The role of knowledge Management Processes (KMP) in Green Innovation through Green Knowledge Sharing Behavior with theModerating role of Employee Environmental Beliefs and Values

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Abbreviations

KM	Knowledge management
KMP	Knowledge management processes
KACQ	Knowledge acquisition
RBV	Resource based view
NRBV	Natural resource-based view
GII	Green innovation index
GI	Green innovation
SME'S	Small and medium enterprises
VBN	Value beliefs norms
SPSS	Statistical Package for Social Scientists

Abstract

Many researchers and intellectuals focused on the topic of green innovation (GI). however, employees' pro-environmental behaviors, such as eco-helping, such as eco-helping, eco-civic engagement, and eco-initiatives, are often being ignored. Also, the investigation of the stimulating factors behind these behaviors remains weak. The purpose of this research is to explore the role of knowledge management processes (KMP) in these two types' of green innovation product innovation and process innovation, with the effects of moderation and mediation employee environmental beliefs and values and green knowledge sharing behavior. Purposive sampling technique is used for data collection for statistically testing the hypotheses, we gathered data from the SMEs of manufacturing industry from five cities of Pakistan, Islamabad, Rawalpindi, Faisalabad and Lahore where manufacturing organizations are mostly located. 500 employees were invited who participated voluntarily and out of those we received only 380 questionnaires and 360 were valid.

Keywords: employees pro environmental behavior, knowledge management processes, Pakistan's manufacturing industries, purposive sampling, green knowledge sharing behavior, green innovation, employee environmental beliefs and values.

Chapter 1

1.1 Introduction:

Pakistan is ranked poorly and is known as one of the least innovative countries in the world. Conducting research on the emerging country like Pakistan might give a further insight in (KMP)-recommended environmental control strategies. Degradation and redesign of environmentally friendly products that reduce industrial waste and protect the environment from pollution (Shahzad, Qu et al. 2021). Businesses and manufacturers must change their behavior to become more environmentally friendly to keep up with the trends. Numerous marketing, corporate ethics, and environmental management scholars have devoted considerable attention to green innovation (Lisi, 2019). Pakistan's government must to embrace more urgent and robust environmental regulations. Environmental challenges, according to (Jiang, Chai et al. 2018) require the government to enact restrictive policies. Daily, the strain on the climate and environment is increasing owing to the rapid usage of natural resources and dangerous pollutants (Razzaq, Sharif et al. 2021)). This poses a significant threat to emerging countries such as Pakistan. As more scientific proof of the negative consequences of this trend emerges, the external pressure on organizations to address the challenges of environmental degradation has increased (Awan, Arnold et al. 2021).

Green innovation has proven to be well-known phenomenon that provides businesses the opportunity to lessen their environmental impact. It aids in the strategy of environmentally friendly products and manufacturing practices(Huang and Li 2017) Ikea, Whole Foods, Uniliver, Tesla, and Nike are among the international companies that have adopted and integrated green innovation into their operations (Williams 2015). Knowledge management dimensions, which are Knowledge acquisition, knowledge dissemination, Knowledge responsiveness, are the most influential determinants on the implementation of green innovation by SMEs. The study significantly facilitates green innovation in SMEs(Singh, Chen et al. 2019).

This study is to investigate the association between Knowledge management and green innovation in Pakistani SMEs. In the age of globalization, different organizations have grabbed the importance of the knowledge management process (KMP), which has emerged as a gauge for organizational competitiveness(Ooi 2014) . Even though SMEs form the backbone of Pakistan's economy, efforts have been focused on large enterprises while disregarding SMEs. According to the World Bank report 2021, when economic pressure is at its peak or as a coping mechanism, people and corporations cause environmental concerns. The global innovation index (GII) identifies knowledge and creativity as the two most crucial variables (GII, 2021). With a mediocre score, Pakistan is known to be one of the least innovative country in the world. Through study on emerging economies like Pakistan, we may acquire a better knowledge of how KMP-supported tactics can be used to manage environmental degradation, reform eco-friendly products, and adopt cutting-edge technologies to reduce industrial waste.

We also look at potential links between knowledge management practices (KMP) and green innovation, and also the mediating and moderating roles that green information sharing practices play. (Wong 2013) and employee environmental attitudes and values (Jones and Dunlap 1992). (GI). There is a growing awareness of how the company's ethical judgments interact with the ethical concerns of its personnel to impact their behavior within the firm (Lin and Chen 2017). Individual and organizational characteristics influence employees' discretionary participation in the management of organization environmental effect, according to a growing body of study on the topic (Chou 2014).To take advantage of organizational green innovation, businesses should promote ecologically responsible employee conduct(Zibarras and Coan 2015) . Employees are increasingly urged to practice environmentally conscious behaviors for the sake of the environment.

1.2 Research gap:

Gap 1

KMP's significance is well known, and prior research has found it to be important for understanding organizational performance and knowledge-based innovation (Guillermo Antonio Davila, 2021). Few studies have examined the connection between KMP and green innovation, despite extensive industry

discussion. According to recent research, there is a connection between KMP and the adoption of green innovations (Abbas and Sagsan, 2019).

Gap 2:

According to earlier research, the performance of SMEs may be explained by both the voices of employees (Elsetouhi et al., 2018) and their psychological characteristics (Palmer et al., 2019). Some studies have concentrated on the religious convictions of senior executives, which may affect how they see environmental challenges (Hope & Jones, 2014; Rice, 2006). A person's primary environmental ethics views and ideals are referred to as their awareness of environmental issues (Gadenne et al., 2009; Cao and Chen, 2019). According to Sanjay Kumar Singh (2020), additional research on how employee environmental views and values affect green innovation is needed.

Gap 3:

According to Abbas and Sagsan (2019), knowledge sharing has a good impact on green technology and management innovation. According to earlier studies, it promotes social interaction and cooperation inside a company and gives staff members the tools they need to find creative solutions to challenges (Awan et al., 2020). Green knowledge sharing behaviour should be further studied as a mediator between Knowledge management systems and green innovation, according to Shahzad, M., Qu, Y., Zafar, A. U., and Appolloni (2021).

Gap 4:

Green innovation (GI) has received a lot of attention from scholars in the present decade as a result of environmental challenges and resource scarcity (Yousef, 2021)

1.3 Problem statement:

Environmental sustainability in the current period is a significant and grave concern. As a result of the huge production-related emissions of harmful gases, international organizations such as the United Nations (UN) have prioritized the enactment of environmental laws and regulations. According to the Global Climate Risk Index, Pakistan is among the top 10 countries which is affected by a concerned climate, with poor air quality and an environmental threat to public health (2021). Climate change and global warming, which are mostly caused by waste disposal and carbon emissions, are Pakistan's most pressing concerns.

With the reference to the Global Innovation Index, Pakistan is one of the least innovative countries in the world (GII, 2021). Despite having a population of 207million and a manufacturing sector GDP share of 14%, it was placed 119th in 2017 and 113th in 2018 out of 126 countries (GII, 2021). (2017 Economic Survey of Pakistan).

After agriculture, the manufacturing industry in Pakistan is the second largest and is responsible for a significant portion of employment. Since SMEs in Pakistan account for 40% of the country's GDP, they are considered to be the key drivers of economic growth, since 95% of all SMEs are SMEs(Anwar and Ali Shah 2020). Due to this manufacturing, SMEs play a key part in Pakistan's environmental pollution (Luken 2000). Since the majority of these SME production sites are located near rivers or coastlines, industrial pollutants immediately enter the water, putting plants, animals, and aquatic life at risk(Sahibzada and Qutub 1993) . In addition, CO2 emissions, one of the largest causes to air pollution, are high among SME's. Lack of awareness and inadequate application of environmental legislation contribute to the large environmental effect of small and medium-sized businesses(Ortolano, Sanchez-Triana et al. 2014).

1.3 Objectives

1: Assessing the influence of knowledge management processes (acquisition, dissemination, and responsiveness) on green innovation (product, process)
2: Examine the impact of employee environmental values and beliefs on green information-sharing behavior in relation to knowledge management systems.
3: Determine how knowledge management procedures and green innovation interact, as well as what role green knowledge sharing behavior plays in this context.

1.5 Research Questions:

The research questions for this study are provided below.

1. Determine the impact of knowledge management processes (KMP) (acquisition, dissemination, and responsiveness) on green innovation.
2. To determine how knowledge management processes (KMP) (acquisition, dissemination, and responsiveness) affect the sharing of green knowledge.

3. How employee environmental values and attitudes impact green information-sharing methods and knowledge management procedures

4: Does the Green Knowledge Sharing Behavior have a mediating role between knowledge management processes and green innovation?

1.6 Significance of the study:

Pakistan has the fifth-largest population in the world, as well as numerous environmental problems, such as water pollution, air, and land. After agriculture, the manufacturing industry in Pakistan is the second largest and is responsible for a significant portion of employment. Since SMEs in Pakistan account for 40% of the country's GDP, they are considered to be the key drivers of economic growth, since 95% of all SMEs are SMEs (Anwar and Ali Shah 2020) Therefore, manufacturing SME's play an important role in Pakistan's environmental pollution (Luken 2000).Climate change has had a huge influence on Pakistan's economy by lowering agricultural harvests and negatively impacting human health and the country's biodiversity.

In order to stop environmental degradation, extensive study is required to improve environmental quality that can be enhanced via green innovation, particularly in manufacturing. So as to better control environmental degradation, Pakistani manufacturing SMEs must immediately implement green innovations into production and operations. The Pakistani government is seeking to minimize environmental pollution through a number of environmental programs, including taxes and subsidies. Value addition through innovation and knowledge is considered to be the most important national development strategy for the ensuing ten years, according to Pakistan Council for Science and Technology's Vision 2025. Pakistan's Ministry of Science and Technology has chosen to carry out the first Industrial National Innovation Survey(Hamza 2018). This investigation's goal is to introduce innovations that improve the growth and sustainability of industrial products on the world market (Secretary, 2018)

Chapter 2

Literature review

Theoretical background and literature review

The current study uses the concepts of ‘knowledge management and ‘theory of Resource based view as its foundation.

2.1 Resource based view

(Wernerfelt 1984) Introduced RBV, which soon became a significant part of literature. As(Altaf, Hameed et al. 2019) state, RBV recommends that the success of a business is based on internal resources that are assets and capabilities of any business. This perspective contends that the firm's distinctive resources, whether material or intangible, produce the firm's competitiveness. (Kull, Mena et al. 2016). Particularly, any assets, competencies, organizational procedures, knowledge, firm features, and data that enable the organization to "conceptualise and implement plans that enhance its effectiveness and efficiency are referred to as organisational resources."(Barney 2018). (Barney 2018). Then, as RBV is restricted to firm-level repercussions and ignores the effect of environmental behaviours on green performance, it was discussed the traits and characteristics of business resources that really are (i) valuable, (2) rare, (3) inimitable, and (4) non-replaceable to encourage long-term competitiveness. (Andersen 2021).

(Hart 1995) As a result, established natural RBV (NRBV). The NRBV recognises the significance of the environment, expands the scope of RBV, and can be considered as a "competitive edge theory. Relationship between the business and the environment (Hart 1995). Diverse scientists and environmentalists have proposed that GI can boost a business's prosperity and long-term success by adopting an NRBV perspective (Shahzad, Qu et al. 2021). (Mills and Smith 2011). Says that one of the main drivers of economic growth is knowledge resources the best course of action for green innovation in the current environment and information-based economy is to rely upon green knowledge sharing behaviour and the KMP. By regulating employee environmental attitudes and values, an RBV supports the structure of a higher KMP to

increase green innovation by green knowledge sharing behaviour. Green innovation, according to knowledge management environmentalists who share the RBV perspective, can increase an employee's work performance and long-term performance.

(Barney 2021). Industry managers frequently utilize the RBV hypothesis as a tool to determine how a firm's resources and performance relate to one another. (Ferraris, Santoro et al. 2017).

2.2 Knowledge management

Many authors have defined knowledge management in different context. Best suitable definitions will be focused for the purpose of this paper. The formalization of and accessibility to experience, information, and expertise that produce new capabilities, produce improved performance, promote innovation, and increase customer value is what is meant by knowledge management (Gloet & Terziovski, 2004). The goal of knowledge management is to promote innovation (Parlby and Taylr, 2000). Km is also described as a collection of tenable convictions that might enable an individual to take action in the direction of innovation (Nonaka, 1994) Knowledge, according to (Ooi, 2014), is an intangible that is a valuable source for both due to the difficulty in duplicating it, both individuals and organizations. (El-Kassar & Singh, 2019) assert that the most significant factors impacting the adoption of green technologies by SMEs are indeed the knowledge management aspects of knowledge gathering, knowledge dissemination, and knowledge responsiveness. This research focuses on the elements that allow SMEs to implement green innovation (El-Kassar & Singh, 2019; Lin et al., 2019). The study primarily focuses on the connection between green innovation and environmental sustainability. One issue is that firms' green innovation activities being monitored and graded, and some corporations don't fully comprehend how to conduct green innovation operations. Few studies have looked at how KM impacts business green innovation. (Polas, M. R. H., Tabash, M. I., Bhattacharjee, A., & Dávila, G. A. 2021).

According to certain theories, knowledge is an essential resource for fostering an organization's innovation, which is a quality of businesses that want to thrive in the present markets (Grant, 1996). (Wojan et al,2018) To enhance the value of knowledge, knowledge management is required. Risk management as a whole is viewed via the lens of KM (Bakar et al., 2016)., incorporates methods in practically all management domains. According to (Mardani et al,2018), the degree of expertise firms apply to their company operations influences how successful they are in a given market. KM continuously employs the gained expertise to handle both continuing issues and emerging problems (Zieba & Zieba, 2014; Wojan et al., 2018). It addresses the issues of Organizational

resilience, development, and adaptability in a world that is becoming increasingly abnormal (Zieba &Zieba, 2014). As the value derived from it develops as competition rises, knowledge management (KM) has become a core competency in the organizations. In the contemporary Focusing on the KMP in a knowledge-based economy seems to be the most effective strategy. With the constant and quick change in the needs of customers and stakeholders in today's competitive market, businesses need to acquire the distinctive and original knowledge to create an environmentally friendly product and make general changes to their current offerings (Xie et al., 2019). KMP distinguishes out as a conscious effort to harness internal expertise to deliver the community's services and enhance performance. (Syed-ikhsan & Rowland, 2004). It serves as a resource for the gathering, sharing, and efficient application of business knowledge assets, which are the main driver of innovation (Darroch, 2005).

2.3 Knowledge acquisition:

The ability to perceive and acquire new knowledge, which is essential for efficient organizational operations, is implied by the term acquisition (Attia & Salama, 2018). Employees learn new information primarily through within business sources like coworkers and members of the team (Qasrawi et al., 2017). The method by which knowledge acquisition includes the definition of the norms or ontologies required for a knowledge-based system. The process of learning, organising, and structuring knowledge from a single source—typically human experts—is known as knowledge acquisition. (Crchione et al., 2015). KACQ is regarded as a key element of KMP, allowing businesses to acquire fresh and current knowledge from numerous stakeholders to guarantee continual organisation improvement (Shahzad st al, 2019). In order to the continual improvement of product and service quality, KACQ offers a better understanding of the business climate, which is evolving dynamically in terms of financial client demands and organisational development (Darroch 2005). Learning is the concept of comprehending and acquiring new abilities required for effective organizational processes (Attia &Salama,2018). Internal networks, including peers and teammates, are typically where employees find out more information. KACQ collects additional data from a variety of trustworthy sources to assist staff in resolving business issues and boosting productivity and efficiency (Mothe et al.,2018). Additionally, another study of (Zhang et al,2010) about German companies revealed that the KAP process of organization would be influenced by the knowledge acquired from collaborator stakeholders, which in turn would boost innovative organizational performance. First from literature, it is clear that experts and academics from all over the world are

focusing increasingly on the question of how knowledge acquisition could contribute to GI.KM is a set of activities that the company uses to acquire, develop, gather, share, apply, and protect knowledge in order to improve organisational performance, according to a number of research studies (Alavi &Leidner, 2001; Grant, 2002; Zack et al., 2009). Although other phrases, like acquire, seek, generate, and capturemay all be used it to describe the procedure of acquiring knowledge; they are all concerned with the acquisition of knowledge (Gold et al., 2001). This study concentrates on acquisition, the first and most crucial phase in the knowledge management cycle, so analyze how KM influences a firm's innovation.

According to earlier research, the relationship between KA and GI has had conflicting effects in developing nations (Abbas and Sagsan, 2019). According to several investigations (Abbas and Sagsan, 2019; Mothe et al., 2018; Zhang et al., 2010), KA from various stakeholders and external markets significantly positively correlates with innovativeness. Although some studies found a negative or no association between KA and firm success, these researchers claimed that spending on R&D could aid businesses in coming up with new ideas, which could boost their performance in terms of innovation (Capon et al., 1992). (Darroch ,2005) asserted that KA was essential for developing capacity, encouraging innovative behavior, and improving incremental performance. Conflicting findings from the past literature were produced in industrialized nations by the KA-GI partnership (Abbas & Sagsan, 2019). Employee participation inside the assimilation given knowledge is essential. (Song et, 2020). There are two types of organizational knowledge: tacit and explicit (Polanyi, 1967). Explicit knowledge, according to Nonaka et al. (2000), encompasses the kind of knowledge that can be easily collected, codified, and stored as knowledge for later use. Contrarily, tacit knowledge is based on both skill and experience, and it is subjective. A person's assessment, estimation, tacit knowledge, and intuition are all examples of tacit knowledge, according to (Bollinger & Smith 2001). A KM strategy is a high-level plan that includes the organizational framework, tools, and technology infrastructure required to manage the organization's knowledge gaps or redundancies (Nouri et al., 2013). The contemporary KM literature also includes information based on the dichotomy between tacit and explicit kinds of organizational knowledge every organization may use either a codification strategy or a personalization strategy, according to a well-known classification of KM strategy created by (Hansen et al,1999), organizations should either strike a balance between codification and personalization inside their knowledge strategy to generate their competitive advantages . Knowledge improvement enables businesses to assess their flaws and capitalise on their strengths (Albort Morant

et al, 2018). Sharing newly obtained knowledge with coworkers is essential, especially those in related departments (Jarrahi 2018).

2.4 Knowledge dissemination:

Knowledge dissemination is defined as the cooperating process of spreading knowledge to targeted audiences to effect change. Knowledge exchange with other employees or business divisions quickly is known as knowledge dissemination (Ding et al, 2019; Shahzad et al; 2020) The process of communicating verbal or tacit knowledge to a person or group of individuals is known as knowledge dissemination (Jarrahi, 2018). In order to progress, KD gives knowledge to employees and distributes it with them (Lee, Leong, Hew, & Ooi, 2013). Exchanging information and gaining knowledge are the two main components of it; sharing aims to convey knowledge, whereas collection denotes getting information from employees (Attia & Salama,2018). It fosters constructive problem-solving among employees by providing opportunities for social contact in the workplace (Attia and Salama, 2018). It also offers helpful assistance for coming up with plans, making decisions, and setting up a learning environment. (Bolisani and Bratianu, 2018).

Sharing knowledge greatly improves workers' explicit and tacit knowledge, which reduces errors and improves operational and economic sustainability. (Maravilhas and Martins, 2019). Sharing knowledge ensures that new and existing knowledge are integrated inside the organisation, making knowledge increasingly useful (Hsiao et al., 2011; Donnelly, 2019). In other words, information can be shared, enhanced, honed, and applied as needed. The performance of a company's innovation increases when knowledge is shared within the organisation (Martn-de Castro, 2015; Akgün et al., 2017) Organizations' capacity can apply knowledge is connected with the capacity to integrate and utilize the acquired, shared, or transformed information within their operations and routines to address real-world problems. (Akgün et al., 2017; Xie et al., 2018). Companies that effectively use the knowledge to address organisational issues might offer cutting-edge goods and services (Liao et al., 2007; Johansson et al., 2019). In numerous research, KD has been shown to be a key component in boosting access to information and having an impact on an organisation that fosters creativity. It enhances business operations, financial planning, and eventually partners' corporate sustainability goals. 2019 (Abbas & Sagsan). (Darroch ,2005), a subsequent study (Monica Hu, Ou, Chiou, & Lin,2012). KD and commercial success and innovation were not related in New Zealand, however Taiwan discovered a favourable correlation between information and company innovation.

Additionally, (Wong, 2013) said that the Chinese electronics industry's GI and design accomplishments were strongly impacted by the flow of expertise. Dynamic businesses routinely engage in social awareness campaigns as part of their societal responsibility to share knowledge (Khodadadi & Feizi, 2015). Expertise sharing is described simply "the act of making one's knowledge available to others inside the organization." (Camelo-Ordaz et al., 2011; Wong, 2013), is crucial to innovation because it has a direct impact on product innovation, process innovations (Maes & Sels, 2014), and innovativeness (Saenz et al., 2012). Knowledge sharing through online platforms is also favorably correlated with creativity (Soto-Acosta et al., 2014). Contrary to the broad description provided above, some articles define information sharing as including various elements, including symbiosis, reputation, and benevolence (Hu et al., 2009). In other publications, several knowledge-sharing systems are examined,like personal interactions, organizational procedures, and information and communication technologies (Saenz et al., 2012). in the study by Maes and Sels (2014), which emphasises the significance of information sharing in order to transform and effectively utilize knowledge for innovation. Place of business in the sector Knowledge exchange is also supported through business clusters (Connell et al., 2014), the development of apprentice-based communities of practise, and intra-organizational communities of practise (Pattinson and Preece, 2014).

