

Impact of Knowledge Management on Firms' Innovation Performance

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Abstract

Purpose: To provide empirical evidence to explore the impact of knowledge management (KM) on the innovation performance of listed manufacturing firms in Ghana. Manufacturing firms are threatened by the absence of internal competitive expertise and external challenges related to varied institutional settings. **Design/Methodology/Approach:** Data were collected using 110 questionnaire surveys sent out to senior managers from a cross-section of manufacturing industries. A total of 1140 usable questionnaires survey were returned representing a 100 percent response rate. The hypotheses and assumptions in the form of mail survey, secondary data, and direct surveillance were established using structural equation modelling. **Findings:** How a firm acquires knowledge, disseminates it and finally its responsiveness toward knowledge management influence on firm innovation performance was tested using developed hypotheses based on theoretical and research framework. The quantitative survey approach was chosen to evaluate the significance of each hypothesis. Empirical evidence asserts that a knowledge management capability firm uses resources efficiently to be innovative and significantly positive in performance. All three KM elements: knowledge acquisition, knowledge dissemination, and responsiveness to knowledge have a significant positive relationship to firm innovation performance. **Research Limitations/Implications:** The sample used slightly under-represented smaller firms and was not entirely characteristic of manufacturing industry segments. Data were also collected in Ghana so the study needs a broader replication in different contexts and or countries with longitudinal studies. **Practical Implications:** This paper presents manufacturing firms in a developing economy, Ghana intending to substantiate knowledge management and innovation performance implementation in an emerging economy and latecomer development to unravel its impact on listed manufacturing firms in Ghana. Knowledge management is incorporated in numerous firms and necessitates a

business instance to defend program outlay to contrivance knowledge management behaviours and practices. This paper provides sustenance for the importance of knowledge management to augment both technological (ICT-based) and human resource (organizational) innovation execution that will bring benefit to manufacturing firms in Ghana's innovation performance. **Originality/Value:** This paper is amongst the first to find empirical results to back the role of knowledge management within manufacturing firms. Additionally, the aligning of knowledge management as a coordinative instrument is also of significant input to our discernment in this area.

Keywords

Knowledge Management, Firm Innovation Performance, Manufacturing Firms, Ghana Stock Exchange

1. Introduction

The evolvment of a knowledge-based economy and research on innovation puts knowledge management and innovation at the center of interest. Many prior literatures have examined that a knowledge-based economy leads to knowledge-generating, knowledge-integrating, and knowledge-protecting firms' concepts in a Modern Corporation (Nonaka & Takeuchi, 1995, Cantner et al., 2009; Amalia & Nugroho, 2011). This has drawn scholarly (Liu & Giroud, 2016; Cui et al., 2017) attention as being informational, and innovative. Knowledge management and innovation play a significant role in the modern economy, and firms face complex informational, global, and innovative challenges in managing today's knowledge-based economy (Castells, 2000; Amalia & Nugroho, 2011). In a knowledge-based economy, firms must conceive themselves as learning agents that are capable of creating and managing purposeful knowledge and innovativeness (Amalia & Nugroho, 2011). Knowledge management (KM, hereafter) and innovation are business practices (Radding, 1998), and contextually significantly critical (Amalia & Nugroho, 2011) have roots intensely entrenched which has been an argued issue since ancient times (Turban et al. 2007). Rapid globalization coupled with the knowledge-based view has led to a surge in firm knowledge management interest. This brought added value to firm knowledge as a vital source of firm capital investment (Conner & Prahalad 1996; Grant 1996; Spender 1996).

To improve the process and facilitate decision-making, better services, and innovative products of firms, business management tools currently exist that contribute to improved firm performance and increased profitability drive (Jafari & Ramalingam, 2015). Achieving productivity through the efficacious implementation of such tools necessitates deeper indulgence in the strengths and weaknesses of respective tools as well as evolving the knack to innovatively assimilate the precise tools, in the correct approach and eventually at the correct

time (Hackett, 2000). Knowledge management has its roots deeply ingrained in the study of knowledge which has been a deeply contested issue since ancient times (Turban et al., 2007). As such, innovation has also been deliberated as a significant dynamic that adds to the progress and existence of manhood. On the outlook of firms, innovation has been recognized as an essential facet for firms that anticipate staying viable in the industry, or pursuing long-term economic benefit (Hamel, 1998; Roberts, 1998). Given the significant role of innovation, studies from a diversity of disciplines have been considered to respond to the vital demand “How do we improve firm innovation performance in a company?” (Capon et al., 1992; Freeman & Soete 1997; Cooper & Kleinschmidt, 2007). With the advent of knowledge management and scholarly as crucial to novel disciplines, researchers (Nonaka & Takeuchi, 1995; Laosirihongthong et al., 2014) have added to the antecedents of innovation.

To ensure uniformity, we embrace Andersson et al. (2016) description of knowledge and explain knowledge as the multi-dimensional enterprise learning method of the firm. KM is a method centered on a set of processes that helps the stream of knowledge outcomes collaboration with other firms (Gibson & Birkinshaw, 2004). Innovation on the other hand is an assemblage of long-term collaboration and mutual trust between firms and other value chain actors such as merchants, businesses, peer rivals, academia, research organizations, mediators, and governments in the collaboration process (Tidd et al., 2001). Knowledge and innovation recombine value to “generate innovation, managed, applied, developed and hence exploited” as an asset (Cantner et al., 2009). Relatedly, the paper sees innovation as the product of knowledge management accomplishments, defined as innovative products, practices, and patents, as well as the general innovativeness of firms (Zhao et al., 2022). A methodology that tries to measure KM accomplished through manufacturing firms’ innovations is still unrevealed and missing; hence, the literature in this paper first fills the gap. This paper will consider applicable studies that examine the mean processes of KM and firm innovation, including knowledge acquisition, knowledge dissemination, and responsiveness to knowledge.

Empirical and theoretical findings (Darroch & McNaughton, 2002; Darroch, 2005; Cantner et al., 2009) do acknowledge the importance of knowledge management to firms but fail to consider and acknowledge how this impacts firms’ innovation performance. Consistent with other researchers (Cantner et al., 2009), this paper will apply the “Mannheim Innovation Panel” matching method, typically used for impact valuation in labor market economics, and adopts the antecedent-process-outcome (APO) (Zhao et al., 2022) guiding framework. The determinants of manufacturing firms regulatory decisions focusing on knowledge-seeking and innovation intentions and geographical location choices form the “antecedents” category, the mechanisms and processes of knowledge management of manufacturing firms, particularly focusing on reverse knowledge transfer and international migration as a knowledge transfer channel form “process” category, while “outcomes” category includes studies concerning

manufacturing firms innovation as the outcomes of their knowledge management (Zhao et al., 2022). This allows us to properly evaluate the key findings and knowledge frontier of manufacturing firms. Furthermore, we can attribute the dissimilarity in success to KM, since the matching procedure enables us to match these characteristic firms' results.

Manufacturing firms are transforming in order to face the manifold forces of constrained products and processes, limited product life cycles, global rivalry, and e-technology challenges (Wang & Ahmed, 2004). Hence, to survive and withstand this era of uncertainty, manufacturing firms need to develop and invest in corporate KM and innovate to obtain heterogeneous knowledge that will stimulate innovation performance success. We argue that knowledge management is related to firm innovation performance success in that, innovation takes place when a manufacturing firm calculatedly alters the way its product or service is manufactured and delivered (Hislop, 2005). Hence, without sound capacity for innovation, it is difficult for manufacturing firms to establish successful knowledge management systems (Liao & Wu, 2009). As an incessant sequence of knowledge acquisition, knowledge dissemination, and responsiveness to knowledge, the process of revolving tacit knowledge into explicit knowledge designates "best practices" within a firm (Hackett, 2000). Most knowledge management exertions have, however, fixated mostly on improving the firm well by the distribution of internal "best practices" and concentrated level ratification of the "best way" could thwart the advancement of realizing ingenuity and innovative discernment within firms (Jafari & Ramalingam, 2015). Therefore, the study attempts to answer the question of knowledge management best practices and the best way that will lead to better firm innovation performance.

Consequently, one of the main recent streams of research in international business is concerned with knowledge management within manufacturing firms, especially innovative knowledge management between parent firms, subsidiaries, and not only enterprises within the same industry but of similar jurisdictions and aims. Given the evidence of the value relevance of knowledge management for manufacturing firms, and for research on them, knowledge management and the firm innovative implementation success have become hot topics to achieve their manufacturing transformational agenda. Hence, it is essential to analyze whether knowledge management impacts firm innovation performance.

