

Towards a wisdom based innovative community: action and decision making in DIKW hierarchy in Indonesian higher education institutions case study.

F Suprata¹ and S P D Kristiana²

¹ Innovation System Laboratory, Department of Industrial Engineering, Atma Jaya Catholic University of Indonesia, South Tangerang, Indonesia

² Production System Laboratory, Department of Industrial Engineering, Atma Jaya Catholic University of Indonesia, South Tangerang, Indonesia

ferdian.suprata@atmajaya.ac.id and stefani.primadyas@atmajaya.ac.id

Abstract. Higher education institutions are characterized with knowledge intensive institutions, consequently the knowledge itself is becoming the primary assets of higher education institutions. This study is based on exploratory research, which focuses and provides insights into a wisdom based innovative community: action and decision making in data-information-knowledge-wisdom (DIKW) in Indonesian higher education institutions case study. A literature study is performed to gather all relevant information. Further, data and information from previous study at Living Labs Indonesia and the Netherlands (LLs RI – NL) during year 2013 until 2015 are used as inputs and knowledge for the rest of the study. The findings show that although DIKW hierarchy is widely recognized in Indonesian higher education institutions, but it has lack of implementation and clarity definition of DIKW. As a result, Indonesian higher education institutions have applied the DIKW hierarchy in reverse mode towards other direction moving away from wisdom leads to a “wrong” decision or action. In the lights of common knowledge management practices literature review, the implication and recommendation of this study will contribute to a wisdom based innovative community in Indonesian higher education institutions context.

Keywords: DIKW Hierarchy, Innovation, Knowledge Management, Information Management, Indonesian Higher Education Institutions

1. Introduction

In today global challenges, the world economy moves fast as knowledge is becoming essential asset and central sources of present (and future) human wealth. Rapid technology development makes the organization innovation and transformation process even faster. Existing information technology, bio technology, and other innovations lead to remarkable changes in the way we live and work. As knowledge becomes essential, so does higher education. Countries need to have a standard of higher education which can educate more of their young generation to a higher standard. So that after graduation, students are able to meet the qualifications required by the industry for both hard and soft skills in applying skill jobs. The quality of knowledge generated within higher education institutions is thus becoming increasingly vital to the national competitiveness.

The knowledge management can be defined as “*The process of systematic organizing and managing knowledge processes, such as identifying knowledge gaps, acquiring and developing knowledge, storing, distributing, and sharing knowledge, and applying knowledge.*” [1]. Analogies as the flow of a river, on one side managing knowledge can be seen as developing the dams that control, direct and filter the course of a river. On the other side facilitating the knowledge is more likely to make sure that existing river banks are not overloaded and may cause dangerous to the main course of river. In other word, the overload water should be assisted to better purposes such as watering houseplants and landscaping created by skilled farmer. The term of knowledge management that we use in this study is the concept of facilitating knowledge in order to achieve competitive advantages beyond only having excellent data or information storage, and retrieval to embrace retrieval, creation, capture, use and reuse of knowledge and information. In daily education activities, facilitating the knowledge occurs undoubtedly during teaching and learning experience between lecturer and student. Henard & Leprince-Ringuet [2] in 2008 argued that learning experience should develop and produce unique and memorable educational experiences. In this case, lecturers should be able to facilitate their students by knowing that to teach, how to teach, and how to improve [3]. Yair [4] stressed that lecturers for a certain range of academic freedom should allow to innovate. “*Growing standardization may hamper individuality and readymade curricula may inhibit initiative and creativity*” [4]. However, in Indonesia most of teaching style is in favour into “managing” the knowledge and this style is typically characterized with teacher-centred and fairly rigid or even authoritarian [5]. Consequently, the old-teaching style should thus be transformed into an innovative student-centre learning style which is more into “Facilitate” the knowledge with interactive methods, teacher feedback mechanism, up-to-date practices and knowledge.

