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FROM “DATA LITERACY’ TO “LITERACY IN THE AGE OF DATA”

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Introduction

Organisations are drowning in data while thirsting for insight and understanding of the real business value of information. This increasing volume and variety of available data make the understating of its value a key issue for organisations. Even though information may be the most important determinant of success or failure of a business, the organisations that do not manage them correctly may lose some potential since they are not as informed as they should be. It also leads to a circumstance when decision makers are lacking the right information to make a decision; a lack of decision intelligence.

Forrester Research said while companies are seeking deeper insights from their data, in reality they are only analysing 12 percent of the data they currently have – leaving 88 percent on the cutting room floor, while, SnapLogic’s 2018 Data Value Report noted that data was driving just 48 percent of decisions.

The generally accepted view considers data as simple facts that become information as data is combined into meaningful structures, which become knowledge as meaningful information is put into a context. This view sees data a prerequisite for information, and information as a prerequisite for knowledge. Data are our starting point here – the raw material that we use to understand our world better. Data itself sit at the bottom of the **data-information-knowledge-wisdom (DIKW) hierarchy**. Operations research expert R.L Ackoff introduced this hierarchy almost three decades ago (Ahsan, 2006). The assumption is that data can be used to create information; information can be used to create knowledge, and knowledge can be used to create wisdom. A lofty goal, but possible.

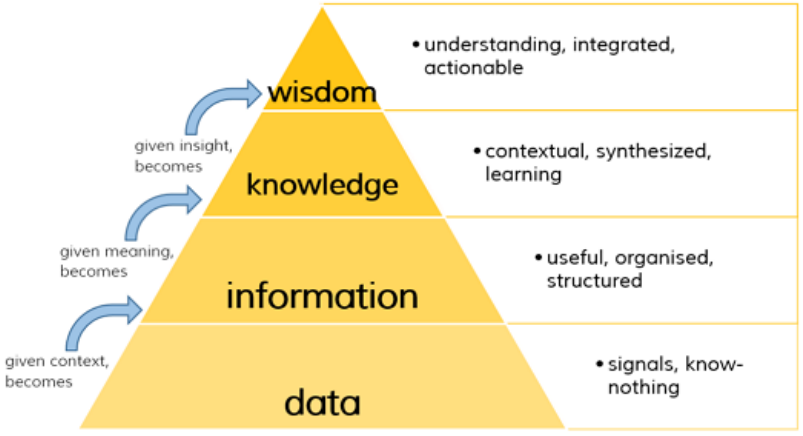

Figure 1 The DIKW pyramid (Source: Soloviev, K., 2016)

Understanding how to get from data to knowledge is one of the crucial goals. We think we want knowledge when what we really want is useful, adequate and powerful information. Understanding the process for moving ourselves from data, through information to knowledge and the wisdom it unlocks is one of the main outcomes of an increase in data literacy. One important thing to keep in mind is that efficiently

working with data requires more than just computing. As we climb the DIKW pyramid, we rely more on our own tacit knowledge, experiences, perceptions, and thoughts. This human relationship with data is an element that is often overlooked when the system biased perspective is considered in isolation. These are the fundamental pillars of data literacy.

Data in itself is by nature an abstraction and is only usable if an individual can understand how it relates to other information in the wider world. This ability to understand complex relationships and connections further enhances capacity for curiosity and deep thinking (Davenport & Patil, 2012). For example, analysis of Big Data can provide insight into the functioning of society involving the flow of ideas and information (Pentland, 2013). For business, this insight into information flows can translate into timely information gathering, more efficient system monitoring, and facilitation of the spread of ideas that "form the basis of innovation" (Pentland, 2013).

An organisation with an information/data culture is one that values data, utilizes it in its own operations, fosters innovation, and provides the necessary tools and atmosphere for leaders, stakeholders and data and analytics leaders to engage with material in a meaningful manner (Johnson et al, 2015). From this crucial foundation, a data literate team/or organisation can continue to grow, evaluate opportunities and make the right decision for positive outcomes. This can be achieved with better data that gives organisations both a panoramic and more granular views of their resources and environment (Ridsdale, 2015).

