Clarifying Concepts Of Knowledge And Information - Literature Review

Michael Ahenkorah-Marfo, Kwame Nkrumah University of Science & Technology, Kumasi, Ghana

ABSTRACT:

This paper analyzes the concepts of information and knowledge constructively, clarifying the confusion between the two concepts in the literature. It does this by reviewing the literature available from notable authors in the knowledge management literature using arguments and counter arguments before arriving at logical conclusions. It concludes that knowledge and information are of same kind but exist separately with similarities and differences. These similarities and differences are clearly outlined.

Keywords: *Knowledge concepts, Information concepts, Knowledge management*

Introduction

Literature abounds on the concepts of knowledge and information. Some authors see information as different from knowledge while others think there is very little to pick between them, meaning they are similar. Furthermore, the two concepts are used interchangeably in the literature. This makes many people who review the literature on information and knowledge tend to confuse the two concepts. Therefore the two concepts need to be discussed clearly and their similarities and differences established.

The question to be addressed in this review is what the key concepts of knowledge and information are, how do they compare and contrast, and what specifically brings about the confusion in the two concepts? Readers, academics and even those in the information profession sometimes get confused with the literature on these two concepts. Therefore, there is the need to discuss them thoroughly.

The review is limited to the discussion of what authors, researchers, information scientists, etc. conceive to be information and knowledge, and have been put in the literature. The differences and similarities between the two concepts are discussed and conclusions drawn based largely on the available literature.

Knowledge can be generally defined as communicated information but the review goes beyond this general definition and discusses the concepts of knowledge and information clearly for easy contrast.

Some Definitions Of Knowledge And Information

The concepts of knowledge and information can be discussed starting with the basic definitions of the two terms. It is, therefore, not only appropriate but also important to look at the basic definitions provided by some notable authors in the literature in order to advance the discussion of these two concepts.

Terra and Angeloni (quoting Drucker, 2001; Probst et.al, 2002; Saint-Onge, 2002) respectively define information as:

- Organized data;
- Data endowed with relevance and purpose; and
- Interpreted data.

These definitions of information and many other ones in the literature point to the fact that information involves human participation in a purposeful organization of raw data.

Terra and Angeloni were quick to add that defining knowledge is much more complex than defining information. They were of the view that when defining knowledge it will be appropriate to refer to the root of the word knowledge, that is “epiteme” which means absolute truth. Even with this meaning, several authors differ as to what absolute truth means.

Davenport and Prusak (1998) define knowledge as a “mix of fluid experiences, values, contextual information and intuition that provides a structure to evaluate and incorporate raw experiences and information”.

All the above definitions suggest that knowledge is information that has been worked on to become more valuable. But the words like fluid, values, contextual and intuition used by Davenport and Prusak to describe knowledge also suggest that knowledge is abstract.

More Definitions From The Literature

Wiig (1999) defines information as facts and data organized to characterize a particular situation and knowledge as a set of truths and beliefs, perspectives and concepts, judgments and expectations, methodologies and know-how. This is similar to Nonaka and Takeuchi’s (1995) definition that says “Knowledge is true and justified belief”.

Thus when a person possesses processed data, also called information on a substance “A”, that person is believed to have knowledge on “A”. Knowledge can therefore, generally be defined as the possession or communication by various means

(memorizing, art, skill, etc.) of information or processed data in such a way that the processed data/information is useful.

In the library setting one can apply the data, information, knowledge concept to the local collection. The bibliographic data on a book captured and stored in a retrieval system constitute refined data. These processed data give information on the book which is on the shelf. Users comprising students, lecturers and / or researchers can rely on this information to access the book either locally or from a remote place if the personal computer in which this information resides is networked. Without this information, there is no knowledge about the book.

In summarizing the concepts of knowledge and information, Kivumbi (2011) compiled the following:

- Information is processed data whereas knowledge is information that is modeled to be useful;
- You need information to be able to get knowledge;
- Information deals with the way data is related while knowledge examines patterns within a given set of information; and
- To get information you need some cognitive and analytical ability while for knowledge you do not need cognitive ability.