Based on prior study at the Living Labs Indonesia – the Netherlands (LLs RI-NL), it was clear that there was a need to transform Indonesian higher education institution into a wisdom based innovative community [6]. The desire to explore this aspect of DIKW hierarchy is based on the wide gap between higher education institutions in developed countries e.g. European higher education institutions with Indonesian higher education institution that the authors experience here. Further, the implementation of DIKW hierarchy in decision making in Indonesian higher education institutions was not commonly used especially the emphasize of wisdom as the top of the hierarchy in decision making and the important of developing an innovative community. Therefore, this study will answer to the following research questions:

- What are the challenges in Indonesian higher education institutions?
- What is DIKW Hierarchy?
- How can we develop a wisdom based innovative community?

2. Methods

This study uses literature reviews such as academic papers, journals reports and textbooks as the most secondary resources. Theoretically, this paper is designed to discuss a DIKW hierarchy and to reflect the relationship among data, information, knowledge and wisdom in decision making process by comparing several literatures. However, this study will not examine in details academic programs or curriculums, and other supporting educational factors such as fees, tools and facilities to implement knowledge management practices in higher education institution. Also this study will not discuss about psychological and neurology view in relation to wisdom.

The primary data collections, information and inputs of this study are coming from previous study at the LLs RI-NL 2013 until 2015. The LLs RI – NL is a bilateral triple helix (government, enterprises, and knowledge institutes) initiative that connects enterprises and government with higher education institutions from both countries through the exchange students, lecturers, and researchers who apply their specialized expertise in specific sectors e.g. Logistics and Water to real-life research challenges. During 2013 until 2015, 16 (Sixteen) higher education institutions from Indonesia were participated in Living Labs with various activities to solve the real-life research challenges.

2.1. Limitation and further research

A few limitation of this study should also be stressed. First, it was related to the validity on the implementation of the DIKW methods in Indonesian higher education institutions. Through the research process, it was founded that the DIKW had a significant influence on the success towards a wisdom based innovative community. Therefore, it is recommended for future study to explore more details on this part of study. Second, this study had some limitations with regards to the selection of Indonesian higher education institutions. As a consequences, more Indonesian higher education institutions are needed to be explored in the future study. Moreover, although this study used reliable inputs from LLs RI-NL organizations, the respondents and data sources can be subjected to a natural bias in their views about Indonesian higher education institutions.

3. Result and Discussion

3.1. The challenges related to a wisdom based community in higher education institutions

In the present global competition, higher education institution faces the challenges of how to best manage its both codified and tacit knowledge assets as well as to be more applied knowledge to generate values for the marketplace and obtaining competitive advantages. Common knowledge management literature categorized the knowledge itself as tacit and codified knowledge. **Tacit knowledge** is inherited in individuals and depends on personal experiences, institutions, insights, and personal judgment, it is difficult to capture. While the **codified** or **explicit knowledge** may be easier to be extracted, shared and used. In much cases, tacit knowledge is seen as a strategic asset for competitive and sustainable higher education institutions [7]. In the United States and Europe Countries estimated the knowledge, skills, and resourcefulness of people are at least three times more important than physical capital [8]. While in a century ago, this would not have been the case. Various studies in knowledge management literatures recommended that human capital and capacity building are becoming a primary focus on countries which are more into “*knowledge society and economy*” [5].

Since education is vital prospects for emerging country like Indonesia, higher education institution will certainly play an important role for the basic creation of fundamental values to properly contribute to the “*knowledge society and economy*”. Consequently, higher education institution is challenged:

- To become a place where its own communities including students, lecturer, and administrators interact appropriately to create, safeguard, and transmit knowledge;
- To restore the medieval values include the search for truth, unity of knowledge, openness to the unknown and to other cultures;
- To develop core competencies, research ethics, and freedom towards a wisdom based innovative community for a wide and wise use of knowledge;
- And to improve triple-helix initiative that is driven by higher education institution. The triple-helix connects companies and governments with higher education institution through students, lectures, and researchers who apply their specialized expertise in a specific sector for real-life challenges.

