Table 1. Most critical drivers associated with green innovation

Number	***Drivers for green innovation***	***References***
1	Technological capabilities	Franco et al. (2009), Heikkurinen (2010), Chang and Chen (2013)
2	Organizational competencies and culture	Lai et al. (2003), Zerjav and Javernick-Will (2009)
3	Cooperation with suppliers/partners	Albort-Morant et al. (2016), Ebrahimi and Mirbargkar (2017)
4	Customer/market demand	Laforet (2009), Guerlek and Tuna (2018)
5	Rules and regulations	Kohtamaki et al. (2013)
6	Skills workforces of green practices	Ebrahimi and Mirbargkar (2017), Takalo et al. (2021)
7	Financial capabilities	Hölzl and Janger (2014)
8	Collaboration with public organizations	Walker et al. (2008)
9	Research and development	Franco et al. (2009), Guerlek and Tuna (2018)
10	Geographical location	McAdam et al. (2004), Kawai et al. (2018)
11	Corporate social responsibility	Plotnikova et al. (2015)
12	Business model	Markides and Sosa (2013), Takalo et al. (2021)

4. Green innovation initiative in Europe

Green innovation has also been recognized as one of the main factors in achieving sustainable development (Dangelico 2010). New measures to promote green and environmentally friendly innovation were integrated into the European Green Deal in the pursuit of a "zero-pollution, competitive, climate-neutral economy by 2050" (European Commission 2022b). The European Union's (EU) commitment to attain climate neutrality by focusing its investments on innovation ensures the imperative of the topic, as well as its extensive opportunities in fostering green innovation within the region. Aligning with this idea, the European Investment Bank set out to provide support in coordination with the EU innovation policy. These supports include support in transformative green and digital technologies and enhancing support for innovation in cohesion regions (European Investment Bank 2022).

Additionally, the support for green transition can be recognized from the European Commission's help in designing and implementing reforms for the European Member States. It is identified that the need for energy transition is not only due to the carbon-neutrality objective but also for energy security and affordability within the region. Europe is heavily dependent on Russia for fossil fuel imports. In 2021, Russia provided more than a quarter of EU imported crude oil (Edmond 2022). The Russia and Ukraine conflict started on 24th February has raised an issue between the EU and Russia relationship that progressed to the EU adoption of economic sanctions towards Russia which include import prohibition on Russian crude oil and refined petroleum products (European Council 2022a). Without a clear conclusion to this conflict, the need to acquire other means of electricity generation rather than fossil fuel-based is crucial for the European Union's energy security.

5. Opportunities in green innovation

To be sustainable want in the turbulent and intensely competitive environments of today, companies must support innovation. To achieve this, businesses must stay informed of the numerous market shifts, fluctuations, and trends that are constantly developing worldwide. This strategic shift is known as a customer-specific and green-oriented strategy. The ultimate goal of practicing a green innovation strategy is to improve the company's survival and performance (Laforet 2009). Practicing green innovation may gain from being pioneers in terms of financial performance through many other routes. For example, it is critical to maintain customer satisfaction to offer distinctive goods and services that appeal to environmentally conscious consumers (Kohtamaki et al., 2013). Additionally, research and development on green innovation can improve productivity and technological prowess (Franco et al. 2009) as well as the pool of highly skilled workers by utilizing creative business models (Markides and Sosa 2013; Takalo et al. 2021).

Moreover, pioneering businesses in the field of green technologies may have a greater preference for formation over customers in this regard (Heikkurinen 2010). Leaders in green innovation across industries may also partake in a

range of other creative activities. To achieve a unique impact on financial performance, it is critical to consider the percentage of green innovations in all innovative activities. Guerlek and Tuna (2018) assert that green innovation assists in satisfying customer expectations to save the environment. In addition, green innovation contributes to decarbonizing global companies. Figure 1 displays some basic opportunities that can be achieved from green innovation practices in organizations.