Though this compilation is not coming from authorities in information or knowledge management, it clarifies the concepts of information and knowledge and gives the general non professional view of the two concepts. It is abundantly clear from the responses that the human factor cannot be waned and this is clearly explained by the knowledge pyramid.

The Knowledge Pyramid (DIKW)

The discussion of the concepts of information and knowledge in the literature may not be complete without the Data-Information-Knowledge-Wisdom hierarchy or the 'knowledge pyramid'.

According to Fricke (2009) many theoreticians in computer science, management information systems and librarianship who have contributed to the knowledge management discussion see information in terms of the data-information-knowledge-wisdom (DIKW) hierarchy or pyramid.

The DIKW is a hierarchical representation of a continuum of

Data ⟶ Information ⟶ Knowledge ⟶ Wisdom

This hierarchy or pyramid is part of the cannon of information science and management. The whole pyramid is built on the foundation of data (mostly observable and measurable entity) which when processed, that is given some meaning, becomes information. This means information is inferred from data. Information systems generate, store, retrieve and process data. The processing may be either statistical or arithmetical (Ackoff, 1989).

From this pyramid, information is seen as a product of data or as data that have been augmented or refined. Information is, therefore, seen by the proponents of DIKW as relevant data, augmented by additional items, inferred or calculated or refined from that data.

Dissenting Views

Rowley (2007) disagrees with the proponents of DIKW hierarchy. In the words of Rowley, "the hierarchy referred to variously as 'Knowledge hierarchy', 'information hierarchy' and 'knowledge pyramid' is one of the fundamental widely recognized and 'taken-for-granted' models in the information and knowledge literature". She claims it is often quoted or used implicitly in definitions of data, information and knowledge in the information and knowledge management literature. Her argument is that acquisition of data for example which according to the pyramid is a product of observation and for that matter depends largely on the technology of sensing or instrumentation can be generalized beyond automatic instruments.

Whereas the pyramid depicts the difference between data and information as structural, Rowley thinks it is functional. She argues that when data is collected from responses to questions beginning with 'who', 'what', when or 'how many', the responses can be processed into information. Here the data itself may not be of value until it is transformed into a relevant form.

Again, Fricke (2009) is of the view that the DIKW theory is essentially conservative over the nature of information. He claims that in this modern world if the theory is still upheld then submicroscopic particles like atoms, or electromagnetic waves well outside the visible range, like radio transmission cannot be information. This is because they are not within the range of observable data; neither can they be created by inference from observable data. Fricke further claims that the intellectual backdrop of the DIKW hierarchy is positivism and operationalism, which are now thoroughly discredited. He also intimates that DIKW is fraught with universal statements or statistical generalizations.

Shannon (1993) has a different view which does not necessarily identify with the DIKW. To Shannon, "The word information has been given different meanings by various writers in the general field of information theory". While he believes it is likely that at least a number of these will prove sufficiently useful in certain applications to deserve further study and permanent recognition, he is of the view that it is difficult to expect that a single concept of information would satisfactorily account for the numerous possible applications of this general field.

This review sees none of Rowley (2007), Fricke (2009) or Shannon's (1993) view as the absolute truth. Though it agrees partially with the proponents of DIKW that information is a product of data (information is a subset of data), it argues that not all

information is derived from refined data. For example, the statement “Accra is the capital of Ghana” is information but is not built on any data.

This reviewer, therefore, shares in the view that knowledge can also be either ‘know how’ or ‘know that’. This is explained by the following scenario. A village boy living at Abodom in the Ashanti Region of Ghana who possesses the ‘know how’ or the skill to weave a basket from raffia does not depend on a collection of data that have been augmented to weave the basket. In much the same way, a traditional birth attendant from this remote part of the world who is able to deliver a pregnant woman of a baby does not rely on any data and subsequently knowledge from any refined data. It is possible though that they might have learnt these through apprenticeship or by observation. Obviously, however, both acquired their knowledge by intuition or skill. This brings in another characteristic that is also related to knowledge, which is intelligence. When skill is applied to “know how” it yields intelligence, which is a little more developed than knowledge. Unfortunately, intelligence is conspicuously missing in the knowledge pyramid.

