)								
2 JaarOrg	4,57	Pearson Correlation	-,522**	1						
		Sig. (2-tailed)	0,001							
3 CBMITOT	4,294	Pearson Correlation	0,207	-0,123	1					
		Sig. (2-tailed)	0,133	0,377						
4 InertiaTOT	3,486	Pearson Correlation	0,009	-0,131	-0,169	1				
		Sig. (2-tailed)	0,95	0,349	0,226					
5 TiesTOT	4,218	Pearson Correlation	,460**	-0,163	,538**	-0,263	1			
		Sig. (2-tailed)	0,001	0,268	0,001	0,071				
6 BusinessTOT	4,95	Pearson Correlation	-0,011	-0,108	0,202	0,228	,498**	1		
		Sig. (2-tailed)	0,939	0,467	0,167	0,119	0,001			
7 PoliticalTOT	3,938	Pearson Correlation	,517**	-0,096	,418**	-0,239	,857**	0,251	1	
		Sig. (2-tailed)	0,001	0,516	0,003	0,101	0,001	0,086		
8 UniversityTOT	3,764	Pearson Correlation	,457**	-0,15	,524**	-,449**	,835**	0,041	,643**	1
		Sig. (2-tailed)	0,001	0,308	0,001	0,001	0,001	0,78	0,001	

Most of the organizations that participated in this study engage in circularity in a few different ways. The most common way the organizations engage in circularity is by recycling measures to create closed resource loops, 77,8% of the organizations indicate that they engage in circularity in this manner. 68,5% of the organizations engage in circularity by extending the life-span of products and materials. 29,6% engage in circularity by intensifying the use of products and materials. 22,2% engage in circularity by dematerializing, the substitution of physical products for online service and software solutions. 7,4% indicate that they have a different strategy to engage in circularity besides the four strategies that are mentioned. Some of these answers include knowledge-sharing and taking part in supply chain initiatives. 11,1% of the organizations in this study note that circularity is not a part of the organizations business model at all. On average, the organizations in this study score relatively high on the scale of CBMI and seem to agree with most of the statements in the questionnaire.

For the scale of organizational inertia, organizations that score below 3.5 are considered to be more flexible and organizations that score above 3.5 are considered to be more inert. In this study, 52,8% of the organizations show to be more flexible and 47,2 % of the organizations show to be more inert. This indicates that the independent variable of this study is fairly normally distributed. Which a bar graph of this scale confirms.

The organizations in this study have the most business ties. Most organizations in this study have less political ties and have least university ties. They utilize these managerial ties less than their business ties. Only 8,3% of these organizations indicate that they make little use of their business ties, whereas this is 25% for political ties and 35,4% for university ties. Overall the managers of the organizations utilize their managerial ties extensively. 54,2% of the organizations report that they utilize their ties ‘quite a lot’ to ‘very extensively’. 31,2% utilize their ties neither little nor much, and 14,6% utilize their ties ‘very little’ to ‘fairly little’.

4.2 Multiple regression analysis

A hierarchical multiple regression analysis is conducted to test the hypotheses of this study. Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity. Table 2 shows the results of the hierarchical multiple regression analysis. In model 1 only the control variables are included, in model 2 the centered independent variable and the moderator variable are included and in model 3 the interaction variable is included too.

Model 2 has a total explained variance of 29,7%, F (2, 43) = 4,542, p = .001. This model tests hypothesis 1, which predicted that organizational inertia has a negative effect on CBMI. The analysis shows no support for this hypothesis. The analysis reveals that there is a negative effect of inertia on CBMI, B = -, 049, however this effect is not statistically significant (*beta* = -,032 , p = .812). Table 1 also shows that there is no statistically significant Pearson correlation between CBMI and organizational inertia. Because of these results hypothesis 1 is rejected.

This model also tests hypothesis 2, which predicts that a variety of managerial ties is positively related to CBMI. In support of this hypothesis, a positive and statistically significant effect is found for a variety of managerial ties on CBMI, B = .729 (*beta* = .559, p < .001). In Table 1 a statistically significant positive correlation can be seen between CBMI and a variety of managerial ties. The larger the variety of managerial ties, the more the organizations in this study engage in CBMI. And the smaller the variety of managerial ties is, the less the organizations in this study engage in CBMI. Because of these results hypothesis 2 is accepted.