Fennell & Alexander (1987) explored and discussed the effects of organizational limitations in comparatively steady settings. However, such stability strains in an ever-changing manufacturing business setting are increasingly inappropriate. Contextually, knowledge management can influence and improve the quality of manufacturing firms' ambidextrous innovation capabilities, in which internationalization plays a moderating role (Duan et al., 2021). Hence, there is a close connection between knowledge management and firm innovation performance success. This is because, firms are nodes with intricate interdependent networks with joint actions where stakeholders exchange knowledge,

information, and value leading to close relationships potentially between knowledge management and corporate innovation (Lyu et al., 2022). Nonetheless, there are facts that only a few scholars have attempted to explore this topic in-depth, especially in Ghana.

To enhance innovation performance success, the absorptive capacity to optimize inter-firm collaboration, and its heterogeneous knowledge utilization is needed since the acquisition of only heterogeneous knowledge is insufficient for corporate innovation (Ferraris et al., 2020; Lyu et al., 2022). Specifically, firms can effectively obtain heterogeneous knowledge through inter-firm knowledge management as this inspires knowledge conception within firms, enhancing their ability to absorb and export knowledge (Moeen & Agarwal, 2017). Therefore, the intermediary restraint amid knowledge management and absorptive capacity hypothetically plays a sequential refereeing role between manufacturing firms and their innovation performance success.

For most manufacturing firms, managing knowledge is important for self-improvement, networking, and development, both at home and in host markets. Knowledge management is a spherical process; manufacturing firms gather knowledge from firm partners and then network with these or other business partners. In this process, knowledge presentation (“implementation”) plays a crucial role; it defines the success of knowledge management and firm innovation performance success, without which, manufacturing firms cannot develop and perhaps cannot endure in overseas markets. Thus, the application of knowledge management and firm innovation performance success should be the focus of consideration by manufacturing firms. Numerous researchers have confirmed that many firms have, in recent times, developed so swiftly that they are now beginning to utilize, manage knowledge, and innovate to attain performance success. However, their multifaceted cultural background, their diverse political background, and their firms’ relatively emergent management innovative skills and e-technologies bring enormous challenges to their performance success. These facets also epitomize hindrances for overseas manufacturing firms who are trying to do business with local firms.

Knowledge management and firm innovation are two key vital approaches in this ever-changing new era. The need for firms to innovate comes from intense competition, customer preferences, and new efficient market productive areas. According to Andreevna (2022), it also shows whether the firms’ new developments are fruitful to their performance and on the market or not. Based on this argument this paper presents the study of ten (10) listed manufacturing firms in Ghana. The Ghanaian backgrounds helps authenticate strategies devised, formulated, and implemented in an example of an emerging economy and latecomer development, which might influence KM activities of manufacturing firms. Framed within these two points; how diverse knowledge is managed in the organization (Nonaka, 1994) since KM processes is a trajectory from devising policies to implementation (Heisig, 2001), taking into account the role of technology

(ICT), and human resource practices (learning and reward systems) (Radding, 1998). Secondly, building a routine of continuous use of KM rather than KM results or its mere implementation (Rogers, 2003).

Knowledge management is a significant influence that ensures firm success (Gan et al., 2006). However, most of these prior researchers focus their investigation analysis on knowledge management in developed and emerging economy multinationals, and there are few empirical studies available exploring the impact of knowledge management on firm innovation performance especially on manufacturing firms listed in the Ghana Stock Exchange (GSE). This study therefore aims to evaluate the hypotheses drawn concerning knowledge management on firms' innovation performance and to explore whether there is a significant impact of knowledge management on the firm' innovation performance of Ghana's listed manufacturing firms.

2. Theoretical Issues in Knowledge Management and Firm Innovation

The question of how firms manage their KM and innovation to systematically exploit and utilize available resources to improve revenue target, profit, and growth dimensions guides our study. We start our analysis with related research to descriptions and forms of knowledge management, and innovation, before reviewing papers dealing with innovation as a precondition of knowledge management. There is a close link between KM and innovation (Cantner et al., 2009) in manufacturing firms. Innovation is the outcome of a recombination of theoretical and physical resources that were hitherto in existence and the amalgamation of firms' existing knowledge assets to generate new knowledge (Cantner et al., 2009). Therefore, an innovative firm's principal mission is to reconfigure prevailing knowledge assets and resources and to reconnoiter novel knowledge (Nonaka & Takeuchi, 1995; Grant, 1996). The innovativeness and competitive advantage of firms have been linked to the contribution of knowledge exploration and exploitation (Levinthal & March 1993; Swan et al., 1999; Hall & Andriani., 2002). Numerous researchers focused on the role of KM in the innovation of firms.

For the realization of greater performance and attaining viable economic gain, the significant role played by intangible assets has been emphasized by preceding literature (Grant, 1996). Knowledge is perhaps the utmost imperative intangible asset reserve any firm controls (Liebeskind, 1999) and is an essential effort toward the innovation process (Rosenkopf & Almeida, 2003).

Conversely, innovation is characterized by the description of something novel and hence augments the prevailing knowledge pool. Numerous authors use the theory of knowledge creation and knowledge production by denoting technological knowledge ensuing to technical innovation as the productivity of the KM process (Nonaka & Takeuchi, 1995). Innovative ideas of a firm must be captured, taken note of, and even recorded for future reference in other to material-

ize innovation within a firm. While there are numerous extensive scholars and researchers on innovation, empirical evidence-based literature that depicts knowledge acquisition to positively affect innovation in Ghana's listed manufacturing firms appears rare. Nevertheless, diverse opinions of knowledge dissemination or receptiveness to both knowledge and innovation revealed that the level of influence backed by knowledge dissemination and receptiveness to knowledge seems to be further substantially related to knowledge acquisition (Jafari & Ramalingam, 2015).

Innovative ideas of market knowledge are positively related to knowledge acquisition (Li & Calantone, 1998; Tang, 1998). As such, the stock of knowledge within a firm improves when knowledge learned is transferred and implemented thereby creating opportunities for new knowledge, cooperation, and innovation (Miller et al., 2007; Sankowska, 2013). An effective knowledge management firm is a likely learning firm that hitherto contributes to the success of innovation at any type of firm (Sinkula et al., 1997). Various scholars have acknowledged the significance of the connections between knowledge management and innovation (Nonaka & Takeuchi, 1995; Davenport & Prusak, 2000; Gopalakrishnan & Bierly, 2001; Chourides et al., 2003; Hall & Andriani, 2002). Knowledge management is adept at leading an idea to an ensuing innovation level (Forrester 2000; Gopalakrishnan & Bierly, 2001; Hung et al., 2010). Knowledge management is evolving as a significant focus; repeatedly quoted as a forerunner of innovation dated back to prior centuries of the 1990s (Nonaka & Takeuchi, 1995; Lin & Lee, 2005). This is because, humanist attitudes towards knowledge management and firm innovation performance are significantly and positively correlated (Gloet & Terziovski, 2004) and knowledge application is the enabler of positive innovation output (Gilbert & Cordey-Hayes, 1996).

It is contended that each knowledge management component is capable of leading an idea to the innovation level (Forrester, 2000; Gopalakrishnan & Bierly, 2001; Hung et al., 2010). For innovation to take place firm knowledge both internal and external is required by managers to enhance innovation. Secondly, knowledge must be disseminated freely within a firm and lastly, innovative firms ought to be responsive (Darroch, 2005). Based on this, it is apparent that active knowledge management is a valuable movement for managers to accentuate innovation exertions to boost firm innovation performance. To inspire the execution of innovation, managers need to improve knowledge management activities and practices (Chourides et al., 2003). Hence, the knowledge management concept is presented as positively affecting firms' innovative performance.

2.1. Knowledge Management

Literature exists that examines the relevance of knowledge management with several definitions and conceptions of KM (Nonaka & Takeuchi, 1995; Coombs et al., 1998; Davenport & Prusak, 1998; Alavi & Leidner, 2001; Cantner et al., 2009). Coombs et al. (1998) reveal that KM concentrates on the formation, dis-

semination, storage, and presentation of either prevailing or novel knowledge. The purpose of KM is to exploit the enterprise's knowledge-related efficiency and earnings from its knowledge assets and to renew them constantly making knowledge evident and evolving a knowledge-intensive culture (Davenport & Prusak, 1998). Studies recognize acquisition, identification, development, diffusion, usage, and repository of knowledge as core KM practices (Alavi & Leidner, 2001; Cantner et al., 2009) and that knowledge assessment and utilization are the core intents of KM (Swan et al., 1999).

