About data, information and how to achieve knowledge or even wisdom

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It takes effort to understand data and information, it takes effort to know and derive skills from it and it takes effort to gain wisdom. When we part with linearity and recognize that the path to wisdom requires many learning loops, real added value can arise.

"SCIENTIA ET POTENTIA HUMANA IN IDEM COINCIDUNT, QUIA IGNORATIO CAUSAE DESTITUIT EFFECTUM"

Francis Bacon: Novum Organum Scientiarum, Venetiis, Typis G. Girardi
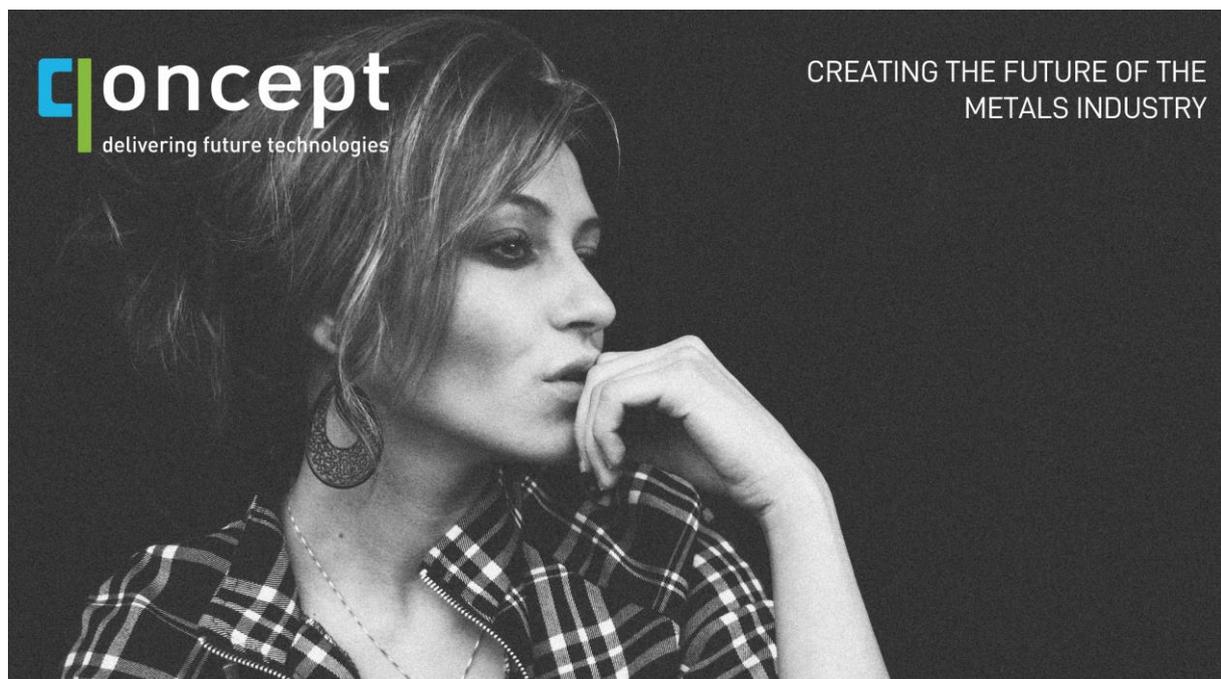
1   INTRODUCTION

> With the rate at which technologies are changing today, if you decide that you are "done" learning, you will be left behind within a matter of years, if not sooner. The idea that you can't teach an old dog new tricks is blatantly false, and you will never wake up and regret having invested in your mind by learning something new.

This quote is from a LinkedIn article published by Bernhard Marr, which from my point of, this quote gets right to the point. But what is learning?

> Psychologists usually define learning as a relatively permanent change in behavior due to past experience or the process by which relatively permanent changes occur in behavioral potential as a result of experience.[1]

According to Richard Gross [1], learning cannot be directly observed, but only inferred from observable behavior. If a change in behavior is to be counted as learning, the change must be lined to some kind of past experience (regardless of whether there was any attempt to bring about that change).