Knowledge sharing, according to Fauji and Utami (2013), encourages enterprises to develop new products, which then improves performance. According to Malik and Nilakant (2016), knowledge perception and dissemination enhance knowledge integration, supporting the process of innovation. Malik et al. (2020) investigated how knowledge integration for generating sustainable innovation advantage is facilitated by knowledge acquisition, dissemination, and sharing. Other research has concentrated on categorising innovation and then analysing the mediating impacts of various innovation types on knowledge management and performance.

Learning organisations make their experimental outcomes public so that other organisations can utilise this knowledge for creative purposes in order to foster collective creativity and a win-win culture (Al-Busaidi and Olfman, 2017). Several businesses divulge the specifics of their production procedures to build customer trust and assure operational openness (Lucas, 2019).

2.5 Knowledge responsiveness:

knowledge responsiveness involves creating original, immediate solutions using accepted information and knowledge (Shahzad et al 2020). Utilizing present organizational knowledge, the knowledge response can be skilled (Ding et al; 2019). By it different kinds of goods, systems, services

can be developed into new markets it also helps in developing new skills and competencies, we can say it helps in improving existing skills and expertise (Ding et al.,2019; Shujahat et al., 2019; Shahzad et al., 2020). One facet of knowledge management that is crucial in creating an innovation strategy is responsiveness. (An et al' 2014). One of the firm's ability is to sense quickly the environmental identification and responsiveness it includes customer demands, competitor moves and market trends (Nidimolu and Knots 1998). Darroch (2005) asserts that KAP strengthens and adapts information to the organization's needs in order to provide it a strategic advantage and meet customer requests. It is also known as information responsiveness (Lee et al., 2013), and an organization exhibits it when it gathers data on consumer demands and market trends and, using that data as a basis, responds promptly to a problem or an opportunity with innovation in processes and products (Mothe et al., 2018). The agility of a company is shown in the increases in quality and reduced reaction times, which ultimately impact levels of customer satisfaction (Dove, 1999). Businesses would use previously learned expertise to improve GI (Kuo, 2011). It is clear from an examination of earlier research that the relationship among KAP with GI has produced a range of outcomes. Darroch (2005) discovered that KAP is a crucial component for organizational innovation in this regard. Abbas & Sagsan (2019) shown in a different study how important KAP is for effective technical advancements and improved performance. The researcher discovered a beneficial association between KAP and green design efficiency (Abbas and Sagsan, 2019; Lin, 2007). It suggests the KAP is a tactical tool that organisations can use to stay afloat in the cutthroat atmosphere of contemporary industry. According to findings by Madhoushi et al. (2011), KAP enables organisations to transform their knowledge and skills into new products and processes. Additionally, taking into account the interests of the shareholders, efficient KAP helps the businesses to develop sustainable products using cutting-edge processing and production technology (Albort-Morant et al., 2018).

Allowing for invention and encouraging group collaboration has a mixed bag of results that include responsiveness and spread of innovation capability (Kang and Lee, 2017). One of the KM components that is crucial to creating an innovation strategy is responsiveness (An et al., 2014). As a result, this is one of the dimensions that is unique and difficult to imitate, and its traits connect it to creative performance and business success. Numerous research on the responsiveness of innovation and knowledge however, have produced contradictory results. Allowing innovation and encouraging teamwork has some varied results, including responsiveness with innovation (Kang and Lee, 2017). Studies linking KM efforts to green innovation are scarce. Companies must recognize distinct sorts

of research innovation in order Due to the fact that various forms of innovation require various fundamental talents and resources (Shujahat et al., 2019; Ding et al., 2019).

Organizations should use organizational knowledge correctly to products, processes, and services to gain a competitive advantage (Bhatt, 2001). In fact, the ultimate objective of KM is knowledge application (Probst et al., 1999). All of these things take place with the aid of efficient exploitation of the collective expertise of the organization's members, capitalising on their knowledge to produce an end result that benefits the business, its staff, and its clients. The output from this method has a distinctive quality that sets the company apart from its rivals (Gloet & Terziovski, 2004). In general, a company that responds to knowledge is that by necessity an innovative company (Darroch, 2005). Actually, innovation is a solution in and of itself. Therefore, an organisation that responds to knowledge better has a stronger capacity for innovation.

2.6 Green innovation:

A source of green innovation is one that helps businesses eliminate or reduce the negative effects of their impact on the climate (Fernando et al 2019). It aids in the development of new environmental protection-related goods, services, technology, and organisational frameworks (Li et al 2017). Green innovation reduces resource use and manages pollution and waste (Rossier and Smith, 2018). According to earlier research, the words environmental development, we can use the terms "eco-innovation," "environmental innovation," and "green innovation" interchangeably. (Aguilera-Caracuel and Ortiz-deMandojana, 2013; Soewarno et al., 2019). Additionally, business and environmental professionals view green innovation as one of the primary corporate resources that increases market demand and equips companies to compete on a global scale (Huang and Li, 2017; Soewarno et al., 2019). A company's dedication to "green innovation" demonstrates its openness to incorporate improvements in products or processes that assist it in maintaining a highly sustainable climate. The process of creating new products that, so over course of their complete lives, are green is known as product innovation, have less impact on the environment, such as those that are toxic-free and support recycling alternatives that are highly usable, consume little energy, and (Aguilera-Caracuel and Ortiz-de-Mandojana, 2013). The conception, cloaking, execution, and fusion of novel ideas and processes are all included in the innovation process. Advancement in hierarchical administration refers to the process of being creative and providing novel methods and techniques. These unique tactics produce a relationship with progress and better results. A new product, method,

innovation, expansion into a new market, and the use of a fresh stuff or mix are all examples of advancement. It can be the association's acceptance of a fresh idea or thought. Organizations should have a knowledge and understanding from which employees may acquire, interpret, and coordinate knowledge whenever and wherever it is necessary in order to add oddity to goods or services (Garca-Morales, Llorens-Montes, & Verd-Jover, 2008).

As the world progresses towards advancement by which it carries certain amount of competitiveness, due to which different forms of innovations have been discovered where green innovation is one of the key problem. Innovation not only delivers a market edge but also has positive effects on the environment and society (Wang et al 2021). Understanding how these phrases differ from one another is crucial. Previous studies claimed that GI, eco-innovation, and the other four types of innovation are interchangeable (Hojnik and Ruzzier, 2016; Schiederig et al., 2012). Both social and environmental factors are incorporated into sustainable innovation. However, eco-innovation addresses both economic and environmental issues, as according Franceschini et al. (2016). Sustainable innovation, in contrast, is closely associated with management and competition goals and holds them to social and moral components. Eco-innovation, according to Chen et al. (2006), can refer both to green processes & green products. Software or hardware innovation that relates towards environmentally friendly materials or practices, such as the development of technology for trash recycling, pollution prevention, and energy conservation, environmentally conscious product designs, or organizational environmental management This is referred to as "green innovation" (GI). Additionally, according to Cancino et al. (2018) and Li et al. (2019) it is "the accomplishment to minimize natural resource harm, get a sizable share of the market, economic, and types of information at all phases of the execution of innovation." Technology development, pollution reduction, recycling, the development of eco-friendly products, and environmental management are GI's top priorities. (Li et al., 2017). Businesses need GI to create value, acquire a competitive edge, and improve performance. For SD, making the choice to provide new content is critical (Ram Nidumolu and Prahalad, 2009).

It is high time for Pakistan to review its technological aspect which is causing a great environmental issues in the surrounding. Environmental management practices, pollution control, waste reduction, and energy conservation are all possible with the help of green innovation (Chen, 2008; Kong, Feng, & Ye, 2016). Additionally, there are two categories of green innovation: green product innovation & green process innovation (Huang & Li, 2017).

2.6.1 Product innovation:

The creation of green products is one of the fundamental components of green innovation. It is a technique for developing new goods that, over the course of their entire lives, have less negative effects on the environment, i.e. goods that can be recycled, have a long usable life, emit few emissions, and use little energy ((Aguilera-Caracuel and Ortiz-de-Mandojana, 2013).Green product innovation is helpful for firms to create environmental sustainability, and helps them to expand their existing market and meet customers' needs ultimately it helps them to achieve sustainable competitive advantages (Chang, 2011, 2016). Green product innovation enhances the environmental performance and sustainability which can fulfill the need for enterprises to assume environmental responsibility. Green product innovation aims to modify and modify product designs utilizing harmless substances and biodegradable materials during the production process in order to lessen overall impact on the environment of waste disposal and to boost energy efficiency (Lin, Tan, & Geng, 2013). A cradle to grave perspective of a product's life cycle, from manufacture to distribution as well as from have used to destruction or reuse/recycling, is necessary for green product creation (Noci & Verganti, 1999). Green new product is specifically focused on making products more durable or recyclable, using less raw materials overall, choosing raw resources that seem to be healthier again for environment, and removing potentially harmful chemicals (Kivimaa & Kautto, 2010).The goal of green product innovation, which refers to the introduction of new or enhanced products, is to lessen environmental impacts throughout a product's life cycle and meet consumer demands by creating innovative products (Cheng et al., 2014; Pujari, 2006). (Cheng et al., 2014). Green product innovation has gained prominence in recent years as one of the most important elements in achieving economic expansion and environmental sustainability (Dangelico & Pujari, 2010). Additionally, by investing in environmentally friendly product innovation, businesses can open up new market prospects, succeed with new green products, and avoid environmental protests and legal repercussions (Chiou et al., 2011; Kam-Sing Wong, 2012). Additionally, sustainable products innovation is essential for fostering green expertise and boosting a enhancing its financial performance and projecting a green image (ching et al 2014).

2.6.2 Process innovation

Green process innovation is crucial for reducing the amount of energy required during production or in the conversion of waste into useful products. (Salvadó et al., 2012, p. 39). The main goals of green process innovation are to reduce energy or air or water emissions, use less water,

increase energies and resources efficiency, plus switch to biofuels instead of fossil fuels. (Kivimaa & Kautto, 2010). Only by applying the process innovation the firms revolutionizing various competitive advantages can be obtained and maintained through the use of green tech innovation strategies (Albort-Morant et al., 2016). This will increase profitability as well as cost effectiveness (Chan et al.,2016). Green process innovation is a great asset for firms to achieve competitive advantage. Second, process innovation can assist businesses in creating new items, expanding their product line, or improving the quality of their existing ones in order to expand their market. share. (Bigliardi & Ivo Dormio, 2009; Damanpour, 2010). Green process innovation seeks to use less energy throughout the process of production or while turning trash into a useful product (Salvadó et al., 2012, p. 39). Green process innovation, in particular, involves lowering emissions into the air or water, consuming less water, increasing resources and fuel efficiency, and converting from fossil energy to biofuels (Kivimaa & Kautto, 2010). By doing this, companies who are at the forefront of green technology innovation can gain and maintain a range of competitive benefits (Albort-Morant et al., 2016), as well as cost efficiency and profitability (Chan et al., 2016).

Green process innovation is typically more expensive to execute and domestically sourced, but it has also been shown more to be successful other than green strategies (Gopalakrishnan, Bierly, & Kessler, 1999). Smokestack scrubbers are an example of the process of green innovation. By changing inputs, boosting productivity, or recycling outputs, the industrial process can also incorporate green innovation capabilities. (Rennings, 2000). Green process innovation has been shown in prior studies to improve organisations' competitive advantage and sustainability (Chen et al., 2006; Cheng et al., 2014; Sezen & ankaya, 2013). Journal of Business Research 101 (2019) 697-706 698 Therefore, investing in green process innovation is generally a wise commercial decision for companies (Li et al., 2017). As a result, we contend that a company's adoption of green process innovation approaches will improve the financial performance. The process of Green innovation, in the first instance, enhances already-existing production processes or introduces new ones to lessen negative environmental effects. This increases a company's environmental compliance and offers distinguishing benefits (Cheng et al., 2014). Furthermore, end-of-pipe technologies as well as clean technologies are essential elements of the strategy, as according Xie et al. (2016).

2.7 Green knowledge sharing behavior

Knowledge management at work has a significant impact on the function of knowledge sharing, according to past study. There has not been much research on how knowledge management

affects employee's behaviour (Bhatti, Zakariya, et al.2020) According to Lin and Chen (2017), effective and improved knowledge creation and transfer capacities with regard to environmental issues among organizational members suggest sustainable knowledge management. The act of sharing green knowledge across numerous personnel to enhance an organization's ability to fulfil its mission (Lin and Chen, 2017). Both organizational (Ferraris et al., 2017; Vrontis and Christofi, 2019) and individual levels are observed in the literature. observes it on both an individual (Vrontis and Christofi, 2019) and an organizational (Ferraris et al., 2017) level (Rubel et al., 2018; Bhatti et al., 2020). A worker shares their expertise with other employees just at individual level, which leads to the creation of more "cooperative" knowledge in the business (Teh and Yong, 2011). Green activity is by nature pro-social (Chou, 2014).

When an employee shares their knowledge with other employees on a personal basis, more "collaborative" knowledge is produced within the company (Teh and Yong, 2011). This type of knowledge includes explicit information that is documented in official records. Documents and implicit knowledge stored by the brain, though it can be challenging to make the latter apparent as information (Shah et al., 2007). Organizations are thought to need information and knowledge diffusion to maintain a sustained competitive edge (Gope et al., 2018). According to Lin and Chen (2017), the extent to which knowledge workers share environmental information with one another. Thus, it is possible to hypothesize that the process of spreading green knowledge among staff is what helps a firm achieve its sustainable goals. Consequently, efficient Improved knowledge infrastructure and transmission capacities regarding environmental challenges among organizational members are indicated by "green knowledge management" (Lin and Chen, 2017).

Team building benefits from knowledge sharing. According to Nancy [48], sharing knowledge and information with others can lead to new learning possibilities and motivate people to learn. According to Ramus and Killmer (2007), organisational green innovation benefits from both in-role and extra-role green behaviour at work. Examples of employment where employees are expected to act in a "green" manner include those that require them to ensure that hazardous materials or toxic waste are not dumped into nearby waterways. Employee attitudes and conduct toward the environment are shaped by their knowledge of the environment. (Kollmuss & Agyeman, 2002). Mostafa (2006) draws the conclusion that education usually enhances one's attitude toward the environment, which in turn inspires conduct that is considerate of the environment.

2.8 Employee environmental beliefs and values:

We employed the VBN theory's personal values and environmental views in this study to analyses how the employees' green activity related to their beliefs. According to the VBN hypothesis, people's environmental behavior is based on a confluence of values, beliefs, and personal standards that encourage them to support the environmental movement. 2005's "Andreeson". Numerous research on individual environmental concern have revealed that those who care about the state of the earth have Employee environmental beliefs were connected to those values which, in turn, contribute to the approval of environmental behaviour. (Ford, Kathryn, Williamsa, and Webbc 2009). (Collier and Esteban 2007) discussed the mutually reinforcing nature of corporate social responsibility and employee commitment strengthening the link between organizational characteristics and individual values. People who agree with a movement's core principles They feel compelled to engage because they believe vital things are in risk and that taking action will assist restore those values (a subjective norm for pro-movement participation that takes into account a propensity to lend support). (Stern 2000). The authors suggested that people's conceptions of self and belief systems influence how socially conscious business operations are translated into personal commitment. Employees look for opportunities to express their values and find greater purpose in their job when they believe that the organization shares their values, which helps to shape and negotiate organizational practices.

Personal environmental attitudes have been connected to individual environmental activism, backing for the environmental community, handling domestic trash, green consumption, and influencing the environmental actions of organisations they are a part of. (Stern, 2000). Employees who are most likely to support and concur with organizational and leadership efforts to address environmental concerns are people who, due to their own pro-environmental beliefs, recognize the significance and value of the greening process (Collier and Esteban 2007; Hoffman 1993). Regarding individual factors, a worker may be encouraged to undertake environmentally friendly working practices according to their individual values and ideas on the environment and nature (Ramus, 2001). Because environmental conduct corresponds to normative statements about environment beliefs and values other than self-interest, personal norms are essential. Supporting a social movement through engaging in environmental activity, including personal behavior (Chou 2014).

Organizational values have a significant impact on human behaviour in firms, especially for middle managers and supervisors whose job it is to communicate these principles to all employees. (Turnbull, 2011). According to Raineri and Paillé (2016), environmental belief refers to one's core viewpoint on the environment, particularly in connection to how humans interact with nature. Due of their commitment to the environment, Managers are more likely to recognise the impacts of human activity on the environment, which provides the rationale for employing green environment (Stern, Dietz, Abel, Guagnano, & Kalof, 1999). (Scott, 1995). According to research, persons who have a strong sense of environmental responsibility are more likely to think about negative long-term repercussions than economic ones when trying to change their behaviour in response to a societal problem (Corraliza & Berenguer, 2000. Organizations that are ecologically sustainable promote values such as environmental protection, organisational improvement, and educational initiatives, all of which demonstrate a strong dedication towards environmental conservation (Starik and Rands 1995). Studies showing us that managers values towards environment might help them become known and aware of crucial stakeholder whose demands are connected to environmental challenges and enlist their aid in designing and putting into practise environmental management practises have previously supported this idea (Jang et al., 2017; Park, Jeong Kim, & McCleary, 2014; Robertson & Barling, 2011).

2.9 KMP and Green Innovation

Km is a collection of many procedures that organisations use to acquire, transmit, and create knowledge in a timely and relevant manner (Darroch and McNaughton 2003). Km entails acquiring new knowledge and applying existing knowledge to generate innovation and produce better outcomes. (Shahzad, Qu et al. 2020). The process of developing rules and ontology to create a knowledge-based organization is known as knowledge acquisition. Distribution is the method of disseminating knowledge with targeted audiences in order to affect organisational change.(Shahzad, Qu et al. 2020). Organizations can improve their capabilities and address their constraints by acquiring knowledge (Albort-Morant et al., 2018). Majority of employees learn about their companies via sources like coworkers and team members. Additionally, data gleaned from external sources include information gleaned from clients, competitors, suppliers, associates, and experts (Abbas and Sagsan, 2019). Understanding customer needs and how they interact with

organizational services and goods is the purpose of acquiring knowledge. This helps businesses may make the required changes to ensure customer contentment (Wijethilake, 2017). Utilizing current organisational knowledge satisfies the need for knowledge responsiveness. (Ding, Choi et al. 2019) . New, efficient solutions are developed using the knowledge already available (Shahzad, Qu et al. 2020) Through innovation, obstacles are overcome and results are enhanced have strategic benefits which add value for firms. Research and development-based organisational knowledge generation is typically linked to KM creation activities (Darroch, 2003). KM is crucial for organisations to allocate adequate financing to knowledge, as well. Since it improves their capacity for creativity and the production of novel goods (Habib et al., 2019), it finally helps them to achieve sustainable development. A successful km provides a chance to improve performance and creativity(al 2020). When senior leadership uses eco-friendly and green resources to grow innovation while utilizing the skills and knowledge of staff, KMP and GI are connected (Pe'rez-Luno et al., 2019). In this situation, organizational learning places a strong emphasis on fusing KM and business strategy to reach GI objectives (Buenechea-Elberdin, 2017; Davenport et al., 2019). Innovative businesses offer numerous opportunities to improve productivity and create long-lasting competitive advantages, or we might say distribution for Knowledge or responsive to Knowledge (al 2019). Numerous authors claim that organisations that can successfully develop, preserve, recover, and apply knowledge are more pioneering and successful than those who can't. Innovation requires the examination of existing data to derive something unique, so creative ideas are highly dependent on timely access to information (Zhang, Shu, Jiang, & Malter, 2010). Knowledge is the direct result of authoritative learning, and both of them play a substantial role in enhancing how well the association advances. An organisation is better able to respond to these developments than competitors since it can more easily understand changes in customers' wants and market slants because to productive board knowledge (Shujahat et al., 2019).

In particular, innovation can improve outcomes, provide a strategic advantage, and add value for businesses. A powerful KM is a tool for improving output and ingenuity (Shujahat et al., 2019; Shahzad et al., 2020). Businesses must learn in order to innovate. in order to gather a variety of knowledge about internal and external influences. Knowledge workers gain awareness primarily as their ability to manage knowledge properties improves (Garca-Fernandez, 2015). Employee organisation and gathering to gain knowledge strengthens this.

Studies linking KM activities with green innovation are few and far between. Companies must adopt and develop many forms of research innovation since various forms of innovation call for

various core competencies and resources.(al 2019).Knowledge management process is a great tool to enhance green innovation. Green innovation seeks to reduce pollution through developing new goods, services, systems, and practises while minimising adverse organisational environmental effects (Abbas and Sağsan 2019).