There is no single way in which a firm manages knowledge; it comprises all kinds of concerns for all kinds of organizations. "The real question is how can a company systematically exploit all dimensions of knowledge and fully utilize them to improve revenues, profit, and growth...Because of the very nature of knowledge, it is difficult for managers to predict what measures can improve performance, and how to encourage and guide knowledge flows within an organization" (Kluge et al., 2001: p. 191). Highlights are prime issues in managing knowledge in organizations and the term "knowledge" in itself is not easy to define (Nonaka, 1994; Hislop, 2005; Mertins et al., 2001). Part of the difficulty possibly lies in the difference concerning data, information, and knowledge (Radding, 1998; Hislop, 2005). At the applied level, data involves raw statistics, words, descriptions, and evidence resulting from surveillance or extent, whereas information denotes administered data in a significant approach and design (Alavi & Leidner, 2001; Hislop, 2005), and knowledge is assumed as genuine evidence that has been integrated into an intelligible structure of consideration (Vance, 1997; Alavi & Leidner, 2001).

To differentiate between information, knowledge, and understanding, "Knowledge and information are critical elements in all modes of development since the process of production is always based on some level of knowledge and in the processing of information. However, what is specific to the informational mode of development is the action of knowledge upon knowledge itself as the main source of productivity" (Castells, 2000: p. 17). Understanding according to Castells is only attained once knowledge has been stored and acted upon. It is significant then to manage knowledge for it is perilous both for managerial and personnel alike. Knowledge, and therefore understanding, is independent and cannot be preserved as static (Hayek, 1945).

The upsurges of economic transformation depend on the crescendos of distinctive knowledge held by economic subjects rather than on collective knowledge (Amalia & Nugroho, 2011). Knowledge is significant in acquiring a coherent supportive structure to systematize challenges, both non-logical and non-linguistic "behavioral knowledge" content, in firm management (Barnard, 1938). Conflicting to Barnard's work, firms are "information-processing machines" of logical characteristics that limit human cognitive capacity (Simon, 1973). This takes into conclusion that, because of the limited cognitive capacity, firms should moderate their information capacity. Both Barnard's synthesis and

Simon's "information-processing paradigm", thus, "behavioral knowledge" (tacit and logical or explicit knowledge) is critical to enterprises (Nonaka & Takeuchi, 1995).

Scholars (Nonaka & Takeuchi, 1995; Polanyi, 1966; Chua, 2002) have proposed means to classify and characterize knowledge. Construing Polanyi (1966)'s work, Nonaka (1994) proposed the explicit and tacit dimensions of knowledge. Explicit herein referred to as "codified" knowledge denotes knowledge that is expressed in words and numbers and communicated in a universal language (Nonaka, 1994: p. 16). While this type of knowledge is impartial, and distinct from individual and shared value structures, in contrast, tacit knowledge is the knowledge that people have which has a peculiar quality and is difficult to codify (Hislop, 2005). Tacit knowledge is "intensely rooted in action, commitment, and involvement in a specific context" (Nonaka, 1994: p. 16), forms the background to interpret explicit knowledge, and as implicit, context-specific knowledge (Hayek, 1945).

Consequently, "four approaches of the conversion of tacit and explicit knowledge conversion proposed by scholars: socialization (from tacit to tacit), externalization (from tacit to explicit), combination (from explicit to tacit), and internalization (from explicit to tacit)" (Nonaka, 1994; Nonaka & Takeuchi, 1995: p. 71; Amalia & Nugroho, 2011, p 73). They further argue that knowledge creation through the conversion modes is a constant and dynamic collaboration between tacit and explicit knowledge, demonstrated as knowledge (Nonaka, 1994; Nonaka & Takeuchi, 1995: p. 71). The transformation of knowledge and its benefit to firms is dealt with within the treatise of KM, at the top of the management agenda in the mid-1990s (Quintas, 2002). Mostly, this is a key feature of KM because changes in markets and businesses, internationalization, and innovative methods of rivalry have amplified speedily leading to the progress of firms' knowledge (Amalia & Nugroho, 2011).

Central to KM in firms exist strategy and process. Foremost, the development of KM strategies is significant to the utilization of the firm's knowledge resources and capabilities (Hansen et al., 1999). Strategically, there are two KM strategy categories reflecting motivation (Choi & Lee, 2002): system strategy which stresses the competency to create, store, distribute, and apply the enterprise's explicit knowledge, and human strategy which emphasizes knowledge allocation through interactive communication using negotiation through social networks such as coordination (Swan et al., 2000).

Secondly, the process of KM (Alavi & Leidner, 2001; Heisig, 2001; Becerra-Fernandez et al., 2004) is central to the KM of firms. Numerous scholars suggest four diverse essential KM processes: knowledge creation; storage; distribution; and application (Heisig, 2001). Since firms seek innovation concentrating on the necessity to build their knowledge bases cumulatively (Quintas, 2002), this paper adopts Heisig (2001, 2009) as it serves our instance.

Knowledge creation is the foremost KM process and refers to how enterprises

develop novel content or supplant the current content (Alavi & Leidner, 2001). According to Alavi & Leidner (2001), the second KM process is an attempt or effort to avert losing track of the first KM process of the attained knowledge, storage, and retrieval of firms' memory or knowledge (Walsh & Ungson, 1991). Aside is knowledge distribution that offers factual knowledge to the right individual at the exact period (Mertins et al., 2001). Lastly, knowledge application is the most vital process of KM as it distributes enterprises' performances when it is being theorized for decision-making and execution tasks (Alavi & Leidner, 2001; Mertins et al., 2001).

While KM strategy and process are explicable dominant with an uneasy implementation process, hence, knowledge transfer matters supreme in KM (Amalia & Nugroho, 2011). KM in itself is "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (Rogers, 2003: p. 36), thus, seen as an innovation (Amalia & Nugroho, 2011). Enterprises innovate to how they can manage their knowledge through technological (ICT-based systems) and organizational (herein, firms) innovations. Technological (ICT-based systems) "support the processes of knowledge creation, storage, distribution" (herein, KM systems) (Amalia & Nugroho, 2011: p. 75). For instance, electronic mail (e-mail) and document management systems (Radding, 1998; Becerra-Fernandez et al., 2004), and alliance tools like Wiki technology that assist its handlers to simply edit pages online in a browser (Ebersbach et al., 2006) thereby fostering KM application in firms (Alavi & Leidner, 2001). A dependable ICT infrastructure is vital to KMS distribution success.

Tidd et al. (2001) reveal that KM application is alienated into IT-based KM, human-resource-related KM, and process-based approaches. Swan et al. (1999) stated that while the demand-driven approach is more apprehensive with expediting interactive knowledge allocation and creation, the IT-based or supply-driven KM stresses the necessity for easy access to prevailing knowledge stored in a database. Our study focuses on the demand-driven approach type of KM implementation.

KM plays a vibrant role in knowledge dispensation expertise and turn, in swiftness and activity of innovation. While technology management (TM) plays a positive role in the prospect and success of firm innovations, the moderating effects of marketing and manufacturing know-how, knowledge attainment, and knowledge diffusion lead to the integration and innovation of knowledge to improve innovative product performance (Yang, 2005). KM tool's "uses of innovative information", "efficient information gathering" and "shared interpretation" to improve the performance and innovativeness of new products (Brockman & Morgan, 2003; Yang, 2005).

Firms steadily monitor their host environs to look for windows of prospects and constantly capitalize on learning mechanisms to overcome flaws in knowledge upgrading (Bernat & Karabag, 2019). In contrast, strong internationalizing firms explore knowledge thereby pushing latecomers with an essential lack of

competitive internal R & D know-how to pursue capability upgrading and catch-up prospects externally, over rapid internationalization through institutionally diverse environments (Zhao et al., 2022). Notwithstanding varying competitive backgrounds, comprehensive analysis of the state of firm knowledge is lacking. While the paper found a few recent analyses (Andersson et al., 2016) summarizing studies on KM, they mostly concentrate on firms in advanced or domestic firms rather than their subsidiary firms' knowledge management. Thus, by far, there has been no analysis concentrated on firms' knowledge management of listed manufacturing firms in Ghana. This omission has occasioned not only a lack of a systematic and consistent synopsis of the advancement of KM in the manufacturing firms field but also limited our appreciation of firms' diverse outlines and trails to KM.

Since our focus is on demand-driven or collaborative KM methods, hypothetical concerns provide ambiguous opinions. For instance, while Alavi & Leidner (2001) argue that exceptionally close links in a knowledge-sharing entity may limit knowledge conception due to redundant information; Nonaka & Toyama (2002) reveal that a shared knowledge base increases knowledge creation within an entity. In their exertion, Darroch (2005) condemns the lack of literature explaining what effective KM means and how to measure its degree of performance. For instance, numerous papers in which KM is a forerunner fail clearly to scrutinize the association between the two constructs (Darroch & McNaughton, 2002). Our paper is an endeavor to address this gap by providing an all-inclusive and systematic synopsis of the contemporary state of knowledge in firms' knowledge management by embracing the antecedent-process-outcome (APO) guiding framework. Objectively, the paper is not only limited to first analyzing and synthesizing the existent literature on knowledge management and firm innovation, bridging diverse streams of literature through numerous fields of study, but also measuring the impact of knowledge management on firm innovation performance of Ghana's listed manufacturing firms. Lastly, our study ascertains knowledge frontier concerns that can offer fruitful possibilities for future research by testing with activity approaches: 1) innovation strategies development; 2) KM ideas and concepts; 3) innovation-related problems support team; 4) departmental meetings on KM; 5) seminars and workshops involving firms; 6) periodic exchange of personnel. Firms are expected to perform at least some type of KM activity and the results matched in identifying the impact of KM on firms' innovation performance.

