Knowledge, Intellectual Capital, and Protection: A Literature Review

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Abstract
This literature review will examine the connection between knowledge management and KM systems with organizational intellectual capital and property. Organizations are collecting, storing, and manipulating knowledge to accomplish their assigned tasks on a daily basis. Organizations can also examine this knowledge as being intellectual capital. This paper reviews the concepts of knowledge serving as intellectual capital, security and approaches toward estimating the value of the capital, and provides a perspective of the current literature. Through the analysis, common themes were identified across three categories including Cultural, Enterprise, and Information Infrastructure which contribute to the understanding of how knowledge management systems impact organizational structures. Further studies are needed to provide guidance on identifying which knowledge can be established as intellectual capital and how to estimate value of such knowledge.

1. Introduction

Data can be obtained and manipulated in a variety of ways based on the knowledge of the individual or an organization. The exponential increase in digital data [10] has impacted the methods of how data is collected and shared on a day-to-day basis. One estimate [9] indicated nearly 1,200 exabytes of new data created in 2009 as compared to 150 exabytes in 2005. The use of knowledge management systems allows an organization to manage the increased flow of data and information [40].

The uses of these systems provide organizations the opportunity to establish its knowledge as intellectual capital, property, or assets which have value. This literature review analyzes a series of articles to provide an understanding of how organizations work toward the development of knowledge as intellectual capital or property. Given the challenge of identifying and valuing knowledge as intellectual property, it is important to maintain discussions regarding this topic. While knowledge management and intellectual property have been studied as separate entities, bridging the gap between the two areas can provide relevance to organizations.

This article (1) provides a review of the extant literature involving knowledge management systems and knowledge and bridges a connection to intellectual capital, (2) discusses issues such as the identification and valuing of knowledge as intellectual capital, and (3) proposes future research agendas. The paper is structured as follows. In section 2, a review of knowledge management systems is discussed. Section 3 highlights the extant literature of intellectual capital and property. Section 4 discusses the methods of securing knowledge. In Section 5, the process used to conduct the literature review is provided following the analysis of the literature in Section 6. Implications for future research agendas are provided in Section 7 followed by conclusions in Section 8.

2. Knowledge management systems

The definition of knowledge can vary across disciplines; however, the processes involved in the discovery, capturing, sharing, and application of the knowledge will still be present. These processes of working with knowledge are not new to businesses, but with innovations within information systems, the ability to conduct these processes has provided organizations new opportunities to manage the knowledge. Whether or not an organization has intentionally implemented knowledge management processes, it is evident organizations will always work with knowledge in some form. The overall process of conducting knowledge management becomes relevant [26] due to the need to develop an understanding of how organizations handle daily
processes. The benefits associated with conducting knowledge management processes can be different for each organization and should correlate with the established goals and objectives of the business itself [23]. It is also the responsibility of each organization to assign value to its knowledge. This value can then dictate how an organization accepts knowledge as intellectual assets. Given the new aspects of how knowledge can be obtained, new knowledge will more likely be created through technological innovations rather than manual or historically traditional methods [43]. Allowing the organization to explore these aspects of knowledge processes provides opportunities for additional knowledge to be gained and improve the overall conditions [24].

As a review of the literature suggests, knowledge can be grouped into two main categories, explicit or tacit [1, 3, 19, 23] where explicit knowledge can be represented by words and numbers and tacit knowledge includes individual insights related to the habits, environment, or culture of the organization itself. While explicit knowledge has already been codified in some manner, tacit knowledge can be more difficult to convert into explicit knowledge [3]. As new technologies are implemented, organizations can obtain new opportunities for the knowledge processes to occur [27] and involve more avenues for the manipulation of knowledge [43]. Being able to effectively manipulate the knowledge will allow organizations to fulfill their established goals and objectives. The ability to capture the knowledge of employees improves the chances of reducing the time needed to train new employees [22] and allows valued knowledge to be passed on to other employees.

3. Intellectual property and capital

The process of knowledge management has also developed further discussions of knowledge serving as intellectual capital or even intellectual property for the organization. Intellectual property can be related to “items of information or knowledge” [15] which can be in the form of tangible items in multiple locations in an unlimited number. As knowledge is processed within the organization, it can take on different explicit or tacit forms. Since it is generated by the individual or organization, it also qualifies for ownership by the individual or organization [15].

Establishing knowledge as intellectual property also allows the organization to establish legitimate ownership and thus also extend property rights to the knowledge as needed based on value [27]. By establishing the ownership rights to knowledge, the organization has the opportunity to control the utilization of the knowledge and even control the value or even profit associated with the knowledge [27]. Intellectual property is generally associated with the aspects of trademarks, patents, copyrights, and licenses whereas intellectual capital is commonly associated with the physical, financial, or intangible assets. Manton [26] also indicated the need for individuals to move beyond their general ideas of what constitutes property by examining the aspects of knowledge management.

