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The impact of strategic knowledge management and the Internet of Things (IoT) on the performance and innovation of Chinese manufacturing firms

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Abstract

New disruptive technologies are altering the way in which organisations manage their knowledge in the context of the Internet of Things (IoT). This calls for a rethinking of the conventional knowledge management system and the implementation of a more open approach to facilitate the free exchange of ideas. This tendency will likely be beneficial to the growth of the key in-house knowledge management skills that are being developed by the organisation. The investigation of this environment will focus on four interconnected ideas: knowledge management, open innovation, the aptitude for knowledge management, and creative brilliance. This objective is accomplished by using the method of structural equation modelling to the information gathered from 685 Chinese businesses. The findings demonstrate that putting in place a knowledge management system raises an organization's capacity for innovation by developing its internal knowledge-management resources. This, in turn, makes it possible for greater opportunities for teamwork and access to informational resources that were not previously utilised. The results of the study are used to draw important aca'emic and management implications, and they are also used to identify prospective future avenues for research.

Key words: Internet of things**,** Strategic knowledge management, Manufacturing firm**,** Chinese innovation**,** Firm performance.

INTRODUCTION

The Internet of Things (IoT) paradigm is a novel paradigm in the current context of modern information and communication technologies (ICTs). The Internet of Things, a collection of disruptive digital technologies, affects both individuals and businesses. Disruptive technologies are increasingly being incorporated into business processes in order to increase efficiency through the flow of knowledge and the collection of data and information. It is imperative for companies to develop appropriate and relevant knowledge management processes and capabilities in order to

maintain their competitive advantage in this global economy. More and more academic and practical research has been done on information management and how to get the most from it at work. Knowledge management refers to the process of identifying and utilizing a group's collective knowledge in order to enhance competitiveness, innovation, and responsiveness to environmental changes. Information technology-based knowledge management systems have received relatively little research attention in terms of their development, implementation, and overall success rates (IT) **(Kim and Kim, 2016; Scuotto et al., 2016).** This represents a significant gap in scientific business knowledge because many organizations are implementing knowledge management systems to make it easier to create, share, and store knowledge. In light of the movement's new and increasing momentum, creating digital ecosystems using ICT tools, experimental technology platforms, e-service applications, and other infrastructures of the information society can give companies a competitive edge by facilitating the collection and exchange of data and information. This phenomenon is reshaping the way innovation is carried out in the first place. Despite significant progress in several areas of knowledge management, the results of programmes to improve knowledge management have been inconsistent and unclear. Then why aren't there more studies on how and when knowledge management initiatives can improve productivity and outcomes? This has resulted in a greater focus on the link between knowledge management and business performance. Research in knowledge management (KM) is also common to focus solely on internal knowledge, ignoring the importance of integrating both internal and external knowledge into a holistic approach. Internal Knowledge Management Capacity (KMC) is becoming increasingly important to companies in today's dynamic environment as a means of effectively managing knowledge flows both within the Organization and to and from the outside world. As the name suggests, KMC is all about a company's ability to explore and retain information not only within the organisation in which it is employed, but also across all other organisations. As a result, firms tend to form alliances with other stakeholders in their ecosystem, resulting in a dynamic exchange of knowledge. As a direct result of the IoT phenomenon, firms can and should implement and maintain KMS that utilise cutting-edge ICTs and external knowledge sources, resulting in improved innovative performance (defined as the ability to introduce new products/services and processes or open up new markets) **(Santoro, 2017).**

LITERATURE REVIEW

The academic conversation on how to effectively manage innovation in a future when the Internet of Things will be the dominant technology has only just started. Discussions on the Internet of Things (IoT) are now taking place in three key groups. These communities include the academic community, the business sector, and the governmental sector. For example, governments all over the world have launched a number of different initiatives, such as those pertaining to the standardization of procedures (in the United States, this initiative is known as the Industrial Internet Consortium (IIC). The Internet of Things (IoT) has been researched by a variety of academic departments utilizing the backdrop of the digital age, which has led to a wide range of perspectives and findings being uncovered. When it comes to the conception and implementation

