



## Centre for Air Power Studies (CAPS)

Forum for National Security Studies (FNSS)

# MASTERING INFORMATION, KNOWLEDGE AND WISDOM TRIUMVIRATE IN THE WAKE OF DATA DELUGE: THE ACME OF ALCHEMIC ENDEAVOUR

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The ever growing reliance on all-pervasive and incessantly proliferating systems, tools and services for various societal functions, economic growth and well-being of people has resulted in generation of staggering amount of data. In one of the study, International Data Corporation (IDC) research brought out that the world's digital information is doubling every two years and will increase by ten folds between 2013 and 2020 – from 4.4 trillion gigabytes to 44 trillion gigabytes.<sup>1</sup>The data is generated from myriad of sources and platforms in all conceivable form. This spectacular growth is attributable to many significant factors including the creation and generation of nearly all data in digital form, a plethora of sensors proliferating society and associated human activities and new data sources. This unprecedented growth is likely to make a transition from linear to exponential,

when the proliferation of Internet of Things (IoT) devices will become more penetrating and widespread. The collection, storage, analysis and dissemination of synthesized data have become key drivers for social well-being, inclusive governance, sustainable development and accountable government machinery.

The existing analytical systems and processes are routinely getting overwhelmed by sheer volume, complexities and associated processing difficulties of the raw data being collected. The data is being generated in various forms and structures and is often stored in isolation without lateral exchange, as a deliberate measure to arrest its cross-fertilization and exploitation, in conformity with security imperatives. This acts as a hindrance to view the data coherently and to infer the right

approach to deal with this complex issue at the required level.

With emergence of new challenges to national security, changing nature of global terrorism and an ever-growing reliance on network-centric operations, the intelligence agencies have to trawl through vast data to identify subtle and specific signatures to determine magnitude, timing and place of conditioned responses. For intelligence analysts, the emphasis is switching increasingly to a more immediate response to fleeting signatures and away from the time-consuming monitoring of routine 'pattern of life' in order to find those signatures.<sup>2</sup> The consequences of not dealing effectively with these challenges are potentially profound.

Against this backdrop, the evaluation of the Data-Information-Knowledge-Wisdom (DIKW) Hierarchy also known as the 'Knowledge Hierarchy' becomes operationally useful, functionally utilitarian and intellectually stimulating construct. The acquired raw data moves up the hierarchical ladder to transform into information. This relevant, usable significant, meaningful or processed data offers to answer to an enquiry.

The definition of data is largely contextual based, encapsulating the results produced by a process. For example, Information system defines data as unprocessed information. Other processes produce data as a representation of objective facts.<sup>3</sup> Data can be placed in databases

or can fill a repository. It is discrete, recordable and can be manipulated, captured and retrieved. Data is a physical entity with an objective existence. Yet, despite this possibility of manipulation, a very limited amount of actions can be performed on data as it lacks inherent structure or viable relationship. The next category is information. Information is quantifiable, adaptable and measurable. It can be processed and accessed, generated and created, transmitted, produced and consumed.<sup>4</sup> Information can also be of different types with different attributes. Information can sensitive, contextual, contemporaneous and ephemeral with or without temporal and spatial relevance.

In DIKW hierarchy, knowledge is often construed as know-how or skill in controlling role to transform information into instructions. Knowledge is generally personal, subjective and inherently local. Within the field of knowledge management, there exist two quite distinct and widely accepted types of knowledge: tacit and explicit. Tacit knowledge is knowledge that is hard to encode and communicate. It is ephemeral and transitory and "cannot be resolved into information or itemized in the manner characteristic of information."<sup>5</sup> Further, tacit knowledge is personal, context-specific and hard to formalize. Towards the other end of the scale, explicit knowledge is exactly that kind of knowledge that can be encoded and is transmittable in language.