In model 3 the interaction variable is included too. The total variance explained by the whole model is 29,3%. In this case the adjusted R squared, which takes into account the complexity of the model. The extra variance that is explained by this model by including the moderator variable is statistically significant, F (1, 42) = 4,891, p = .036. This model tests hypothesis 3, which predicted that a variety of managerial ties moderates the relationship between organizational inertia and CBMI. Model 3 reveals that there is a statistically significant effect of the interaction variable on CBMI, B = -.322 (*beta* = -.854, p = .036). Therefore, hypothesis 3 is accepted, the level of variety of managerial ties moderates the relationship between organizational inertia and CBMI. In Model 3 the effect of organizational inertia on CBMI remains statistically non-significant (*beta* = .762, p = .056), and the effect of a variety of managerial ties on CBMI remains statistically significant (*beta* = .499, p = .002).

Table 2 *Results of Multiple Regression Models*

Variable	**Model 1**			**Model 2**			**Model 3**		
	B	β	Sig.	B	β	Sig	B	β	Sig
Constant	3,867		0,000	3,867		0,07	3,867		0,033
Employees organization	0,112	0,197	0,255	-0,053	-0,094	0,58	-0,033	-0,059	0,717
Year organization	-0,007	-0,02	0,908	-0,029	-0,085	0,58	-0,029	-0,084	0,566
Organizational inertia				-0,049	-0,032	0,812	1,164	0,762	0,056
Variety of managerial ties				0,729**	0,559	0,001	0,651**	0,499	0,002
Managerial tie – inertia interaction							-0,322*	-0,854	0,036

* p < .05
** p < .01

5 Discussion

This study has examined the notion of organizational inertia within the context of CBMI, and the role of managerial tie variety in this relationship. Based on knowledge diversity literature, three types of managerial ties were included in this study. Business ties, political ties and university ties. It is shown that successful CBMI is associated with a broad variety of managerial ties. In this discussion, theoretical and practical implications of the findings in this study will be discussed. Additionally, important limitations of the study will be explained. This discussion will end with the conclusion of this study.

5.1 Theoretical implications

The first hypothesis expected organizational inertia to have a negative effect on CBMI. In the analysis there was no support found for this hypothesis. This is striking, as the expectation was that these variables would be positively related. In literature, there is extensive research that organizational inertia is negatively related to BMI (Bouchikhi & Kimberly, 2003; Huang et al., 2013; Moradi et al., 2021). And that this effect is likely to be even more prominent in the context of CBMI (Korhonen, 2018; Yamoah, 2022). The implication for theory is that the topic of organizational inertia needs to be researched even further, even though this topic has been researched extensively. This extensive literature on organizational inertia may have given the wrong impression to scholars, given the fact that organizational inertia is an under researched topic in CBMI (Santa-Maria et al., (2021). But 'old' topics such as organizational inertia need to be examined in 'new' settings such as CBMI in order for this research stream to stay relevant. This study shows that there is much more to uncover about organizational inertia in CBMI.

The analysis shows that organizations that have a high level of variety of managerial ties engage more in CBMI than organizations that have a low level of variety of managerial ties. This was the hypothesized result, and the analysis confirms these expectations. However, there are a few things that need to be considered when looking at this result. The first of which is that most organizations indicate they utilize their managerial ties a lot. So the level of variety of managerial ties is not entirely evenly distributed, this could distort the results a little bit. The second is that organizations indicate that they are relatively much engaged in CBMI, there are more organizations that engage a lot in CBMI than organizations that engage little in CBMI in this sample. To account for the perspective the respondent may have on circularity, there was an explanation in the questionnaire and questions were asked about how the organizations engage in CBMI and what circular strategy they align with. With the confirmation of this hypothesis this study contributes to theory about managerial ties in CBMI.

The third hypothesis examined the effect of different levels of variety of managerial ties on the relationship between organizational inertia and CBMI. The findings showed that there is a statistically significant interaction effect of the variety of managerial ties and organizational inertia on CBMI, but this is a negative effect. Which means that a high variety of managerial ties does not mitigate the effect of organizational inertia on CBMI like expected, but aggravates this. We should be cautious when looking at these findings, because there is no theoretical evidence found that support these findings. Besides, hypothesis 1 is rejected, so organizational inertia is not negatively related to CBMI in this study as a direct effect. What is made clear by these findings is that further research is needed on the moderating effect of the variety of managerial ties on the relationship between organizational inertia and CBMI. This study contributes to this literature, since these factors have not been researched in the context of CBMI thus far.

5.2 Practical implications

As mentioned in paragraph 5.1 it was not expected in this study that organizational inertia would not have a negative effect on CBMI based on extant research of this topic in BMI literature. The cause for this different result could be due to the sector that was researched. Namely, the construction and infrastructure industry. In this sector, there are a lot of laws and regulations that cause organizations to have to be more environmentally focused. There are new national policies such as the BENG-requirements (near-zero energy building) which took effect from 1 January 2021. And the obligation of the MPG (environmental performance of buildings), which is an indicator of the environmental impact of the materials in new constructions. Since 2021 there is a limit on how high this indicator can be (De Circulaire Bouweconomie, 2023). This may cause even inert organizations to be more engaged in CBMI. This could also be the reason that most organizations in this sample are scoring relatively high on the scale of CBMI.