Maquire [25] indicated the need for organizations to develop further understanding of what intellectual capital can include. As part of this process, the need exists to decide on how to protect the intellectual capital identified and also review which knowledge asset should be maintained as capital. This research also indicated the awareness of intellectual capital and property issues is low among management employees in regards to knowledge since it can be harder to understand compared to other tangible assets [25]. The ability to evaluate what knowledge can be associated as intellectual capital can also be enhanced through the integration of the company’s knowledge management strategy and current intellectual property strategy [26]. By aligning these two areas, it is possible to see how knowledge can be assigned as intellectual capital.

With knowledge being generated as intellectual property for the organization, measuring the value of the property can become problematic. Adding value depends on the objectives guiding the use of the knowledge and if the knowledge is to be used as a way of establishing competitive advantage, then value can be determined based on how it is actually utilized and also how quickly it can be acquired [28]. Utilizing an integrated methodology proposed by Coelho and Vilares [6], the value of knowledge could be related to the valuing of other organizational investments. Working from research regarding other capital investment models, Coelho and Vilares reviewed the link between customer satisfaction and attitudes with quality investments. Their research focused on measuring the value of quality investments through reviewing various aspects of the investment itself such as the perceived quality of the investment, cost of acquiring investments, and customer satisfaction, and revenues per customer [6]. Another aspect is presented by Levinson [23] in which a more simple approach included looking for value at an individual level such as reducing the amount of time consumers spend with customer service representatives due to an
increase in the amount of knowledge provided to the customer representatives.

Further research by Skryme [38] presented several steps in which organizations can go through in order to establish measurements for knowledge as intellectual capital. In his studies, it was determined organizations need to first have the awareness and understanding of the knowledge within the organization and the processes involved in its creation. From this foundation, other steps such as creating a common language and developing indicators for success play an important role. However, a more important aspect for organizations to consider is to maintain communication and involvement between those individuals connected to the measurement.

The aspect of knowledge serving as intellectual property or capital creates the opportunity for ownership but it then also raises the question of who serves as the owner of the intellectual property? Since the organization itself employs individuals to complete duties and tasks, it can also be assumed the knowledge gained by the employees through these processes [27] becomes the property of the organization itself. Along with this definition of ownership being established, the processes themselves need to have ownership established since it is through these processes in which knowledge is generated. By establishing control over the knowledge itself and the processes in which knowledge is generated, the organization can justify complete ownership [27]. Skryme [38] suggests three levels of classification for intellectual capital which includes human, structural, and relationship categories.

4. Intellectual property protection

Along with the research associated with the understanding of how knowledge can be deemed intellectual capital or property, research is also needed to review how to protect this capital investment. Baldock [2], Friedman and Hoffman [13], and Roberts [34] indicated the need to promote computer forensic activities in order to help provide security and investigative techniques when intellectual capital is involved in a potential theft. This research indicated the importance of recognizing security measures for intellectual property and be aware of internal threats to the organizational knowledge. External threats also need to be identified since IT infrastructures may include third-party control [2].

The threat can come in a variety of ways and companies need to ensure policies and monitoring techniques are in place to help identify or prevent unauthorized access to the knowledge system or even the copying of knowledge data from the system directly. Companies can also help knowledge system or network security by not allowing the connection of removable storage devices such as USB memory sticks, PDAs, or even MP3 devices to the company’s computer systems [13]. Providing strong encryption techniques is also a recommended security measure which can be implemented. Baldock [2] also recommended the use of content-awareness monitoring services to review the data being accessed to ensure proper access is granted to the viewable knowledge. This content-awareness could be included within ambient intelligence systems as indicated by Snidaro and Foresti [39]. Through their research, Snidaro and Foresti presented ambient intelligence as a means of providing reasoning capabilities through the system itself to determine available services to the user, profiles of the user, activity and intentions of the user. Although these systems are difficult and challenging to implement, it this type of content-awareness which could help provide further security measures to the organization.

As indicated by the research, the knowledge generated needs to be protected from the beginning and organizations should be aware of any potential risks to knowledge theft or loss. The investigation of knowledge theft can also begin with the establishment of what-if scenarios to help guide investigations when needed [2, 34]. In a January 2009 survey conducted by the Ponemon Institute from Traverse City, Michigan, it was reported 63% of those individuals surveyed indicated their positions included access to customer data, contact lists, employee records, financial reports, software tools or other proprietary information [34]. Of these individuals who voluntarily or involuntarily left these positions, 59% admitted to the theft of information at the time of dismissal even though most of them also indicated the companies had policies against such theft. In regards to portable devices, only 15% of those surveyed indicated the companies involved performed reviews of electronic documents or scanning of those portable memory devices.

Friedman and Hoffman [13] also provided research regarding the use of mobile devices being utilized for information sharing and warned about gaps in security measures threatening the overall growth of mobile computing. Their studies indicated an increase growth in the use of mobile computing,
utilization of USB memory drives, and the storage of data onto handheld devices including cellular phones. In one case presented by Friedman and Hoffman, a scientist downloaded 22,000 documents and transferred a small portion of these documents to a portable device under control of the employer. The documents copied were estimated to have a worth of $400 million.

