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**INFORMATION ECOLOGY FOR EFFECTIVE KNOWLEDGE MANAGEMENT
IN 21ST CENTURY**

BY

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***Abstract:** This paper is an opinion paper design to provides a conceptual framework on information ecology for effective knowledge management in 21st century. itconsiders the creation of knowledge, and the flow of information within the society and organization. The paper hopes to encourage readers of any organizational setting on how to become accustomed to the information ecology to survive in knowledge management and competitive atmosphere. For that, based on literature review, the main elements of the information ecology in 21st century, knowledge and knowledge management, information ecology and technology, challenges of information ecology and knowledge management in 21st century and how-to bring prosperity in an organization was discussed.*

***Key words:** Information Ecology, Knowledge Management and 21st century.*

INTRODUCTION

Information Ecology is an organized information environment, and consist of the numerous interacting and interdependent social, cultural and political subsystem that shape the creation, flow and use of information in the society. The term “information ecology” is used in many areas of research that include studies of animal behavior and human psychology. The studies of human ecosystems, natural ecosystems and within the human dominion of information systems development, business processes, organizational theory, politics, and culture (Fiedler et al. 2007). Although there is not yet a core body of knowledge or theory associated with the field, it is rational to categorize two general areas where the term is applied are: Information environments within human organizations and Information environments that involvetheinteractionbetween human and natural system.

The first area focuses specifically on information technology and management with particular attention to political and cultural aspects of information use within human organizations. In this context, ecology is used as a metaphor on the rationale of processes that affect information flow and use in human organizations exhibit characteristics similar to processes observed in natural systems (Davenport,1997).

Similarly, Davenport, (1997) stated that, Information ecology includes a much richer set of tools than that employed to date by information engineers and architects. Information ecologists can mobilize not only architectural designs and IT but also information strategy, politics, behavior, support staff, and work processes to produce better information environments. They rely on the disciplines of biology, sociology, psychology, economics, political science, and business strategy to frame their approach to information use. In a similar vein, Nardi and O’Day (2000) opined that, the view of an “information community” is treated in mainstream IT/IM as a homogenous environment with definable characteristics. They offer an alternative perspective that views human information environments as more open, dynamic, and nonlinear, with characteristics that are continuously changing, and for which there can be multiple and overlapping communities. A number of ecological concepts they use to characterize human information environments include the metaphor of a keystone species to refer to specific

individuals in an organization that are deemed critical for information flow and connectivity, as well as locality, context, and habitat.

The second area to which definitions have been proposed are those that include the study of information processes in both the human domain and the natural world, with particular attention given to the role of information in the interaction between the two. In this context, Stepp (1999) describes information ecology as the study of the relationship of environmental information (at least physical, biological, social and cultural environments) to all that comprises collective and individual processes of knowing and decision making (ideology, values, expectations, beliefs, symbolism). The idea of extending the functional role of information in natural systems to the study of human systems is further supported by Eryomin (1998) who offers the following perspective: Information ecology is a science which studies the laws governing the influence of information summary on the formation and functioning of bio-systems, including that of individuals, human communities and humanity in general and on the health and psychological, physical and social well-being of the human being; and which undertakes to develop methodologies to improve the information environment. Although there are differences in perspective, it is evident from these descriptions that the intent is to use information ecology as a framework to provide a more open, dynamic, and ecological context for studying how information processes operate in both human and natural environments.

The concept of information ecology, According to Davenport and Prusak, (1997) Stated that, the information ecology is an organization's information environment and involves several interacting and interdependence social, cultural and political sub-systems that shape the creation, flows and use of information in the organization. Thus, the information ecology in the society influences what information is produced, and stored, what information is made available and to whom, and what information is required and valued in task performance. For example, advocacy forum on human trafficking is hidden information ecology within a group of experts on advocacy. However, the framework of information ecology attempts to emphasize people rather than on the hardware, software or telecommunication networks. Information ecology is organizations need to focus beyond the "machine engineering" but focus on the technologies of information. And then here, the complete information environment addresses all of the

organization values and beliefs about information culture; that implies how people actually use information and what they do with it.

Information ecology in 21st century

Thus, an organization's information ecology influence what information is produced and stored, what information is made available and to whom, and what information is required to and value in task performance. The framework of information ecology attempt to emphasized people rather than technology within networked information and communication system. The key proponent of information ecology has made an interesting case for focusing on information rather than on the hardware, software and telecommunication network.