Prior study done by LLs RI-NL [6] in 2015 showed that major challenges were highly related to the availability of skilled human resources in Indonesia. Indonesian higher education institutions were not be able to find solutions to the local challenge e.g. water challenges. “*The problem is that we cannot find sanitation engineering graduates. The social dimension is also important because the project has to be adopted by the local governments nationwide in Indonesia. We need people to use the theoretical background into the practical.*” Government Representatives LLs RI-NL, Jakarta 2015. On the quality of some Indonesian young professionals, Indonesian students are not able to apply their theoretical knowledge into their working situation, lack of knowledge in integrated approach, and lack of focus on result or solution. “*They have theoretical knowledge but it cannot be applied in the actual working conditions. And generally the companies in Indonesia will not count on students for an important*

research since credibility of sound results is not assured” Company Representatives LRs RI – NL, Jakarta 2015. Based on the given challenges, the Indonesian higher education institutions are needed to be transformed through innovations and best practices. Hence, Indonesian higher education institutions can add value by addressing solutions to social, economic, and environmental challenges.

3.2. What is DIKW hierarchy?

As it was introduced by R.L. Ackoff [9] in 1989, there are many other views and opinions about DIKW and its properties. However there is a basic principle and sufficient similarities in a view for each definitions to be used as a fundamental concept of DIKW and how does it work? It is commonly accepted that data is being used as a foundation of the DIKW hierarchy.

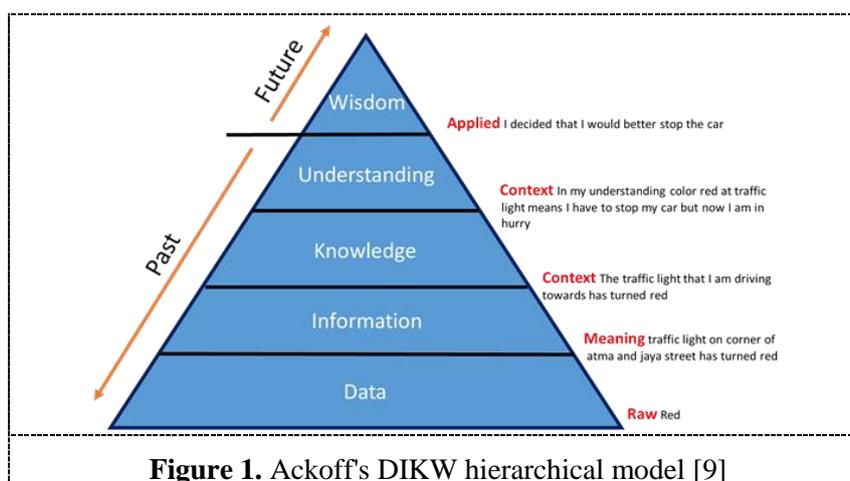


Figure 1. Ackoff's DIKW hierarchical model [9]

Ackoff's hierarchical model consists of five components including wisdom at the top level, understanding, knowledge, information, and data at the lowest level. Supposed that all components have properties that can be observed: data is defined as symbols or signs, representing stimuli or signals. It is raw and has no meaning beyond its existence. Examples of data are including red, green, blue, prime number, binary number, 11111000, 3, 200, @, #, H₂O. The data can be retrieved beyond automatic instruments e.g. a prospective students have to fill in a form of registration including their full name, address, age, telephone number, email address, and national identity number. All of inputs are becoming data once it is filled. Information conceived of as data that are endowed with relevant, meaning and purpose. By answering the “who”, “what”, “where”, “when”, and “how many” the data is processed into an answer to an enquiry. When this process occurs, the form of information is presented. Data itself has no value until it is transformed into a relevant form. As a result, the different between data and information is functional rather than structural. Information can be calculated from the data. An example of this, question of “what is the average final score of calculus students?” The answer may not be directed immediately available but it needs some calculation for the average scores from the individual calculus students score data. The processing of data to produce information often reduces the data since only some of the data is relevant. According to Ackoff [9], “*information systems generate, store, retrieve, and process data. In many cases their processing is statistical or arithmetical. In either case, information is inferred from data.*” Information is thus a subset of the data or a subset of the data augmented by additional items refined or calculated from the subset.