Additional recent research found that KM strategies had a favourable effect on GI (Abbas and Sagsan, 2019). Businesses need new capabilities to produce progressive innovations, or new ideas, in the world. Examples of these capabilities include small businesses or scientific competence paired with KM skills in an organisation.

Companies that prioritise innovation are expected to flourish and are capable of producing large revenues and increasing companies' market competitiveness compared to other forms of innovation (Shujahat et al., 2019). The literature mentioned above shows that knowledge management is crucial to the development of new ideas. It provides a base for research and analysis activities (Ferrode, Eliana et al. 2018). Thus, it can be said that knowledge management processes and green innovation have a good and important relationship.

H_1: Knowledge acquisition has a substantial and favorable direct effect on green innovation.

H_2: Knowledge Dissemination has considerably and favorably effect on Green Innovation.

H_3: knowledge Responsiveness has considerably and favorably effect on Green Innovation.

H4: KMP has a positive and significant impact on Green Innovation

2.10 Mediating role of green knowledge sharing behavior between knowledge management processes (GMP) and green innovation:

Knowledge is an essential and intangible asset and of organization. it is a competitive instrument that help the organization to compete with its competitor A procedure called knowledge management (KM) makes sure that "Employees inside the business have access towards the right information just at right moment in the appropriate format. Organizations that operate according to KM principles exhibit superior effectiveness, productivity, and service quality. (Abbas, Jawad; Mustafa, 2019)

Knowledge management plays a crucial role in organization success as due to limitation of resources the environmental pollution is one of the major issue that world is facing (Pan, Liu, &

Ma, 2021). Limited natural resources and a rapidly increase in the global warming organizations are facing a pressure from the society to abandon the practices that effects the environment. Organizations constantly struggle to strike a balance between high resource usage and the growth of economy leftovers, which requires them to carry out eco-friendly professional acts with high economic value (Khan & Qianli, 2017). Green innovation is a way through which organizations can overcome and minimize the impact of their activities on the environment. It is a practice that helps the organization to improve its competitiveness, environmental and economic performance (Zartea, Pechmann, & L.Nunes, 2022). An organization's capacity for innovation is positively impacted by the efficient management of knowledge. For effective knowledge management process it is necessary that there will be knowledge sharing among employees. (Zhoubc, Govindanab, & Xie, 2020). The idea that a company with an information strategy implementation will use assets more efficiently and be more inventive, resulting in improved performance, is supported by empirical data (Darroch 2005). Generally speaking, knowledge management is seen as a process-oriented viewpoint that represents methods for acquiring or producing information (Uhlaner et al. 2007). To distribute green knowledge throughout the organisation, businesses must gather and organise their green information. Making a difference can be achieved by incorporating green knowledge management into the design of goods and services and by emphasising their environmental advantages. Companies may seek to provide opportunities to translate environmental concepts into practical business lessons because not everyone approaches problems from an environmental perspective. To do this, they should first gather and organise green knowledge. In addition, businesses should work to increase workers' awareness of ecological problems. Employee education on environmental issues is a low-cost yet powerful technique to create momentum and introduce green concepts to motivate their services.

The process by which individuals get both explicit and implicit knowledge is known as knowledge sharing. Employees can effectively address problems thanks to this type of social engagement in the workplace.(Maria, Borsatto, & Bazani, 2021). It supports managers in devising plans of action, making choices, and creating a learning environment inside a company. Significantly increasing employees' explicit and tacit knowledge through knowledge sharing reduces errors and improves operational and economic sustainability. (Gluch, Johansson, & Räisänen, 2013). Organizations view information sharing as part of their social obligation because of the changing environment. According to (Jianga, Shaoa, & TaiwenFengb, 2018) The effectiveness of an organization's KM procedures substantially influences its capacity for green

innovation and the development of new products, processes, and body of knowledge. Knowledge is an essential and intangible asset and of organization .it is a competitive instrument that help the organization to compete with its competitor. A procedure called knowledge management (KM) makes sure that "Employees inside the business have access towards the right information there at right moment in the appropriate form. Organizations that operate according to KM principles exhibit superior efficiency, productivity, overall service quality. ”(2019)**.**

When the information provider shares their knowledge with the knowledge seeker so that others might learn and acquire new skills (Drucker, Dyson et al. 1997). A type of transfer behaviour seen during the learning process is knowledge sharing. (Darr and Kurtzberg 2000).Knowledge sharing behavior is further transformed into innovation and helps creating competitive advantage(Karlsson and Rodriguez 2015). Most often, green manufacturing companies encourage the members of their supply chains to create environmental procedures in order to comply with regulations, which necessitates that firms share their knowledge of such processes. (Dangelico 2015). Knowledge sharing has been linked to creativity and change in previous studies. Lin and Lee (2005) discovered that businesses that used techniques for sharing technological know-how with rival businesses outperformed those that did not. Innovation and knowledge sharing are positively correlated, according to (Chen, Huang, and Hsiao 2010). Knowledge development can forecast product, managerial, and marketing innovation, according to Andreeva and Kianto (2013).

Through "green innovation," businesses can mitigate and counteract the impact of their activities on the environment. It is a practice that helps the organization to improve its competitiveness, environmental and economic performance (Zartea, Pechmann et al. 2022)

Green innovation is frequently divided into green process and green product innovation, both of which teach about environmental implications. (Chen, Lai et al. 2006). Studies have shown that sharing green knowledge directly promotes green innovation. (Wong 2013). When businesses acquire that share external green skills and knowledge with in all supply chain participants, they may truly succeed with green innovation. (wu 2013).

Organizations view information sharing as part of their social obligation because of the changing environment. According to (Jianga, Shaoa et al. 2018) the effectiveness of an organization's knowledge management (KM) systems has a significant impact on its capacity to engage in green innovation and develop new products, processes, and knowledge. Therefore, the KM process will be more effective when knowledge sharing occurs among employees since it

lays the groundwork for a firm to become more inventive and marketable. In light of the foregoing literature, it can be said that knowledge management processes (acquired, dissemination, & responsiveness) and green innovation are related through the behaviour of green knowledge sharing.

H5: Knowledge management procedures (acquisition, dissemination, responsiveness) significantly and favorably influence how people share green information.

H6: The connection among knowledge management (acquisition, dissemination, and responsiveness) with green innovation is mediated by green knowledge sharing behavior.

2.11: Moderating role of employee environmental beliefs and values between KMP and green Knowledge sharing behavior:

Pervious researches identify the significant impact of knowledge management in the organization (Wanga, Xueb et al. 2020) . It is acknowledged that knowledge management influences an organization's performance. However, knowledge sharing is the core element of knowledge management. A knowledge management method known as knowledge sharing makes information accessible to organization's personnel. It guarantees that employees have access to internal knowledge whenever they need it (K.LimaMing, Kim et al. 2017). While "green knowledge sharing" refers to employees of a firm sharing green knowledge to obtain a competitive environmental advantage (Marra, Mazzocchitti et al. 2018) . Knowledge sharing occurred at the individual level and organization level. Employees can generate collaborative knowledge by sharing it with other employees. In this rapid changing environment green knowledge sharing plays an important role for organizations to become more successful and gain competitive advantage(Zhoubc, Govindanab et al. 2020).

Employee environmental beliefs and values are employee perception towards the environment and how they taking part in environmental behavior. Due rapid change in environment pressurize the organization to produce the product in a way that require fewer natural resources(Abbas and Dogan 2022). As the employee beliefs on environmental protection is high and the employee values are directed towards environmental friendly behavior employees will have a tendency to share green behavior. Implementation of environmental knowledge shows that team members who care about the environment have a sense of duty or concern for the

environment's effects. Considering the impact of individuals' personal characteristics, environmental behavioral intention, and They feel passionate about environmental conservation and their moral obligations are triggered, making them more likely to engage in green behavior (Zhang, Xu et al. 2021). if the organization is wanted to succeed in this changing business environment, then they have to adopt green knowledge sharing in their organization. Application of environmental knowledge demonstrates that staff members are aware of the environment, have a responsibility for it, or are concerned about its effects. (Ahmad, Al-Hawari et al. 2021). Individual environmental concern has been the subject of a wide range of studies, which has shown that those people that care about the environment are more inclined to behave in an environmentally responsible way. (e.g., Dunlap et al., 2000) It has been discovered that a variety of distinct pro-environmental behaviours and intentions are predicted by and correlate with broad-based personal attitudes toward the natural environment, particularly those measured by the New Ecological Paradigm scale (e.g., Cordano et al., 2004, 2003; Dunlap et al., 2000; Stern et al., 1999, 1995). A green work climate perception is created by the company's green initiatives to support employees' green behavior.

Employees see their coworkers engaging in eco-friendly activities, and they encourage and participate in the workplace to engage in activities of self-sustaining (Norton et al., 2015). Green psychological environment Environmental performance is affected by a person's pro-environmental conduct (Dumont et al., 2017). The knowledge based view (KBV) places a high value on intangible knowledge resources, yet nowadays, consumers are more interested in ecologically friendly items. Because the environment is so important to assessing environmental performance, organisations cannot disregard it (Kraus et al., 2020; Rehman et al., 2021a; Rehman et al., 2020). The green work climate perception can influence how employees perceive a company's environmental sustainability-related behavioural norms (Norton et al., 2014) Personal environmental beliefs have been linked to things like adherence towards environmental public policy, individual environmental advocacy, waste removal from homes, green consumerism, and the capacity to affect overall environmental policies of organizations they are a part of (Stern, 2000). People who are concerned about the environment are more likely to be aware of the risks posed by environmental pollution, to assist in reducing or eliminating the issue, and to be prepared to help with its solution. In this situation, KM practises are crucial. Without the requisite comprehension, nothing in the acceptance any green innovation occurs (Chen et al., 2019; Fu et al., 2020). Effective KM empowers businesses to gather, exchange, and use information between

parties and internal departments in a scientific manner (Mahdiraji et al., 2021). Mokhtarzadeh et al.'s (2021) argument is that inter-organizational relationships in organizations are expanding quickly. Technology undergoes rapid change, which makes it challenging for enterprises to identify and anticipate it. From a sustainability standpoint, knowledge management (KM) is primarily in charge of developing and utilizing sustainable use of knowledge resources whilst bringing economic, social, as well as environmental performance into consideration. Only when employees' moral responsibilities and personal dispositions are engaged and they grow passionate regarding environmental protection are they more likely to act in accordance with the organization's intentions for environmental conduct. Particularly, employee environmental views and values provide a gauge for how they feel and think about the sharing of green knowledge.(Blok 2015). If they have high beliefs and values towards environment than they will become more prepared to put environmental learning into action and more aware of the need to address environmental challenges. Therefore, from the above literature we propose that:

H7: environmental values and beliefs of employees modifies the link between green knowledge sharing behavior and knowledge process management (acquisition, dissemination, and responsiveness).

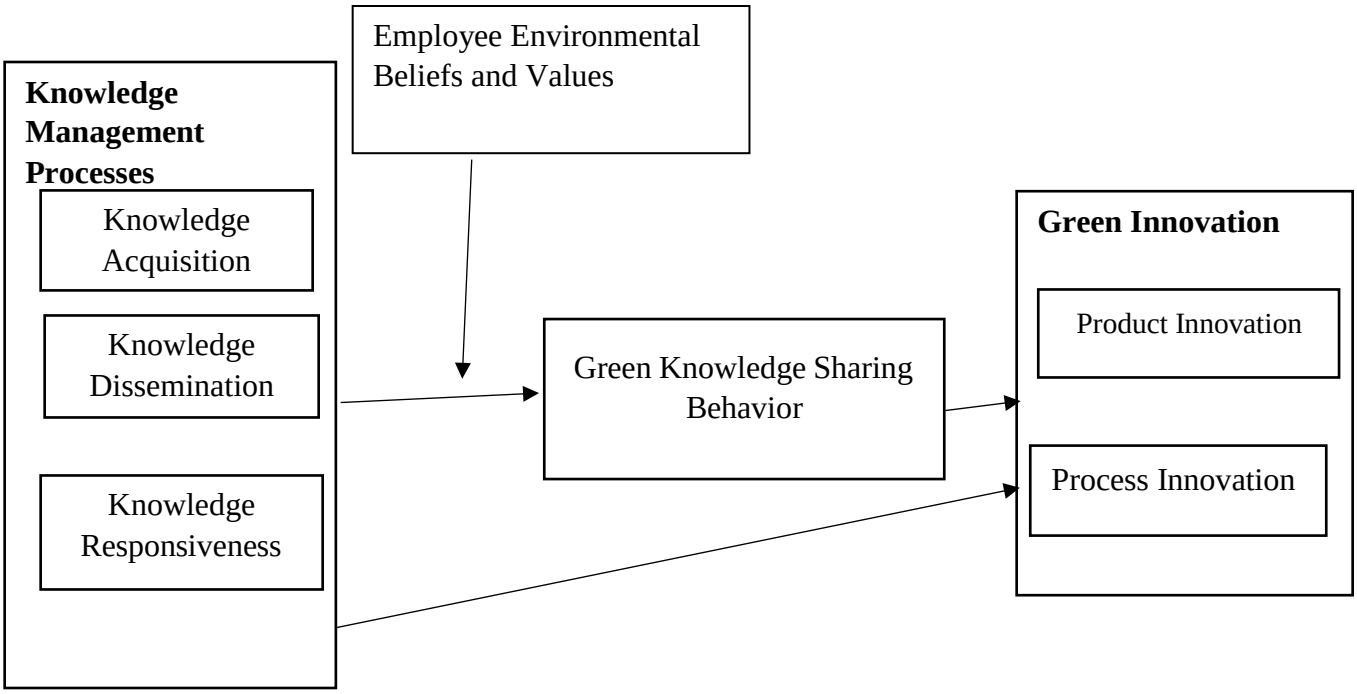
2.12 Conceptual Framework

A conceptual framework is really a visible or written item that attempts to explain the main sections of research, which will be conducted, the basic components, thoughts, or variables that will be researched, and suggested linkages among them, either graphically or even in descriptive form (Miles and Huberman, 1994). Additionally, they explained that the suggested study's conceptual framework also is known as the "theoretical framework" or the "idea context."

Conceptual framework a more general phrase that refers to a researcher's genuine beliefs, ideas, or thoughts concerning his subject expressed graphically or informally. The key component of a conceptual framework that demands concentration is a model or phenomenon that researchers wish to investigate, together with any potential connections that may be made and the rationale behind why it is important to do so. It not only clarifies and polishes the study's objectives but also creates pertinent and practical research questions and aids in the decision of the best research methodologies.

In this study, Green innovation is considered as a dependent variable and its relationships are established with knowledge management processes (acquisition, dissemination, responsiveness) through mediating and moderating effect of green knowledge sharing behavior and employee environmental beliefs and values. Based on the mix of these variables, that are put out in the current study, hypotheses are formed.

In order to build the conceptual framework below, a defined hypothesis and supporting study evidence were used.



(Diagrammatical demonstration of the proposed relationships between variables of current study)

2.13 Summary of Hypotheses

H_1: Knowledge acquisition has a substantial and favorable direct effect on green innovation.

H_2: Knowledge Dissemination has considerably and favorably effect on Green Innovation.

H_3: knowledge Responsiveness has considerably and favorably effect on Green Innovation.

H4: KMP has a positive and significant impact on Green Innovation

H5: KMP has a positive and significant impact on Green Knowledge Sharing Behavior

H6: Green Knowledge Sharing Behavior has a mediating role between KMP and Green Innovation

H_7: Employee environmental beliefs and values moderate the relationship between knowledge

Chapter 3

Overview

The most important action that must be made is to develop a method of research that is suitable and applicable for the real process of data analysis. This is the step that must come first. Chinnathambi, Rajasekar, and Philominathan (2013) define a research method as an effective strategy that is used by the researcher to address a particular problem that they have come across in their line of work. It's possible that the problem stems from the subject of the research being done. The study of technology enables one to determine the approach that will be used to carry out a certain piece of research. It is the phrase that researchers use in order to communicate with one another, to make their work more obvious, and to forecast the consequences of their study. In addition to this, it has been claimed that the research process is the mechanism via which uncommon information may be found. The purpose of this part is to offer a complete examination of the methodology, technique, and research plan that were used for the study, all of which will be described in greater depth in the next section. Because it helps determine the degree to which KMP antecedents has an impact on Green Innovation as inspiring, this evaluation is particularly essential. The impact that KMP, Green Knowledge Sharing Behavior and EEBV had on its overall impact on Green Innovation was analyzed. The empirical results agree with the theoretical basis that was laid forth before. The hypothesis that KMP antecedents have a significant influence on team Green Innovation was empirically examined with the help of quantitative research. This led to the formation of a picture of Green Innovation, which was then subjected to an assessment. The findings of this investigation are discussed in more detail below. In this chapter, we are going to undertake an examination of the research design, theoretical framework, constructs, and population, as well as an analysis of the sampling strategies, data collection methodologies, and statistical methodology.

3.1. Research Design

The research design is the true foundation of the study; it gives guidelines for the investigation, and it contributes to the interpretation of the findings of the research (Sreejesh, Mohapatra, & Anusree, 2014). The study design refers to the strategy that is used to gather all of the answers to the research questions and to successfully carry out the objective of the research. In addition to this, it plays an

important role in the research procedure, as well as in the gathering of data for the following analysis (Saunders & Thornhill, 2011). It included details on the data, the size of the sample, and the methods that had been used. The testing of hypotheses and determining the extent to which the research had an influence were the primary focuses of this investigation. Therefore, it is all about doing research into brand-new and natural occurrences (Sekaran & Bougie, 2016). In other words, if the nature of the current research is descriptive, then it uses the deductive method, which entails presenting a general theory via the theme assumption and concluding with the specific assumption relevant to the topic along with supporting evidence. In other words, if the research is descriptive in nature, then the deductive method is used. To put it another way, if the present study is descriptive in its approach, then it utilises the deductive method.

In this specific inquiry, questionnaires were utilized almost solely for the objectives of processing the data and verifying the hypotheses. Albaum, G., & Murphy, B. D. (1988) The scoring method for the questionnaire is based on the Likert scale, which has a range from one (strongly disagree) to five (strongly agree), with one being the strongest disagreement (strongly agree).

In the context of the present inquiry, each item that was included on the questionnaire was based on an observation of a feature of the natural world that was being investigated. This was an exploratory study that investigated the effect of KMP antecedents (Acquisition, dissemination and responsiveness) on Green Innovation, with Green Knowledge Sharing Behavior as a mediator and Employee Environmental Beliefs and Values as a moderator. Acquisition, Dissemination and responsiveness were the KMP antecedents that were investigated. For instance, the instrument was modified in accordance with the results of a number of studies; hence, in order to satisfy the needs of the survey, this instrument was sent to a number of small and medium-sized businesses situated in Rawalpindi, Islamabad, Faisalabad and Lahore. During every single minute that I was supposed to be studying, I should have been gathering information for this study instead. Cross-sectional data were used to compile the findings of the study. After we had finished the process of collecting the necessary data, we next looked into the dependability and validity of the questionnaire in order to verify that our hypothesis was correct. Both the findings and the outcomes provide a substantial quantity of data and information that is relevant to the investigation's technique.

3.2. Population of the study

The questionnaire's primary objective was to collect information that could be used in the process of evaluating the hypotheses that were the focus of the research project. The population frame for this research consists of people employed by Pakistani small and medium-sized enterprises (SMEs). The cities of Rawalpindi, Islamabad, Faisalabad and Lahore were chosen as the key areas of the research since it was very simple to travel to the four locations utilizing the resources that were readily accessible.

3.3. Sampling Techniques

The following factors played a role in leading to the conclusion that purposeful sampling was the most suitable approach to use throughout the process of data collection: It was inexpensive, effective in terms of time, quick, simplistic, and simple to use, and it was not difficult to get volunteers to serve as samples. When it is difficult to identify the population and gather precise data, this is a strategy that has shown to be highly effective. It has demonstrated positive results in several situations. The researchers picked the volunteers for the study based on how well they knew each other, regardless of whether the individuals were typical of the community as a whole. If researchers use this method, they will increase their chances of obtaining insightful ideas and points of view from participants. As part of a research into the ways in which the variables in the theoretical framework are related to one another, staff members from Rawalpindi, Islamabad, Faisalabad and Lahore filled out 380 questionnaires. We had no choice but to make use of it due to the limited amount of time we had. We were able to collect a significant number of completed surveys in a timely fashion while maintaining an acceptable level of efficiency and cost-effectiveness thanks to a technique that is known as systematic sampling. standard for evaluation and comparison

3.4 Unit of Analysis

When going on to the following stage of the analysis process, the analytical unit will represent the level that the data was acquired. Individual case studies of middle-level and top level managers working for small and medium-sized businesses (SMEs) in the cities of Islamabad, Rawalpindi, Faisalabad and Lahore were used as the unit of analysis for this study. These cities are located in

Pakistan. The gathering of this data had the objective of making a comparison between Pakistan's creative performance and that of other nations on the rise. Primary sources and reputable teams came from a number of middle-level and top-level SME sectors in Pakistan to compile the data that was used in this study.