The Confusion

A lack of agreed definition of “information” leads to a considerable confusion about the relationship between the concepts of “information” and “knowledge” (Nitecki, 1985). He, however, attempts to define knowledge as something that is true, intuitive or inferred from either logically or empirically established relations. To him, the intuitive approach assumes the existence of knowledge independently of the human mind, and this rational approach implies that knowledge is a system of relations as they are perceived by an individual.

In the argument of Nitecki (1985), the contextual definition of knowledge is prescriptive, addressing the most effective use of empirical experience. It gives room for the earlier suggested “know-how” in this review and also to Ryle’s (1949) “knows how-to do things effectively”. He concludes that, in all cases, knowledge is abstract, an idea, which is open-ended constantly changing in terms of newly, acquired understanding of relations among different aspects of reality.

Goffman (1970), discouraged by a variety of usages of the term information, suggested that the focus of the studies should not be on information itself, but rather on information related phenomena. He goes on further to state that a discussion of relationship between information and knowledge is further complicated by a similar lack of agreement on the definition of knowledge. He intimates that for many people, knowledge simply means a true belief, while others consider it as an all-inclusive term of being aware of the world around us, thus leading to a circular definition of knowledge as that which is known.

This reviewer is of the opinion that it will be too simplistic to consider knowledge as true belief. This is based on the possibility that, if the knowledge pyramid is anything to go by, data from which information is born can be wrongly observed or captured. Subsequently, knowledge emanating from such data may not necessarily be true. He rather agrees with Goffman (1970) that discussion of the relationship between information and knowledge should focus on information related phenomena like skill, intuition, etc., and the human factor should not be downplayed.

Terra and Angeloni (n.d) corroborate the human factor by adding that there are some differences between knowledge and information and the key difference in information and knowledge is summed up in the human factor, that is, the role played by human beings. Individuals play various roles in knowledge as creators, carriers, conveyors and users. Again because of the human factor involved, culture, tradition, religion, etc. can also influence knowledge. On the other hand the various roles can be performed without direct human influence in the case of information.

Differences Between Knowledge And Information

Contributions to Kivumbi’s (2011) compilation “what is the difference between knowledge and information?” are revisited in the following:

- Knowledge is familiarity with facts, which you may have learned through study, observation or personal experience;
- Information is the communication of knowledge or intelligence or knowledge obtained from investigation, study or instruction;
- Knowledge makes one accountable. Information makes knowledge available;
- Knowledge you retain, information you share,
- Information can be either true or untrue, and is abstract. Knowledge is belief that it is true, justified, and relies on no false premises;
- Information is what you get from different sources and later turned into knowledge;
- Humans can achieve knowledge (so we think), but computers only have information;
- Knowledge is what you have investigated and information is knowledge that is communicated;
- Knowledge is in your head and information can be anywhere;
- Information is usually unintegrated and processed data. Knowledge is information which has been integrated into an existing body of information/data. The next step up is wisdom, which is information applied with reason, logic, insight and love;
- Information becomes knowledge when it gets to your brain;

- Knowledge is the condition of knowing something with familiarity and information is the communication or reception of knowledge; and

- Information is neutral, knowledge is contextual.

The above contributions, varied and independent as they may be, clarify the differences between information and knowledge to a considerable extent. What is evident from these is that the two concepts are closely related. Out of data information is generated, when information is received or communicated, it is retained as knowledge, and knowledge when logically or reasonably used is regarded as wisdom.

It must, however, be noted that current technological advancement ridicules some of the ideas that were expressed in the various answers provided by these individuals. Today's view about knowledge is changing. Rather knowledge is created in a situation, and is never again used in exactly the same way. For example, a dancer on stage; there is no symbolic knowledge about the dance stored in the brain of the dancer. It is created while dancing, listening to the music, feeling the music and the audience.

Differences Between Knowledge And Information By Way Of Management

The differences between knowledge and information can also be clarified in the way they are managed, that is the differences between Information Management (IM) and Knowledge Management (KM).

Terra and Angeloni (n.d) again identify five different dimensions in which IM and KM differ. These are:

- IM and KM projects: different scopes, approaches and measurement systems;

- Organizational learning and KM;

- Interplay between information and knowledge;

- Broad concepts of KM; and

- Protecting Intellectual Capital: IM and KM perspectives.