According to Casonato, R., Lapkin,A., Beyer, M.A., Genovese, Y., and Friedman, T. (2011). Stated that, the proponents of the information ecology, in fact, have criticized the simplistic assumptions of the information processing model of organizational information systems. However, instead of a sole on technology, the information ecology puts how people create, distribute, understand and use information. It is understood that in the information ecology, humans are very important than any other elements of an organization. It means so-called technology. Therefore, based on the model of information ecology, we can identify key components of the organization's information ecology that are: information politics, information culture and information technology. So, information politics involves the power of information providers and the governance responsibilities for its management and use. Information culture comprises an organization's information behaviors and information use. However, information behaviors include encouragement of information sharing among organizations while addressing various political, emotional, and technological barriers. And then information use determines that how valuable information shares across the organizational boundaries, disclose internally and externally, and capitalize on it in their businesses. And finally, information technology is already existing information

According to Mallawaraachchi, (2011). Stated that, Ecology is a science use to analyze the relationship between members or species of a community and their interaction with the environment. Species are the basic element in ecology. A group of organisms of the same

species occupying a particular space at a particular time form a population. Several populations gather together to become a community. The community forms a specialized network and becomes an ecosystem. For instance, Staff Training and Development Centre of a university is one of a specialized network. In this network all elements, knowledge, resources, environment and technology, have equal values. Inappropriate function of one element may directly affects the entire information ecology. Thus, unable to identify the organization's information ecology may lead to collapse or unsteady development processes.

Malhotra, (2002), opined that, complete information environment, address all of a firm, value and beliefs about information culture, how people actually use information and what they do with it. The exponent of information ecology has criticized information processing model of an organization as: information is easily to store on computer as data; Modeling computer databases is the only way to master information complexity; Information must be common in the society; Technology change will improvesociety and information environment.

Instead to narrow and focus on technology, information ecology puts how people create, distribute, understand and use of information as its center to support the following beliefs. Information is not easily stored on the computer, is not data; The more complex an information model, the less useful it will be; Information can take on many meaning in the society; Technology is only one component of the information environment and often not the right way to create change. Information ecology recognized that human endowinformation with relevance purpose and acknowledge that human involvement increases as we move along the continuum of data, information and knowledge(Burgin and Zhong, 2018).

Informational Ecologiesshow how technology can acquire a human face when properly managed and integrated into a social environment where the human factor cannot be ignored. Information ecology is a system that includes people, practices, technologies and values as part of the local environment. This enable to focus on some aspects of the impact of new technologies on the media:

Accessibility: the technology allows you to transfer news and quality content using mobile applications and smartphones, the reader can reach the material much faster than with traditional means.

Use of social networks: today most of the media use active social networks such as Facebook, Twitter and Instagram.

Involvement: through social networks, traditional news sites seek feedback and connect the reader with content. Comments help to improve the service of people in the future and get more information about interesting materials;

Podcasting: the perfect way to stream audio programs, for example, using phones and computers. People listening to podcasts are easily trained to pay attention to discussions about politics, national issues, education and finances.

Streaming: a new wave - puts the person at the center of what is happening. This is achieved through funds such as YouTube Live or Facebook Live. Information is a fundamental dimension, as well as matter, energy, space and time. In recent years, many physicists believe that material physical reality, or even called "this" completely consists of information or bits. Recently, theories that describe space and time using quantum mechanics, which analyze elementary particles and substances based on information, are the most common language for describing processes. (Marinov, 2019).

Knowledge and control of the information field has recently become an important condition for structuring a communication system and providing useful information about threats to enterprises and institutions, as well as providing knowledge about potential problems and risks. The information domain includes the following main elements: the construction of a modern information system; creation of data storage and processing centers; implementation of platforms and programs of cloud resources; building an analytical architecture; software for data analysis and interpretation of information; integration and integration of individual platforms; training managers to work with information retrieval programs; education and training organization.