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of the Internet of Things, there is a substantial gap in the levels of success shown by the different sectors in terms of this technology. To provide just one example, the business of selling consumer products is light years ahead of the sector of providing financial services. In addition, because of the ambiguity that surrounds the definitions, layers, tactics, and implications of the internet of things, it is still difficult to adequately portray the degree of disagreement that is now going place. In order to set the stage for the current conversation, they are going to begin by doing a literature review that draws from a variety of academic disciplines and covers topics such as digitalization, the Internet of Things (IoT), and industrial IoT. They provide the conclusions of studies that were generated by both the business sector and the government in order to demonstrate that they have taken their points of view into consideration. In this paper, they show how the existing corpus of literature has become wider over the last ten years in terms of the diversity of topics it explores and the ways in which it classifies those topics. In order to organize and standardize both the review process as well as the findings of it, the study draws on concepts from both the philosophy of science as well as the area of systems thinking. In order to wrap things up, they will now organize the results of the debate and evaluation into the following four categories: digitalization, the internet of things (IoT), the industrial internet of things (IIoT), and electronic collaboration. The Internet of Things refers to a network of interconnected physical devices that are able to communicate with one another and share data using a variety of network connections, including wireless, optical, and coaxial cable. The application of information and communications technology (ICT) as well as real-time analytic hubs to digital technologies that are currently in use paves the way for a broad variety of potential outcomes. Since it is an open system that links a variety of devices to the internet, they may consider the Internet of Objects to be a global network of linked things. This is because it connects a broad range of items to the internet. According to the IoT European Research Cluster (IERC), the term "Internet of Things" refers to "a dynamic global network infrastructure with self-configuring capabilities based on standard and interoperable communication protocols where physical and virtual things have identities, physical attributes, and virtual personalities, use intelligent interfaces, and are seamlessly integrated into the information network." Although the term "Internet of Things" does not have a definition that is universally accepted, this definition was provided by the IoT European Research Cluster (IERC). The Internet of Things is based on two core principles: first, that there should be network connectivity everywhere, and second, that access should not be prohibited for anyone or anything.

CONTINUOUS SENSING FOR THE ULTRASONIC POSITIONING MODULE

The field of study known as UPM condition monitoring has been established for some time, yet it is one that is consistently increasing. Researchers have presented extensive literature reviews on sensor-based monitoring for a range of ultraprecision manufacturing processes, including UPM. Specifically, these studies focus on UPM. These review papers discuss a variety of subjects, including the mechanics of material removal, the phenomena that need to be assessed, and the needed level of accuracy. In addition, some methods for selecting sensors are presented. However, researchers point out that sensor-based monitoring is a burgeoning area of research, with a

particular focus on surface to near-surface phenomena in the domain of ultraprecision manufacturing. As a direct result of the aforementioned factors, surface integrity monitoring in UPM has received a comparably low level of attention from researchers **(Rao, 2013)**.

COMBINING AND ANALYSING THE DATA FROM VARIOUS SENSORS

Data fusion methods combine the findings obtained from a number of distinct sensors into a single set of findings in order to arrive at conclusions that are more precise than those that could be arrived at by using just one. In a general sense, the many approaches of sensor fusion may be classified into one of three tiers, which are as follows:

(1) raw data level fusion, which is when data from sensors that have similar qualities are merged to generate a new signal that has an improved signal-to-noise ratio.

(2) multi-sensor fusion, which is when data from multiple sensors that measure the same thing are combined to measure a single variable.

(3) Sensor level fusion, which is when related features derived from sensors are fused for decision making; feature level fusion, which is when distinct features are retrieved from multiple sensor signals in the time and frequency domains; and sensor level fusion, which is when related features derived from sensors are fused for decision making.