2.2. Firms Innovation

Knowledge management is essential to firms' innovation and overall success effectiveness. The degree of international divergence across advanced and developing markets distress firms' innovation (Jiang et al., 2016; Amendolagine et al., 2018; Wu & Park, 2019). For instance, Foreign Direct Investment (FDI) of Chinese and Indian firms reveals significant positive firm innovation performance

of patent citations and new products in advanced markets. In contrast, [Amen-dolagine et al. \(2018\)](#) observe that the medium to high-technology sectors in Europe and the US are unable to profit from innovative target firms. Innovation in advanced markets brings more products and patents while emerging markets innovation encourages more process-based ([Wu & Park, 2019](#)). Thus, FDI brings positive effects on innovation only for firms with a resilient knowledge base and high status, irrespective of how innovative the target firm is ([Zhao et al., 2022](#)).

Implementation of a firm innovation according to diffusion theory begins when innovation is put to use in a firm decision-making unit ([Rogers, 2003: p. 179](#)) leading to a firm's initiation stage and implementation stage ([Damanpour, 1991](#)). This is "characterized by problem definition, prioritization of needs, and active search for innovation to contribute to problem-solving" ([Amalia & Nugroho, 2011: p. 75](#)). A firm's initiation phase starts with "agenda-setting" where the firm puts innovation into a state that modifies and exploits it within its explicit situation, hence, the initial stage is then followed by "matching" ([Rogers, 2003: pp. 423-424](#)). When the initiation phase elapses, the decision to embrace innovation necessitates the firm to prepare imperatively for the succeeding stage: implementation ([Rogers, 2003](#)). The implementation phase involves three stages. It begins once the use of innovation extensively spreads across firms, and is known as the "clarifying" stage ([Rogers, 2003: pp. 427-428](#)). The next stage called "redefining/restructuring" ([Rogers, 2003: pp. 424-427](#)) when the firm acquaints itself with innovation in two means: reconfiguring the innovation to match the firm's desires and restructuring the firm to implement the innovation. This indicates a great deal of adaptation through experimental and training at the firm level, which denotes back to "clarifying". The last stage, "routinizing", occurs once the innovation is integrated into the firms' systematic undertakings to advance the attainment of the firm's goals ([Rogers, 2003: pp. 428-430](#)).

Firm innovation evolves when a firm embraces innovations, be it the implementation of innovative knowledge, techniques, practices, or external relations ([Damanpour, 1991, 1992; Amalia & Nugroho, 2011](#)). Firm innovations also comprise the implementation of new techniques for allocating duties and decision-making amongst the workforce for the separation of work within and between firm undertakings and firm units ([Amalia & Nugroho, 2011](#)). It also covers innovative models for the constituting of activities, such as the implementation of firm concepts that incorporate the initiatives to manage the firms' knowledge into its employees' day-to-day activities ([Davenport & Prusak, 2000](#)). In this circumstance, these firms' innovations replicate intensely how innovation can and truly do evident in the course of the strategy design when the firm elects to embrace KM ([Amalia & Nugroho, 2011](#)).

Moreover, it is not challenging to envisage that social learning is significant in firm innovation. The impression is "that one individual learns from another using observational modelling" ([Amalia & Nugroho, 2011: p. 76](#)). This is often the

situation in knowledge management firms over a mentoring system. In numerous cases, social learning eases the method after a firm embraces and acquaints itself with innovation and desires to regulate its firm structures (Amalia & Nugroho, 2011: p. 76). Firms practice and innovate in and around novel technology to attain their missions as well as goals, advance their firm management, and improve innovative performance policies. This is because “managing knowledge is beyond applying and implementing certain technological innovations” (Amalia & Nugroho, 2011: p. 76). Instead, firm innovation outlooks aid in replicating and communicating how innovations unveil in the course of the devising of KM strategy (as firm innovation) and of the embracing of a KM structure (as technological innovation) (Amalia & Nugroho, 2011).

When institutional growth in innovative host markets improves, on average, firm innovation performance with the number of patents increases in Brazil, Russia, India, China, and South Africa (BRICS nations) (Juasrikul et al., 2018). These studies however have noted four diverse situations. Firstly, firms diversify into a larger quantity of nations. Secondly, a restrained level of firm complexity creates the most patents compared with high difficulty. As such, the top management team’s host-nation exposure. Lastly, heterogeneity has a positive moderating effect and the level of cultural distance between home and host countries can have a negative effect (Juasrikul et al., 2018; Zhao et al., 2022, p. 18).

In contrast, the influence of internationalization rapidity on firm innovation enticed less interest (Bonaglia et al., 2007; Kotabe & Kothari, 2016). The general assumption is that firms are inclined to embrace an augmented internationalization tactic, which diverges from the traditional opinion of the steady internationalization model (Zhao et al., 2022). Such rapid internationalization influence on firms’ innovation is inadequate. For example, a study of the white goods industry from China, Mexico, and Turkey reveals that augmented internationalization facilitates rapid innovation and catch-up of their technical innovation competence as compared to internationalization arrays of innovation from North America, Europe, and Japan which did not delay internationalization until they were enormous at home but relatively developed hefty as they internationalized (Bonaglia et al., 2007; Zhao et al., 2022). This unique Foreign Direct Investment (FDI) method comprises extensive acquisitions to advance innovative technological assets to multiply and diversify their competency base (Bonaglia et al., 2007).

The vital role of time in the internationalization process of firm innovation and development has been acknowledged (Jiang et al., 2016; Kotabe & Kothari, 2016; Ray et al., 2023). For instance, in the case of Chinese and Indian firms, it was revealed that new product expansion, improved design capability, and enhanced positive innovation performance (Ray et al., 2023). This is because firms must be able to obtain and absorb their competitive advantage and enhance innovative performance over time in order to overcome the threat of emergingness (Kotabe & Kothari, 2016). Whilst relationships and KM through the primary

phases of firm internationalization add to the growth of innovative competence, it is firms' core sovereign KM ability that adds to their technical advancement and market performance (Jiang et al., 2016; Ray et al., 2023). We focus our study on mechanisms that inhibit the performance of firm innovation in KM firms. Among the mechanisms such as managing global relations, subsidiary environments, supremacy dealings, global knowledge, entrepreneurship alignment and ownership variances, and technological management, significantly, managerial factors predominantly dominate researchers' views on firm innovation (Zhao et al., 2022).

We identify two research areas where host country knowledge suggests more mixed results than home country connexions and internal KM. For instance, studies in Pakistani, Indian, and Chinese firms reveal that global connections are significant sources of firm innovation (He et al., 2018). This is because given their home institutional flaws, firms strive to alleviate their home environments and seek superior firm innovation through effectually managing their international networks over the global value chain (Zhao et al., 2022), hence, enhancing positive influence on firms' innovation. As such, in their study of a takeover of Chinese firms in the UK, He et al. (2018) reveal that the prime location of the acquirer in the global value chain, matching assets, and the power connection between the acquirer and acquired are significant determinants of effective firm innovation (He et al., 2018).

Similarly, in pursuing enhanced innovation performance, firms use diverse innovative and KM processes. For instance, whilst Danish headquarters function as the primary source of knowledge for its foreign subsidiaries, Indian headquarters access knowledge from R & D subsidiaries in advanced markets over reverse knowledge transfer leading to enhanced innovation outcomes (Awate et al., 2012). This according to Awate et al. (2012) is because the Indian firms have caught up in terms of innovative expertise for enhanced production, but still lag in radical innovation. In contrast to the research on host international country knowledge connexions and internal KM, there are few studies of knowledge connexions and internal KM in the home country. For instance, disruptive technological applications in home country knowledge connections and internal KM have been found to achieve innovative low-cost products that mass markets valued when firms collaborate closely with domestic suppliers during the early phase of component design leading to enhanced innovation performance (Ray & Ray, 2011).