3.5. Sample Size

On the basis of a literature review of factors involving a significant sample size, a methodology was selected for the evaluation of three hundred and eighty people in Islamabad, Rawalpindi, Faisalabad and Lahore Pakistan, who are genuine and trustworthy and who work in different divisions of SME enterprises. These individuals are employed in various departments of SME businesses. When compared to the actual sample size, the sample size of a study is said to be of good quality if it is larger than the sample size used in the study (Green, 1991).

In order to do multivariate analysis, the sample size has to be ten times larger than the actual sample size of the research that was granted permission to be carried out (Sekaran & Bougie, 2016). However, the outcomes of other research revealed that the perfect size of the sample should be more than thirty but less than five hundred. This ideal size of the sample was shown to be more accurate. (Field, 2005). The idea of the size of the study's sample has also been broken down and addressed by a variety of different academics. The sample for the research project consisted of 360 individuals due to this particular reason. However, if you are doing a power analysis on a research project that contains four or five independent variables, you may assume a probability level which is of 0.05 and a recommended statistical power which is level of 0.80. which will allow you to make more accurate predictions about the results ofno your study. This is because a bigger number of people participated in the research study. In this particular scenario, the minimum number of samples necessary is 342, and the maximum number of samples required is 361. (Soper, 2014). The table that follows provides more clarification about the sample size used for the investigation that is currently being carried out.

	Frequency	%
Total	500	100%
Received	380	76%
Valid	360	96.87%

Rejected	20	6.25%

The information pertaining to the size of the sample may be found in the table that follows. As a direct consequence of this, there was a grand total of 360 questionnaires spread out over the population. Despite this, a total of 380 out of the 500 surveys were filled out and returned, which equates to a response rate of 96.87%. even though 20 out of 360 questionnaires were thrown away, and 6.25 percent were discovered to be lacking needed information, the study was nonetheless successful. As a direct consequence of this, the regression analysis will use a total of 360 questionnaires, each of which has a validity rating of 90.62 percent.

3.6. Methods of Data Collection

The approach for getting data included the preparation of a questionnaire with closed-ended questions for the goal of collecting quantitative data. This was done as part of the plan. Following a comprehensive review of the relevant literature, the questionnaire was modified to incorporate findings from a variety of different studies after being informed by the results of the review. All questionnaire items were graded on a 5-point scale. On the Likert scale, the extremes of disagreement and agreement are strongly disagreed and strongly agree, respectively. The various SMES workers were provided with physical copies of the surveys, which they were tasked with filling out and returning.

During the process of collecting data, quantifiable information was gathered via the use of a questionnaire that had questions with predetermined answers. After conducting a comprehensive analysis of the relevant research literature, this questionnaire was revised to reflect the changes. Each question on the survey received a score between 0 and 5 based on a Likert scale that ranged from strongly disagreeing to strongly agreeing with the statement being asked. The authentic and reliable teams working in various departments (including production, marketing, human resources, and management) of Pakistani small and medium-sized businesses were the recipients of physical copies of questionnaires that were sent to them. These departments include production, marketing, and human resources.

3.7 Operationalization of Variables and Research Design

3.7.1 Operationalization of Variables

3.7.1.1 knowledge management processes (acquisition, dissemination, responsiveness)

KMP is one of the most essential components that helps to enhance innovation, and when it comes to the present organizational structure, it is one of the most crucial components. The management can become more effective and efficient as a result of the incorporation of KMP into the organizational structure of the company, and the information also helps to the process of shaping the behavior of the personnel working for the company. KMP differentiates itself from other organizations by being an active and deliberate effort to capitalize on corporate information to increase performance and deliver community benefits (Syed-ikhsan and Rowland, 2004). It serves as a resource for the collecting, diffusion, and effective use of the company's knowledge assets, which are the primary factor in determining the level of innovation achieved (Darroch, 2005).
Within the scope of this investigation, the processes for managing knowledge are conceptualized as the gathering, dissemination, and processing of information, respectively.

MEASUREMENT

As a result of this, we were able to deduce the features of the processes involved in knowledge management, such as acquisition, dissemination, and reactions (Darroch and McNaughton, 2003). The variables that are being analysed each have their own unique set of five attributes that set them apart from the other variables. These qualities are being compared and contrasted. A Likert scale with five points has been used to record the responses to the questions that have been asked (1 being strongly agree and 5 being strongly disagree). This scale only makes use of a single dimension.

3.7.1.2 Green knowledge sharing behavior

Within the framework of an organization, the sharing of knowledge is seen as a productive endeavor that should be encouraged and is usually met with significant praise and compensation. It

makes it simpler for information to flow and provides an atmosphere that is attractive, both of which lead to a reduction in the likelihood that errors will occur inside the organizational structure. One worker shares their knowledge and experience with another employee on an individual basis, which eventually leads to the formation of more "cooperative" knowledge throughout the organization (Teh and Yong, 2011). Taking care of the environment is in and of itself a completely unselfish act (Chou, 2014). The body of information that an organization is able to develop as a result of individuals within the organization sharing their specific areas of expertise with one another is referred to as "collaborative knowledge," and the term "collaborative knowledge" is used interchangeably with "collective knowledge" (Teh and Yong, 2011). As a consequence of this, it is not unreasonable to hypothesise that the strategy of disseminating information about environmentally friendly practises within the workforce of an organisation is what makes it possible for the firm to accomplish its sustainable objectives.

According to the results of the current research, change-seeking characteristics may be conceptualised as personality variables that have an influence on the acquisition of novel objects. It is ingrained in the personalities of a large number of individuals that they will never be content with the way things are and that they will always be on the lookout for novel experiences. This is due to the fact that it is innately human for individuals to want to broaden their horizons and try new things.

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The ten different items that were discovered during the course of the research (Wong, 2013) were used in order to carry out an analysis of the behaviours that are linked with the dissemination of information that is favorable to the environment. The responses are ranked from one to five on a scale that spans from one to five (1 being strongly agree and 5 being strongly disagree).

3.7.1.3 Employee environmental beliefs and values

According to the principle of planned action, the three most important aspects that go into making up an individual's attitude are their information, their beliefs, and their ideas. Beliefs and values are highly potent sentiments that have a propensity to form a person's identity. As a result of this tendency, beliefs and values also have a predisposition to influence a person's behavior.

The interaction of people's ideas, views, and personal standards influences how they behave in relation to the natural world. These ideas, beliefs, and standards motivate individuals to support environmental

issues (Andreeson,2005) People who are worried about the state of the planet often exhibit the following qualities, as determined by the results of a vast number of studies on the environmental awareness of individuals: The viewpoints of employees on the environment were tied to the guiding ideas that eventually led to the adoption of environmentally responsible behaviors by the workforce (Ford, Kathryn, Williamsa, and Webbc 2009).

Attitudes are conceptualized in this research as attitudes toward frozen dinners, which serve as the topic of the experiment. It argues that the mentality of a customer functions as a driving force to induce certain behaviorsleve, such as the urge to buy frozen dinners. One example of this may be seen in the graph below.

MEASUREMENT

According to what was said, the evaluation of environmental values and beliefs was conducted using a total of seven criteria (Stern, Dietz et al. 1999). A score of 1 indicates extremely strong agreement, while a score of 5 indicates very strong disagreement with the statement.

3.7.1.4 green innovation (product and processes innovation)

Companies place a key priority on innovation in today's highly competitive business environment because of the need of staying ahead of the competition. Two important steps that businesses need to take in order to be environmentally responsible while still gaining a competitive edge are going green and establishing a production and process creative green infrastructure. These are two steps that businesses need to take in order to gain a competitive edge. As more people become concerned about the state of the environment, there is an increasing demand for this. A source of green innovation is one that helps companies eliminate or cut down on the negative impact that they have on the environment around them (Fernando et al 2019). It makes a contribution to the creation of novel products, services, technological advancements, and organisational structures that are pertinent to environmental preservation (Li et al 2017). Innovation that is more environmentally friendly uses less resources and results in better waste management (Rossier and Smith, 2018).

Measurement

The findings of the investigation were included into the analysis on a total of eight distinct fronts (Chen, Lai et al. 2006). 1 indicates a very strong agreement; 5 indicates a very strong disagreement.

Table 3.2: *Instrument Adaption*

Variables	Items	Sources
Knowledge acquisition –	5	Darroch and McNaughton, 2003)
Knowledge dissemination –	5	Darroch and McNaughton, 2003)
Knowledge responsiveness –	5	Darroch and McNaughton, 2003)
Green knowledge sharing behavior –	10	Wong 2013)
Environmental beliefs and values –	7	Stern et al. (1999).
Green innovation	9	Chen, Lai, and Wen (2006)
Total Instrument items	41	

3.7.2 Data Collection

3.7.2.1 Instrument

In order to gather information for this research, questionnaires that participants are responsible for filling out on their own are being utilised as the instrument. The questionnaires were distributed one at a time in Rawalpindi, Islamabad, Faisalabad and Lahore Pakistan, to a variety of small and medium-sized manufacturing enterprises, and respondents filled them out during their respective visits.

A data set is considered to be dependable if the value of Cronbach's coefficient alpha is.7 or above. The dependability of a data collection may be verified by utilising Cronbach's coefficient alpha (Cronbach, 1951). According to Peterson (1994), a score of 0.6 or above for the Cronbach Alpha statistic is sufficient to be regarded adequate.

If a number is less than.7, it indicates that the collection of data that was acquired is dubious and maybe insufficient for obtaining the required or proper results. In a similar vein, outcomes that are acceptable are those that are relatively near to the value 0.7.

Table 3.3: *Cronbach's Alpha Values*

Variables	Cronbach's Alpha	No of item
Employee environmental beliefs	.823	6
And values		
Knowledge acquisition	.807	5
Knowledge dissemination	.832	5
Knowledge responsiveness	.852	5
Green knowledge sharing behavior	.784	10
Green innovation	.812	9

3.7.2.3 Data Collection and Procedure

The questionnaire has been used throughout the duration of this inquiry as the tool for the collection of primary data. In order to determine knowledge management processes (acquisition, dissemination, and responsiveness), green knowledge sharing behavior, employee environmental beliefs and values, and green innovation, a questionnaire was distributed in the cities of Islamabad, Faisalabad, Lahore, and Rawalpindi in Pakistan (product and process innovation).

A questionnaire was used in order to accomplish the goal of data collecting. Utilizing the questionnaire enables the identification of green innovation (both product and process innovation), knowledge management processes (acquisition, dissemination, and responsiveness), green knowledge sharing behavior, employee environmental attitudes and values, and green knowledge sharing behavior. In order to complete the data gathering procedure, it is necessary to go visit each of the smaller and medium-sized industrial businesses personally. Respondents who were physically present at the locations were specifically asked to fill out the questionnaire. In addition, respondents were assured that the data acquired from them would only be used for the sake of research and teaching, and that their personal information would be kept confidential. This was done in order to gain respondents' trust and participation in the study.

It was difficult to acquire data from managers directly while they were occupied with their regular obligations since they were so busy with their regular responsibilities. Nevertheless, managers were requested once again, and on some occasions, wait staff waited for them for a lengthy period of time before releasing them from their responsibilities. In spite of the fact that I asked that all managers fill out the form, the great majority of those in control ignored my request and did not do so. The most major challenge that arose throughout the process of collecting data was the limitation of time, since many managers did not have sufficient free time to conclude their job and fill out the questionnaire. Despite this, a conclusion on the size of the sample was reached after a number of visits were made to a representative sample of manufacturing SMEs. Some of the respondents who were offered remuneration in exchange for completing the questionnaire declined the offer, citing the possibility that the findings may be skewed as a justification for their decision. When it came to the collecting of data, managers' coworkers played a significant and useful part in the process. They specifically requested that particular managers fill out the questionnaire, and the next day, they received a limited number of completed surveys from managers who had been in a hurry and were unable to finish it at the time. Because of this, we were able to get a more precise picture of the manager population.

3.7.3 Data Analysis and Processing

Version 20 of SPSS, the most recent release of the software, is used for the processing and analysis of data. In order to accomplish the goals of this investigation, the structural equation modelling (SEM) analysis that AMOS offered was carried out. Coding has been done in line with the

scale that was indicated in the questionnaire, and the acquired data are now being analysed using Statistical Package for the Social Sciences (SPSS). In addition, the research standards are followed meticulously when inputting the responses into the system for this investigation. In order to carry out data analysis, analysis of Moment Structures (AMOS) is also utilised when it is essential to do so in collaboration with Structural Equation Modeling (SEM).

In order to determine whether or not the research tools could be depended upon, SPSS was used. In addition, spss is used so that data may be analysed in terms of a comprehensive collection of descriptive statistics. Exploratory factor analysis (also known as EFA) and confirmatory factor analysis (also known as CFA) are the two forms of factor analyses that were used in the process of validating the findings of the study (CFA). In addition to this, Structural Equation Modeling (SEM) has been included into the research and the model in order to carry out an evaluation of the hypotheses that have been proposed. When testing the posited model, SEM is also employed as a central component of AMOS. This is done by obtaining values from the SPSS data sheet. This function is intended to test whether or not the variables have the connection that was hypothesised between them.

3.7.4 AMOS AND Structural Equation Modeling (SEM)

3.7.4.1 Amos

AMOS Graphics and AMOS Basic are the two fundamental elements that make up the Analysis of Moment Structure, version 5 add-on module for SPSS. AMOS Graphics is the first of these two components. "analysis of moment structure" is what the letters AMOS stand for in the acronym "AMOS." The AMOS Graphics display of the model is based on a graphical representation of the model, which was generated using the diagrammatic specification of the model. When working with AMOS Basic, you also have the option of defining models via the use of equation statements. AMOS is distinguished by the fact that, in addition to providing bootstrapped standard errors, it is also able to provide confidence ranges for parameter estimations, which is a feature of note.

3.7.4.2 Structural equation modeling (SEM)

According to (Lei and Wu 2007), the term "Structural Equation Modeling" refers to a wide variety of statistical models that can be used to determine whether or not fundamental concepts can be supported by observable data. These models can be used to determine whether or not fundamental

concepts can be supported by observable data by determining whether or not they can be used. It is the extension of the General Linear Modeling (GLM) statistical methods, including Multiple Linear Regression and Analysis of Variance. (ANOVA). When compared to other generalized linear modelling (GLM) programmers, the structural equation model (SEM) is preferable since it can study the interactions between latent variables that are defined by numerous processes. In addition to experimental and non-experimental data, cross-sectional and longitudinal data are also important. In addition, Lei and Wu (2007) said that Confirmatory Factor Analysis is used so that researchers may evaluate the latent components of a study. To put it another way, SEM necessitates an analysis of two models, which are the Measurement Model and the Path Model. Both of these models are referred to as models of measurement.

The route maps of the relationships, their estimations, and a description of the model fit for this body of work were all constructed with the use of SEM Analysis. The primary purpose of structural equation modelling (also known as SEM) is to determine whether or not the hypothesised model is consistent with the data that has been collected. The amount of consistency that may be found depends on a number of factors, one of which is the extent to which the purported linkages can be accepted, as determined by model fit.

3.8 DATA CODING AND ANALYSIS TECHNIQUE

The coding of the data is done using SPSS (version 20), and the analysis of the data is done with SEM analysis conducted using AMOS. Both of these analyses were performed on the data. Structural Equation Modeling (SEM) is considered to be more versatile than other multivariate methodologies because it enables researchers to investigate simultaneous, multiple dependent interactions between dependent and independent variables. This is one of the reasons why SEM is considered to be more versatile. This assumption exists for a number of reasons, one of which is because it allows researchers to investigate causal linkages. To put it another way, factors that were dependent in previous study may be recast as independent variables in later investigations, provided that the context allows for such a transformation. The use of Cronbach's alpha with a value that is higher than 0.7 is utilised in order to evaluate the validity and reliability of the instrument. Analyses are also performed on the descriptive statistics of the instrument, which include the mean, percentage, and standard deviation.

CHAPTER 4

ANALYSIS AND FINDING OF RESEARCH

Overview

This chapter is broken up into three distinct parts or phases. Explain the descriptive analysis in detail here in the first step, and then go on to the demographic analysis of the present study respondents by using the questionnaires that were filled out during the visit to the SMEs. In the second stage, an explanation of the Confirmatory Factor Analysis (CFA) should be given. In the third and final stage, the emphasis should be placed on testing the hypotheses that show the relationship between the dependent variable known as Green Innovation, the mediator known as Green Knowledge Sharing Behavior, the independent variables known as Knowledge Acquisition, Knowledge Dissemination, and Knowledge Responsiveness, and the moderator known as Employee Environmental Beliefs and Values, and so on, and seeing how these relationships influence one.

4.1 Missing Value and Sample Demographic

Using descriptive analysis, this finding reveals out information about the sample's demographics, such as its age, education level, marital status, and department. They are aware of the issues that relate to data screening, as well as the procedures that are effective for the treatment of the missing values, and they are able to grasp both of these things.

4.2 Missing Value Identification and Entry of Data

It is required to do a comprehensive analysis of the data in order to determine whether or not there was a possibility of a mistake in the input of the data and how the missing values in the adjusted data were dealt with. In the beginning, a total of 500 questionnaires were sent to the small and medium-sized enterprises (SMEs) that were situated in Rawalpindi, Islamabad, Faisalabad, and Lahore. Nonetheless, only 380 of these surveys are returned. despite the fact that around twenty instances were dismissed, these individuals were not included in the study. As a result, a final sample size of 360 was selected for the final analysis, and the reply rate was 84.44%, which was consistent with what was anticipated owing to the use of a self-managed questionnaire. However, this percentage was not as high as what is often found by researchers because of the difficulties in collecting information from the sample group using the questionnaire. During the inquiry, there were some respondents who declined to fill out the questionnaire because there was a time constraint.

In the subsequent step, a descriptive analysis was carried out to determine whether there was a possibility of the presence of an outlier. Additionally, in this study, any abnormal form of variation in the data was investigated. The research was fortunate in that it did not include any cases of outliers. To ensure that the inputted data was accurate, the results were produced using the frequency distribution, mean deviation, and standard deviation. This led to the conclusion that the data entry was correct. The new research used directly observed surveys to fill in missing values, which allowed for a more accurate representation of the data. As a result, there was no questionnaire included in the SPSS sheet that had missing data. As a result, there are no gaps in any of the currently available research data.

4.3 Correlation Analysis

The term "correlation" refers to a method that illustrates the link that exists between two or more variables with the purpose of quantifying the level of correlation. Testing for simultaneous change between the two variables may be done in a manner that is both extremely beneficial and quite frequent. Therefore, the value of correlation might range anywhere from minus one to plus one. It is important to make use of bivariate correlation when assessing the collinearity of suggested variables. In correlation analysis, values with a negative sign indicate a negative link between the variables. Values with a positive sign indicate a positive relationship between the variables. Values with a zero indicate that there is no association between the variables. According to the findings of this research, there is strong intercorrelation between all of the dependent and independent variables, and these correlations might be significant in both positive and negative directions.

Table 4.1: *Correlation Coefficients: Knowledge Management Processes and Green Innovation Model*

Correlations

	GI	KMP	GKSB	EEBV	KR	KD	KA
GI	1						
KMP	.568**	1					
GKSB	.305**	.326**	1				
EEBV	.405**	.313**	.208**	1			
KR	.444**	.901**	.145**	.220**	1		
KD	.447**	.899**	.264**	.258**	.889**	1	
KA	.532**	.714**	.415**	.309**	.379**	.397**	1

**. Correlation is significant at the 0.01 level (2-tailed).

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
EEBV	360	1.00	7.00	4.1728	1.26457	.153	.129	-.625	.256
KR	360	1.00	7.00	4.8283	1.31914	-.508	.129	-.391	.256
KD	360	1.29	7.00	4.7496	1.07003	-.546	.129	.071	.256
GKSB	360	1.00	7.00	4.6011	1.43959	-.426	.129	-.629	.256
KA	360	1.00	7.00	4.8550	1.25028	-.337	.129	-.313	.256
KMP	360	1.43	7.00	4.8110	1.01489	-.488	.129	.017	.256
GI	360	1.67	6.75	4.8302	.98961	-.487	.129	-.171	.256
Valid N (listwise)	360								

This table presents the correlation matrix for this research, which includes both the dependent and independent variables. In addition to this, it illustrates the links between the variables that are dependent and those that are independent. It is recommended that the value of the independent variables be lower than 0.8 in the correlation matrix (Sekaran & Bougie, 2010). Therefore, the only thing that we will be looking at is whether or not the values of the independent variables are greater than 0.8 or 0.7. According to Sekaran and Bougie (2010), there is a problem with multi-collinearity when the association between two independent variables is more than or equal to 0.8. On the other hand, there is no problem with multi-collinearity when the value of the independent variables is less than 0.8. In such a situation, we shall not proceed with doing a test to check for multi-collinearity between the variables that are being considered independent.