Are current conceptualisations of data literacy adequate—or do they put too much emphasis on technical requirements and fail to challenge deeper structural and more politically controversial issues? What does it mean to be "data literate" in an age where data is everywhere and how does it differ from being literate? Why and how should it be promoted? How might the promotion of 'data literacy' empower individuals and communities to keep governments accountable, solve local and global problems, and navigate their own data ecosystems?
We are all surrounded by data. But are we equipped with the skills, knowledge and adequate tools required to make sense of it (Bhargava, 2015).

Conceptualizing data literacy

One of the big challenges in becoming data literate is being able to quickly identify data and determine what or who keeps them. To uncover that challenge we need to develop a data state of mind, one that helps us to open our eyes to the propagation of data. After developing a data state of mind it's easier to see the possibilities, since data are everywhere.

Figure 2 Data Literacy Word Cloud

In the past, our data was more structured, clear and organised; often siloed. Now, we have a lot of unstructured data, we must learn to uncover new tools and methodologies to get the right insights from it – and this means we must think outside the box.

The vast amounts of data allow us to ask new questions in new ways, and at the same time also it leads to the conclusion that one of the most important goals of data literacy should be to encourage critical thinking that keeps us away from being overly optimistic or excessively pessimistic. Data Literacy positively actioned within an organisation should counter the cognitive bias that builds inside any business culture over time. Mobilising the culture to do more with what data already exists and identify the requirements for data needed to do new things, is an exciting effect of becoming data literate (Koltay, 2015).

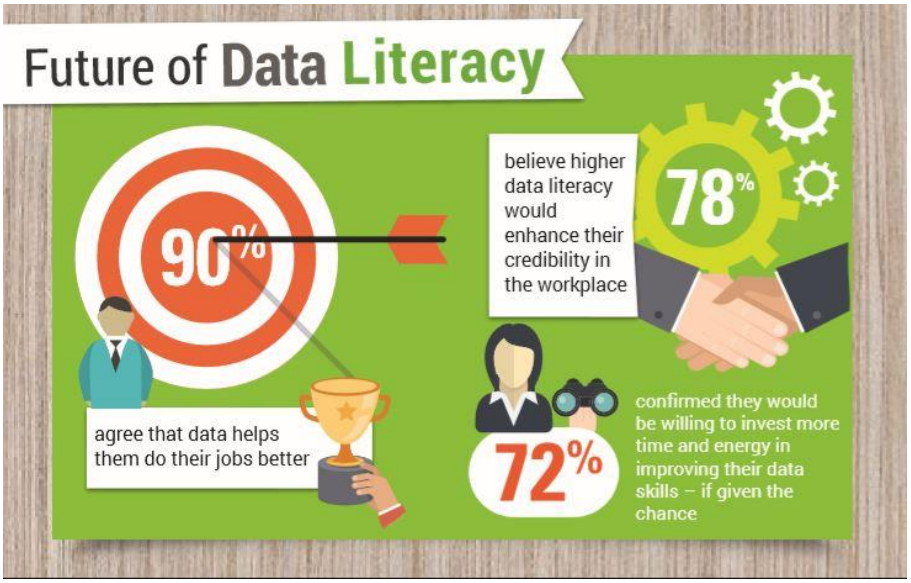

Figure 3 The future of Data Literacy (Source: Questex LLC, 2018)

Data literacy pushes us to further consider what it would mean to be "literate in the age of data" and denote four core pillars in literacy promotion:

- Data literacy promotion must be agile and adaptive, focusing on helping to foster adaptive capacities and resilience rather than teaching platforms and technical languages that are bound to become outdated,
- Data literacy promotion must build on the key features and pillars from all core subcategories of literacy,
- Data literacy promotion must involve empowering people to navigate their current ecosystems and societies in ways that are meaningful and effective for them,
- Data literacy promotion must involve providing multiple pathways for people with different data literacy needs and capacities to interact within a complex system.

By 2020, 80% of organisations will initiate deliberate competency development in the field of data literacy.