Thus, it is obvious that experience plays an important role in context of learning. This importance of experience is also reflected in the so called DIKW (Data, Information, Knowledge and Wisdom hierarchy or pyramid) as illustrated in Figure 1 (according to e.g. [2-5]).
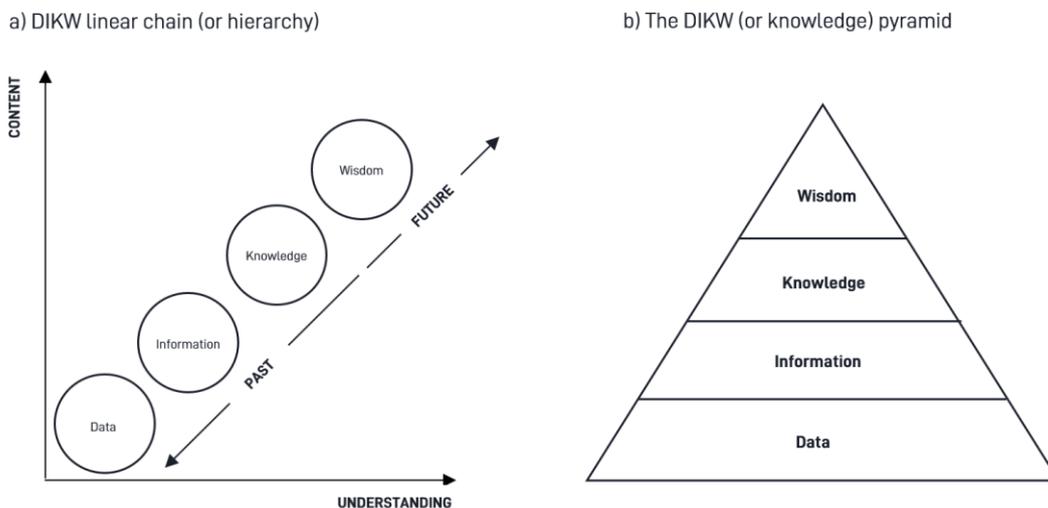
Figure 1: The linear DIKW chain (a) and the knowledge pyramid (b)

According to Nikhil Sharma [6] it is interesting that the first ever mention of the hierarchy is neither in the knowledge management field, nor the information science domain, but in an unexpected place: poetry. In his futurist article, Cleveland cites T.S. Eliot as the person who suggested the hierarchy in the first place. Cleveland names it "the T.S. Eliot hierarchy". The poet T.S. Eliot was the first to mention the "DIKW hierarchy" without even calling it by that name. In 1934 Eliot wrote in "The Rock"[7]:

> Where is the Life we have lost in living? Where is the wisdom we have lost in knowledge? Where is the knowledge we have lost in information?

For more information regarding the interaction of data, information, knowledge and wisdom, the curious reader is referred to really interesting papers and publications [e.g. 2-6]. In the following, this article describes that the phenomenon of more data / information does not necessarily lead to knowledge or even wisdom and how a path to wisdom can be achieved.

2   A PARADOX?

As illustrated in **Figure 2**, could it be that even though we have access to a huge amount of information today, we still don't have more knowledge than we did 50 years ago?
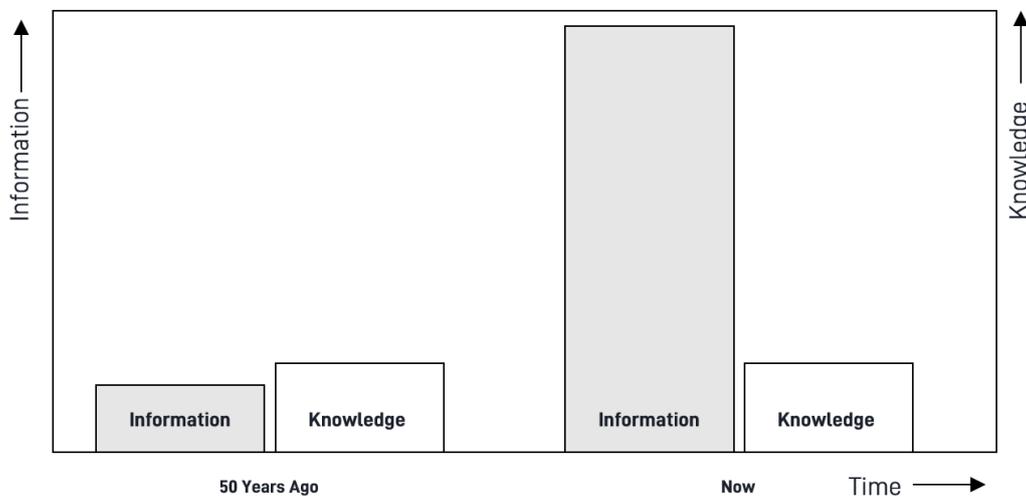
Figure 2: More information does not necessarily lead to more knowledge.

Is this figure a provocation? Nope, this is definitely no provocation. Metallurgist would tend to cite a song from Metallica: Sad but true. People believe that we do not live in a knowledge society anymore, because knowledge is everywhere in these days:

> For a long time, it was said that we live in a knowledge society. But those times are over. Nowadays, knowledge is everywhere. To know something is not important anymore. Skills/abilities (to be able to do something) is becoming more important.