4.4 Regression Analysis

Indicating the link between dependent and independent variables may be done with the use of a model called linear regression. It is used to assess the influence that independent variables have on variables that are dependent. The optimum equation for linear regression will be the one that satisfies the quantifiable requirements, which are referred to as BLUE (Best, linear, Unbiased equation).

4.4.1 Assumption of Regression Equation

This study using a regression model makes a lot of assumptions. Before using either simple or multiple regression models, one may additionally ensure that all the assumptions have been satisfied. The following are the fundamental presumptions that a linear model must meet.

4.4.1.2 Assumption # 1

It is required that the interval level of every single variable included in the experiments be measured. We designed a questionnaire with the use of Likert scales, which are often referred to as interval scales, and each scale has five points. The Likert scale, with its five points, is not regarded an interval scale but rather an ordinal scale (Kelley & Maxwell, 2003). On the other hand, the majority of the studies used a Likert scale with five points as an interval scale, and they used it to test their research investigations. In light of this, the Likert scales, which have five points each, are used in this investigation in order to verify the hypothesis and determine the range of the variables.

4.4.1.3 Assumption # 2

When doing an analysis using structural equation modelling (SEM), it is essential to verify that the normalcy assumption has been met. Therefore, kurtosis is used to examine the normality of the data, in addition to skewness and drawing normal curves, both of which are also used to check the normality of the data that is presented.

Both tests' high results indicate that the data did not follow the expected pattern (Hair, Black, Babin, & Anderson, 2010). For both kurtosis and skewness, the range of acceptable values should be between minus two to plus two. The normalcy of the data is shown by the values that are displayed farther down in the table. When the statistical value of all the data is divided by the standard error, the resulting range of values, from plus two to minus two, indicates that the data should be considered normal at every level. Therefore, every value is inside the acceptable range for kurtosis and skewness that has been given. In order to carry out the structural equation modelling (SEM) study, you are required to verify that the assumption of normality is correct. Therefore, kurtosis is used to examine the normality of the data, in addition to skewness and drawing normal curves, both of which are also used to check the normality of the data that is presented.

Both tests' high results indicate that the data did not follow the expected pattern (Hair, Black, Babin, & Anderson, 2010). For both kurtosis and skewness, the range of acceptable values should go from minus two to plus two. The normalcy of the data is shown by the values that are displayed farther down in the table. When the statistical value of all the data is divided by the standard error, the resulting range of values, from plus two to minus two, indicates that the data should be considered normal at every level. Therefore, all the values are located inside the kurtosis and skewness limits that have been given.

After the measurement of these two tests, and before moving on to any investigation, It is necessary to test the data for additional fundamental presumptions, such as (a) verifying the normality of the data's distribution through variance, means, kurtosis, and skewness; (b) ensuring that there is no multicollinearity; if there is, it can be verified through the variance inflation factor (VIF) and by creating a correlation matrix; and (c) ensuring that the data is free of missing values. By the end of this chapter, the values of variance, means, kurtosis, skewness, and the variance inflation factor shall all have been determined in order to confirm the fundamental requirements of normality and multicollinearity.

Several studies shown that there is no cause for concern when vast amounts of data are being analyzed since this allows for the possibility of non-normality. If the sample size is more than 200 or 300, then there should not be a significant issue with deviation from the normal distribution (Ghasemi, 2012). Therefore, it demonstrates that we are also able to make use of parametric approaches even when the data do not have a normal distribution over all of the supplied points. In addition, if the sample size of the research is large enough to incorporate hundreds of observations, then we can disregard the distribution of the data. Accordingly, taking into consideration what has been said so far, the statistics at hand are normal. Therefore, there should be no issues with the examination.

Table 4.2: *Descriptive Statistics of Normality for Knowledge Management Processes and Green Innovation*

**. Correlation is significant at the 0.01 level (2-tailed).

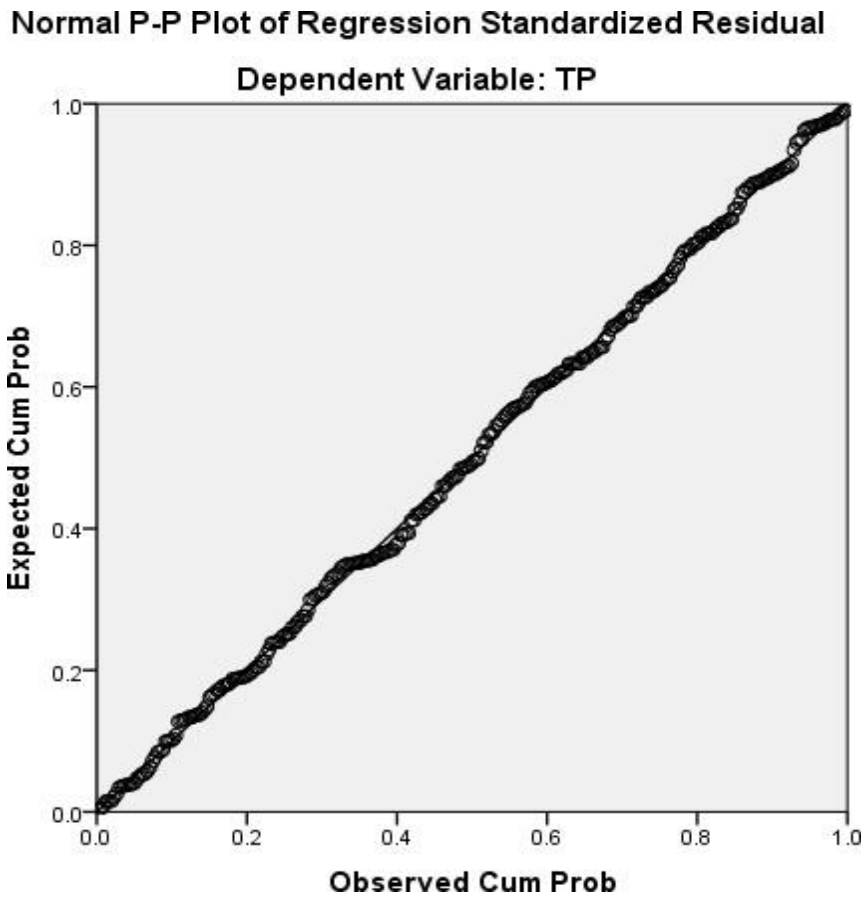
Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
EEBV	360	1.00	7.00	4.1728	1.26457	.153	.129	-.625	.256
KR	360	1.00	7.00	4.8283	1.31914	-.508	.129	-.391	.256
KD	360	1.29	7.00	4.7496	1.07003	-.546	.129	.071	.256
GKSB	360	1.00	7.00	4.6011	1.43959	-.426	.129	-.629	.256
KA	360	1.00	7.00	4.8550	1.25028	-.337	.129	-.313	.256
KMP	360	1.43	7.00	4.8110	1.01489	-.488	.129	.017	.256
GI	360	1.67	6.75	4.8302	.98961	-.487	.129	-.171	.256
Valid N (listwise)	360								

Although the kurtosis & skewness in the current study demonstrate that the data is normal. When the statics value is divided by the standard error, the result must fall between +2 and -2. Therefore, as you can see in the accompanying table, all of the replies fall within the range of +2 to –2, demonstrating the reliability of the data and the normality of their distribution. because the variables' variance from means was smaller than 1.

4.4.4 Assumption # 3

Figure 4.1: *Normal P-P Plot of Regression Standardized Residual: Knowledge Management Processes with Green Innovation*



The usual P-P plots for the efficient performance of multiple regressions are explained in the image above. The normal P-P plots conduct an analysis to determine whether or not the residuals or the error conditions are normally distributed. Therefore, we check to see whether there is a delicate distribution between the estimated value and the true value, and this figure ensures that the assumption of normality is met for regression.

4.4.5 Assumption # 4

The model that fits data the best should have a Durbin Watson value that is less than +2, and the R square value should always fall somewhere between 0 and 1 regardless of the circumstances (Sekaran & Bougie, 2010). When we take a look at the information shown in the table that is located below, we can see that the value of Durbin Watson is 1.883, which is less than the value of + 2. Given the characteristics of this inquiry, using this number is the one that is going to be the most appropriate. On the other hand, the value of R square and adjusted R square are both 0.362, and 0.355, respectively, and both of these values are located somewhere in the range of 0 to 1. As a result, this number is

suitable for the inquiry that is now being conducted. This shows that the auto relationship between the variables is not problematic and that the model is suitable for examining auto correlation. Additionally, this shows that the autocorrelation between the variables is in good shape.

Table 4.3: *Model Summary of GKSB, KD, KR, KA with GI*

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					
					R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.602[a]	.362	.355	.79499	.362	50.322	4	355	.000	1.883

a. Predictors: (Constant), GKSB, KR, KA, KD

b. Dependent Variable: GI

4.4.6 assumption # 5

At this point, we look at whether the data exhibit multicollinearity. It is a very significant problem in the statics, and it cannot be relied upon for the model's presentation. It takes place when there is a connection that is perfectly linear between the variables that are independent. Therefore, in the event that it is present in the data, it is essential to eliminate multi-collinearity first before continuing with further research. The examination of the Tolerance and Variance Inflation Factor is what is used to diagnose it (VIF). Tolerance is helpful in assessing multi-collinearity, and the range of values that are considered acceptable for it is from 0.1 to 1. The value that will be occurring around 0.1 requires another check to be performed. A number of small tolerance indicates that there is an excellent correlation between the independent variable and the other factors. When there is a huge standard error combined with a low tolerance value, multi-collinearity is regarded to be a significant concern. On the other hand, the Variance Inflation Factor (VIF) assists in the comprehension of the influence that multi-collinearity has on the model. VIF is fundamentally the opposite of Tolerance, and the range of values that are allowed for it is from 1 to 10. In the event when the sum of the values of the variables is larger than 10, it is necessary to check on them once again. If the tolerance value is

low, the VIF will display a high value; a greater value for the VIF indicates multi-collinearity in the data. This assumption is valid only for analyses that include multiple regressions, therefore multicollinearity in the data is unacceptable.

The authors probably consider the value that is equal to or more than 0.2 to be the sufficient range for tolerance, and they probably consider the value that is equal to or less than 5.0 to be the suitable range for VIF (Saunders & Thornhill, 2011). The multi-collinearity, as suggested by the current research model, is shown in the following table, which can be found below.***Table 4.4:*** *Multi-Collinearity Statistics for Knowledge Management Processes and Green Innovation*

	Collinearity Statistics	
	Tolerance	**VIF**
Knowledge Responsiveness	.197	5.083
Knowledge Dissemination	.191	5.237
Knowledge Acquisition	.723	1.382
Green Knowledge Sharing Behavior	.769	1.301

a. Dependent Variable: Green Innovation

The fact that multicollinearity did not exist in the data is shown by the table above. The collinearity analysis that is being shown in SPSS looks at the values of VIF and Tolerance. These numbers are the result of an observation made by the examiner, who is looking at the multi-collinearity (Hair, Black, Babin, & Anderson, 2010). Therefore, it is evident from the table that is shown above that multi-collinearity does not exist in the data that is currently being analysed.

As a result, the presence of multi-collinearity provides evidence that the independent variables are highly linked with one another if the value of the correlation is 0.9 or higher. Therefore, it is evident that if the values of VIF and Tolerance are expressing an amount that is more than the limit that has been defined, then there will be no problem with multi-collinearity. Because of this, every single one of the VIF values ought to be lower than 10, and the Tolerance value ought to be higher than 0.1. Therefore, both of the numbers shown in the aforementioned tables are inside the permitted range.

4.5 Sample Demographics

Descriptive analysis was used to investigate many demographic aspects of the sample that was the subject of the research. These aspects included gender, years of experience, and job positions. The analysis of the demographic factors is outlined in Table 4.1 for your convenience.

The descriptive data for Gender, Job Positions, and Experience are shown in Table 4.1. The table demonstrates that there is a significant amount of diversity among the respondents with regard to their gender, work position, and years of experience. Nevertheless, the proportion of male responders was 65.6%, which is also the case in Pakistan; men are often overrepresented in leadership roles in businesses. There are a significant number of women in high positions, however less than men. There has been a recent trend of women being strongly driven into top positions owing to their interpersonal abilities. As a result, a lot of females are placed as top managers in SMEs, although not as many as there are males. The share of women working in senior management positions in small and medium-sized enterprises (SMEs) is on the rise, according to a recent survey, which found that 34.4% of such positions are held by female.

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	236	65.6	65.6	65.6
	Female	124	34.4	34.4	100.0
	Total	360	100.0	100.0	

Due to the fact that men mostly hold positions of authority in Pakistan's administration, this is the situation. The fact that 65.6% of management roles in Pakistan's small and medium-sized enterprises are held by men demonstrates unequivocally that men mostly hold top-level jobs in the country.

Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Up to 5 Years	146	40.6	40.6	40.6
	6-10 Years	62	17.2	17.2	57.8
	11-15 Years	124	34.4	34.4	92.2
	More than 15 Years	28	7.8	7.8	100.0
	Total	360	100.0	100.0	

The work experience of the respondents of the sample is shown in the table above. The chart reveals that 40.6% percent of respondents were workers with up to 5 years of experience, while 17.2% were workers with up to 6-10 years, those who were from 11-15 years' experience percent were 34.4% and more than 15 years were 7.8% .

Job Position

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4.00	29	8.1	8.1	8.1
	5.00	178	49.4	49.4	57.5
	6.00	153	42.5	42.5	100.0

Total	360	100.0	100.0	

The above table shows the job positions of the respondent of sample

4.4 Exploratory Factor Analysis (EFA)

Exploratory factor analysis is a technique that assists researchers in determining which factors are most important in order to build a model from a relatively large number of unobserved constructs that are often symbolised by a collection of variables (Henson & Roberts, 2006). It has a broad range of applications, including the investigation of the correlations between the variables and the creation of an instrument for assessment (Pitombo & E.Kawamoto, 2011). The EFA makes assumptions and projections, based on models and theories, about the many constructs that determine the degree to which certain theories and models are applicable (Williams & T. Brown, 2010). It does this by using correlations, which determine whether the items in question are loaded on the same hidden variable or some other hidden variable. This results in the formation of the affiliation and link between the construct and the items (Byrne, 2001).

Investigation of the construct may be done utilising the matrices that are listed below.

I Structure Matrix

ii) Rotated Matrix

iii) Component Correlation Matrix

Structure Matrix is accountable for significant data spanning the correlation coefficient among a variety of components. It is helpful to determine the independent filling of each individual item based upon the optimal size using the rotational matrix.

The Component Correlation Matrix defines the link between the variables and the elements of the construct, as well as the strengths in the relationships among the factors of the construct (Henson &

Roberts, 2006). (Tabachnick & Fidell, 2001) It was recommended that the variables should have a correlation coefficient of greater than 0.30 between them.

According to the "Eigen value rule," it is presumable that those components with an Eigen value that is less than one are deemed to be negligible in the variables, and they also contribute less to the overall change in the construct (Kaiser, 1960). Because of this, the analysis should be free from all of the components that do not contribute to creating the current circumstance.

As a result, it is clear that the KA construct consists of five different components. Because of EFA, which demonstrates that these 5 items are appropriately correlated with each other's, it was maintaining its momentum in the direction of loading on the factor. The following table shows the confirmed findings of the number of techniques that were revealed, and KA was found to be unaffected by any of them. All of the things are shown below the table.

Table 4.5: *Factor Analysis of Knowledge Acquisition*

Initial Items (5-Items)		**Final Items (5- Items)**	
Dimension	Items	Dimension	Items
Knowledge Acquisition (KA)	KA 1, KA 2, KA 3, KA 4, KA 5	Knowledge Acquisition (KA)	KA 1, KA 2, KA 3, KA 4, KA 5

Accumulation of Information There were 5 components to Construct. Via the use of EFA, the expansion of KA was limited to one factor loading. It was discovered through this factor that all of the items are effectively associated, as can be seen in the table that is located above.

Table 4.6: *Factor Analysis of Knowledge Dissemination*

Initial Items (5-Items)		**Final Items (5- Items)**	
Dimension	Items	Dimension	Items

Knowledge Dissemination (KD)	KD 1, KD 2, KD 3 KD 4, KD 5	Knowledge Dissemination (KD)	KD 1, KD 2, KD 3 KD 4, KD 5

Knowledge Sharing and Spreading There were 5 components to Construct. Through the use of EFA, the expansion of KD was limited to one factor loading. This factor indicated that all of the items are effectively associated, as can be seen in the table that is located above.

Table 4.7: *Factor Analysis of Knowledge Responsiveness*

Initial Items (5-Items)		**Final Items (5- Items)**	
Dimension	Items	Dimension	Items
Knowledge Responsiveness (KR)	KR 1, KR 2, KR 3 KR 4, KR 5	Knowledge Responsiveness (KR)	KR 1, KR 2, KR 3 KR 4, KR 5

Adaptability to New Information There were 5 components to Construct. In the exploratory factor analysis (EFA), the expansion of KR was reduced to a single component loading. This factor revealed that all of the items are significantly connected, as seen in the table above.

Table 4.8: *Factor Analysis of Green Knowledge Sharing Behavior*

Initial Items (10-Items)		**Final Items (10- Items)**	
Dimension	Items	Dimension	Items
Green knowledge sharing Behavior (GKSB)	GKSB 1, GKSB 2, GKSB 3 GKSB 4, GKSB 5, GKSB 6, GKSB 7, GKSB 8, GKSB 9, GKSB 10	Green Knowledge Sharing Behavior (GKSB)	GKSB 1, GKSB 2, GKSB 3 GKSB 4, GKSB 5, GKSB 6, GKSB 7, GKSB 8, GKSB 9, GKSB 10.

The Green Knowledge Sharing Behavior Construct was comprised of ten different factors. Through the utilisation of EFA, the expansion of GKSB was limited to one factor loading. Within this factor,

it was discovered that all of the items are, in fact, effectively associated, as was previously said in the table.

Table 4.9: *Factor Analysis of Employee Environmental Beliefs and Values*

Initial Items (7-Items)		**Final Items (7- Items)**	
Dimension	Items	Dimension	Items
Employee Environmental Beliefs and Values (EEBV)	EEBV 1, EEBV 2, EEBV 3 EEBV 4, EEBV 5, EEBV 6 EEBV 7	Employee Environmental Beliefs and Values (EEBV)	EEBV 1, EEBV 2, EEBV 3 EEBV 4, EEBV 5, EEBV 6 EEBV 7

Environmental Beliefs and Values Held by Employees There were seven parts to Construct. Through the use of EFA, the growth of EEBV was restricted to the loading of a single component. Within this factor, it was found that all of the items are effectively associated, as was said before in the table.

Table 4.10: *Factor Analysis of Green Innovation*

Initial Items (5-Items)		**Final Items (5- Items)**	
Dimension	Items	Dimension	Items
Green Innovation (GI)	GI 1, GI 2, GI 3 GI 4 , GPI1 , GPI 2, GPI 3 GPI 4	Green Innovation (GI)	GI 1, GI 2, GI 3 GI 4, GPI 2, GPI 3 GPI 4

There were five components to the Green Innovation Construct. Through EFA, the expansion of GI was limited to loading onto a single factor. Within this factor, it was discovered that all of the elements are effectively connected with one another, as seen in the table above.

4.5 KMO and Bartlett's Test of Sphericity

Before the actual extraction of the construct, there are a few checks that have to be done to make sure that the sample is representative of the population and that the data being used are accurate for factor analysis (Burton & Mazerolle, 2011). Because the sample's competency provides information on the survey's item groupings, and because these element groupings may more effectively describe the construct in analysis, it is important to have a sample with high competency. Therefore, the Kaiser Meyer Olkin (KMO) test is carried out in order to evaluate the reliability of the sample (Kraiser, 1970). It is favoured in situations in which The ratio of cased items to variable items is lower than 1:5. On the other hand, according to Tabachnick and Fidell's Using multivariate statistics (2001), an acceptable value for factor analysis is 0.50, while a KMO correlation that displays greater than 0.60 is deemed adequate value for analysing the output of EFA. You can locate both of these numbers in Tabachnick and Fidell's Using multivariate statistics (Netemeyer & W. O. Bearden, 2003). The results of the sphericity test performed by Barlett provide a chi-square value that ought to be significant (Bartlett, 1950). If this test determines that the matrix in question is not an identity matrix and if the result is significant (with a p-value of less than 0.05), then the matrix in question is suitable for factor analysis (Tabachnick & Fidell, Using multivariate statistics, 2001).

The findings of the study are explained in the table that can be seen below. These results were obtained by applying the KMO and Bartlett's tests to the hypothesised relationship between the variables. In this table, all of the variables reveal their values, and the most acceptable ranges have values that are more than 0.7. The tables also indicate the significant levels of the variables, which have values that are either 0.000 or less than 0.05.