Notwithstanding the above innovation connexions and internal KM factors, there is somewhat inconclusive. This is because resilient internal organizational learning, flexible habits, entrepreneurial alignment, proficient social capital, and cross-functional technical KM at the distinct or group level have been revealed to have a positive significance on product innovation and patent generation (Li & Kozhikode, 2008) and can inhibit firms innovation performance. Conversely, a lack of investment interest in innovation by firms and unsuitable technological

knowledge management of firms to guarantee required autonomy in product advancement may be insignificant to firm innovation performance (Karabag, 2019).

Our secondary survey data encompasses different measures of innovation. The survey looks at the distinction between process and product innovations while making considerations for market innovations and novel innovative firms. Market innovations are the subdivision of product innovations that not only accomplish the least originality standard of being considered as an innovation (“new to the enterprise”, incremental innovations) but also the firmer standard of being novel to the market of the firms (“market novelties”—radical innovations) (Cantner et al., 2009). There are two different measures for the economic performance of product innovations; the share of total turnover attributable to product innovations and the share of total turnover due to market novelties (Cantner et al., 2009). By definition, the latter share is zero for innovative firms that did not introduce any market innovation novelties.

3. Empirical Framework and Hypothesis

As a recently developing discipline and given its newness (Darroch, 2005), KM has emerged as a resource in its own right that provides a support mechanism (Penrose & Pitelis, 1959; Nelson & Winter, 1982; Darroch, 2005). This according to Darroch (2005) enables the effective management of knowledge from the extracted resources into capabilities, hence, firm innovative performance.

Of dominant theme in economic theory suggests why firms exist and the hows of resource allocation choices. However, at times, there is a problem in the treatment of resources in economic theory (Penrose, 1959). For instance, resources were well thought out as standardized in general equilibrium theory (a pillar of neo-classical microeconomic theory), an equilibrium level of output-guided manufacturing choices, statistics impeccably obtainable and evenly disseminated, and profit maximization dominant (Penrose, 1959). The general equilibrium theory was lacking as it failed to accurately ponder undertakings inside firms (Nelson, 1991). In an attempt to break away from the general equilibrium model, the book, “The Theory of the Growth of the Firm” (Penrose, 1995) was written. According to Penrose (1959), although resources required and allocation influence set price signals, activities to be involved in and performed decisions are made within the firm, and ultimately which different activities resources are allocated and used. Therefore, a firm’s growth is influenced significantly by burdened uncertainty internal processes and insights instead of external market prices and cost signals (Darroch, 2005). However, to a large extent, either decision-makers lack substantial unavailable information or the information on internal procedures whereupon to act is asymmetrically distributed (Coase, 1937; Clarke & McGuinness, 1987). The types and effects of information on resource decisions are significant to comprehend the internal processes of a firm (Darroch, 2005).

What contributes to Penrose (1959)'s importance is that she attempted to consider what goes on inside a firm, somewhat not conventionally accounted for by typical economists (Nelson, 1991; Sautet, 2000). Penrose (1959)'s work has also contributed not only as one of several theories of the firm; to the nitty-gritty of what is now called the resource-based view (RBV) of the firm (Sautet, 2000), but also choices concerning the acquisition and use of resources (Penrose, 1959). Here, resources are "generally tangible assets (financial resources, types of capital equipment, land and buildings, location, and the qualification profile of employees) and intangible assets (people dependent (e.g. human capital) or people independent and include organizational capital (e.g. culture, norms, routines, and databases), technical capital (e.g. patents) and relational capital (e.g. reputation, brands, customer and employee loyalty, networks within the distribution channel, the ability of managers to work together, relationships between buyers and sellers, etc.)" (Darroch, 2005: p. 102). "Strictly speaking, it is never the resources themselves that are the 'inputs' into the production process, but only the services that the resources can render. The services yielded by resources are a function of how they are used the same resources when used for different purposes or in different ways and combination with different types or amounts of other resources provide different service or set of services" (Penrose, 1959: p. 25). This is because owning resources does not inevitably provide an advantage to a firm as "the services that the resources will yield depend on the capacities of the men using them, but the development of the capacities of men is partly shaped by the resources men deal with" (Penrose, 1959: p. 78).

Employee's knowledge is founded upon their skills and experiences and their capacity to captivate, use, and manage innovative knowledge affects the worth of possessed leveraged resources of a firm (Penrose, 1959). This paper suggests that Penrose (1959)'s work also buttresses that knowledge management is a coordinating mechanism that allows resources to be transformed into capabilities (Nelson & Winter, 1982) and a significant innovative supportive discipline within a firm. Coordinating mechanisms are obliged to ensure people know their jobs and are also able to construe and respond to information flowing into the firm (Nelson & Winter, 1982). Arguably, effective KM is a contemporary term that is critical to the long-run existence of the firm as it designates the notion of a coordinating mechanism because it reinforces the progress of added capabilities (Penrose, 1959; Nelson & Winter, 1982). By this, the provision of theoretical nitty-gritty from which the resource-based view of the firm was spawned and its involvement in the novel discipline of KM can rightly be accredited to Penrose (1959).

Having acknowledged the significant role of effective KM, it is somehow disappointing that extant literature gives less attention to the quantifiable outcomes that might be on firm innovation performance. Perhaps one must accept that knowledge and its management are incompletely treated due to the tacitness in identification and measurement (Nonaka & Takeuchi, 1995). Empirical studies

attempt to attribute this gap not only to identifying and measuring knowledge and KM but also that KM is a comparatively novel discipline (Darroch, 2005). Hence, “the need now is for analytical methods that can be used in this new discipline, so that management may add a quantitative dimension to qualitative [KM] approaches” (Preiss, 1999, p. 39).

The study addresses our deficiencies by first integrating KM into the resource-based view of the firm (Penrose, 1959), and establishing that coordinating mechanisms (KM behaviors and practices) are essential for resources to be converted into capabilities (Nelson & Winter, 1982). Secondly, KM seen as a supporting role limits its relevance (Darroch, 2005). Hence, firms require competitive gain, enhanced firm financial performance, innovation, problems expectancy greater use of information, and improved firm knowledge for effective KM significance. This research will empirically study the link between KM and firm innovation performance.

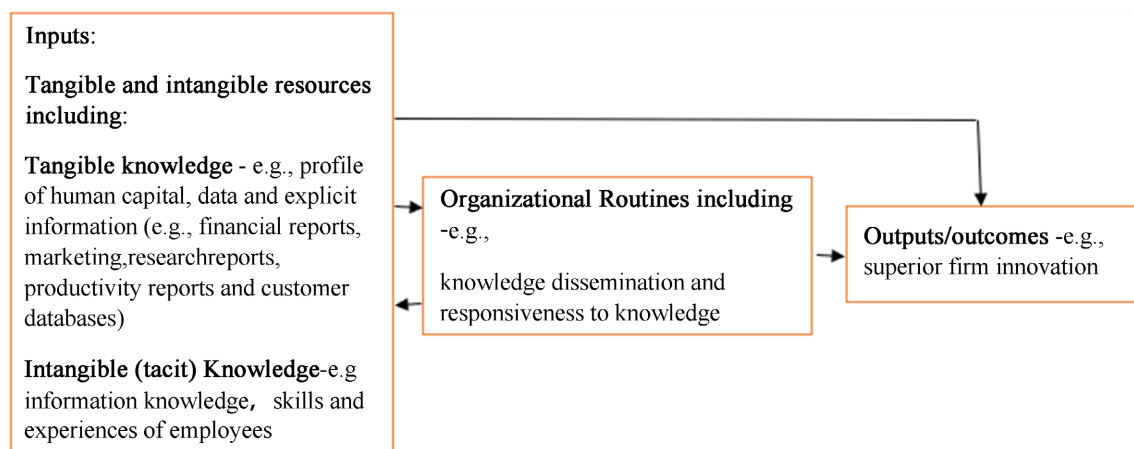
In summary, the conceptual model in **Figure 1** below provides an overview so far described and used in this study as follows:

Following Darroch (2003, 2005), this study examines the impact of KM on firm innovation performance in three parts: “knowledge acquisition, knowledge dissemination, and responsiveness to knowledge and assumes a positive relationship between the three KM components” (Darroch, 2003, 2005; Jafari & Ramalingam, 2015: p. 84). A firm will experience a lead in innovation level through the capability of KM (Forrester, 2000; Gopalakrishnan & Bierly, 2001; Hung et al., 2010). The more responsive and agile a firm is, its KM is likely to have a positive effect on firm innovation performance (Darroch, 2005). Thus, we hypothesize that:

H1; Knowledge acquisition positively affects a firm’s innovative performance.

H2; Knowledge dissemination positively affects a firm’s innovative performance.

H3; Responsiveness to knowledge positively affects a firm’s innovative performance.



Source: Modified from Darroch (2005).

Figure 1. The conceptual model.