5. Literature review approach

The approach to the literature review included multiple searches within the Business Source Premier and Academic Search Premier databases along with the Association of Information Systems library of journal articles in which the search criteria involved keywords such as knowledge management, intellectual capital (and or property), protection, and security. Although most sources were from the past five years or less, several additional articles were pulled within a five to ten-year period. This review did not specifically eliminate a resource based on the level of analysis (individual, group, or organization) but included multiple areas for inclusion in order to provide a broader perspective. The selected articles provided information regarding the processes and structures of organizational knowledge-management systems and/or offered suggestions regarding the process of valuing knowledge for intellectual property and protecting the identified property.

6. Analysis

The majority of the articles reviewed based their research focus on either group or organizational levels with a few leaning toward the aspect of individual. Within the articles, common themes were identified based on three categories: Cultural, Enterprise, or Information Infrastructure which provided a perspective of how knowledge-management systems impact the organizational level in regards to general social aspects, enterprise-wide decision making, and information technology infrastructures. Each category supported additional subcategories.

As shown in Table 1, four subcategories were identified which pertain to the cultural aspects of knowledge and intellectual property. These aspects included topics such as the ability or willingness to provide continuous learning opportunities related to IP and KM, the ethical reasoning associated with the dealings of knowledge, the overall understanding of what is intellectual property and how it can be defined within the organization, and transparency of the knowledge between individuals and/or the organization as a whole.

<table>
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<th>Table 1. Cultural</th>
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<td>Commitment to continuous learning</td>
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<td>Ethical reasoning</td>
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<td>Understanding IP</td>
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<td>Knowledge transparency</td>
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The second category provided additional insights into the organization itself related to several subcategories. Table 2 indicates the areas identified which were related to the ownership of intellectual property, business intelligence, and management issues.

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<th>Table 2. Enterprise</th>
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<td>Accepting IP ownership</td>
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<td>Asset recovery processes</td>
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<tr>
<td>Creation of communities of practices; culture of learning</td>
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<tr>
<td>Adopting KM processes</td>
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<td>Knowledge contributions; business intelligence</td>
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<tr>
<td>Measuring IP and Knowledge value</td>
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<td>Knowledge-Management governance</td>
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<td>Patent law/regulations</td>
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The number of articles identified within the second category provided an indication of the need to make a connection between the overall management of knowledge within the organization and the ownership of intellectual property.

Table 3 provides a look at the areas which are associated with the infrastructure within the organization such as data storage, collaboration systems, security concerns, and technology-based intellectual property.

<table>
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<th>Table 3. Infrastructure</th>
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<tr>
<td>Single data repositories/storage areas</td>
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<td>Computer-supported collaboration; knowledge transfer processes</td>
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<td>Knowledge managers</td>
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<tr>
<td>Security, encryption, watermarking, forensics, content-awareness</td>
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<td>IT Intellectual Property</td>
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As shown in the three tables, multiple areas were identified within the three categories with a large number of articles providing the focus on enterprise-wide initiatives especially centered on the potential to enhance the overall management of knowledge management systems. Additional key areas focused on the need to review the processes on how to evaluate and which knowledge should be classified as intellectual property and the value of the identified knowledge. As seen within the themes identified the aspect of having knowledge throughout multiple areas does exist which verifies the importance of utilizing the knowledge to maximize the benefits within the organization.

7. Implications for IS research

Although several articles provided a foundation of knowledge-management systems and intellectual property as separate entities, the research was limited when the two subjects were combined. It was clear from the research the benefits of having knowledge-management systems implemented and the need for quality security measures to protect organizational data; however, the ability to effectively measure the intangible aspects of knowledge still needs improvement.

The research provided a trend in the growth in the amount of data being collected and the recognition among managers regarding the use of KM systems. The research also provided viewpoints of measuring the tangible capital and property within the organizations; however, further research focusing on knowledge as intangible assets would seem to be appropriate.

In addition, research which lends itself toward the three identified categories would also be appropriate for future consideration due to the importance of not only providing appropriate management of knowledge-management systems, but also providing attention to the infrastructure and social aspects.

8. Conclusions

The research does provide an indication of a trend toward establishing knowledge as intellectual property. The main issues which tend to be within the focus of the current research is establishing the processes of identifying which knowledge should be considered intellectual property, measuring the value of this intellectual property, securing, and managing the knowledge management system. The majority of the research articles reviewed was established within formal peer-reviewed journals with others coming from various industry sources. The current research does support the viewpoint of having knowledge serve as intellectual property; however, most of the reviewed articles provided limited aspects as to how to have knowledge become intellectual property due to the difficult nature of identifying intangible assets. With the ability to store vast amounts of data in digital formats, the opportunity exists to continue converting knowledge to explicit formats and identifying this knowledge as intellectual property.

10. References


[40] C. Steyn and M. Kahn, “Towards the development of a knowledge management practices survey for application in knowledge intensive organisations”, *South African