Table 4.11: *KMO and Bartlett's Test*

KMO and Bartlett's Test	KA	KD	KR	GKSB	EEBV	GI
KMO Measure of Sampling Adequacy	.771	.882	.861	.863	.853	.782
Approx. Chi-Square	700.748	1058.947	698.251	714.573	614.297	414.733

Bartlett's Test of Sphericity df	15	15	10	15	21	10
Sig.	.000	.000	.000	.000	.000	.000

4.6 Structural Equation Modeling

In order to analyses both the directional and non-directional interactions between the noticed and unnoticed variables in the hypothesized model, the Structural Equation Model (SEM) is used (MacCallum & Austin, 2000). Understanding the correlation between the variables and how their variation relates to the model that has been presented is useful. This is due to the high value of both. (Kline, 1998). The most important purpose of structural equation modelling (SEM) is to provide hypotheses for the representation of models that are compatible with the variables that have been observed. On the other hand, structural equation modelling (SEM) is used to conduct out analysis of the variables' behavior and investigation of the interactions between various components using either a direct or indirect approach (Lleras, 2004). By making use of observed data, SEM is also helpful in assisting with the examination of the validity of the fundamental hypotheses. SEM is suitable for a large number of samples, which in general the sample size is defined by the evaluation method, the distributed features of the observed data, and the intricacy of the model, and should be greater than 200. (Kline R. , 2011). Because SEM is required to carry out confirmatory analysis, the SEM method is performed before the confirmation analysis is carried out.

4.7 Fit Indices

In order for a researcher to determine whether the data that were gathered or observed react to the whether the model fits or not, it matters for them to observe values for the model fit and normalized regression weights. Many researchers employ a variety of methods to determine whether or not a model is suitable for usage, but the comparative Fit Index (CFI), the Goodness of Fit Index (GFI), and the Root Mean Square Error of Approximation are the methods that are used most often (RMSEA).

The CFI is a measurement tool that is used to assess the discrepancy function in relation to the sample size, and the significant values for this function range from 0 to 1. The value 0.90 is the one that is recommended the most, and it is the one that indicates the greatest model fit (Hu & Bentler,

1999). The GFI is used to determine the level of deviation present in the model (Barrett, 2006). Its significant value might range from 0 to 1, and the most acceptable value should be 0.90 or above in order to ensure that the model is well fitted. The size of the sample being used is directly related to the significance of the result. Therefore, the sample size need to be increased in order to satisfy the criterion of model fit (Wang X. , 1999). The RMSEA is a measure that is connected to the model's residual values, and the significant range for it is between 0 and 1. The most acceptable number should be 0.06 or less, and this value should also be the one that best fits the model (Hu & Bentler, 1999).

After it has been shown that the model provides a satisfactory fit for the data, the next step is to estimate the values of the model's parameters. The Z statistic is defined as the ratio of the estimated value of each parameter to the standard error associated with that parameter. The significant value of this statistic is 0.05, which is more than the value of 1.96, and the significant value of this statistic is 0.01, which is greater than the value of 2.56. (Hoyle, 1995).

Unstandardized parameter estimate entirely relies on the scaling information offered by variables, and is hence incomprehensible without their aid. In the model fitting process, standardized parameter estimate, a variation of unstandardized parameter estimation, uses informal parameter assessment rather than scaling.

In the event that an inadequate model fit is identified, then it is possible to adjust the model if the modifications appear to have a substantial impact. The process of correcting a specific and approximated model via either fixing the parameters that were previously free or releasing the parameters that were previously fixed is included in model modification. In this situation, the Language multipliers test, also known as LMT is used to obtain data on the value of the chi-square change, that is what happens when a fixed parameter is converted into the a free one (Hoyle, 1995).

4.8 Model Fit Measurement and Modifications

At this point, the primary emphasis is on determining how well the model fits the data with the assistance of CFA. As you are aware, CFA is used to determine whether or not a single factor model is valid, to determine the importance of a certain factor loading, and to determine whether or not there is a connection between the variables. In addition to this, it is used in the analysis of convergent validity and the assessment of discriminant validity (DeCoster, 1998). CFA provides sufficient details regarding the requirements of the model and the estimate in order to inspire confidence in the outcomes. (Hu & Bentler, 1999) It is recommended that we should depend on those fit indices which have diverse qualities of measurement such as an incremental fit index and a residual based fit index.

The cutoff values for several operations during the assessment of the model have been subject to constant revision throughout the course of time. The number 0.90 should be used as the cutoff for various incremental fit indices (Bentler & Bonett, 1980). On the other hand, the cutoff value for incremental fit indices should be 0.95, and 0.97 is regarded a more acceptable number (Schermelleh-Engel, Moosbrugger, & Muller, 2003). When estimating the fit of the subsidiary measures, the cutoff value must first be removed from that scenario. Researchers focus their emphasis on additional aspects of model fit in order to discover the global fit measures. These aspects include determining the standardised residual in order to determine whether or not certain variables are linked with one another (Bollen, 1989).

Another aspect of the model's validity that has to be considered is whether or not it can be modified. Researchers look at a wide variety of difficult models, but they are unable to adapt the models such that they provide a sufficient model fit. It is often said that post hoc adjustments were made to the model, which is fundamentally what was used for the modification indices. It is only carried out when the possible deviations can be rationalized both in theory and in practice (MacCallum, 1995).

When the value of the T test is 2, the results of the T test will not be distributed on the basis of the post hoc model change. However, when analysing the outcomes of a research study, numerous model modifications need to be explicitly indicated. In addition, it is recommended that a letter be supplied with the text showing that each parameter in the model represents the priori hypothesis. This is due to the fact that letters tend to be more convincing than text alone. In the event that this does not take place, then each modification has to be well explained (Bentler, On tests and indices for evaluating structural models, 2007).

4.9 Confirmatory Factor Analysis

For the purpose of authorising the building of the assembly in the research study, a Confirmatory Factor Analysis is performed. Examining both the seen and the unobserved aspects of the data is the primary objective of this research. Following an investigation of the observed factors, those variables are included into the comprehensive model, which is then made prepared for more research. It also identifies the factor loading of the observed variables based on its constructions, and it gives the acceptable model fit for probable presented hypotheses based on their acceptance or rejection. Both of these functions are carried out based on the results of the analysis. Because we

hypothesis CFA first inside a component structure and then verify it empirically, as opposed to deriving it from the data as in exploratory factor analysis, it is distinct from exploratory factor analysis in this respect (Lei et al., 2007). The canonical factor analysis (CFA) is a statistical approach that may verify the component structure of a collection of observable variables by the usage of the variables themselves. When it comes to CFA, academics have extremely strong opinions on the number of factors, the relationship between the factors, as well as the link between the variables and the measured variables (DeCoster, 1998).

***Table 4.12**: Model Fit Indices with Accepted Value*

Level of Model Fit	**Overall Model Fit**				
	Model Fit		Model Comparison		
Fit Measure	CMIN/DF	RMSEA	IFI	TLI	CFI
Further Analysis is Required	> 2	> .1	< .90	< .90	< .90
Acceptable Scale for good Model Fit	≤ 2 or 5	< .80 (Accepted up to .1)	≥ .90	≥ .90	≥ .90

4.10.1 Knowledge Acquisition

Acquiring Knowledge is the independent variable, which consists of the following 5 items: (Fig 4.2). Investigate the demonstrative vigour while looking at the measurement that was meant for the key want of CFA. There were five products that had entire factor loadings indicated, and the loadings were diagonally 0.50. Therefore, the first CFA that was asked was a continuation for OTE. The results of the model fit are shown in Table 4.13, which may be seen below.

Figure 4.2: CFA for Knowledge Acquisition

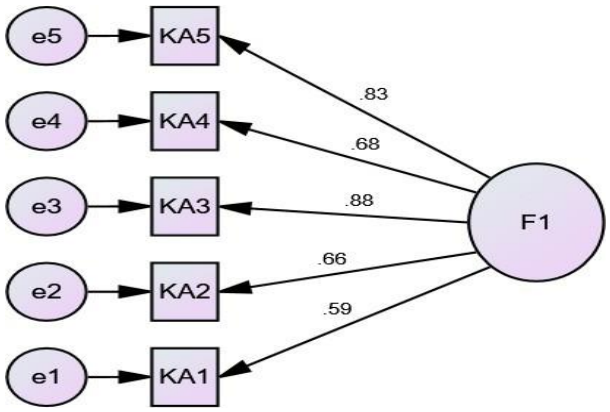


Table 4.13: *Model Fit of Knowledge Acquisition*

Question Items	Instruments in detail	Final	
		Standardized Loading	Critical Ratio
KA 1	Organization values employ's attitudes and opinions	.59	9.541
KA 2	Organization has well- developed financial reporting system	.66	8.556

KA 3	Organization gets information from market surveys			.88		16.142
KA 4	Organization works in partnership with international customers			.68		12.214
KA 5	Organization is sensitive to information about changes in the marketplace			.83		15.124
	CMIN/DF (χ2/df)	RMSEA	GFI	TLI	CFI	
Model Fit	3.441	.06	.964	.941	.911	

4.10.2 Knowledge Dissemination

The independent variable, Knowledge Dissemination, contains 5 components (Fig 4.3). Examine the CFA measurement for main demand in order to research the demonstrative force. Five products had entire factor loadings that were given, and they were diagonally 0.50. So, continuing for OTE was the first CFA that was requested. Below, in Table 4.14, the model fit is expressed.

Figure 4.3: CFA for Knowledge Dissemination

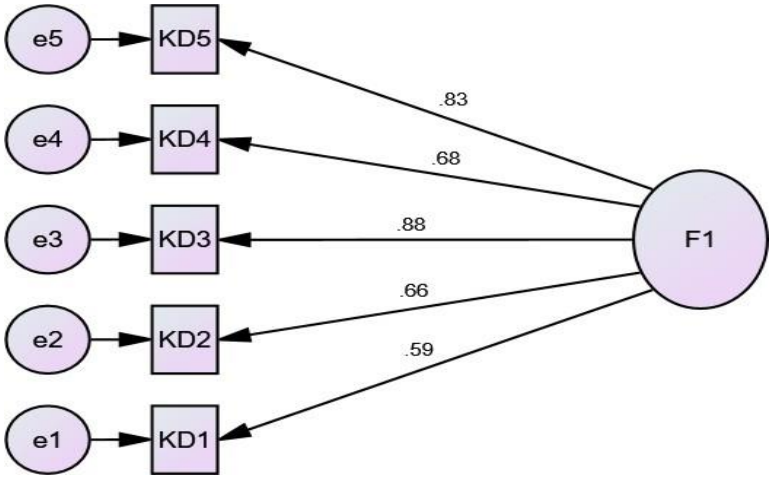


Table 4.14: *Model fit of Knowledge Dissemination*

Instruments in detail	Final

Question Items		Standardized Loading	Critical Ratio
KD 1	Environmental relation is freely disseminated in our organization	.59	17.542
KD 2	Knowledge is disseminated on the job	. 66	9.514
KD 3	Use of specific techniques to disseminate Knowledge is common practice	.88	19.221
KD 4	Organization uses technology to disseminate Knowledge	.68	11.221
KD 5	Organization prefers written communication	.83	8.

	CMIN/DF (χ2/df)	RMSEA	GFI	TLI	CFI
Model Fit	3.214	.087	.941	.981	.955

4.10.3 Knowledge Responsiveness

Knowledge The independent variable is called responsiveness, and it consists of 5 different things (Fig 4.4). Investigate the demonstrative vigour while looking at the measurement that was meant for the key want of CFA. There were five products that had entire factor loadings indicated, and the loadings were diagonally 0.50. Therefore, the first CFA that was asked was a continuation for OTE. The results of the model fit are shown in Table 4.15, which may be seen below.

Figure 4.4: CFA for Knowledge Responsiveness

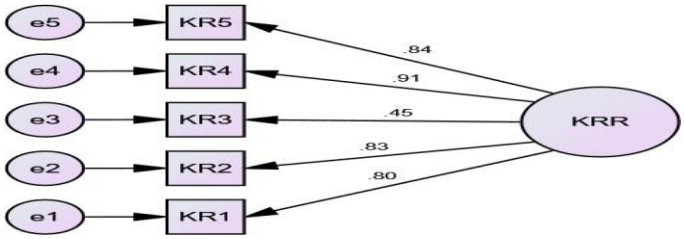


Table 4.15: *Model Fit of Knowledge Responsiveness*

Question Items	Instruments in detail	Final	
		Standardized Loading	Critical Ratio
KR 1	Feedback of customers is highly considered in our organization	.80	18.121
KR 2	Our organization has well developed its product processing function	.83	21.542
KR 3	Our organization continuously upgrade technological functions	.45	6.231
KR 4	Our organization quickly responds to environmental-related concerns	.91	16.124
KR 5	Organization process are flexible and opportunistic	.84	15.187
	CMIN/DF (χ2/df) RMSEA GFI TLI CFI		

Model Fit	4.401	.074	.922	.901	.979

4.10.4 Green Knowledge Sharing Behavior

The Green Knowledge Sharing Behavior is the mediating variable, which consists of seven different components (Fig 4.5). Investigate the demonstrative vigour while looking at the measurement that was meant for the key want of CFA. There were seven factors whose entire loadings were stated, and each of them was diagonally 0.50. Therefore, the first CFA that was asked was a continuation for OTE. The results of the model fit are shown in Table 4.16, which may be seen below.

Figure 4.5: CFA for Green Knowledge Sharing Behavior

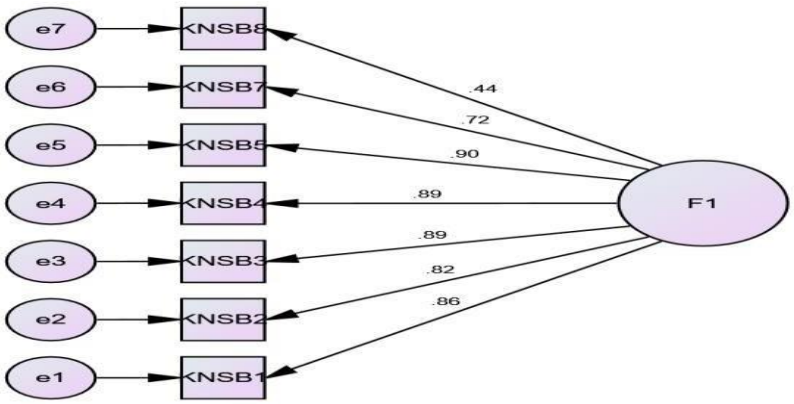


Table 4.16: *Model Fit of Green Knowledge Sharing Behavior*

Question Items	Instruments in detail	Standardized Loading	Final Critical Ratio
GKSB1	I always share green Knowledge obtained from newspapers magazines journals television and other sources	.86	18.221
GKSB2	I enjoy sharing environmental-friendly Knowledge with my colleagues	.82	16.154
GKSB3	In my organization, people share expertise from work experience with each other Sharing my Knowledge with colleagues is pleasurable	.89	21.882
GKSB4	I believe that knowledge sharing can benefit all parties involved	.89	21.889
GKSB5	I adequately complete assigned duties in environment-friendly ways	.90	22.154
GKSB6	I fulfill the responsibilities specified in my job description in environment-friendly ways	.35	1.241
GKSB7	I perform tasks that are expected of me in environment-friendly ways	.72	8.712
GKSB8	I took a chance to get actively involved in environmental protection at work	.44	9.124
GKSB9	I took the initiative to act in environment-friendly ways at work	.21	1.123
GKSB10	I did more for the environment at work than I was expected to	.30	2.457

			TLI	CFI
Model Fit	.078	.928	.986	.932

4.10.6 Employee Environmental Beliefs and Values

The moderating variable is the Employee Environmental Beliefs and Values scale, which has a total of seven items (Fig 4.6). Investigate the demonstrative vigour while looking at the measurement that was meant for the key want of CFA. There were seven factors whose entire loadings were stated, and each of them was diagonally 0.50. Therefore, the first CFA that was asked was a continuation for OTE. The results of the model fit are shown in Table 4.17, which may be seen below.

Figure 4.6: CFA for Employee Environmental Beliefs and Values

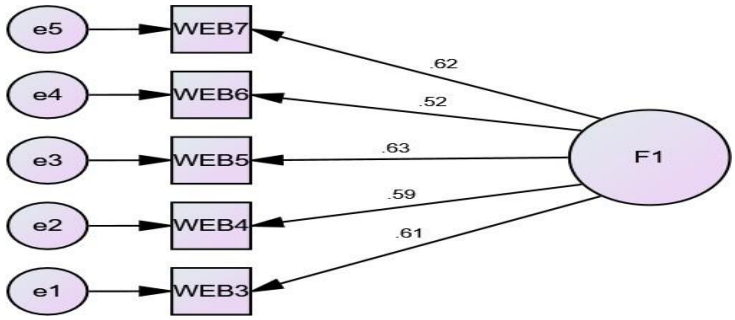


Table 4.17: *Model Fit of Employee Environmental Beliefs and Values*

Question Items	Instruments in detail	Final	
		Standardized Loading	Critical Ratio
EEBV 1	The government should take stronger action to clean up toxic substances in the environment	.61	11.493
EEBV 2	feel a personal obligation to do whatever I can to prevent climate change	.59	10.863
EEBV 3	I feel a sense of personal obligation to take action to stop the disposal of toxic substances in the air, water, and soil.	.63	9.842
EEBV 4	Business and industry should reduce their emissions to help prevent climate change	.52	9.812
EEBV 5	The government should exert pressure internationally to preserve the tropical forests.	.62	9.047
EEBV 6		.52	10.929
EEBV 7	The government should take strong action to reduce emissions and prevent global climate change	.62	9.916

	I strongly value the environmental efforts of my company				
	CMIN/DF (χ2/df)	RMSEA	GFI	TLI	CFI
Model Fit	3.912	.078	.9441	.9221	.889

4.10.7 Green Innovation

The dependent variable is referred to be Green Innovation, and it consists of the following five items: (Fig 4.7). Investigate the demonstrative vigour while looking at the measurement that was meant for the key want of CFA. There were five products that had entire factor loadings indicated, and the loadings were diagonally 0.50. Therefore, the first CFA that was asked was a continuation for OTE. The results of the model fit are shown in Table 4.18, which may be seen below.

Figure 4.7: CFA for Green Innovation

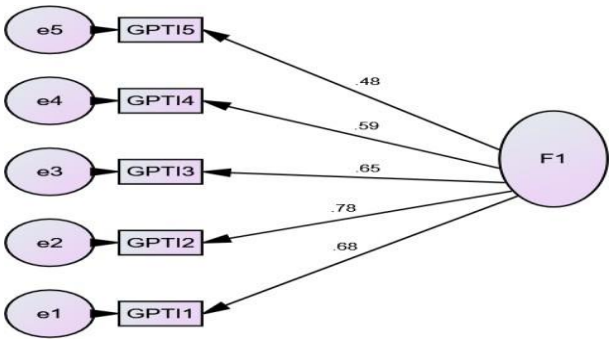


Table 4.18: *Model Fit of Green Innovation*

Question Items	Instruments in detail	Final	
		Standardized Loading	Critical Ratio
GI 1	Our firm chooses the materials of the product that produce the least amount of Pollution for conducting the product development or design.	.48	9.817
GI 2	Our firm chooses the materials of the product that consume the least amount of energy and resources for conducting the product development or design	.58	9.967
GI 3	Our firm uses the fewest amount of materials to comprise the product for conducting the product development or design	.65	8.879
GI 4	Our firm would circumspectly deliberate whether the product is easy to recycle, reuse, and decompose for conducting the product development or design.	.78	8.207

GI5	The manufacturing process of our firm effectively reduces the emission of hazardous substances or waste.	.68	10.786
GI6	The manufacturing process of our firm reduces the consumption of Water, electricity, coal, or oil.	.32	4.12
GI7	The manufacturing process of our firm recycles waste and emission that allow them to be treated and reused	.25	2.54
GI8	The manufacturing process of our firm reduces the use of raw materials.	.31	1.24
	CMIN/DF (χ2/df) RMSEA GFI	TLI	CFI
Model Fit	6.214 .081 .961	.931	.969

4.10.8Overall Measurement of Model Fit

Now we will talk about the overall measurement of the model fit by combining all of the CFAs that have previously been described. In essence, it is connected to the dependent and independent variables, and its primary purpose is to validate the appropriateness of the measurement model, which is a development of dependent and independent covariance arrangements. Therefore, all of the remaining items that are connected to the contradicting construct offer an adequate match with the data and the measurement model.