AN EXAMINATION ON THE LEVEL OF THE ORGANIZATION

OI is connected to the possibilities, actions, and outcomes of entrepreneurial endeavours at the level of the organisation. The impact of OI on commercial endeavours in has important ramifications for both brand-new ones and established corporate ones already in operation. In particular, OI can help business owners see prospects that are located remotely from their existing knowledge base, giving them a fuller picture of the potential opportunity landscape. OI can also help business owners see prospects that are in close proximity to their current knowledge base **(Gruber, MacMillan, and Thompson 2013)**. Across addition, OI strategies make opportunities for entrepreneurial endeavours available in a diverse array of work environments and types of organisations, as well as encourage their development. For example, an OI strategy based on platforms makes it possible for startups to expand via the production of auxiliary products and services; to put it another way, platforms themselves become the site of entrepreneurial activity. In a similar vein, when enormous enterprises implement an inbound OI strategy, doors of opportunity are opened for smaller companies **(Zahra and Nambisan 2011)**.

A LEVEL OF ANALYSIS CONSISTENT ACROSS ALL ORGANIZATIONS

For organisational innovation to be effective, it is vital to engage in activities in the early stages of an innovation process that go beyond simple information exchanges across organisations. The establishment or active engagement of innovation ecosystems, which bring together a broad variety of inventive individuals at various times along the process, is often required in order for organisations to innovate successfully. Even in the absence of a central organisation, they are capable of developing original and workable solutions to problems relating to innovation. The

development and marketing of a product are only two of the numerous outcomes that are presumed to result from organisational innovation, which also necessitates a diverse range of interactions and information flows **(Chesbrough and Bogers 2014)**.

Before there is a set architecture in place for creating value inside the ecosystem. The value of an innovation ecosystem will change depending on the nature and degree of difficulty of the technology that is being produced. OI explains how creative dynamic network structures evolve via the dynamic interactions of a number of individuals throughout the innovation lifecycle by adopting the viewpoint of a network theorist. Therefore, the problem of governance in these ever-changing relationships is very necessary to the success of OI. In point of fact, one of the primary concerns is the extent to which such leadership should be "transparent." The lack of hierarchical control structures necessitates the development of new "dynamic" theories in order to characterise the impact of "open" governance on the manner in which a large number of stakeholders co-evolve throughout the process of innovation. Research on platform-based ecosystems has uncovered important facets of "openness" of governance, such as ownership over intellectual property, access to the technology, and social variables like transparent information policy **(Benlian, Hilkert, and Hess 2015)**.

ANALYSIS ON A HIGHER LEVEL THAT IS OUTSIDE OF THE ORGANISATION

The extent to which external stakeholders (individuals or communities) are involved in the innovation process as either contributors to the development of new knowledge and innovations or as recipients of information that is used to produce innovations is an essential factor in determining the success of open innovation (OI). There have been many various kinds of literature that have come into existence to address the role that these "external stakeholders."

The range of knowledge production and innovation includes individual contributors (such as user innovation), collaborations with extra-organizational groups (such as communities, consortia, and crowdsourcing), and working with a wider network or ecosystem **(West, 2014)**. However, despite the fact that all of these may be considered cases of OI involving third parties, it is essential to bear in mind that many stakeholders might each bring about distinct factors that, as a result of their differences, can impair the effectiveness of OI. There is a vast range of input that may make a difference, some examples of which are the goals, desires, thoughts, and solutions to challenges as well as designs and patents provided by external parties. It appears fruitful to discuss the importance of the contribution of external stakeholders as well as the phases of the innovation process in which they engage. Individuals and members of communities may also have very different conceptions of the factors that motivate them to take part in OI processes, which may lead to large differences in participation rates. The type of the process by which new information is generated, the repercussions of that process, and the degree to which it is absorbed are the factors that define the amount to which stakeholders from the outside participate to the process of innovation. External stakeholders take on a more significant role when the scenario calls for experts to play a major role in identifying problems and/or providing knowledge input to solutions, as well as when the needed information matches to the preferences and expectations of customers

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and users. The involvement of external stakeholders in the innovation process is diminished when the knowledge in question is deemed to be tacit and when its development is seen to be inextricably linked to the contextual aspects of an organisation, such as its culture, history, and traditions. Another essential component that requires more research is the way in which the variety of internal and external contributors, as well as cognitive distance, impact the dynamics of knowledge generation and the output of innovation.