Knowledge and Knowledge Management

Knowledge is the capacity to act, and it's also an information that changes something or somebody either by becoming grounds for actions, or by making an individual or an institution capable of different or more effective action. So, knowledge acts an ecosystem and it indicates how its species work together to create new knowledge. To shape the knowledge, it has to be communicated effectively and efficiently at all the species of the knowledge ecosystem. Therefore, knowledge is not an individual component of the ecosystem, but it is a series of process: from data to information; intelligence to wisdom; wisdom to knowledge and then form entire information ecology (Mallawaraachchi and Xiangxin, 2011).

Statistics on population is data sets. Source sets, databases, help desks, are repositories of information. Use intelligence to create or form new knowledge based on collected data and information. In addition, data and information are not knowledge because they do not have capacity to act. Also, knowledge cannot be managed. For example, a testing taste of wine is knowledge. To use that knowledge requires a certain level of intelligence. However, having wisdom, knowledge can use through collaborative intelligence. Wisdom is an effective use of intelligence and then it tells what to pay attention to and what to communicate. In general view it is so-called knowledge management. Knowledge management is used to describe the management of information-based knowledge assets within an organization. There are many definitions of knowledge management.

Duffy (2000) defines knowledge management as a discipline that encourages a mutually supported method to create, capture, arrange and use information. While, the nature of knowledge Schultze and Leidner (2002) designate as images and knowledge views as an object, an asset, and as situated practice. In the same vein, Nonaka and Takeuchi (1995) differentiate knowledge into explicit and tacit knowledge. Explicit knowledge is factual knowledge that can be easily transferred like in documents. Tacit knowledge is intuitive knowledge that is generally gained through personal experience, like "crafting a violin, or interpreting a complex seismic printout of an oil reservoir". Recently the concept of community of practice becomes a one way of knowledge management, the community of practice itself, is a place that in acculturation, fascination, and real learning take place. In particular, the term knowledge management has been

used to illustrate how ideas are exchanged, innovation blossom, values are added to information, and new knowledge is tested and applied through accrued expertise learning and within the rich perspective of the ecosystem. Therefore, information ecology, in general, is different from knowledge management. Information ecology, in particular, does not claim to institutionalize new ideas nor knowledge itself be managed. It is seen as an organic and evolving solution that exists over time. Information ecology has been used as a framework to show how the goals and objectives of an organization can be cultivated. The ecological framework expands on traditional concepts of knowledge management and a wide range of disciplines such as organizational learning.

Information Ecology and Technology:

Information Technology is a very broader to the concept of information ecology. An existing information technology is only one section of an organization and there are very active and vast domains of information technology outside the organization. Significantly, the information ecology urges that technology is an only one component of the information environment and often not the right way to make organizational changes. Therefore, in fact, it worth knowing users of information technology, comprehend the maximum benefits. At the same time, it is vital to understand how people interpret, perceive and act on information. As you are aware people are at the center of the information ecology and any change in the ecology will affect them than other sub-systems of the organizational ecosystem. Hence, people have a profound influence on the functioning of all other inanimate elements in the information ecology. The perceptions of organizational structures and roles by people have a marked impact on the way the organizational functions (Lucas, Balley, and Mcmanus, 2012).The organizational structure to functions effectively, there must be a good planning.

Mallawaarachchi and Xiangxin, (2011) Opined that, changes in the information ecology must be planned in such a way that the perception of all stakeholders affects the performance of the system positively. However, a rapid development of information technology is a big challenge for the organization knowledge distribution and management process because if the existing systems are not elastic enough to evolve in response to the opportunities and the requirements of the external environment. For instance, often the organization strategists focus on the internal

structure of the organization to match the requirements of the market. To respond speedily to the change in market conditions, a flexible and evolving internal structure is required. Hence, a static and inflexible information systems will not help the organization sustains and it will become a stumbling block in the way of organizational excellence by limiting the potential growth. the information ecology describes the convergence of several disparate, but linked technologies such as instructional designs, multimedia technologies, computers and telecommunications technologies, content area expertise, and business and industry linkages. In circumstance, that is the interaction of the systems in the overall organization ecology, rather than depict information systems on technical architecture and engineering drawings. Therefore, this is more suitable for information engineering than the conventional methods of system architecture because it is better to understand social events both in market and technology perspectives.