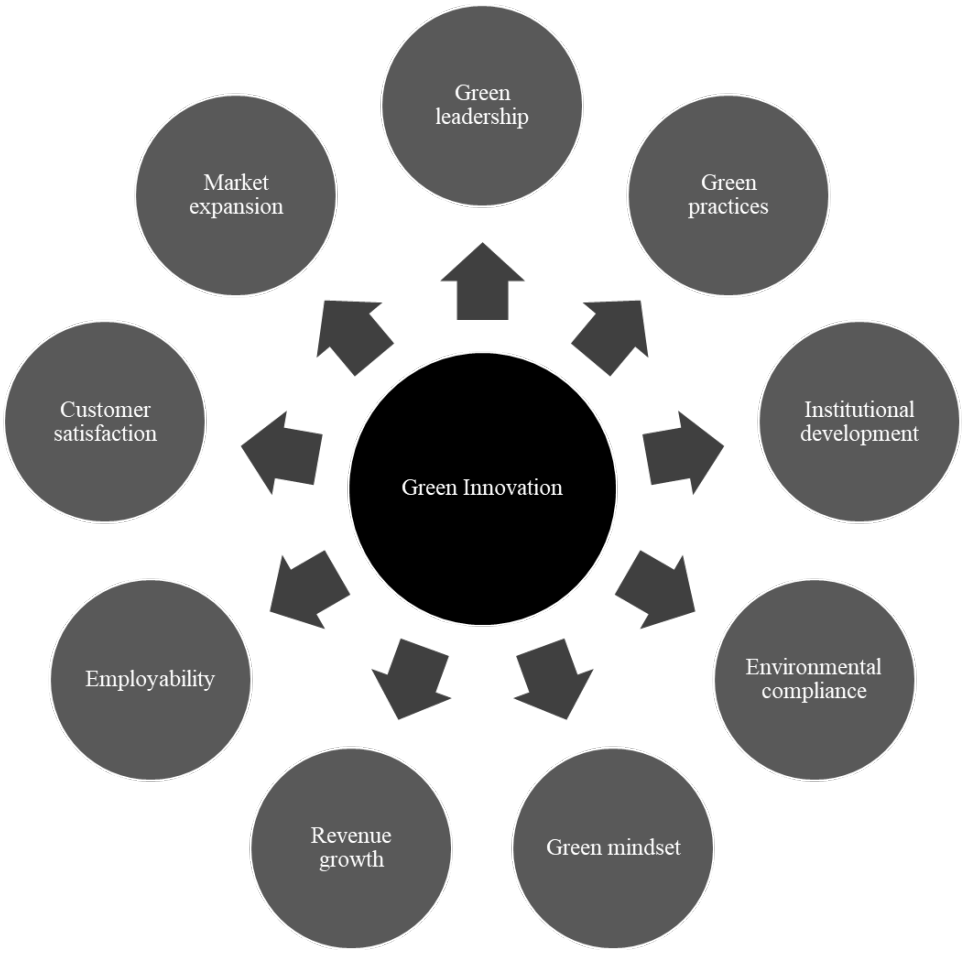

Figure 1. Display some basic opportunities from green innovation practices in organizations

Opportunities for green innovation can be defined as both hardware or software innovation, where it is relevant to green products or processes and includes technological advancements in fields like waste recycling, energy conservation, pollution avoidance, and green product design (Chen et al. 2006). Based on the performance of environmental management, green innovation can be divided into green product innovation and green process innovation (Chen et al., 2006). The performance of product innovation is related to environmental innovation, including the innovation in products that are involved in energy-saving, pollution-prevention, waste recycling, no toxicity, or green product designs (Lai et al., 2003). On the other hand, the performance of process innovation is also related to energy-saving, pollution-prevention, waste recycling, or no toxicity (Lai et al. 2003). Green process innovation is utilized to improve environmental management effectiveness to meet environmental protection criteria.

6. Challenges in green innovation

There are internal and exterior barriers related to green innovation. Internal barriers are the challenges that arise from within an organization, whereas, external challenges are problems that arise from outside the organization (Walker et al. 2008). In the literature, many studies are seen on the challenges or obstacles to general innovation but there are few studies found in the literature on the obstacles to green innovation (Madrid-Guijarro et al. 2009; Hölzl and Janger 2014). Hölzl and Janger (2014) identified several barriers to innovation, which can be stated as: a lack of

funding and competent staff, a lack of knowledge of technology, a lack of knowledge of markets, a lack of partners in innovation, and more are the top five hurdles to innovation (difficulty in finding cooperation partners for innovation). Plotnikova et al. (2015) categorized the innovation barriers as infrastructure, support for innovation activity, management, education, government acts, information, and infrastructure.

Numerous studies have found other barriers to innovation such as organizational culture (Zerjav and Javernick-Will 2009), absorptive capacity (Cohen and Levinthal 1990), ineffective training and deficient technical support from vendors (Baldwin and Lin 2002), limited supply (Carlsen and Edwards 2008), competitive pressure (Özgen and Ölçer, 2007), lacking customer responsiveness, lack of consensus at the CEO level and lack of sustainability standards and appropriate regulations (Galia and Legros 2004), lack of management awareness (Muduli et al. 2013), etc.