When the data is used to answer “how” question, it is defined as knowledge. Knowledge is thus a fluid mix of framed experience, values, contextual information, expert insight and grounded intuition that provides an environment and framework for evaluating and incorporating new experiences and information. Traditionally philosophers define knowledge is just a collection of “know-that”. For example, Administrator A might know that Mr. B is the expert in economic foundation class and know that Room 9 in Level 7 is equipped with a teleconference and high-speed Wi-Fi. Moreover, with a

different concept of knowledge, Administrator A might know how to create a financial report for Engineering Faculty Graduation Day event. The latter one is defined as a knowledge, it is skill and know-how. Therefore, the know-how should allow a person to promote information to a controlling role and to transform information into instructions. Next, the “why” question related to knowledge creates understanding. For example, a student can answer his/her self to answer why he/she would like to have 8 grade in his/her final score of calculus class. In some other literatures, the Know-Why is categorized as wisdom. Higher education institutions commonly indicates explicit or codified knowledge such as strategies, methodologies, processes, patents, products, and services. Whereas the tacit knowledge are embedded in the human mind such as skills and competencies, experiences, relationships, individual beliefs, values, and ideas [10]. In order to make decisions and to do actions, a person needs to integrate the information and knowledge flows into a unified system of transformations [11]. Zeleny’s covered the interaction between information and knowledge is continually repeated in a circular organization of knowledge production. The knowledge improvement cycle is illustrated to the following:

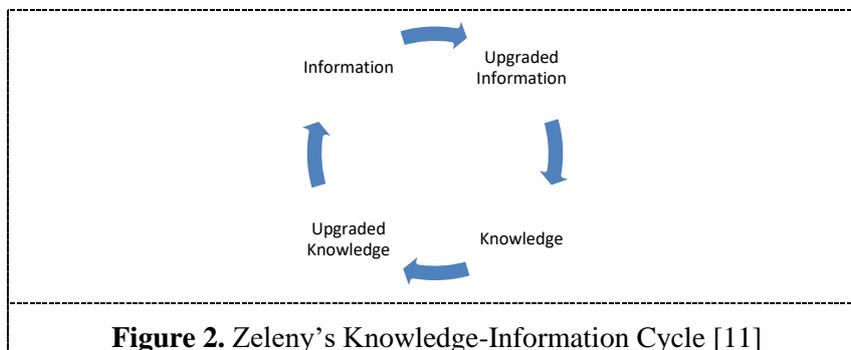


Figure 2. Zeleny’s Knowledge-Information Cycle [11]

3.3. *Toward a wisdom based innovative community*

Wisdom is the future [12]. In the following the flow of DIKW is illustrated.

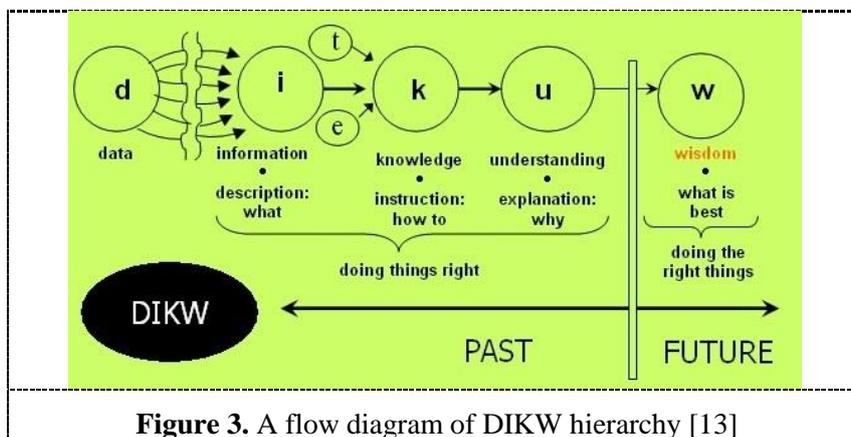


Figure 3. A flow diagram of DIKW hierarchy [13]