From management perspective, the two authors think the key difference between information and knowledge is that information is much more easily identified, organized and distributed. Knowledge on the other hand, cannot really be managed because it resides in one's mind. Thus, knowledge management basically is about creating the right conditions for individuals to learn and apply their knowledge to the benefit of an enterprise and the application of one's knowledge can be translated into relevant information that is shared and used.

Terra and Angeloni (n.d) think that the spiral of knowledge "proposed by Nonaka and Takeuchi (1995) falls short of explaining the difference between information and knowledge. In their opinion this famous proposition uses the term "explicit knowledge" almost as a synonym for the word information and the interchange more or less has made many practitioners identify Information Management as Knowledge Management. They, however, agree subtly with Nonaka and Takeuchi (1995) that knowledge is turned into information (documents, best-practices, databases, etc.), that is a transformation occurs. Thus information is not the same as knowledge (outside an individual's head).

Terra and Angeloni (1995) stated further that one of the most telling differences between IM and KM projects is related to the measurement of results of such initiatives. Whiles IM follows a long tradition of information technology projects that tend to associate results with quantitative and some intangible results, KM projects on the other hand, rely heavily on the willingness of individuals to modify their behavior and share, codify and use information and their own personal knowledge to the benefit of the organization.

Badii and Sharif (2003) share in the opinion of Terra and Angeloni (1995) that knowledge is not managed but information can be managed. Hence, they find the discussion of knowledge management untenable. They see "knowledge management" as a "problematic choice of terminology" except when knowledge is limited to a very narrow definition. They rather prefer to have and discuss knowledge integration in an enterprise. According to Badii and Sharif (2003) knowledge is created out of reflection and is subject to inborn qualities of the individual who possesses knowledge. It is, therefore, inappropriate to seek one generalized approach to manage knowledge. Knowledge, they think, should be integrated into an enterprise and integration means exchanging, sharing, evolving, refining and making knowledge readily available when it is needed. Information, on the other hand, can be managed using effective logistics like computers so that the right information will be available for the right purpose, at the right time and at the right place.

Von Krogh et al (2000) put forward an interesting perspective that distinguishes KM from IM. According to their view, one can only prepare and affect the knowledge creation process through many managerial actions and decisions. Thus KM, unlike IM is about supporting a humanistic perspective of work.

Despres and Chauvel (2000), after reviewing KM schemes from leading authors such as Nonaka and Takeuchi, Wiig, Earl, etc. showed that most KM models and not IM include both a structural and a perspective aspect.

There are also very important differences between information and knowledge management when it comes to strategies for protecting valuable intellectual capital. The IM perspective leads to putting too much emphasis on security. The KM perspective believes in developing and mentoring people, fostering teamwork thereby reducing the potential of losing knowledge by the departure of an individual. These differences notwithstanding, there are some similarities between knowledge and information. Some of these are discussed below.

Similarities Between Knowledge And Information

In the various definitions reviewed, it can be generally accepted that there exists an essential relationship between the two concepts. For example, information has been found to emerge from raw data and knowledge has been found to emerge from organized data. Thus "knowledge" and "information" both have data as an essential component.

Nitecki (1985) explained the two concepts by statements such as "information is knowledge of facts" [and] "knowledge is information processed with a point of view through representation, and that information is a representation, a coded fact that can be stored, retrieved, and transferred". From the foregoing argument information and knowledge are considered to be of same kind, with knowledge being considered more developed form of information. If this argument is upheld then it follows that both information and knowledge can be identified by observation; can be stored, retrieved and processed. Therefore, information and knowledge are similar.

Otten (1974) joins the discussion with a new but similar concept of information-knowledge process in which he sees the two as separate but similar entities. His new dimension is a whole new discipline called "epistemo-dynamics". This discipline is similar to the DIKW hierarchy. It outlines the processes involved in the acquisition of information; its transformation into knowledge, assimilation of knowledge into a more general understanding, and finally, a fusion of understanding into wisdom.