With green innovation, the challenges are also similar to generic innovation. However, some challenges are more specific to green innovation, which needs special attention. According to Abdullah et al. (2016), the common challenges associated with green innovation can be divided into internal and external. The most significant internal challenges can be identified as business processes, environmental resources, attitude and perception, information-related obstacles, and technical-related barriers, poor corporate norms and culture, poor knowledge and experience, insufficient communication, lack of support and commitment from top management teams, lack of qualified/skilled staff, high cost of research and development (Martinez-Ros and Kunapatarawong 2019), etc (Zwick 2002; McAdam et al. 2004). It is also noticed that the most prevalent sorts of green innovation are those that are supported by the government, information-related types, partnerships, environmental commercial benefits, and customer demand are the most prominent types of green innovation initiatives (Abdullah et al. 2016).

Similar to internal challenges, external barriers are also needed to be identified to foster green innovation in organizations. The most common external challenges can be identified as a lack of green new technologies (Gerstlberger et al. 2014), insufficient government support (Aguilera-Caracuel and Ortiz-de-Mandojana 2013), difficulties in data collection (Schweitzer 2015), insufficient funds to implement green principle/project (Wakeford et al., 2017), lack of external knowledge, absence of specific rules and regulations, absence of proper policy planning, insufficient knowledge of green initiatives (Ebrahimi and Mirbargkar 2017), stakeholder pressure (Kawai et al. 2018), etc. Major internal and external challenges related to green innovation are summed up and presented in Figure 2.

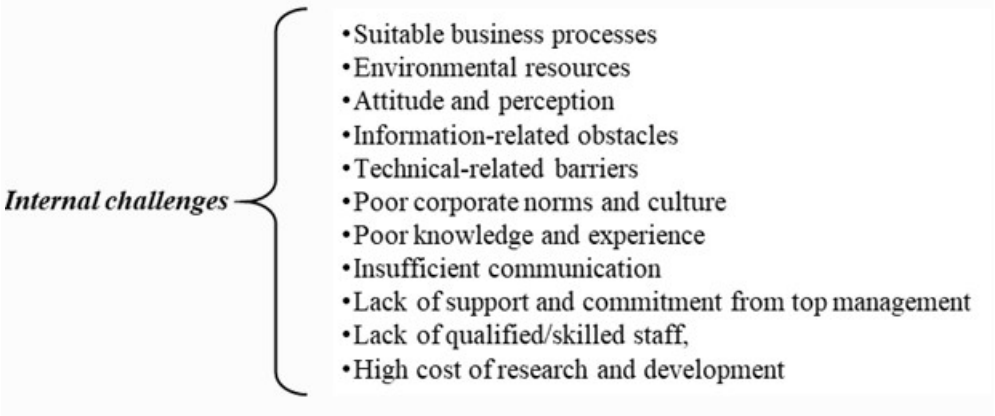

Figure 2. Major internal and external challenges related to green innovation

7. Conclusions

Although academic interest in green innovation has increased recently, the study of green innovation is still relatively new in comparison to conventional innovation and new product creation (Takalo et al. 2021). This study contributes to the discussion of creating green and sustainable innovation to achieve competitive advantages for firms by aligning with other capabilities of firms. This study has several useful implications for managers. First, it is suggested that sustainable innovation capabilities foster opportunities for organizations. It also attracts the attention of stakeholders that are under huge pressure to practice green initiatives in their everyday operations. Especially, case of SMEs, which are vulnerable to environmental dynamism problems need to incorporate green management and green innovation in their business operations.

The adoption of green innovations could be accelerated and competitive advantages for businesses revealed through the application of green practices. Due to the widespread recognition of the beneficial role that green innovation adoption plays in the business world; a growing body of literature has begun to examine green innovation adoption in organizations. The developing academic tendency has greatly aided organizational efforts to develop sustainably through strategic initiatives like green innovation capability. Thus, green innovation capability has become a significant enabler that organizations should carefully address. The study findings revealed that despite the increasing scholarly attention it has received in other domains, the idea of green innovation capability is still in its infancy. The current study is an attempt to examine the generalizability of existing measures and conceptions of green innovation and its opportunities and challenges across various organizational structures.

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