From above figure it is illustrated that the DIKW flow starts from data (d) transform into information (i). Further, information (i) + tacit (t) + explicit (e) into knowledge (k). Next, knowledge (k) into understanding (u). And finally understanding (u) into wisdom (w). Nowadays, the decision making and actions will be transformed from doing things right into doing the right things. Zeleny [12] and Ackoff [9] emphasized that wisdom is in the top level of hierarchy. Despite its highest position, an observation in many information and knowledge management books resulted that only three of the books tries to define wisdom. In prior explanation, Ackhoff defined wisdom as evaluated knowledge. Wisdom is a process that makes use of knowledge to answer “difficult” questions while considering human factors such as moral and ethical codes. This means that wisdom requires knowledge and reasoning mechanisms that are able to handle additional constraints such as ethical codes.

In earlier tradition, wisdom was defined as an effort to reveal the mysteries of the natural world and the life in it. Dating back from the belief that absolute wisdom is only a property to (the) God(s), philosophers believe that wisdom was developed according to the epistemic humility and epistemic accuracy theories [12]. These two theories emphasized a wise person means that he/she is capable to acknowledge his/her limits. Wisdom in philosophy also stresses that wisdom may also include the important of factual knowledge and a person can be wise if he/she will actually implement his/her knowledge of a good life. Moreover, Sytse Strijbos [14] offers wisdom as the basic fundamental to every human action that is not purely based on instincts and reflexes. Hence, “Wisdom implies: [14] Correct insight into the situation:

1. Correct insight into what need needs to be done;
2. Appropriate action.

This study will define wisdom as a human action that is based on proper knowledge and capabilities to creatively create soundness decisions or actions while considering human factors such as moral and ethical codes.

3.4. Innovative community in higher education institutions

Given the challenges described in previous chapter, an innovative community should be developed. This innovative community will be developed sustainably when a source of innovation does not solely come from one or two individuals [1]. It should involve organization capability to stimulate, encourage, develop, and productively combine inherent innovative qualities of its people to create sustainable competitive advantages in each arena of higher education institution operation.

Innovation is thus about people and it is typically a human activity, natural, proactive, innate, and non-linear. Innovation should be developed in communities so that it can have a better outcome. In many cases innovative communities in higher education institutions will able to bring in new approaches, methods, and ideas to improve their environment, and initiate changes through human intelligence, especially of imaginative thought or artistic ability. Hence, typically innovative community in higher education institutions focuses on knowledge, education, information exchange, and networking to reach sustainable communities [15].

Intrinsic motivation from each individual at higher education institutions is seen as a trigger to develop to innovative community [16]. Through planned behaviour theory and self-determination theory, Gagne insisted that intrinsically motivated people can share knowledge for an expression of themselves and for their passion to work. Hence, human resources management practices may create a proper job design, performance appraisal, compensation systems, managerial styles and training, some basic psychological needs including autonomy, competence, and relatedness should be met in a norm of sharing organization settings [16]. Hargraves [17] suggests to higher education institution to promote a high investment, high capacity educational system in which highly skilled teachers are able to generate creativity and ingenuity among its students. By doing this, the learning experience between teacher and students will reach far beyond the technical tasks of producing acceptable test results, to pursuing teaching as a life shaping and world changing social mission.

Innovative community in higher education institutions requires some changes in each operational processes. Students, Lecturers and Administrators should be able to interact properly in the daily educational activities. Higher education institution should be able to facilitate the knowledge so as to train and to educate students effectively. Kidwell et al. [10] emphasizes if the knowledge sharing occurs within internal institution, it will leverage knowledge to spur innovation and achieve operational excellence. Another study by Norris et al. [18] stressed that several universities and colleges need to use their knowledge assets to differentiate with other institutions. Higher education institution should focus

on Research and Development (R&D). R&D is the key essential for spurring innovation since it may hold, share, and create knowledge for achieving competitive sustainable. Here the DIKW hierarchy will become the primary elements to produce new products and services.