With data and analytics becoming increasingly more pervasive, data literacy – the ability to gain meaningful, usable, insights from data – is becoming a new must-have skill. Gartner has even gone as far as saying all companies must take steps to teach all relevant employees 'to speak data as their new second language', and a core element of digital transformation.

One of the biggest challenges in how to achieve the above mentioned is to speak data clearly in the capabilities of business models. By using **information as a second language** it is feasible to identify and support improvements to achieve data literacy by identifying areas where data is spoken clearly and where gaps still exist.

Supporting data literacy is not primarily about enabling individuals to master a particular skill or to become proficient in a certain technology platform. Rather it is about equipping individuals to understand the underlying principles and challenges of data, and to be able to communicate it in a way that everyone understands.

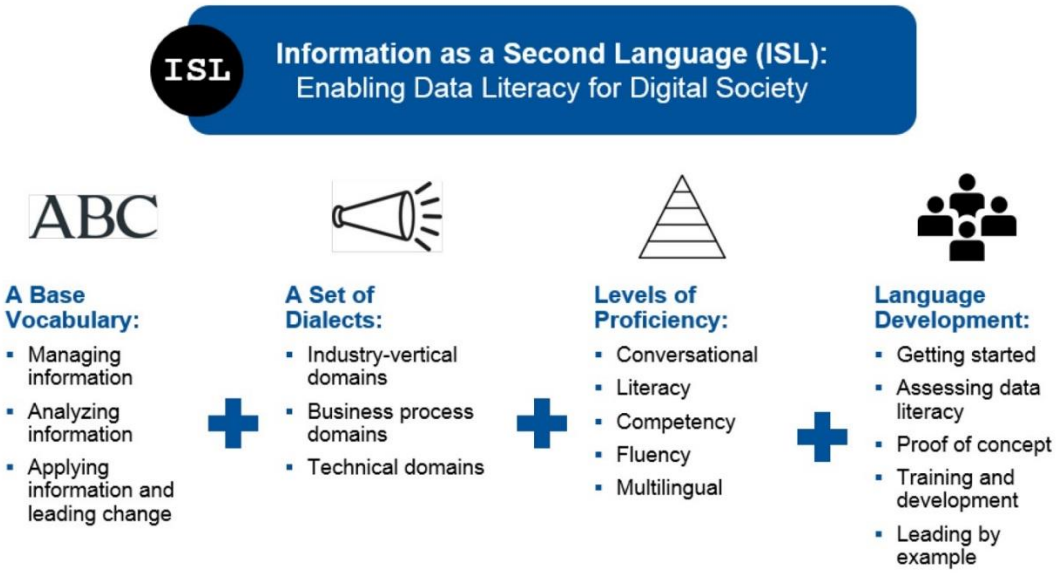

Figure 4 Information as a second language (Source: Gartner, Inc., 2017)

This understanding will in turn empower people to comprehend, interpret, communicate and use the data they encounter—and even to produce and analyse their own data. This can only be achieved by considering data literacy as a means toward a necessary reinvention of community engagement and empowerment—towards what we term “literacy in the age of data” (Bhargava, 2015).

In today’s data-driven society, a lot of individuals are struggling to answer a question, how do we deal with data literacy and implement a correct strategy to empower our current state and define our future state. At this time when data is considered as the “lifeblood” of every organisations, it’s extremely critical that businesses approach this problem properly. According to IDC (International Data Corporation) spending on big data and analytics products is expected to eclipse $200 billion by 2020. To get the most from these investments, companies must educate their employees to use data thoroughly.

In 2014 analysts estimated that 90% of the world’s data had come into existence within the previous 2 years (Vesset et al. 2014). Organisations in all sectors are struggling with this enormous volume of data, however they are aware that despite the velocity at which it is growing, and variety of its formats, there is value to be had in that content. The goal is simple. The transition from being data-rich to being information and knowledge rich, requires people capable of working and communicating effectively with data.

Integrating data literacy into the business environment

So, what is data literacy in the context of a business? It’s the ability to derive meaningful insights from data and apply those in a way that benefits the organisation.