Challenges of information ecology and knowledge management in 21st century

Humans influence is the biggest challenge because working with emotional responses to artificial knowledge agents obviously will become conflicts. Historically, knowledge and intelligence have been the distinguishing characteristic of human beings. Now computers are able to take over some of the routine and even the expert functions of knowledge work. In some area's computers excel over humans' capabilities. A related problem is the very natural humans' fear that computerized the information ecology come dangerously close to replacing humans in knowledge work. This conflict is an intensely emotional matter. Like other emotional issues it remains largely suppressed in organizations. Another challenge is to face the organization's the social and the institutional environments.

This stage carrying out of the information ecology is more challenging and more conflicts than humans' level. In this stage, it affects to the whole organization's functions, tasks, and performance. At the same time, it changes career prospects and earning potential of members. The organizational members require retraining due to changes in structures and systems, and also installation of new equipment.

The difficulties composite by the lack of comprehension of what the information ecology represents. In some senses, the information ecology is an extended virtual brain of the

organization. Knowledge functions and access of this ecology extends well beyond the cognitive capacity for individual humans or even departments and divisions. It represents a new form of organized complexity that many managers and workers find incomprehensible. It falls outside the collective cognitive map of the organization or society (Duffy, 2000).

From "Information as a Byproduct" to "Information as an Asset"

The 21st century, Information Capabilities Framework (ICF) has addresses three key transformations, these three transformations demand a profound modernization of current information management infrastructure and will be part of the modernization that many organizations will go through in the next five to 10 years (Casonato,etal, 2011).

1. Use Cases: Emerging information uses and major changes to existing information uses often represent the greatest new value to the enterprise and require information to be available across use cases rather than being locked into only one-use case. **The information consumptions use case are:** Analytics – Transfer- Content- Hybrid

2. The Information Capabilities Framework: This is a representation of the actions needed for the information to be used, treated, organized or developed for the general management of, and for specific purposes in an organization. Moving toward the deployment of application- enabling, information repositories and sources, as well as information infrastructure that handles many data types rather than infrastructure dedicated to data types. **The information capabilities are to:** Describe- Organize- Integrate- Share- Govern- Implement.

3. Information Sources: Leveraging the information continuum with a consistent approach to information management and governance of multiple types of information sources, and expanding information volume, velocity, variety and complexity. **Information sources are:** Social, Document, Transactional data, IT/OT, Images, Audio, Mobile, Video, Text, search engine.

The position taken by the researcher

The position taken by the researcher is based on the literature review carried out in the process of undergoing this research. The researcher concord with the idea of Casonato, R.,

Lapkin, A., Beyer, M.A., Genovese, Y., and Friedman, T. (2011). Stated the key components of the organization's information ecology that are: information politics, information culture and information technology. Information politics involves the power of information providers, responsibilities for its management and use. Information culture comprises an organization's information behaviors and information use. However, information behaviors include encouragement of information sharing among organizations while addressing various political, emotional, and technological barriers. And then information use determines that how valuable information shares across the organizational boundaries, disclose internally and externally, and capitalize on it in their businesses. And finally, information technology is already existing information.

The need for designing appropriate information ecology in an organization or society for adequate flow of information are in line with the idea of Mallawaraachchi, (2011). Stated that, several populations gather together to become a community. The community forms a specialized network and becomes an ecosystem. For instance, Staff Training and Development Centre of a university is one of a specialized network. In this network all elements, knowledge, resources, environment and technology have equal values. Inappropriate function of one element may directly affects the entire information ecology. Thus, unable to identify the organization's information ecology may lead to ineffective flow of information.

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Conclusions

This study shows that in knowledge competitive advantages, existing concepts on knowledge management has been drastically changing. Knowledge is growing organism and cannot be managed. Therefore, information ecology, knowledge, communities, organizational

resources and external environment, has potentials to encounter greatest challenges in knowledge creation, distribution, transfer, diffusion and management in 21st century. The study discusses the important mechanisms of the information ecology, knowledge management and information technologies ever-changing the social and technological phenomena. Knowledge management and information culture can encourage knowledge sharing habits while it integrating the organization culture and also it helps create a sustainable organization. Information technology is not only hardware and software aspect, but also including other technological elements that keep smooth functions of the organization.

Recommendation

It has been observed that, many organizations have been ignoring ecosystem of their organization thus unable to find potentials and sustainable functions of an organization. Therefore, the study recommends appropriate design of information ecology and knowledge management of the organization, this would enable organizational activities to run smoothly and bring about organizational development and society.

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