Innovative culture is thus needed to restore the real value of education to search for truth, unity of knowledge, openness to the unknown and to other cultures. Using the “truth” data, “proper” information for providing sustainable improvement and efficiency are necessary in each processes of decision making toward action to others. Technologies or telecommunication tools such as internet, search engines, portals, data storage management (database, document management systems), expert systems and decision support systems are created to help on identifying knowledge gaps, acquiring and developing knowledge, storing, distributing, and sharing knowledge, and applying knowledge. Norris et al. [18] discussed the important of e-knowledge in creating a knowledge economy based on creating, distributing, and adding value to knowledge. Even the knowledge can be shared through e-mailed best practices memos or even sticky notes on a cubicle wall [10].

Generally standardize tests in education fail to capture higher order of learning objectives such as application, analysis, synthesis, and evaluation. Mitri [19] recommended educators to utilize some technologies such as semantic networks, frame representations, and rule-based techniques for assessing performance especially where intuition, judgement and feeling are needed for the assessment. Therefore, teaching and learning process should also embed unstructured knowledge assessments (written in paragraphs or text) in which the relationship between individual objects and concept are described.

Effective knowledge management would be essential in higher education institution as it is in the corporate sector. Each decision making and actions should be based on DIKW model so that it can lead to a better decision making capabilities, reduce “product” development cycle time e.g. curriculum development and research, improved academic and administrative services, and reduce cost. And importantly Wisdom should be stressed to the transformation among data to Information and Knowledge. The ability to manage this entire knowledge management will deliver competitive advantage to the institutions [10] as well as to develop core competencies, research ethics, and freedom toward a wisdom based innovative community for a wide and wise use of knowledge.

A strong professional learning innovative community is thus a social process for turning information into knowledge in which both wisdom and data have an influence to the result of each decision making and actions. The decisions and actions will be made with the help of digital dashboards which normally include all critical information, integrated information from a variety of sources, and use all relevant knowledge. So that, one may expect it will result in “proper” actions and decision making. And last but not least, this innovative community may bring together DIKW, skills, personalities of each institution stakeholders including students, teachers, and administrators across institutions to promote share learning and improvement. It is a piece of social ingenuity based on the Fullan’s principle “*new ideas, knowledge creation, inquiry and sharing are essential to solving learning problems in a rapidly changing society*” [20].

4. Conclusion and Recommendation

In recent fast growing and competitive environment, many higher education institutions are challenged to develop knowledge and to effectively utilize its knowledge assets to achieve competitive advantages. As the knowledge becomes increasing valuable, the process on from data to information to knowledge to wisdom is thus prominent issue for making change and improvement of the institutions. However, although DIKW is widely discussed in information management, knowledge management, and librarian literatures, the wisdom which is actually essential to make decisions and actions, is not commonly stressed. In many cases higher educational institutions are not capable in utilizing knowledge in general knowledge management. In the lights of the information management and knowledge management

literature, the following recommendation are made for developing a wisdom based innovative community in decision making at higher education institution in Indonesia:

- Facilitate the sharing of tacit knowledge throughout the institutions. In each educational process opportunities to discuss among lecturers, students, and administrators should be encouraged. By implementation a triple-helix collaboration, higher education institutions may transfer the knowledge into broaden audiences including companies and governments;
- Higher education Institution should create Innovative culture to support innovative teaching - learning and improvement. Leadership should be placed in the current community to facilitate a new institutional culture which welcomes learning and experiencing. Here, cooperation and collaboration among internal stakeholders should be established;
- Decision making or actions should be based on proper DIKW. Each institutional members should be able to understand the process of data to information to knowledge to wisdom. And each members should be able to understand the consequences of each decision made;
- Knowledge should be captured, enhanced, strengthen, shared and transferred through formal and informal meetings, excursions, exhibitions, panels, storytelling, joint problem solving, reflective evaluation;
- Technologies and telecommunication infrastructure (internet, portal) should become appropriate for helping effective facilitating knowledge. The technologies should be provided and effective us of it e.g. virtual conferences.

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