Arguably, it is evident that effective KM is a valuable activity for managers to accentuate their innovation exertions to enhance firm performance. KM behaviors and practices need to be developed by managers to encourage the implementation of innovation (Chourides et al., 2003). In the USA, innovative firms were noted to acquire new firms in order to access novel knowledge, and their innovation ability was not affected (Capon et al., 1992). Put, “Simply owning resources is not necessarily going to provide any kind of advantage to the firm” (Darroch, 2005: p. 105). Hence, the KM paradigm is presented as positively affecting a firm’s innovation performance. Thus, we develop the hypothesis that:

H4; Knowledge acquisition, knowledge dissemination, and responsiveness to knowledge positively affect a firm’s innovative performance.

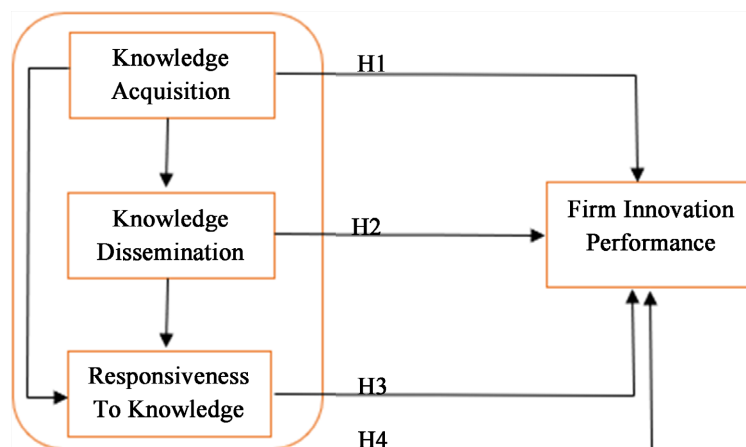
In summary, the research measurement framework model in **Figure 2** below provides an overview described above and used in this study as follows:

4. Research Design

4.1. Data

The study data was obtained from a sample of Ghana’s listed manufacturing firms with 1140 employees or more. The data was screened in a criterion to establish the quality of data by ensuring that the most senior person in the highest managerial position with many years of experience in each department within the firm was identified. This senior manager in each department was relied on to distribute the survey to other employees in their department. The assumption is that he or she has vast knowledge and, is in a position, to identify and comment on the flow of KM and firm innovation performance in not only one or few departments but around the entire firm.

To administer the survey as the representation of the cross-section of the manufacturing industry in Ghana, the study identified a total of ten (10) listed manufacturing firms with at least 1140 employees (see <http://www.asetena.com/> and <http://www.kompass.com/> for the database description) (Darroch, 2005).



Source: Modified from Jafari & Ramalingam (2015).

Figure 2. Research measurement framework.

Letters in the form of emails were sent to the Managing Directors (MDs) to pre-notify all departmental senior managers about the intended survey. As potential respondents, the letters explained the research purpose, soliciting senior managers' emails, WhatsApp, or WeChat numbers (to receive the survey through) in the MDs' response letters. Senior managers were directed to share the survey with as many employees in their department who could comment on and complete the survey. As an incentive after completing the survey, respondents and their firms were promised a report card of their firm KM profile along with any research the firm will need to conduct for them in the future at a moderate fee. As soon as a response was received from MDs, a copy of the questionnaire was sent to potential respondents using my official email, WhatsApp number, and WeChat as needed. The usable sample was 1140, and all ten (10) firms responded representing 100 percent as the researcher took time to make follow-ups until all firms' responses were received within one (1) week. The sample was restricted to only representative of listed manufacturing industry groupings within Ghana, firm size was not considered as far as is listed in Ghana Stock Exchange (GSE). Subsequently, there has been little empirical study on KM and innovation performance in the extant literature, "it is difficult to know how industry classification or industry size might bias the results" (Darroch, 2005: p. 106). To check for senior managers' non-response bias, a random sample of three (3) firms, was selected and a brief phone interview was made and recorded for their completion using their official lines. All three (3), representing 100 percent of this group completed this questionnaire interview on the phone, hence, using an ANOVA test reveals no significant difference in the mean responses of respondents. The required research model sample size for testing was 1140, consequently, the study used the sample size formula of Krejcie and Morgan's (1970).

4.2. Measures

To build the questionnaire, the study adopted knowledge acquisition (KA), knowledge dissemination (KD), and responsiveness to knowledge (KR) from Darroch (2005). The study used comparative measures and internal reflective measures to measure their correlation with knowledge management factors. Firm innovation performance was also assumed, and modified by De Jong & Den Hartog (2007), Fernandez & Moldogaziev (2011), and Bawa et al. (2018). The study selected the Likert scale to examine from a five-point scale statements how strongly subjects agree or disagree from "strongly disagree" to "strongly agree". A total of four (4) groupings of correlations with questionnaires were used. The questionnaire was pre-tested by specialists and scholars specialized in questionnaire design, knowledge management, and innovation field. A reliability test was performed after improving on the specialists' suggestions and feedback using sample respondents from pilot study data. Our reliability test score was relatively positively significant and exceeded the value of 0.8 reliability instru-

ment used (Darroch, 2005; Hair et al. 2006). Insignificant changes were made to the questionnaire based on the feedback and suggestions made. Hence, the study used Cronbach's Alpha scores for our construct variables as shown in **Table 1** below.

The study used the online electronic questionnaire survey as an instrument for statistical data gathering in this fast-moving environment. This is because is perhaps the most generally used technique for conducting surveys and can reach across an extensively distributed population (Jafari & Ramalingam, 2015), and comprehensive research is presently immensely eased by electronic systems (Sekaran & Bougie, 2010). Thus, the targeted firms were located in various parts of Ghana, hence, a "Web-based survey was a good tool to reach these respondents" (Jafari & Ramalingam, 2015: p. 87). Analogous to the performance measures for product innovations, the survey likewise contained straight inquiry on the performance of process innovations. To measure the economic performance of process innovations introduced, firms were probed through telephone interviews on whether they presented any process innovations, whether cost saving was attained, and whether the cost of share declines was realized before the survey. Evidence on the performance variables is not available for firms that did not have economic performance indicator measures or that had continued or abandoned KM innovative activity approaches during that period. Hence, our sample was restricted to firms that engage in KM actively and this allows us to identify the impact of KM on firms' innovation performance using profitability and operating cash flow. All questionnaire surveys conducted and output responses collected were useable and used for the data analysis.

4.3. Variables Definition

4.3.1. Knowledge Management

Three scales of knowledge management: knowledge acquisition, knowledge dissemination, and responsiveness to knowledge were developed to measure behaviours and performance for each element (Darroch, 2003) which the study adopted. Six factors: "appreciating employees' attitudes, and views, and inspiring employees to up-skill; having a sophisticated financial reporting scheme; being market-focused by dynamically finding client and manufacturing data; being sensitive to data concerning variations in the marketplace; engaging and absorbing an abundance of individuals competent in knowledge, manufacturing or arithmetic; working in partnership with global clientele; and receiving data

Table 1. Reliability test statistics.

Variable	Cronbach's Alpha
Knowledge Acquisition	0.812
Knowledge Dissemination	0.803
Responsiveness to Knowledge	0.925
Firm Innovation Performance	0.957

Source: Statistical package (SPSS) output (2023).

from market surveys” (Darroch, 2005: p. 106) were used to capture knowledge acquisition. As such, “the knowledge dissemination construct was described by: readily dissemination of market data about the firm; on-the-job knowledge dissemination; using practices such as superiority spheres, situational transcriptions, mentoring, and training to disseminate knowledge; using technological know-how (e.g., teleconferencing, videoconferencing, and Groupware) to ease communication; and choosing written communication to disseminate knowledge” (Darroch, 2005: p. 106). Finally, “responding to knowledge about clients, entrants, and expertise; being flexible and resourceful by willingly varying products, procedures, and policies; and having a sophisticated advertising role” (Darroch, 2005: p. 106) were used to describe responsiveness to knowledge.

4.3.2. Firm Innovation

The study uses Hamilton (1982)’s “typology of innovation and comparative internally reflective performance measures” (Darroch, 2005: p. 107). Innovations here are seen as novel products to the firm and global that serve as add-ons, upgrading, and cost-saving or transposition to prevailing product outlines. Global novel innovations are typically radical innovations whereas the other groupings are incremental innovations. Thus, the scale of innovation typologies (Hamilton, 1982; Garcia & Calantone, 2002) still upholds the realistic rationality aspect (Darroch, 2005). “Concerning typical manufacturing, our firm is further profitable and within insightful performance measures, therefore, our firm is superfluously profitable now than years ago” (Darroch, 2005). Hence, financial measures (profit) and non-financial measures (market share and sales growth) are captured by these financial measures (Darroch, 2005).