METHODOLOGY

Methodology and research plan

This section's goal is to provide an explanation of the methods of research that were taken. The stated goals and conceptual framework of the research programme ought to serve as the primary inspiration for the study's design and analysis. The impact of strategic knowledge management and the internet of things (iot) on chinese innovation and manufacturing firm's performance will have a significant impact on scanning the environment, plans and strategies, strategies execution, analyses and regulation. It is necessary to ascertain how significant these adjustments are. This objective has been taken into consideration when developing the suggested layout. The goals of this section are meant to follow immediately in the footsteps of this fact and are designed to:

1. The benefits and cons of different quantitative approaches to study should be weighed together.
2. Provide a brief explanation of how quantitative research is conducted.
3. The rationale and explanation for the study's use of quantitative research methods are required.

Methodological Approach

The purpose of this study is to offer a background for the empirical analysis and hypothesis testing of the theoretical relational path that was chosen based on the existing literature. The conceptual models that have been offered make it possible for this to occur. Quantifying the facts is one of the goals that the conceptual framework seeks to accomplish. In this particular investigation, the majority of the approaches and methodologies that we used were quantitative. In spite of this, qualitative information has the potential to enrich any research technique by verifying concepts in novel ways. Learn how to confirm the process of creating trust and commitment with the help of qualitative data collection and analysis. This is a precondition for knowing how to do so. In order to ascertain the level of relevance in connection to the qualitative data that investigates the phenomena, the suggested research makes use of a triangulation of qualitative and quantitative data.

Quantitative Research Design

Researchers that use quantitative methods attempt to numerically represent and manipulate data in order to better describe and explain the processes they study. During the course of the last few decades, it has been utilised in a wide variety of fields, including physics, biology, sociology, and geology.

In addition, quantitative research is social research that makes use of empirical methodologies and empirical claims. An empirical claim, in his view, is a statement about the way things actually are, as opposed to an assertion about the way things "should be." In quantitative research, empirical assessments are utilised rather frequently, and numerical formulations of empirical statements are a significant component of this type of study. To restate this, the purpose of an empirical evaluation is to establish whether or not a particular programme or policy satisfies a particular set of criteria.

i) Study Design

The research was a detailed cross-sectional investigation that took place over the course of three months, from September to December of 2022. In this study, we used a cross-sectional design, which allowed us to gather data at a particular moment in time in a straightforward and economical manner. The researcher had to use a quantitative strategy to limit the use of resources. The total sample size of 700 included people from manufacturing. We contacted every member of staff at the aforementioned establishments to collect this statistically valid sample. Workplace surveys were used to collect data from participants. The research was explained to anybody who was interested, and those who agreed to take part completed a questionnaire on their own time in the waiting area after they had finished their shifts. In case any questions arose, the researcher was there to address them. In addition, questionnaires were handed out in a variety of locations and were meant to be filled out and returned quickly.

ii) Study Area

The study was mostly focused on the industrial sector in China.

Population and sample of the study

The term "sample" refers to a subset of data that has been arbitrarily selected from a broader population. One of these things might be called a sample point, sampling unit, or observation, depending on the context. When doing research, using a sample as a starting point is an effective way to save time. To undertake a thorough investigation of a whole community would be impractical, prohibitively expensive, and very time consuming in almost all circumstances. This indicates that researchers may be able to learn anything about the community as a whole by examining a relatively small subset of the members of the community.