With the realization that the variety of managerial ties has a large positive effect on CBMI, organizations can use this to their advantage. Organizations can start thinking about how they can support their managers in developing a broad variety of managerial ties and how this could help their innovation process. This study reveals that larger organizations tend to have more political ties and university ties, most likely because they have had the most time to develop these over the years. Organizations do not have to wait and let these managerial ties develop organically, especially those political and university ties. They can support their managers by collaborating with universities on (circular) projects or reach out to a consulting firm to find out if there are any grants available for circular innovations for example.

5.3 Limitations

The biggest limitation of this study is the small number of organizations that took part in this study. Therefore, the results are not generalizable for the entire population, all the construction and infrastructure organizations in the Netherlands. The low number of respondents is most likely due to a certain organization for which this research is conducted. This organization has terminated the research early. Another reason could be that the data in this study is gathered in combination with another study, which caused the questionnaire to be longer than if only the data of the current study was gathered. Some organizations probably haven't had time to fill out the questionnaire because of this length. When more organizations would have taken part in this study, the results could be different. There is no way of knowing whether the hypotheses would have been rejected or supported if there would have been more organizations that took part in this study. The results would also be more reliable, for it is less likely that repeating this same study will yield a different result if there were more respondents. Further research, with a much larger sample size, will be needed to identify the key factors of successful CBMI.

A second important limitation of this study is the mistake that has been made by the question of the control variable age. This variable was incorrectly made to be a ratio variable, while this should be a scale variable. In the questionnaire, respondents could fill out when the organization was founded by a multiple choice question which incorporated five years at a time. The respondent could for example, choose 'between 2001 and 2005'. The choice for this multiple choice question was made in order to account for the respondents that didn't know exactly in which year the organization was founded. But in hindsight it turns out that a lot of organizations chose the option 'before 1970', which indicates that more years, maybe even decades before 1970 should have been included. Due to this mistake, certain results can be a little distorted. This may be the reason that there was no statistically significant Pearson correlations found between the control variable 'age' and organizational inertia, which is usually an indicator of organizational inertia (Hannan & Freeman, 1984; Kelly & Amburgey, 1991).

5.4 Conclusion

This quantitative study focused on the following research question; '*How does organizational inertia influence circular business model innovation and how is this relationship affected by the variety of managerial ties?*'. The analysis reveals that there is no statistically significant negative relationship between organizational inertia and CBMI. Additionally, the results show that the organizations overall have a great variety of managerial ties, and that they utilize their business ties the most. Furthermore, larger organizations have more political ties and university ties than smaller organizations. The analysis reveals that there is a statistically significant positive relationship between the variety of managerial ties and CBMI. The larger the variety of managerial ties, the more the organizations engage in CBMI. And the smaller the variety of managerial ties, the less the organizations engage in CBMI. Thus, the variety of managerial ties seem to be key driver for successful CBMI. This indicates that all three types of managerial ties included in this study, business ties, political ties and university ties, are important in CBMI. Lastly, the analysis shows that there is a statistically significant interaction effect between the moderator variable, variety of managerial ties, and the independent variable, organizational inertia, on CBMI. But not in the direction that was expected, the interaction of these variables showed to have a negative effect on CBMI instead of a positive effect.

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Appendix Questionnaire

Bedankt voor uw interesse in deze studie. Het doel van dit onderzoek is om inzicht te krijgen in verschillende factoren als het gaat om het innoveren op duurzaam en circulair gebied bij organisaties in de bouw en infrasector in Nederland. In deze online vragenlijst wordt er daarom van u gevraagd om een aantal vragen te beantwoorden. Het onderzoek duurt ongeveer 10 minuten.

Uw antwoorden zullen enkel gebruikt worden voor onderzoeksdoeleinden en uw deelname is anoniem en vrijwillig. Wij vragen bijvoorbeeld naar de naam van uw organisatie, alleen de onderzoekers kunnen dit zien. U kunt te allen tijde stoppen met deze vragenlijst. Er zijn geen goede of foute antwoorden. Voor vragen of opmerkingen kunt u een e-mail sturen naar het volgende e-mailadres; thessa.pater@ru.nl.

Alvast hartelijk dank voor uw deelname!

William van Omme en Thessa Pater

Wilt u deelnemen aan dit onderzoek?