Although the last two sentences are perfectly correct, the first three still need reconsideration. The only thing, one has to do is to deal with the above illustrated wisdom chain or pyramid. What we have is data and assuming that one is able to read meaningfully, we have information. We gain knowledge from information and wisdom from knowledge. From physics and chemistry, we know the following:

> Diffusion is the net movement of anything from a region of higher concentration to a region of lower concentration and is driven by a gradient in concentration.

Unfortunately, and in contrast to chemistry and physics, there is absolutely no net movement from information to knowledge and from knowledge to wisdom. The reason for this is because the transformation from one stage to the another along the wisdom chain requires time and effort. Yes, this is exhausting and as long as we think that the web and all the related stuff is full of knowledge, we will not gain understanding and certainly not wisdom...sad but true or in other words: This is the DIKW Paradox.

3   IS THERE A SOLUTION?

The solution is never stop learning. The best way to explain the solution is to take a detailed look at the DIKW chain again. Both, the pyramid as well as the chain is too simple. That is not changed by adding understanding or intelligence (as suggested sometimes on the web) as a stage between knowledge and wisdom because it is still a linear consideration. The key is to arrange the stages around two circles and to add the stage skills (the ability to do something well; expertise) to the inner circle as illustrated in **Figure 3.**

The inner circle describes the concept of (continuous) never stop learning (continuous learning) very similar to the lean startup approach (build - measure - learn). To jump from one to the next stage we need understanding. We need to understand the data and information to gain knowledge and we need to understand how to apply knowledge to do something well (to acquire skills). The next level (wisdom) can only be reached if certain skills have been acquired. In the following, this should be clarified in a simplified manner using the example of artificial intelligence:

1. The word/string Artificial Intelligence alone is data
2. Understanding that it is a string is information
3. Understanding that it is data-driven modeling is knowledge
4. Understanding how to develop models / algorithms are skills
5. Using it to add value (into your products /for your customers) is wisdom
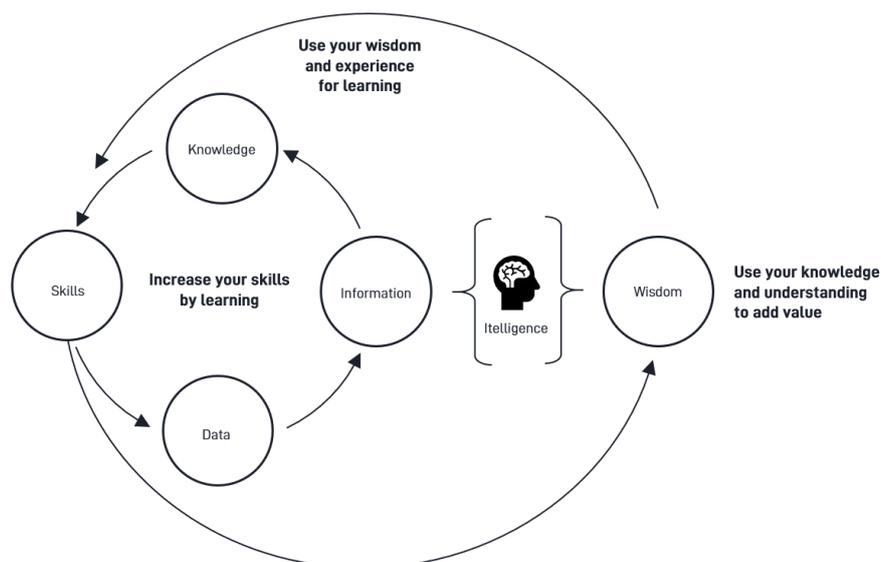
Figure 3: From data to wisdom through continuous learning.

Unfortunately, intelligence is at the center of this entire process. It represents the most important requirement for the transitions from every stage to the next stage Yes, we need intelligence, but now worries, fortunately intelligence consists of two parts [8, 9]: the fluid and the crystalline intelligence. Fluid intelligence is inherited (genetics / nature) and cannot be influenced by environmental factors. Crystalline intelligence includes all skills that are learned in the course of life and are determined by the environment. So, we need intelligence to do the journey towards wisdom and a part of our intelligent is crystalline. Since the stages are arranged along circles, we can go through these stages infinitely often from data to wisdom. Building up knowledge and transforming it into skills. And the best thing is we can simultaneously increase our crystalline intelligence.

4   SUMMARY

Wisdom primarily describes a deep understanding of the interrelationships in nature, life and society as well as the ability to identify the most coherent and meaningful course of action in the case of problems and challenges. It is the basic requirement for added value, in whatever area of application, environment or in whatever form.

However, it takes effort to gain wisdom: It takes effort to understand data and information and it takes effort to know and derive skills from it. When we part with linearity and recognize that the path to wisdom requires many learning loops, real added value can arise. Yes, it also needs intelligence, but a lot more passion, willingness, perseverance, healthy ambition and getting up again after failures.

5   REFERENCES

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