According to the information that was gathered from different parts of the world, it was anticipated that the total working population would reach three billion. Rao soft was used to do the determination, and the results showed that the sample size was. The samples were from a selection that was completely at random. Over 815 questionnaires were sent, and only 795 were brought back for further inspection and 685 of which were complete.

Unit of analysis

The single individual, group of individuals, or thing that serves as the "unit of analysis" is the subject of in-depth investigation. Units of analysis might take the form of individuals, groups, organisations, countries, technological advancements, products, and many other things. This is true, for example, for academics who are interested in analysing consumer behaviour, educational outcomes, and attitudes regarding the advancement of technology.

The individual serves as both the fundamental and the primary unit of study in sociology. Studies involving just one participant are often utilised to help us get a better understanding of the linkages that exist among societies. This is due to the fact that one of the primary objectives of sociology is to learn about people's positions in society. It is possible for a community or specialised group to acquire insight into similarities in the lives of its members, which may be utilised to assist in the resolution of difficulties that are faced by society as a whole.

Selection of key informants

Key informant interviews include having in-depth discussions with individuals who are thought to possess substantial expertise on a certain subject. There are two major aspects of key informant interviews that should be highlighted.

In the initial phase, interviews with just a few of people are required. The investigator chooses to consult these people because they could have useful insights or data to contribute to the investigation. Based on the inquiry's purpose and scope, the investigator finds appropriate communities and selects key informants from among them.

It's also crucial to remember that interviews are qualitative in nature. The interview rules indicate the themes and concerns that will be handled during a particular interview session. The interviewer formulates the specific questions that will be asked. The interviews are casual and relaxed, like chitchat between pals.

To get more information out of the interviewees, the interviewer asks them subtle questions and takes detailed notes, which are then analysed and interpreted.

DISCUSSION

Demographic Details

In the first part of the study, it was found that the total respondent of the research is 685 and male respondents are more than female respondents. Out of this 390 people are male and 295 people are female. Valid percentage of male is 57% and female is 43%. Highest respondents are from 26-25 years and the lowest number of respondents are from above 60 years. 222 respondents are from 18-25 age group, 249 respondents are from 26-40 age group, 128 respondents are from 41-60 age group and 86 respondents are age of above 60. Valid percentage of age groups are 32%, 36%, 19%, and 13% respectively. Among the respondents 184 female and 173 male respondents are

unmarried, 111 female respondents and 217 male respondents are married, and the percentages are 52% male and 48% female respectively. According to the study, the highest income group is found that 21000-30000 and the lowest income group was found to be 31000-40000. 87 respondent's income per month is between 20000, 129 respondent's income per month 21000-30000, 81 respondent's income per month 31000-40000, 93 respondent's income is more than 41000 and the percentages are 28%, 26%, 22% and 24% respectively. In the study the highest number of respondents from the group of work experience are 6 years to 10 years and 11 years to 15 years, and the lowest is above 15 years. 178 respondents have 0 to 5 years work experience, 185 respondents have 6 to 10 years work experience, 185 respondents have 11 to 15 years work experience, 137 respondents have above 15 years work experience and the percentages are 26%, 27%, 287% and 20% respectively. In the study it was found that the computer knowledge as proficient and experts are the highest number and beginner is the lowest number. 130 respondents are beginner who have computer knowledge, 144 respondents are average in computer knowledge, 206 respondents are proficient in computer knowledge, 206 respondents are expert in computer knowledge, and the valid percentage is 19%, 21%, 30% and 30%. In the study it was found that the technical skills as expert is the highest number and beginners are the lowest. 144 respondents are beginner who have technical skills, 164 respondents have average technical skills, 158 respondents are proficient in technical skills, 219 respondents are expert in technical skills. The valid percentages of technical skills are 21%, 24%, 23% and 32% respectively.