5. Empirical Analysis—The Matching Procedure

The matching technique is usually used to evaluate the impact of public programs; hence, this paper adapts the matching technique to measure the impact of KM on firms’ innovation performance. Dating back to labour market research (Heckman et al., 1999), the technique has also been used in the assessment of public R & D funding (Löf & Heshmati, 2005). For instance, the matching method was applied in matching the outcome of firms that are active in global sensing and vice versa (Cantner et al., 2009). They argue that the matching procedure is appropriate to the analysis of the resource-based view and the capability-based view because it allows linking a firm with similar settings and dynamics in their environment and preserves the heterogeneity of firms.

The matching technique differs from the non-parametric matching method. The basic knowledge of the non-parametric matching method is that the non-parametric matching procedure compares the means of firms’ variable outcomes with special characteristic (“treatment”) with firms that have a similar predefined set of variables but does not exhibit that particular characteristic (Cantner et al., 2009). The matching procedure permits its user to respond to the question

as to how firms would have performed if it was not in the hypothetical state (“counterfactual”), by re-establishing the conditions of research with findings and control groups (Cantner et al., 2009). The effect of the treatment on performance (“average treatment effect on the treated (ATT)”) can be secluded from other influences while keeping the heterogeneity of the firms intact instead of assessing the mean influence, as would be done in a regression analysis. To avoid biased results, the counterfactual state performance of firms cannot be used to determine the normal performance of the non-treated firms; hence, the paper endeavours to match individually treated firms with a non-treated firm that shows the same characteristics except the treatment variable (Cantner et al., 2009).

Rosenbaum & Rubin (1983, 1985) suggest using the propensity score (probability) for a firm to have KM as a standard for finding a similar firm in the control group. “To obtain the propensity score this paper estimates a probity model on the full sample with a dummy variable for KM as the dependent variable and the determinants of KM described above as the independent variables” (Rosenbaum & Rubin, 1983, 1985; Cantner et al., 2009). The comparison between firms concerning these characteristics and the propensity score is calculated using the Mahalanobis distance between the variables for firms. To improve the quality of the matches, we exclude firms that have a propensity score above maximum or below minimum in the possible control group (Czarnitzki et al., 2007; Cantner et al., 2009).

5.1. Assumptions

Two assumptions, the conditional independence assumption (CIA) and stable unit treatment value assumption (SUTVA) (Rubin, 1977, 1990, 1991) must hold to use the matching procedure (Cantner et al., 2009). The conditional independence assumption (CIA) states that the independent variables that affect both the performance and the status of a KM firm, the performance variable, and the KM variable are statistically independent. This CIA assists in overcoming the challenge that the KM firm cannot be detected without KM activities, thus, the counterfactual outcome is unobservable. If the CIA is satisfied, we can achieve the normal effect of KM firms in the absence of KM from the sample of local firms. It indicates that all variables that affect the performance and the status of a KM firm are recognized and available in the data set. However, the CIA cannot be authenticated empirically. We consequently have to assume that the CIA is satisfied resulting from prior studies using the GSE and firms matching and or evaluation exercises that made the same assumptions (Czarnitzki et al., 2007). What is more, we are relatively assertive that the survey, which covers an extensive variety of firms’ innovative activities, encompasses all influences significantly for explaining KM and the firm innovation performance in the procedure we use it. Hence, we assume that the CIA is satisfied (Cantner et al., 2009). The adopted steps undertaken in the “nearest neighbour matching using the propen-

sity score” are summarized in the appendix.

The next assumption we follow is the stable unit treatment value assumption (SUTVA) asserting that the usage of KM does not influence any other firm (Rubin, 1990, 1991). In our perspective, this indicates that KM does not influence firms by market effects or knowledge spillovers. Thus, SUTVA rules out common symmetry effects of KM implementation. Nonetheless, collaboration impact can equally over and underestimate the ATT. Conversely, the ATT is overestimated when the innovative performance of KM firms is realized. Since these mechanisms of action are challenging to ascertain empirically, we follow the SUTVA, thereby ignoring general equilibrium effects (Cantner et al., 2009).

5.2. Manufacturing Firms in Ghana: The Cases

We chose case studies at listed manufacturing firms in the Ghana Stock Exchange as a method to argue for their knowledge management and the innovation performance in the Head Office Department (herein “HOD”) of these firms in Ghana. The materials used in the case study for this paper were gathered through in-depth interviews, questionnaire surveys, and surveillance in addition to widely existing secondary data. The secondary data sources include publications, firms’ website information, field minutes, and semi-structured and structured interviews. This permits this study to “tell” from the respondents’ opinions (Stark & Torrance, 2005). Subsequently, the study was able to dig deep into the firms, and secondly, the study only concentrated on listed manufacturing firms, hence, the findings can only be used to generalize listed manufacturing firms in Ghana. Lastly, the study covers different manufacturing sectors in Ghana.

6. Empirical Results and Discussion

6.1. Descriptive Statistics

The respondents’ characteristics are: 1) 57% males and 43% females. 2) Those with the highest frequency fall under 31 - 40 years old representing more than 50% of age group respondents. Age group 21 - 30 years and above 41 years combined with age group 31 - 40 years brings the total responses to 100% of respondents. 3) 90% of respondents hold a bachelor’s degree qualification and above, and the rest hold a diploma degree. 4) 40% of the respondents came from the executive and management-level positions, the rest came from other employees. Executives’ and managers’ opinions as an elite group are crucial as they have fresh ideas for innovation from prevailing working procedures for the upgrading of their firms’ business growth (Van Clieaf, 1992). Lastly, 5) More than 50% of the survey respondents have been with their various firms for more than 7 years, an indication that their work experience is enough for reliance on the survey questions comments.

6.2. Correlation Analysis

The variables correlation analysis is presented in **Table 3** below. Thus, there was

Table 2. Demographics of correspondents.

Details	Frequency	Percentages
Gender of Respondents		
Male	650	57
Female	490	43
Age Groupings of Respondents		
21 - 30	399	35
31 - 40	570	50
41 and above	171	15
Qualifications		
Diploma	114	10
Bachelors and above	1026	90
Positions		
Executive and management level	456	40
Other employees	684	60
Years of employment		
Less than 6 years	568	49.8
7 years and above	572	50.2

Source: Research Survey (2023).

Table 3. Correlation analysis.

Variable	KA	KD	RK	FIP
Knowledge Acquisition (KA)	1			
Knowledge Dissemination (KD)	0.781**	1		
Responsiveness to Knowledge (RK)	0.781**	0.683**	1	
Firm Innovative Performance (FIP)	0.694**	0.728**	0.776**	1

Source: Statistical package (SPSS) output (2023).

a significantly positive correlation between KM subcategory variables and firm innovation performance.

6.3. Testing of Hypothesis

Linear regressing analysis was used in testing the hypothesized relationships among the variables in the research model using SPSS software version 23. The summarized outcomes are revealed in **Table 4** with all hypotheses supported by empirical statistics data.

7. Discussion

The study was conducted to address the question: “What is the impact of KM on

Table 4. Hypotheses results of a structural equation modeling.

Hypothesis	Standardized Regression Weights (β)	Supported Hypothesis (Y/N)
H1: Knowledge Acquisition \Rightarrow Firm Innovation Performance	0.676*	Y
H2: Knowledge Dissemination \Rightarrow Firm Innovation Performance	0.710*	Y
H3: Responsiveness to Knowledge \Rightarrow Firm Innovation Performance	0.758*	Y
H4: Knowledge Acquisition, Knowledge Dissemination, and Responsiveness to Knowledge \Rightarrow Firm Innovation Performance	0.341* 0.242* 0.488*	Y

*Significant at $p < 0.01$. Source: Statistical package (SPSS) output (2023).

firm innovation performance”? Based on the literature review and to address this question, the study developed and formulated four (4) hypotheses as presented in **Table 4** as follows:

The empirical data supported all hypothesized relationships in the study model, and revealed several consistent significant findings confirming the results of other researchers (Darroch, 2005; Jafari & Ramalingam, 2015). Hypotheses H1 - H4, thus, Knowledge acquisition ($\beta = 0.676$, p -value = 0.000), knowledge dissemination ($\beta = 0.710$, p -value = 0.000), responsiveness to knowledge ($\beta = 0.758$, p -value = 0.000), and the three KM elements (knowledge acquisition, knowledge dissemination and responsiveness to knowledge) ($\beta_1 = 0.341$, p -value = 0.000, $\beta_2 = 0.242$, p -value = 0.000, $\beta_3 = 0.488$, p -value = 0.000) all have a significant positive relationship to firm innovation performance. This conforms with prior literature emphasizing the capability of KM as an antecedent that can lead an idea to a firm innovation performance level (Forrester, 2000; Gopalakrishnan & Bierly, 2001; Hung et al., 2010). As such, the results of our H4 in the multiple regression depict that knowledge acquisition and responsiveness to knowledge are statistically more significant at $\beta_1 = 0.341$ and $\beta_3 = 0.488$ antecedents respectively for firm innovation performance more than knowledge dissemination, $\beta_2 = 0.242$ antecedent. This is because knowledge acquisition captures novel firm ideas whereas responsiveness to knowledge implies how responsive a firm is to knowledge and this ultimately affects the likelihood of a firm's innovation performance.