Vinken (1982) is also of the view that the information-knowledge continuity starts with information generating knowledge, while knowledge in turn generates information on a higher level. According to him, new information replaces or supersedes old knowledge. Bretz's (1997) view of information is similar to that of Vinken (1982). According to Bretz (1997), information enters one's own knowledge, "where it is combined with existing knowledge acquired from experience or earlier training".

The above theories point to the fact that information becomes a part of the human mind by a continuous interrelation of data identified and acquired empirically, described experimentally, and explained philosophically, each emphasizing different aspects of the information-knowledge process.

In all the discussion of knowledge management three key elements appear to be the main building blocks of the IM-KM interrelationship. These elements, also rightly observed by Boder (2006) are "creation", "organization" and "sharing" of information/knowledge. This paper is of the view that when information is communicated from a person "A" to another person "B", the information resides in person "B" as knowledge. But further knowledge can be created out of this knowledge through natural qualities like skill and intuition. In most cases the new knowledge supersedes the old one. The interesting aspect is that this same knowledge which resides in person "B" can be shared with or communicated to a third person "C" as information and eventually becomes knowledge in the head of person "C". So information can be communicated as knowledge and knowledge can also be shared as information, making the two similar.

Conclusion

A review of the literature reveals that knowledge and information are developed in a continuum. They both have very much to share in common; however, there are also differences between the two concepts.

These differences and similarities are largely based on the following:

- basis of information and knowledge;
- the human factor involved;
- processes involved in the handling of either information or knowledge;
- nature of finished product; and
- management aspect of information and knowledge.

Many authors largely buy the DIKW hierarchy as a clear concept of the development from data to wisdom, the middle of which information and knowledge belong. Based on this hierarchy, knowledge is simply a product of information. However, it is arguably clear that in this current technological age, not all information and for that matter, knowledge is derived from data. Therefore the relationship between information and knowledge cannot and should not be limited to the knowledge hierarchy or pyramid. This is where it is appropriate to agree with Davenport and Prusak (1998) that knowledge is a "mix of fluid experiences, values, contextual information and intuition that provides a structure to evaluate and incorporate raw experiences and information". Their concept takes care of other concepts of information and knowledge that do not derive from only data, for example information to knowledge developed through intuition and skill. Again most of the literature available accepts the developmental continuum and the interrelationship between information and knowledge. By this process information can be transformed into knowledge and knowledge can be communicated as information. Another area we can see the relationship between information and knowledge is the way the two are managed in an enterprise.

The key differences and similarities between the two concepts may be summarized as follows:

Differences ---

Information	**Knowledge**
(i) Can be true or false	Factual or true
(ii) Familiarity with facts	Communication of facts

(iii) Obtained through communication or sharing	Obtained through study, investigation, personal experience and sharing
(iv) Human factor can be left out	Human factor cannot be done away with
(v) Neutral	Contextual
(vi) Can be anywhere	Resides in the brain or mind
(vii) Easily managed, i.e., identified, organized and distributed	Cannot be managed, it is integrated

Similarities ---

- Knowledge and information both basically have data as an essential component.
- Both knowledge and information can be identified by observation, stored, retrieved and processed further.
- Information can be processed into knowledge; knowledge can be communicated as information.

It must be noted that knowledge and information are of same kind with knowledge considered a bit more developed. Both of them are mostly born out of close continuous interrelation of data. This continuous relationship makes it difficult sometimes to differentiate one from the other. There are other aspects of the interrelationship that are not based on data but on natural factors such as skill and intuition. More of such new aspects are being discovered (with technological advancement) that dispute what has already been put in the literature. This accounts for the confusion of the two concepts in the literature.

It must finally be noted that there is an important distinction between knowledge and information. The two resources are different and the approaches to managing them are quite distinct. Understanding the different characteristics of these two resources enable the appropriate management approaches to be applied. Knowledge is ever changing and is multifaceted, while information is something fixed. In other words, information is the stock of the existing known, while knowledge is the flow of the new and ever expanding areas of the known. (UNISA, 2011)

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Contact the Author:

Michael Ahenkorah-Marfo, Senior Assistant Librarian, Kwame Nkrumah University of Science & Technology, Kumasi, Private Mail Bag, KNUST, Kumasi, Ghana. Email: mahenko@yahoo.com; Tel: +233266846782