CONCLUSION

It has been shown that knowledge management, often known as KM, is an efficient strategy that may boost both creativity and productivity. In addition, improved financial outcomes may be achieved by the combination of codification and customization. It is becoming more obvious that KM and KM strategy have a favourable influence on the creativity and performance of corporations. Companies have come to realise that a knowledge management strategy that is well defined has the ability to boost revenue, efficiency, creativity, and talent. Because of these advantages, the link's capacity to nurture novel patterns of performance is improved.

A significant amount of effort has been invested by researchers in the process of learning about and trying a variety of organisational solutions for supporting creative thinking. In academic papers such as these, a focus is placed on both the theoretical and practical significance of these tactics for companies. Knowledge creation is essential for a business to get the advantages that are based on the invention, transmission, and application of knowledge, as well as to supply the service that may give the organisation with its full potential for competitive advantage. The strategy for managing knowledge is viewed as an adaptable capability that is centred on the continuous upgrading of a knowledge opportunity. This is accomplished by making use of the innovations that are generated to manipulate, develop, encode, and use the implicit and explicit information that exists within the company. If the user's privacy, personal information, or even physical safety is compromised, then the security of a smart home or smart device is at risk. This is especially true

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for an Internet of Things (IoT)-based smart home, which is extremely vulnerable to various security threats from both inside and outside the home.

The gap that exists between entrepreneurial initiative and strategic management practises may be bridged by using strategic information. Planning strategically and managing effectively are both helpful strategies for entrepreneurs who run their own businesses. Because many business objectives cannot be accomplished without them, strategic management and intelligence are essential components of a successful entrepreneur's toolkit. In addition, the findings of the related study cannot be comprehended in their entirety without first considering the part that strategic management plays in motivating entrepreneurial endeavours. The generation of value for the company is the ultimate goal of both Chinese business strategy and management, as well as Chinese manufacturing firm.

There are four different, but interconnected phases involved in the management of knowledge. These steps include the development of knowledge, the storage and retrieval of information, the transfer of knowledge, and the application of knowledge. It is quite feasible for an organisation and the individuals working inside it to be participating in many knowledge management process chains all at once. As a consequence of this, knowledge management is not something that remains the same inside a corporation over the course of time; rather, it is something that is continuously adjusting to accommodate new conditions.

Companies that approach innovation with an open mind and are willing to try new things are more likely to be successful in cultivating this talent. As a direct result of this, there has been a rise in the quantity of internal KMC that extols the virtues of open innovation practises. This is due to the widespread consensus that increased openness and cooperation among people is one of the most important factors in the process of encouraging innovation. Therefore, maintaining an open mind may increase one's chances of gaining in skill, and it is strongly recommended that you do so. In particular, an open approach encourages the generation of information as well as integration and connectivity, all of which contribute to an open innovation process operating at a higher level of efficiency. This highlights the importance of expanding a company's scope and hints at the potential it may bring for entering unexplored sectors and getting unique insights. Additionally, this demonstrates the worth of expanding a company's scope. Working with a diverse array of partners (partners' diversity), which may result in a continuous supply of fresh ideas, may be beneficial to the organisation in terms of gaining access to new spheres of expertise and generating new ideas. At the same time, in this day and age, where the economy is based on information, the widespread use of modern information and communications technologies (ICTs) ought to at least put the businesses' openness to the test. When it comes to innovation, the most senior level of an organisation needs to be the one to first evaluate the value of digital and open ecosystems.
It is envisaged that by extending the size of KMS, more individuals would have easier access to the system, which would lead to an increase in the exploration and exploitation of underexplored

areas of knowledge. In point of fact, in the fast-paced world of today, the innovation processes that occur inside and between organisations are driven by the ability to exchange information, integrate it, and produce new knowledge. The first stage in building online communities with external partners for the purpose of information sharing and the promotion of cooperation within departments is the creation of a knowledge management system (KMS). Although the advancement of technology is very important, it is not sufficient on its own to stimulate creative endeavours. Businesses should exercise caution when selecting their partners for collaborative projects and make appropriate adjustments to the intensity of their interactions in order to maximise the likelihood that they will work together.

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