In this hierarchy, the first three rungs of hierarchical ladder which leads to 'wisdom'. Data needs to be manipulated and supplemented and to be sieved through some processes to elicit tangible meaning. Information needs to be analyzed and organized cogently and succinctly to create knowledge. But, whether the sum total of knowledge will lead to attainment of wisdom is a debatable issue. In several scientific communities, there is an explicit distinction made between general knowledge and wisdom-related knowledge. Thus, there might be interconnections of information that create knowledge - but that will not build a foundation for wisdom.<sup>6</sup> Furthermore, the three lower concepts are considered to be storable, transferable and sharable. Wisdom however cannot be stored, neither be transferred from one being to another. It implies deeper understanding and application of the wisdom-based knowledge.<sup>7</sup>

For practitioners of strategic art and science, the collected raw data must traverse through the hierarchical ladder to provide real or at least simulated wisdom. In his works towards computational wisdom, René V. Mayorga defines wisdom as, "Wisdom: the ability to discern inner qualities and relationships and the exercise of good judgment/ knowledge."<sup>8</sup> Mayorga also relates the concept of wisdom to the concept of intelligence. "Intelligence" would be the ability to choose a proper action by analysis of the situation and thus, attain a local goal; while "Wisdom" not only includes detailed analysis of

the underlying conditions, but also proper synthesis to act in a way that leads to "the attainment of global objectives"

Wisdom is commonly seen as acme of human existencethat is based on knowledge and judgmental capabilities. Though there are generic interpretations of what could be part of wisdom in different domains, there is no specific, widely accepted definition. It is universally agreed that a certain type of knowledge is needed to develop wisdom<sup>9</sup> but the definite type is hard to portray. Wisdom is neither pure rationality, nor pure emotion based; it creates a certain kind of "intuition". Solutions elicited by wisdom, approach a problem by using a creative interconnection of knowledge and experience. Wisdom is acquired based on experience and knowledge.

The metaphorical analysis of the DIKW hierarchy provides a number of interesting insights. With the deluge of data, the quantity of information generated increases beyond a manageable, manipulable size resulting in loss of its relative structural relationships and its usefulness as knowledge. By adding structure to data to make information and structuring information according to a certain perspective, one can avoid generation of tacit knowledge and create knowledge which is explicit and unequivocal. The 'Knowledge pyramid' conceptualizes distillation of large amounts of data to a manageable quantity of information,

which is then aggregates to create more distilled, actionable and widely applicable knowledge.

In the context of warfare, the war principles themselves embody practical wisdom built over the centuries. But application of these principles requires situation specific and contextual knowledge, discerning disposition and homogenized actions. Military leaders entrusted with the onerous responsibility of orchestrating warfare at strategic and tactical level, by careful training and experience, acquire practical wisdom to achieve set objectives during the course of military actions. The possession of this quality, either acquired through training or accumulated with experience, coupled with intuitive ingenuity and intuitional perceptions, are characteristics and qualifications of great military leaders.

***(Disclaimer: The views and opinions expressed in this article are those of the author and do not necessarily reflect the position of the Centre for Air Power Studies [CAPS])***

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#### Notes

<sup>1</sup>Hopkinton, "Digital Universe Invaded By Sensors ", EMC<sup>2</sup>, (April 9, 2014), <http://www.emc.com/about/news/press/2014/20140409-01.htm>

<sup>2</sup>Royal United Services Institute for Defence and Security Studies, "Big Data For Defence And Security," by Neil Couch and Bill Robins (Occasional Paper, September 2013).

<sup>3</sup> Mark Burgin, *Theory of Information: Fundamentality, Diversity and Unification*, (Singapore: World Scientific Publishing Co, 2010), P.188

<sup>4</sup> Rajendra Akerkar and Priti Sajja, *Knowledge-Based Systems*, (Massachusetts :Jones & Bartlett Publishers, 2010)

<sup>5</sup>Katja Franko Aas, *Sentencing in the Age of Information: From Faust to Macintos*", (London : Glasshouse press, 2005), p. 56.

<sup>6</sup>Anett Hoppe et al.' "Wisdom - the blurry top of human cognition in the DIKW-model?" 7th conference of the European Society for Fuzzy Logic and Technology, July 2011

<sup>7</sup>Ackoff, R.L. (1989) "From Data to Wisdom", *Journal of Applied Systems Analysis*, Volume 16, 1989 p 3-9.

<sup>8</sup>Rene V. Mayorga & Leonid I. Perlovsky, "Integration of Knowledge Intensive Multi-Agent Systems," *IEEE International Conference* 2005, [http://www.uv.mx/jnegrete/workshop/kimas\\_2k5\\_sapient\\_systemsmonograph.pdf](http://www.uv.mx/jnegrete/workshop/kimas_2k5_sapient_systemsmonograph.pdf), accessed on 30 Sep 15

<sup>9</sup>Anett Hoppe et al.