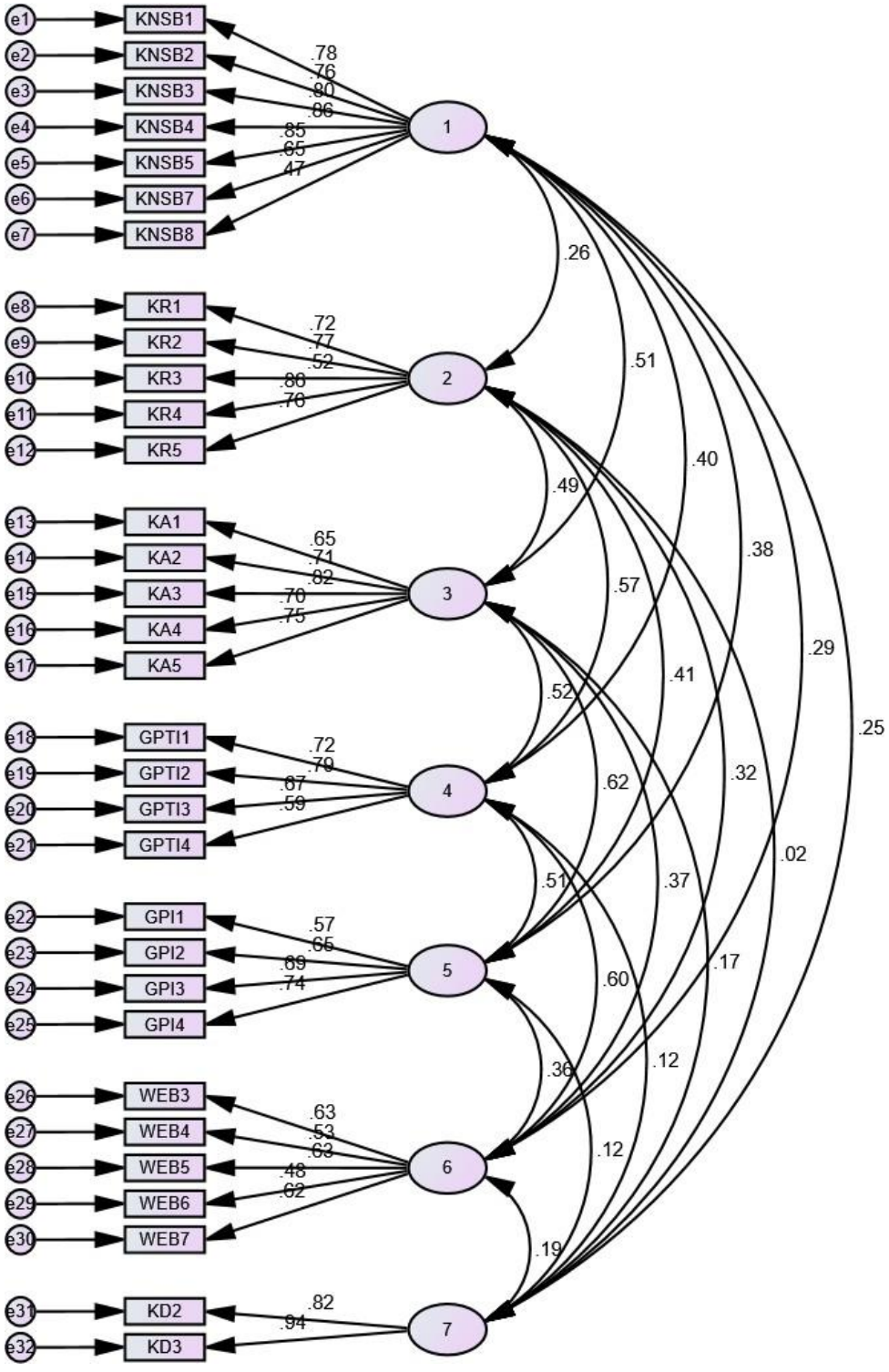


Figure 4.8: *CFA for Overall Model Fit*

	CMIN/DF (χ2/df)	RMSEA	GFI	TLI	CFI
Model Fit	4.211	.081	.9441	.911	.981

4.11 Validity of Construct

Validity refers to the process of determining whether or not the measurements used in a quantitative research are accurate. When doing any kind of research, it is necessary to ensure the validity of the findings, as this provides the crucial foundation upon which the procedures and ideas that are developed as a consequence of the study are based, both in terms of their practicality and their applicability. Based on the findings of past research, it is common knowledge that the content and construct validity of survey instruments is among the most regarded. In various aspects of the study, other types of validity evaluations are also used. Validity of constructs is an expression of how ideas, concepts, and actions may be translated into reality and operated using them. Validity of this kind is characterised by the fact that it is based on the compilation of data from a variety of studies via the use of certain measurement toolsEstimating the construct validity calls for a recognition of the link between the measure that is going to be assessed and those factors that are theoretically associated to the construct measurement via the instrument. This is necessary in order to arrive at an accurate estimate of the construct validity. In order to arrive at an accurate assessment of the construct validity, this is required (Crocker & Algina, 1986).

Content validity is used to investigate how a component was formed to actualize a construct in a manner that yields a suitable and representative sample of all the items which may strengthen the measures of the construct of interest. This is done since there is no statistical test that really can examine whether a measure appropriately covers a content area or appropriately shows a construct. This is due to the fact that no statistical test exists to determine if a measure appropriately demonstrates a construct or covers a content area. Because there is no statistical test that can determine whether or not a measure adequately covers a content area or adequately shows a construct, the determination of a measure's content validity is almost entirely dependent on the judgement of individuals who are knowledgeable in the relevant subject area.

Research uses the idea of divergent validity to study the startling and exciting differences that exist between the independent variables, while at the same time analyzing the variations that exist all through dependent variable (Hair, Black, Babin, & Anderson, 2010). Average Variance Validity (AVE) has been used to predict convergent validity, and a considerable level of convergent validity is indicated by AVE values more than 0.5. Average Variance Validity (AVE) has predicted convergent validity based on observations of measures that do so (Bagozzi, 1995).

Table 4.19: *Construct Validities*

	CR	**AVE**	**MSV**	**ASV**	**KMP**	**KA**	**KD**	**KR**	**GKSB**	**GI**
KMP	0.689	0.562	0.395	0.321	0.699					
KA	0.854	0.752	0.464	0.201	0.305	0.617				
KD	0.704	0.651	0.416	0.399	0.351	0.731	0.525			
KR	0.799	0.621	0.237	0.254	0.482	0.409	0.687	0.736		
GKSB	0.672	0.589	0.412	0.298	0.443	0.581	0.520	0.283	0.758	
GI	0.852	0.631	0.512	0.418	0.590	0.499	0.716	0.470	0.801	0.816

4.11 Hypotheses Analysis

4.11.1 Knowledge Acquisition has a positive and significant impact on the Green Innovation.

The standardized approximation of the GI – KACQ connection yields the value of beta that is 0.63, with the P value being 0.00 and the critical value being 15.53. It reveals the important association between the Knowledge Acquisition and Green Innovation.

KACQ is recognized as a significant feature of KMP, permitting organizations to receive fresh and current information from various stakeholders to ensure constant organization growth (Shahzad st al, 2019). (Shahzad st al, 2019). In order to the constant improvement of product and service quality, KACQ gives a deeper awareness of the business environment, which is growing dynamically in terms of financial customer expectations and organizational growth (Darroch 2005). (Darroch 2005). According to findings from past studies, the link between KA and GI has been associated with a

variety of contradictory outcomes in developing countries (Abbas and Sagsan, 2019). According to multiple research (Abbas and Sagsan, 2019; Mothe et al., 2018; Zhang and al., 2010), KA from different stakeholders and external markets strongly positively correlates with innovativeness

Hence H1 backed by prior research that Knowledge Acquisition has a large and favorable influence on the Green innovation. This is displayed below in table 4.20.

4.11.2 Knowledge Dissemination has significant and positive impact on the Green Innovation.

According to the standardized approximation of the GI – KD relationship, the value of beta is calculated to be 0.58, and the P value is 0.00, while the critical value is 13.12.

It demonstrates the crucial link between the dissemination of knowledge and the innovation of environmentally friendly practices.

As a result, Hypothesis 2 (H2) was validated by the research that came before it, proving that the dissemination of knowledge has a substantial and beneficial effect on green innovation, as seen in table 4.20 below.

The two most important aspects of it are information gathering and knowledge sharing; information collecting refers to acquiring information from personnel, while information sharing tries to pass on previously acquired knowledge (Attia & Salama,2018). It does this by giving employees with chances for social interaction at work, which in turn encourages constructive problem-solving among workers (Attia and Salama, 2018). Numerous studies have shown that KD is an essential component in increasing access to information and having an effect on an organization that stimulates creativity. This has led researchers to conclude that KD is one of the most important factors in these areas. It improves company operations and financial planning, and in the long run, it helps partners achieve their corporate green environmental objectives (Abbas & Sagsan 2019).

Therefore, the first hypothesis, which states that knowledge dissemination has a considerable and beneficial effect on green innovation, is supported by the past research. It may be seen in the table 4.20 down below.

4.11.3 Knowledge Responsiveness has a significant and positive impact on the Green innovation

According to the standardized approximation of the GI – KR relationship, the value of beta is 0.78, and the P value is 0.00, while the critical value is 19.92. It demonstrates the important connection between the Knowledge Responsiveness and the Innovation in Green Technologies.

In a separate research, Abbas and Sagsan (2019) shown how vital KAP is for the successful implementation of technological breakthroughs and the enhancement of performance. The investigation of the researcher revealed a fruitful connection between KAP and the effective use of green design (Abbas and Sagsan, 2019; Lin, 2007). It seems that the KAP is a strategic instrument that companies may use in order to maintain their viability in the harsh environment of the modern business world. As a result, Hypothesis 3 (H3) was validated by the research that came before it, proving that Knowledge Responsiveness does, in fact, have a substantial and beneficial effect on Green Innovation, as can be shown in Table 4.20 below.

4.11.4 Green Knowledge sharing Behavior has a significant and positive impact on the Green Innovation

The critical value of 16.92 is determined using the standardised approximation of the GI–GKSB relationship, which provides the value of beta as 0.62. The P value is determined to be 0.00. It demonstrates the important connection between green innovation and green knowledge sharing behaviour.

It is often believed that organisations cannot retain a sustainable competitive advantage without the dissemination of information and expertise (Gope et al., 2018). According to Lin and Chen (2017), the degree to which knowledge workers share their expertise with other members of the team may be characterised as "green sharing of information." As a result, it is plausible to postulate that imparting environmental awareness to a company's workforce is one of the processes that contributes to the achievement of the company's goal of green innovation. As a result, Hypothesis 4 (H4) was validated by the research that came before it, proving that the behaviour of green knowledge sharing has a considerable and favourable influence on green innovation, as seen in table 4.20 below.

Table 4.20**:** *Summary of Results Related to Hypotheses H1 to H5*

Connection Between Variables	**Beta Value**	**Critical Value**	**P Value**	**Decision**
β_1 (GI←KA)	.63	15.39	0.00	Supported
β_2 (GI ← KD)	.58	13.12	0.00	Supported
B_3 (GI ← KR)	.78	19.56	0.00	Supported

B_4(GI← KMP)	.71	17.23	0.00	Supported
B5(GI← GKSB)	.65	16.92	0.00	Supported

4.11.5 Green knowledge sharing behavior significantly and partially mediates the relationshipbetween KMP and Green Innovation

The value of beta in the various effects may be determined using a standardized approximation of the KMP-GKSB-GI connection. The table that is presenting below shows the value of beta with overall effect, which is 1.42 with the P value of 0.01, beta of direct effect, which is 0.13 with the p value of 0.002, and finally displays the beta value of indirect effects, which is 1.29 with the P value of 0.001. This exemplifies the degree of mediation that occurs between the process of managing information and developing environmentally friendly products. Table 4.21, which may be found further down this page, provides an unambiguous breakdown of the consequences that result from the existence of this link. According to a number of studies, the dissemination of green information directly stimulates green innovation. (Wong 2013). It is possible for companies to achieve genuine success with green innovation if they acquire and share green skills and information gained from the outside with all players in the supply chain. (wu 2013). Because of the rapidly changing environment, organizations see the sharing of information as part of their social responsibilities to the community. According to Jianga, Shaoa, et al. (2018), the efficiency of an organization's knowledge management (KM) systems has a significant impact on its capacity to engage in green innovation and develop new products, processes, and knowledge. This is the conclusion drawn from a study that looked at the relationship between KM systems and green innovation.

Therefore, Hypothesis 5 is validated by the prior research, which demonstrates that Green Knowledge Sharing Behavior Employee Beliefs and Values Regarding the Environment The KMP and Green Innovation have a link that is partly mediated by behavior, which also has a substantial impact on the relationship.

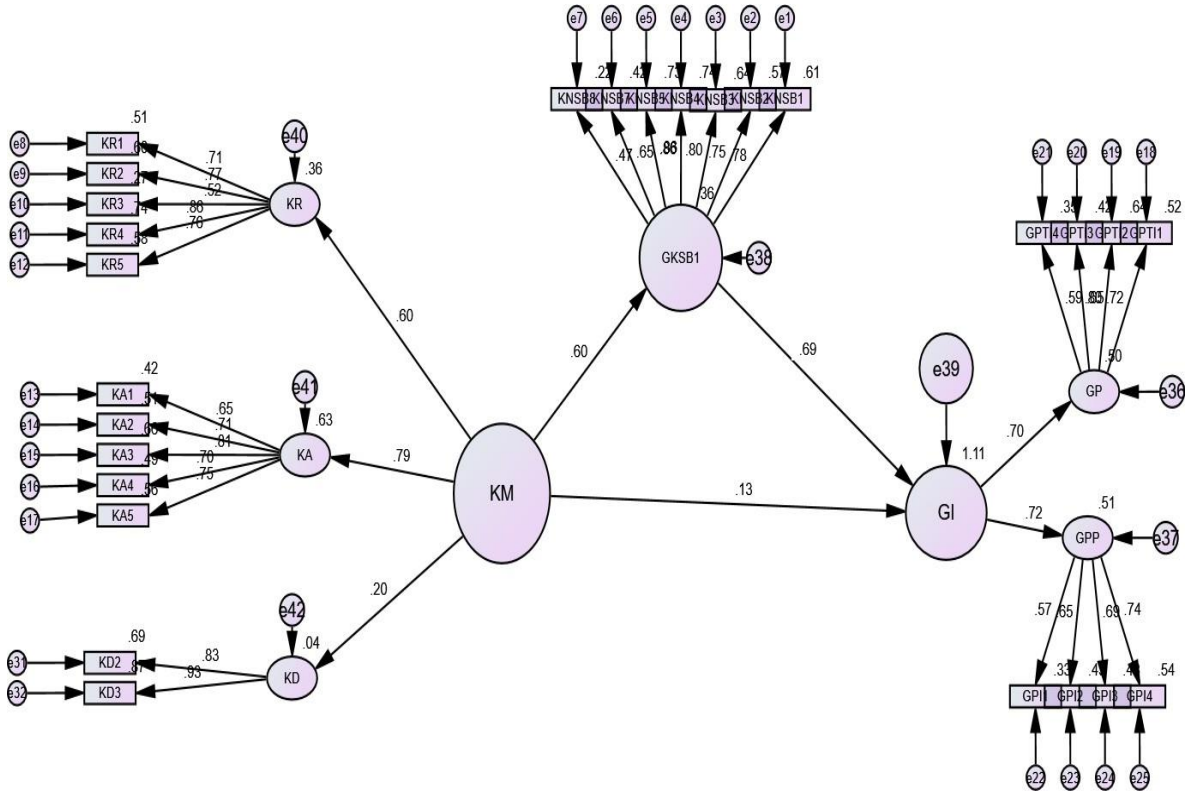


***Table 4.21*:** *Summary of Mediator Result Green Knowledge sharing Behavior Related to Hypothesis H5*

Variables	Total Effects (C)	Direct Effects (C')	Indirect Effects (ab)	Results	Mediation Level
KMP-GKSB-GI	β= 1.42 p = .01	β= .13 p = .002	β= 1.29 p = .001	Significant	Partial

***p≤0.05

4.11.6 Employee Environmental Beliefs and Values significantly moderates the relationship between Knowledge Management Process and Green Knowledge sharing Behavior

4.11.7 Analysis of Moderator impact by Preacher and Hayes Approach

In SPSS, PROCESS is a fundamentally flawed theory attestation method that can be used to measure the coefficient values of mediation as well as interaction models in a variety of ways. PROCESS can also be used to obtain crucial inferential strategies for preventing fraudulent results related to bootstrap warranty between periods and interims. Additionally, it is used to obtain crucial inferential strategies for preventing misleading conclusions related to the bootstrap warranty between periods and interims. It does so by using a graphic representation of the moderation assessment (Hayes A. F., 2013).

The process independent factors (Knowledge Acquisition, Knowledge Dissemination, and Knowledge Responsiveness), the mediation variable of Green knowledge sharing behavior, and the interaction variable that is Employee Environmental Beliefs and Values are employed in this study. The PROCESS evaluation method takes into consideration whether the independent variable in question need to be continuous or dichotomous.

This will start the operation PROCESS K-1Times, where K is a collection and K-1 is the value of a self-contained variable. of codes that were accumulated before the implementation of PROCESS. The operation is going to be carried out K-1 times. When this programme is executed, X is used as one gathering code, and other variables are used as covariates to serve the code of X, that is then exchanged with the help of covariate. Therefore, identical bootstrap examinations which are used as the part of continuous installation. By providing the command seed=summon, the irregular number initiator will launch concurrently. This irregular number initiator would be chosen at random by the researcher in order to discriminate the model based on a multi-level variable that is included inside itself.

Table 4.22**:** *Model Coefficients for Conditional Indirect Effects of Green Employee Environmental Beliefs and Values Behavior (GKSB) on Knowledge Management Process by Green Knowledge Sharing Behavior.*

		Consequent						
		M (GKSB)				GI (Rep. Int.)		
Antecedents		Coeff.	SE	P		Coeff.	SE	P
M (GKSB)		---	---	---	b_1	0.621	0.069	< 0.03
V (EEBV)					b_2	0.245	0.044	< 0.002
MVX		---	---	---	b_3	0.054	0.034	0.021
Constant	i_1	1.215	0.145	< .001	i_2	1.321	0.276	< 0.002

The findings of the dependent variables and mediator are shown in the table above, which can be used to investigate the connection that the moderator has with them. According to Sekaran and Bougie's (2010) research, the acceptable range for model fit is a statistical value that is less than or equal to 0.05, which is the minimum acceptable value. The fact that Employee Environmental Beliefs and Values has a value of 0.002 in the table shown above indicates that it plays a significant role as a moderator between Green Knowledge Sharing Behavior and Knowledge Management Processes. This indicates that it is an important factor. Therefore, the idea that EEBV acts as a moderator between KMP and Green Knowledge Sharing Behaviour was validated by H8.

4.12 Result Discussion

The primary objective of this research is to investigate the relationship between green innovation and knowledge management processes, namely knowledge acquisition, knowledge dissemination, and knowledge responsiveness, as well as to investigate the function of green knowledge sharing behavior as a moderating factor in this relationship. A secondary objective of this study is to investigate the role of employee environmental beliefs and values in this context. Because of this, the findings acknowledged that there is a strong association between all dependent and

independent factors. In addition, this study helped define the roles of mediators and moderators, who also significantly play their roles in the Green Innovation sector among SMEs.

The primary purpose of knowledge acquisition is to ascertain the needs of consumers and their responses to various goods and services. Incorporating a green and increasing the chance of cooperation and communication with external stakeholders is possible with a sustainable agenda, which also makes use of the most current information and technology that these stakeholders have available (Shah & Soomro, 2021). The KA-GI partnership's research in industrialised countries yielded conclusions from previous research that were in conflict with one another (Abbas & Sagsan, 2019). It is crucial for employees to participate in the process of assimilating the new information. (Song et, 2020) Previous research has shown that there is a connection between KACQ and innovativeness in performance (Cui et al., 2020). For this reason, past research provide credence to the hypothesis that knowledge acquisition has a considerable impact—both positively and significantly—on environmentally friendly innovation.

Knowledge-sharing practises on the part of workers should be encouraged in the workplace so that organisations may reach high levels of performance (Song et al., 2020). According to Abbas and Sagsan, the dissemination of information contributes positively to the organisational sustainability by making use of environmentally friendly innovations (2019). According to Martn-de Castro (2015) and Akgün et al. (2017), the performance of an organization's innovation improves when information is shared across employees inside the organisation. The act of making one's knowledge accessible to others inside the business is a straightforward definition of what is meant by "expertise sharing." (Camelo-Ordaz et al., 2011; Wong, 2013), is essential to innovation since it has a direct influence on product innovation, process innovations (Maes and Sels, 2014), and innovativeness (Camelo-Ordaz et al., 2011; Wong, 2013). (Saenz et al., 2012).

As a result, past research lends credence to the hypothesis that Green Innovation is significantly influenced in a positive direction by the dissemination of knowledge.In addition to this, Knowledge Responsiveness makes it possible to include the knowledge and information of an organisation into the process of creating processes and products (Mills & Smith, 2011). Products that are environmentally friendly may be made by companies because of the innovative, creative, and digital manufacturing technologies available to them (Awan et al., 2020). According to recent research (Abbas & Sagsan, 2019; Shahzad, Qu, Zafar, Ding, & Rehman, 2020), Knowledge Responsiveness has been used to advance a company's commitment to environmentally responsible business practises

in order to achieve green growth results. A review of the studies done in the past makes it abundantly evident that the connection between KAP and GI has resulted in a wide variety of phenomena. According to the findings of Darroch (2005), KAP is an essential component for organisational innovation in this respect. Therefore, past research lends credence to the hypothesis that knowledge responsiveness has a materially important effect—albeit a beneficial one—on green innovation.