- Ja, ik stem geheel vrijwillig in met deelname aan dit onderzoek, waarbij mijn onderzoeksgegevens anoniem worden gemaakt en veilig worden opgeslagen volgens de richtlijnen voor het beheer van onderzoeksgegevens van de Radboud Universiteit.
- Nee, ik stem niet in met deelname aan dit onderzoek, ik kies ervoor om de vragenlijst te beëindigen.

Er worden eerst een aantal algemene vragen gesteld over de organisatie waar u werkt.

1. Wat is de naam van de organisatie?

   …
2. Hoeveel werknemers heeft de organisatie?
- Minder dan 25
- Tussen de 25 en de 50
- Tussen de 51 en de 100
- Tussen de 101 en de 150

- Tussen de 151 en de 250
- Tussen de 251 en de 500
- Meer dan 500

3. In welk jaar is uw organisatie opgericht?

   …

De volgende vragen gaan over circulariteit. Met circulariteit bedoelen we een vorm van duurzaamheid waarbij grondstoffen en materialen zo veel mogelijk in een gesloten kringloop worden gehouden. Met als doel zo min mogelijk afval te creëren en optimaal gebruik te maken van grondstoffen en materialen.

4. Hoe implementeert uw organisatie circulariteit? (er zijn meerdere antwoorden mogelijk)

a. Door het hergebruik van materialen of energie (zoals recycling of refurbishing)
b. Door het verlengen van de levensduur van producten (door bijvoorbeeld reparatie, onderhoud of het duurzaam ontwerpen van producten)
c. Door het intensiever gebruiken van producten of materialen (door bijvoorbeeld een deelsysteem)
d. Door fysieke producten te vervangen voor online service- en softwareoplossingen
e. Op een andere manier, namelijk…

f. Circulariteit is geen onderdeel van het bedrijfsmodel van de organisatie

(De volgende vragen zijn op basis van een Likert schaal, waarbij één 'helemaal oneens betekent' en zeven 'helemaal eens' betekent)

5. Geef aan in hoeverre u het eens bent met de volgende stellingen;

- Wij zijn een pionier op het gebied van circulariteit door het bedrijfsmodel.
- Wij introduceren regelmatig circulaire innovaties in het bedrijfsmodel.
- Er worden veel verschillende stakeholders samengebracht door het bedrijfsmodel.
- De circulaire aspecten van het bedrijfsmodel zijn vernieuwend.
- De circulaire aspecten van het bedrijfsmodel zorgen voor lagere kosten bij de stakeholders.

- De circulaire aspecten van het bedrijfsmodel zorgen voor hogere efficiëntie.

(De volgende vragen zijn op basis van een Likert schaal, waarbij één ‘helemaal oneens betekent’ en zeven ‘helemaal eens’ betekent)

6. De volgende vragen gaan over de wendbaarheid van de organisatie. Geef aan in hoeverre u het eens bent met de volgende stellingen.

Insight inertia	Onze organisatie neemt zelden veranderingen in de externe omgeving waar.
	Onze organisatie gebruikt informatie en kennis uit het verleden om problemen op te lossen.
	De mensen in onze organisatie proberen zelden hun denken en gedrag te veranderen door nieuwe dingen te leren.
Action inertia	Onze organisatie heeft een diepgewortelde organisatiecultuur.
	De normen en waarden van onze organisatie zijn heilig en we zijn niet van plan om deze te veranderen.
	Wanneer ons gedrag moet veranderen, is het moeilijk om anderen te overtuigen dit te doen.
Psychological inertia	De mensen in onze organisatie voelen zich bedreigd door organisatorische veranderingen.
	De mensen in onze organisatie bieden weerstand als gevolg van organisatorische veranderingen.
	De mensen in onze organisatie zijn tevreden met de huidige processen en houden niet van verandering.

(De volgende vragen zijn op basis van een Likert schaal, waarbij één ‘zeer weinig’ en zeven ‘zeer veel’ betekent)

7. De volgende vragen gaan over de externe connecties van de managers in de organisatie.

In welke mate hebben de managers van de organisatie in de afgelopen drie jaar gebruik gemaakt van verschillende persoonlijke connecties, netwerken en verbindingen met;

Business ties	Managers bij zakelijke afnemers
	Managers bij leveranciers
	Managers bij concurrenten

Political ties	Politieke leiders op verschillende niveaus van de regering
	Ambtenaren in de regelgeving zoals de gemeente, het Waterschap, Rijkswaterstaat etc.
	Adviseurs bij organisaties zoals adviesbureaus, advocatenkantoren, banken etc.
University ties	Studenten en docenten bij Hogescholen
	Studenten en professoren bij Universiteiten
	Onderzoekers bij onderzoekinstellingen