The Matching Principle

According to our correlation analysis and test of hypothesis results generated from Statistical package (SPSS) output, our two assumptions, the conditional independence assumption (CIA) and stable unit treatment value assumption (SUTVA) (Rubin, 1977, 1990, 1991) hold to use the matching procedure (Cantner et al., 2009). Consequently, the conditional independence assumption (CIA)

states that the independent variables that affect both the performance and the status of a KM firm, the performance variable, and the KM variable are statistically independent while the stable unit treatment value assumption (SUTVA) asserts that the usage of KM does not influence any other firm (Rubin, 1990, 1991). Thus, SUTVA rules out common symmetry effects of KM implementation.

In our perspective, the results of our secondary data (Darroch, 2005) hold for the study to use the matching principle. Our results are appropriate to the analysis of the resource-based view and the capability-based view because they allow linking manufacturing firms with similar settings and dynamics in their environment while preserving the heterogeneity of firms.

The results of our correlation analysis indicate that firms that manage knowledge effectively are likely to have innovative output leading to superior firm performance outcomes. We omitted statistically insignificant correlation coefficients to assist legibility and the results reveal that KM components do correlate with all types of innovation (Darroch, 2005) and so backing preliminary opinion indicating that a KM capability firm is also possible to be more innovative.

However, our research realized that is less possible in the ecosphere of innovation for a novel firm with KM capability to advance. In other words, the lack of scientific or business expertise of a firm that develops a novel product or service KM capability may be unhelpful (Darroch, 2005). In contrast, firms working within the limits of systematic and corporate expertise (evolving incremental innovations) tend to have sophisticated KM conducts and practices. Interestingly, this outcome indicates that KM conducts and practices flourish when firm employees work diligently within the limits of prevailing capabilities. This confirms the view of other researchers (Tushman & Anderson, 1986) that incremental innovations are capability enhancing, while radical (i.e., novel to the ecosphere innovations) are capability destroying. Contextually, novel to the ecosphere innovations (radical) are capable of putting the firm's business at risk. This is because not only is a prevailing KM capability virtually irrelevant but also prevailing resources available to the business may be unutilized well (Darroch, 2005).

The study observed a significantly positive correlation between KM and relative performances on one hand and a restricted quantity of significant correlation between KM and internal performance measures. This may be because these internal measures may be exaggerated, is insignificant to use only KM as a variable to determine performance, and a firm's fiscal or competitive setting might impact greatly on firm innovation performance. At a combined level it is coherent to conclude that firms with erudite KM practices and behaviours are more likely to develop incremental innovations (Darroch, 2005). All three components of KM after matching confirm the significant positive relationship with firm innovation performance although empirical evidence differs. Thus, "a firm capable in knowledge acquisition, knowledge dissemination and responsiveness to

knowledge is more innovative” (Darroch, 2005: p. 112). As generally regarded, intangible knowledge affords superior potential for evolving competitive advantages as is likely to be tougher for entrants to access and replica (Nonaka and Takeuchi, 1995). As such, knowledge dissemination and responsiveness to knowledge influence the conception of sustainable competitive advantages because of their uncertainty and distinctiveness to the firm and the fact that knowledge becomes entrenched in firm processes (Grant, 1996). Hence, “to be innovative, knowing is as significant as what is done with that knowledge” (Darroch, 2005: p. 111). Responsive firms are the statistically substantial antecedent of performance and so extract more resources thereby enjoying superior benefits than less responsive firms (Penrose, 1959).

Survey data was used to test the hypothesis here, hence, the hypotheses tested have no extant empirical literature influence. This is because KM is extensive as it comprises knowledge concerning market and non-market events. Non-market events have no direct effect on profitability. To remain competitive, managers wanting KM must pursue innovation, for without innovation, firms jeopardize losing their viable position by sinking behind (Veryzer Jr., 1998). The general characteristics of the innovating firm (Capon et al., 1992), the number of innovations (Han et al., 1998), and the benefits of the novel product (Li & Calantone, 1998) are generally considered by extant literature on firm innovation performance studies.

8. Conclusion

The paper aimed to analyze the impact of knowledge management on firms’ innovation performance. Theoretically, the analysis made several contributions. Firstly, consideration of knowledge management was extended by applying it to the firm’s innovation performance in manufacturing and offers a thorough sequential justification of the situation growth. Secondly, the paper agrees and further explains the prior study on firms’ innovation performance in Ghana. As such, firms’ innovation performance emphasizes the application of the competition central notion that strains among alliance and rivalry play in the knowledge management practices of the manufacturing industry. The intricacy that experts face in knowledge management was also discovered by the study, hence, further study aimed at shaping an improved theoretical consideration of this phenomenon is desired.

8.1. Theory Implications

Firms make choices as to the activities to elaborate on, how to execute those activities, essential resource allocation, and eventually, resource usage (Penrose, 1959). This study contends against this background that: foremost, knowledge is both a tangible and an intangible resource; secondly, KM capability aids individuals inside a firm to leverage the utmost package of knowledge and added resources; as such, having access to knowledge helps any decision-making con-

cerning resource usage and allocation; and, efficient KM makes contributes to firm innovation performance.

It was established that firms with efficient sophisticated KM practices and behaviours have coordinative mechanisms and a tendency toward evolving incremental innovations, hence, our results support these empirical ideas from [Penrose \(1959\)](#), [Nelson & Winter \(1982\)](#), [Darroch \(2005\)](#), and [Jafari & Ramalingam \(2015\)](#). Thus, these firms aside from their KM capacity can efficiently make use of available resources.

Novel firms emerging into the ecosphere of innovation however had inadequate backing with KM activities and neither superior KM nor firm innovation performance co-existed. Novel firm ecosphere innovations performance requires the backing of prevailing firms to progress outside their comfort zone, take on board novel knowledge, and advance innovative performance capabilities ([Darroch, 2005](#)). Aside from the widened gap of KM support role, over-reliance on prevailing knowledge and procedures inhibits novel knowledge response and diffusion of firm innovation ecosphere performance. KM firms must be responsive and are imperative for firm innovation performance as “the knowledge-creating company” ([Nonaka & Takeuchi, 1995](#)). Our construct of the knowledge dissemination constituent is consistent with [Nonaka & Takeuchi \(1995\)](#), [Darroch \(2005\)](#), and [Jafari & Ramalingam \(2015\)](#) because they also add empirical manifold conjectures sustenance concerning the significance of effective KM on firm innovation performance.

8.2. Implications for Managers

As a novel ecosphere discipline, KM theory interpretation is regrettably, frequently confused with the primer of information technology as a key to capturing knowledge ([Darroch, 2005](#)). A comprehensive concept of KM factors was presented that ascertained the impact of effective KM on a firm innovation performance of manufacturing firms listed in GSE. Consequently, managers must reflect on programs that pursue enhancing KM activities since a firm that capably manages knowledge will achieve significant positive innovation. KM implementation performs are essential for enhancing the firm innovation performance.

8.3. Limitations

The sample used in this study under-represented firms with 1140 employees and was not entirely characteristic of manufacturing industry segments. The result of firm size or manufacturing industry type on KM is unknown. Knowledge-intensive firms need efficient KM given their larger quantity of individuals, divisions, or settings or abundance of multifaceted knowledge. Dissemination and responsiveness to knowledge activities in bigger firms might be more problematic, hence, vice versa in smaller firms. It should be noted that, as an emerging developing country, Ghanaian manufacturing firms by global standards are small (see <https://www.dnb.com/business-directory/company-information.manufacturing>).

[gh.html](#)), and thus, a small number of respondents. This study needs a broader replication in different contexts and or countries with longitudinal studies.

8.4. Future Research

It was revealed from this study that firms developed more innovatively and achieved well when they efficiently manage knowledge. When a firm is effective and responsive to KM, it empowers good superiority services to be extracted from added resources and ultimately leads to significant positive performance. Hopefully, future research is essential to firmly establish this assertion as a central tenet of this study by further exploring the supportive role of KM practices. Lastly, given the significant role of KM in knowledge-based-economic societies, it is hoped that further confirmation will be provided by upcoming research regarding the reported outcomes in this study and identify other significances, and sequence antecedents, of effective KM practices.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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