It is generally accepted that organisations need information and knowledge dissemination in order to maintain their ongoing competitive advantage (Gope et al., 2018). According to Lin and Chen (2017), the degree to which employees in the knowledge economy communicate information about the environment with one another. It is thus plausible to postulate that the process of disseminating information about sustainable practises among employees is what enables a company to realise its sustainable objectives. As a result, "green knowledge management" denotes an effective improvement in the knowledge infrastructure and transmission capabilities regarding environmental concerns among organisational members (Lin and Chen, 2017). As a result, past research lends credence to the hypothesis that Green Knowledge Sharing Behavior has a material influence, both positively and significantly, on Green Innovation.

Innovation that is environmentally friendly is a strategy that businesses may use to mitigate the negative effects that their operations have on the surrounding environment. It is a method that assists the company in improving its competitiveness as well as its environmental and economic performance (Zartea, Pechmann, & L.Nunes, 2022). The effective administration of a company's information has a direct and positive bearing on the inventive potential of that organisation. It is essential for there to be information sharing among workers if there is to be any hope of achieving a successful knowledge management process. (Zhoubc, Govindanab, & Xie, 2020). Therefore, past research lends credence to Hypothesis 5 (H5), which asserts that considerable and partial mediation of the connection between knowledge management processes and green innovation is provided by green knowledge sharing behaviour.

The ideas and values that employees have in regard to the environment include their perceptions of the world around them and the ways in which they participate in environmental behaviour. Because of the fast changes in the environment, there is increased pressure on the company to manufacture the product in a manner that uses less natural resources (Abbas and Dogan 2022).

Employees will have a predisposition to share green conduct to the extent that employee attitudes on environmental preservation are strong and employee values are focused toward environmentally friendly activity. Previous research lends credence to the hypothesis that employee environmental beliefs and values substantially affect the connection between knowledge management practises and environmentally conscious behaviours.

Table 4.23: *Summary of Results*

Hypotheses	Status
H1: Knowledge Acquisition has a significant and positive impact on Green Innovation.	Supported
H2: Knowledge Dissemination has a significant and positive impact on Green Innovation.	Supported
H3: Knowledge Responsiveness has a significant and positive impact on green innovation.	Supported
H4: Green knowledge sharing Behavior has a significant and positive impact on Green Innovation.	Supported
H5: Green Knowledge sharing Behavior significantly mediates the relationship between Knowledge Management Process and Green Innovation.	Supported
H6: Employee Environmental Beliefs and Values significantly moderates the relationship between Knowledge Management Process and Green Knowledge sharing behavior.	Supported

Chap 5

5.1 Discussion:

The aim of the research was to determine that how KMP influences green innovation through the mediation and moderation of employee environmental values and attitudes as well as green information sharing behavior. Information was gathered from the manufacturing sectors in the four cities of Islamabad, Rawalpindi, Lahore, Faisalabad, of Pakistan.

Hypothesis1 to 4: It was suggested that knowledge management techniques have a promising and significant impact on green innovation. Positive findings from the KMP's analysis of green innovation demonstrate that the KMP has the ability to support environmental innovation efforts. This result is similar with (Allameh and Abbas 2010) investigation. Who have unequivocally shown how the three KM dimensions' aid firms in enhancing their capacity for product innovation and also process innovation. KMP offers a range of chances for employees to work together and share information. KACQ's main objective is to determine consumer demands and reactions to products and services. Including a green and the likelihood of communication and collaboration with external stakeholder's increases with a sustainable agenda, which also takes advantage of their most recent knowledge and technology (Shah & Soomro, 2021). El-Kassar and Singh (2019) claim that the most important variables influencing a company's adoption of green technologies in SMEs are knowledge management dimensions, specifically knowledge acquisition, knowledge dissemination, and knowledge responsiveness.

Previous studies have discovered an association between KACQ and productivity innovativeness (Cui et al., 2020). To enhance the company's operations, KDISS collects, disseminates, and transfers knowledge among staff members (Shahzad, Qu, Zafar, Rehman, & Islam, 2020). According to previous studies, it might be a common style of interpersonal interaction and collaboration inside an organization that supports staff members in finding creative solutions to challenges (Awan et al., 2020). Through the use of cutting-edge, creative, and digital manufacturing technology, organizations are able to produce sustainable products (Awan et al., 2020). According to recent academic studies, KAPP has been utilized to support businesses' sustainable business practices in order to gain green growth innovative results (Ding, & Rehman, 2020).

Working together, employees can have access to outside knowledge that calls for significant R&D efforts. They can get knowledge from their peers' operational experience to create environmentally friendly technologies.

Hypothesis 5: It has been suggested that knowledge management procedures have a favorable and considerable influence on green knowledge sharing behavior. Our investigation of KMP's impact on green knowledge sharing behavior revealed a favorable outcome, demonstrating that KMP significantly influences how employees behave when it comes to sharing their knowledge about other employees. This study is comparable to that of(Abbas and Sağsan 2019) , which found that knowledge sharing and collaboration among employees are made possible by KM. An organization's capacity for innovation is positively impacted by the efficient management of knowledge. For effective knowledge management process, it is necessary that there will be knowledge sharing among employees. (Zhoubc, Govindanab, & Xie, 2020)**.**

They are able to do extensive R&D with the assistance of the opportunities offered by KM. They can improve environmentally friendly technologies by using what their peers have learned from running their businesses. In other words, KM raises employees' understanding of environmental issues by encouraging pro-environmental behavior, which in turn increases their understanding environmental issues and their causes gives one direction to practice green behavior(Zhang, Xu et al. 2021).

Hypothesis 6: It has been suggested that green innovation and KMP can coexist through green knowledge sharing behavior. Our attempt to mediate green knowledge exchange between KMP and green innovation has been also accepted. Previous research have discussed the impact of knowledge sharing on innovation, and(White, Habib et al. 2019) found that knowledge sharing helps to improve employees' capacity for innovation and the financial success of organizations. Similar research was done by(Abbas and Sağsan 2019) who found that information sharing influenced green innovation favorably. All of the findings demonstrated to us that the example firm’s priorities information exchange both inside and outside of their organizations. Our results are related with the study of (Zhou, Govindan et al. 2020) which shows that information sharing acts as a catalyst for green innovation.

When we apply the green knowledge-sharing habit to Pakistani businesses there, we discover a similar phenomenon occurrence. According to our analysis, we discover that Pakistani industries pay insufficient attention to employees' green conduct. As evidenced by outdated carbon emission policies and a lack of communication on environmental sustainability, we discover a significant amount of

ignorance among top management and staff regarding green behavior. Natural catastrophes and climate change pose a serious threat to Pakistan. During the current flood in September 2022, more over 1600 people perished.

The floods have reportedly affected more than 33 million people in Pakistan, according to the government. Nearly 8 million people were compelled to flee their homes. The deteriorating state of the living species are under a tremendous deal of stress from ongoing environmental change. Pakistan has reportedly been among the top 10 most vulnerable nations on the climate risk index for the past 20 years, according to the charity German Watch. It is reported that 173 extreme weather events have occurred, resulting in 10,000 fatalities and $4 billion in damages.

Hypothesis 7: Our findings match with the idea that KMP and green knowledge sharing behavior should be moderated in terms of employee environmental beliefs and values. According to (Wong and Aspinwall 2004) statistics, SMEs benefit better from an integrated culture with a small number of interest groups. A small group of workers are frequently associated with a widely held value or idea that motivates their actions. Employees with high green values are found to have a stronger connection between green employee empowerment and employees' overall job satisfaction, according to a study by Hameed, Khan, and colleagues in 2020. Similar research was done by(Dumont, Shen et al. 2017) which found that personal environmental values can affect how psychological environmental climate affects extra role environmental behavior. We have learned from earlier research that environmental belief and values has always played an important role in the company’s capacity for innovation. According to (Raineri and Paillé 2016) managerial staff and the organization as a whole already support socially responsible causes, hence this has a moderating influence on employees' commitment to the environment.

There is a lot of systemic negligence when looking at Pakistan and the organizational structure that is used there. According to the notion of value-belief-norm theory (Stern, Dietz et al. 1999) explicit attitudes which are more situational and have a behavioral way which are more likely to become reinforced. Environmental issues are at the least concerning to top management and staff. Due to a lack of principles and beliefs we are unable to identify any purposeful activity with reference to the dissemination of green information. As a result, Pakistan has experienced significant climate change. Businesses in Pakistan are oblivious of the climate phenomenon that has regularly inflicted enormous amounts of damage. Pakistan is now the most susceptible country in terms of the environment due to

a lack of environmentally friendly attitudes and behaviors as well as a lack of ethical ideals and beliefs regarding environmental activities.

5.2 Implications:

5.2.1 Theoretical implications

Additionally, the recent discovery has numerous theoretical implications.First off, by adding the mediating and moderating roles of green information sharing behavior and employee environmental attitudes and values, this research adds to the scant body of literature examining the link with KMP and green innovation. The study examines the understudied multifaceted connection among KMP and green innovation based on RBV theory and NRBV theory and explains how KMP is a good resource in boosting green innovation in small and medium size manufacturing firms in Pakistan. This is done using the multivariate statistical technique, carried out by SEM.

Second, it provides insight into how KMP influences green knowledge-sharing behavior, adding to the hitherto unexplored notion of NRBV. This study also emphasizes how crucial it is to apply all three KM components—acquisition, dissemination, and responsiveness—to successfully influence staff members' behavior and attitudes about the sharing of green knowledge.

Third, we learn from the literature that information sharing has aided in green innovation as a major source of knowledge management. In order to learn new things, solve difficulties, and develop core competitiveness, knowledge is a key component (Liao, Chang et al. 2004). We learn from the study of (Liao, Chang et al. 2004) that information sharing involves behavioral factors in addition to technological ones. As a result, we also included the NRBV green knowledge sharing failure, which is crucial because it works as a catalyst for green innovation. When employees in an organization are passionate about environmental issues, sharing green knowledge is relevant, according to the study by (Chang and Hung 2021).

Fourth, by using NRBV, our research expands the body of theoretical information. According to the study of (Chou 2014), personal norms and beliefs play a significant role in employee green behavior. According to research done by (Ford, Williams et al. 2009) each person's environmental views are connected to the values that come from accepting environmental behavior. Employee attitudes, business ideals, and managerial support are a fantastic mix to ultimately effect employee

green behaviors, according to the study by (Daily, Bishop et al. 2009). In order to broaden the scope of NRBV, we therefore included employee environmental views and values as a moderator.

5.2.3Practical implications:

First, it draws attention to the connection between KMP and green innovation and emphasizes that KMP is a fantastic resource for businesses looking to go green. By embracing all the processes, businesses may become more innovative and gain a competitive edge. By implementing all the KMP processes, organizations become green innovators. Through green innovation, businesses can make known to new technologies, allowing their employees to bring up high-quality, environmentally friendly goods and services, which promotes both economic and environmental sustainability. Policymakers should initiate training and development initiatives for workforce development for advancing green innovation after taking into account the significance of KMP.

Second, the KMP is a great resource for influencing employee environmental behaviors and attitudes to share green knowledge at the workforce. This aids top management and professionals in developing policies regarding the sharing of green knowledge, but successful implementation depends on knowledge acquisition, assimilation, and application to the operations and organizational culture.

Thirdly, this study concentrated on the importance of KMP to makers of policy and government employees, suggesting that various levels of government must acknowledge the importance of green knowledge sharing behavior in fostering green innovation. This may enable managers to launch a unique programme aimed at educating and assisting managers in creating long-term organizations. KMP is therefore a significant source of green innovation in developing nations where businesses are less inventive than in rich nations.

The fourth and last practical implication of these findings is that employee environmental ideas and values are a significant contributor to the development of their green behavior. According to(Chou 2014) intrinsic motivation is crucial to an employee's environmental behavior. Statistical data did not, however, indicate that taking environmental developments into account had a major impact. We infer from the findings that employee environmental beliefs may be influenced by environmental education. According to the VBN model, personal environmental norms are acquired personal values that are connected to environmental actions, and they are the result of opposing consequences for valuable goods and perceived threat-reduction abilities (Stern 2000).

As a result, formal education and training sessions reinforce knowledge of the negative effects of non-green behavior and enable behavioral adjustments that are beneficial in establishing personal environmental norms and internalizing green behavior in all contexts or in relation to particular tasks. Employee training in green behavior and education about the effects of their behavior, such as v. high electricity bills as a result of high electricity use, are advantageous for the business and the environment.

5.2.3 Academic Implications

The phenomena of green innovation are one of the great concern for most of the organizations, which makes organizations and businesses to understand their environment, make different strategies accordingly, and be more environment friendly and gain a competitive edge. Green innovation provides managers a certain sort of evaluation/judgement about the product and process of the business. The creation of green innovations would increase environmental sustainability and give companies a competitive edge (ElKassar and Singh, 2019; Choi, 2020). As a result, most firms have taken steps to learn about and comprehend the various driving forces behind green innovation in order to comprehend its effects on the environment. Purpose behind assessing factors behind green innovation to gain competitive advantage and ear profit. Concerns of environment are growing day by day and many law and regulations are being imposed on environmental activities in Pakistan, as climate is deteriorating by all its might, therefore, it is important to know causes behind its changing phenomenon. By this organizations and businesses can understand environmental impacts and can diminish them in best way. In particular, innovation can improve outcomes, provide a strategic advantage, also add value for businesses. A powerful KM is a tool for improving output and ingenuity (Shujahat et al., 2019; Shahzad et al., 2020). To innovate, businesses must have knowledge of both internal and external factors. However, beside all this knowledge management processes contributes a lot in enhancing green innovation, as results of this study clearly elaborate the fact The basic goal of knowledge management (KM) is to increase results by employing information already acquired to innovate (Shahzad et al., 2020). This study makes a significant contribution by adding to the existing literature with a fresh scale that examines "green innovation" from the viewpoint of SMEs in a developing nation like Pakistan. Through an examination of the literature, it has become clear that the notions of knowledge management procedures and how they relate to green innovation are unclear. In order to close this gap, this study attempts to do so.

This study also makes a contribution to a novel, straightforward conceptual framework that has yet to be developed. As a result, similar research can be done in the future, even with more intricate build arrangements.

From this study we come up with the new introduction and a new perspective of studying green innovation, specifically with the mediating effect of green knowledge sharing behavior, by understanding the relationship of knowledge management processes in the enhancing of green innovation. Further, this current study explores how employee environmental beliefs and values moderates between KMP and GKSB.

5.3 Limitations:

Additionally, the current study has some restrictions. Only middle-level managers provided data, and senior and operational workers were neglected even though their perspectives may have provided insightful information. Therefore, to further broaden the study, researchers should add them in the future. Second, because the managers were asked to operationalize the research instrument in light of their organizational operations, the data were based on the managers' perspectives, which would have fostered prejudice. The effects of bias cannot entirely be eliminated, notwithstanding our analysis of reliability. The firms in Pakistan's cities of Rawalpindi, Islamabad, Faisalabad and Lahore provided the data for the current study. We advise extending the study's geographic scope to include additional cities and nations.

5.4 Conclusions:

Relationship between KMP, employee environmental beliefs and values, green knowledge sharing behavior and Green innovationas.it was founded on the tenets of both the RBV and NRBV theories. We employed two green innovation methods, namely product innovation and process innovation, together with three KM practices, namely knowledge responsiveness, acquisition and dissemination. The investigation was built around the idea that employee environmental values and beliefs and green knowledge sharing behavior might both moderate and mediate the effect of KM on green innovation. As a result, KM has a big impact on how people innovate in the green space and

how they share that knowledge. The idea that sharing green knowledge may act as a bridge between KM and green innovation was also proved. Additionally, the moderating vale of employee environmental beliefs and values variables between KM and green knowledge sharing behavior has also been validated.

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Questionnaire Survey

Research Instrument:

Dear, Sir/Mam

I am the student of MSBA in NUML Islamabad. Currently, I am pursuing my research on "How knowledge management processes enhance green innovation through green knowledge sharing behavior with moderating role of employee environmental beliefs and values in SMEs sector of Pakistan". In this content questionnaire has been developed to solicit your responses in view of your based experience. I assure you the information you provide will be kept confidential and will be used only for academic purpose. Respondents should be rated on a five-point Likert scale.

Instructions

- Please put round circle to appropriate answer according to the scale given below.
- Your patience will be required to complete the questionnaire which will be give us a fair picture of your response.

a) Which age group do you belong to?

1) Below 20 years 2)21 – 30 years 3)31 – 40 years 4)41 – 51 years 5)51 and above

b) What is your job experience?

1) Up to 5years 2) 6-10 years 3) 11-15 years 4) more than 15 years

c) What is your job position?

1) Top level manager 2) middle level manager 3) low level manager

d) Gender

1) Male 2) Female

	Variables	SDA	DA	N	A	SA
KA	**Knowledge acquisition** (Darroch and McNaughton 2003)					

	Organization values employ's attitudes and opinions	1	2	3	4	5
	Organization has well- developed financial reporting system	1	2	3	4	5
	Organization gets information from market surveys	1	2	3	4	5
	Organization works in partnership with international customers	1	2	3	4	5
	Organization is sensitive to information about changes in the marketplace	1	2	3	4	5
KD	**Knowledge dissemination** (Darroch and McNaughton 2003)					
	Environmental relation is freely disseminated in our organization	1	2	3	4	5
	Knowledge is disseminated on the job	1	2	3	4	5
	Use of specific techniques to disseminate Knowledge is common practice	1	2	3	4	5
	Organization uses technology to disseminate Knowledge	1	2	3	4	5
	Organization prefers written communication	1	2	3	4	5
KR	**Responsiveness to Knowledge** (Darroch and McNaughton 2003)					
	Feedback of customers is highly considered in our organization	1	2	3	4	5
	Our organization has well developed its product processing function	1	2	3	4	5

	Our organization continuously upgrade technological functions	1	2	3	4	5
	Our organization quickly responds to environmental-related concerns	1	2	3	4	5
	Organization process are flexible and opportunistic	1	2	3	4	5
KNSB	**Green knowledge sharing behavior** (Wong 2013)					
	I always share green Knowledge obtained from newspapers magazines journals television and other sources	1	2	3	4	5
	I enjoy sharing environmental-friendly Knowledge with my colleagues	1	2	3	4	5
	In my organization, people share expertise from work experience with each other Sharing my Knowledge with colleagues is pleasurable	1	2	3	4	5
	I believe that knowledge sharing can benefit all parties involved	1	2	3	4	5
	I adequately complete assigned duties in environment-friendly ways	1	2	3	4	5
	I fulfill the responsibilities specified in my job description in environment-friendly ways	1	2	3	4	5
	I perform tasks that are expected of me in environment-friendly ways	1	2	3	4	5
	I took a chance to get actively involved in environmental protection at work	1	2	3	4	5
	I took the initiative to act in environment-friendly ways at work					
	I did more for the environment at work than I was expected to					

WEB	**Employee environmental beliefs and values** (Stern et al. (1999).					
	The government should take stronger action to clean up toxic substances in the environment					
	feel a personal obligation to do whatever I can to prevent climate change	1	2	3	4	5
	I feel a sense of personal obligation to take action to stop the disposal of toxic substances in the air, water, and soil.	1	2	3	4	5
	Business and industry should reduce their emissions to help prevent climate change	1	2	3	4	5
	The government should exert pressure internationally to preserve the tropical forests.	1	2	3	4	5
	The government should take strong action to reduce emissions and prevent global climate change	1	2	3	4	5
	I strongly value the environmental efforts of my company	1	2	3	4	5
GI	**Green innovation** (Chen, Lai, and Wen (2006)					
GPI	**Green product innovation**					
	Our firm chooses the materials of the product that produce the least amount of Pollution for conducting the product development or design.	1	2	3	4	5
	Our firm chooses the materials of the product that consume the least amount of energy and resources for conducting the product development or design	1	2	3	4	5
	Our firm uses the fewest amount of materials to comprise the product	1	2	3	4	5

	for conducting the product development or design					
	Our firm would circumspectly deliberate whether the product is easy to recycle, reuse, and decompose for conducting the product development or design.	1	2	3	4	5
GPI	**Green process innovation**					
	The manufacturing process of our firm effectively reduces the emission of hazardous substances or waste.	1	2	3	4	5
	The manufacturing process of our firm reduces the consumption of Water, electricity, coal, or oil.	1	2	3	4	5
	The manufacturing process of our firm recycles waste and emission that allow them to be treated and reused	1	2	3	4	5
	The manufacturing process of our firm reduces the use of raw materials.	1	2	3	4	5