The scope as well as nature of data available is growing at a rapidly increasing rate. Parallel to this growth in data is the realisation that we need to understand how to use tangible evidence to support our decisions

rather than use intuitions, gut feelings or personal preferences. However, helping business decision makers to become data literate is not as straightforward as it may seem.

Through 2020, 95% of business leaders will continue to make decisions using intuition, instead of data-driven evidence and will significantly underestimate risk as a result – Gartner 2018.

In this paper we decided to define data literacy as ability to understand and use data efficiently to inform decisions. A specific skill set, and knowledge base is needed to transform data into information and eventually into actionable knowledge. These skills include knowing how to identify, collect, organise, analyse, summarise, and prioritise data.

The required research background currently facilitating the precise description of data literacy skills and knowledge adequately indicates the complexity of properly using data, yet the agreement about data literacy as a concept remains embryonic. Despite the hype around "Big Data" and the overall knowledge revolution it creates, there is a strong inequality between those who are benefitting from collection and analysis of data and those who are not (D'Ignazio, 2017). Data has become an ultimate currency of power.

In the context of the business, data literacy is the organisation's ability to collect, manage, evaluate, correctly apply data in a critical manner, and communicate to everyone involved; a key principle of literacy that people regularly seem to miss, especially when taking a systems approach to data literacy creation. To be literate is to be able to communicate easily with others in ways that helps make you understood. Data Literacy must enable communication through information as a second language; an essential capability for today's global knowledge-based economy. A clear understanding of how decisions are informed by data, and how to collect, manage, evaluate and apply this data in support of evidence-based decision making, will benefit every organisation, and will increasingly be required in knowledge economy environments. Data literacy education is however currently inconsistent not just across public and private sectors, but also in academia. Data literacy training has not been approached systematically or formally which can lead to many gaps, and those gaps make it difficult to set realistic expectations of data-based skills. That's just one of the reasons why data literacy needs to be implemented correctly with a very strong strategy and framework.

As companies aim to capitalise on the potential business value generated from data, employees with data science skills have become highly valuable in today's economy. Businesses have begun investing in skill-based trainings to help their analysts "conduct data-driven experiments, to interpret data, and to create innovative data-based products and services." (Harris, 2012). For many managers and business owners, the more "data literate" their workforce, the bigger their profit margins.

Data Literacy is being cited as a new core capability of businesses; it has moved beyond the data scientists and the data experts. If a business is to become data literate, everyone needs to know how to talk about it, in a consistent way. Only then will the data element be included in conversation alongside people, systems and technology. Achieving data literacy therefore has several essential and connected components. Tools and technology are a crucial part of it, however, it also needs a culture in which employees think critically about data.

There are some basic things (Bhargava, 2015A) you need to focus on when building data literacy:

Access to data

To build a data-literate organization, employees must have access to data without having to go through a mediator. Calling the IT department just to learn how many new customers your team added last month, is not a sign that your company is data-literate.

A platform which enables you to work properly with data – data visualisation

Once individuals have access to data, they need to view it, manipulate it, share the results with colleagues/peers to enable further discussions and it can uncover some unknown facts. Many people default to using Excel or other familiar desktop application, however they are limiting and easily lead to inconsistencies. Information becomes out of date, and employees get conflicting results. Having a shared platform for viewing, analysing, sharing and communicating information is crucial. Data visualisation is a complementary skill that is necessary to enable story-telling with data-derived information.

Critical thinking

Providing data to a few people/experts is a very powerful thing but making it available throughout an organisation can be a real game changer. Having access to powerful tools that make it possible is just the first part of an equation. Employees must be also able to assess the value of the data and interpret it properly. We definitely don't need to be data scientists to get value from data, but we do need to be data-literate.

Data modelling

In order to achieve the desired outcome, employees need to be more data literate to contribute to decisions and processes. This also highlights the critical need for usable tools and trusted intermediaries that can open "black boxes" and uncover the processes and expose their potential biases in a comprehensible and engaging ways.

To date, no specific standards or guidelines have been established for data literacy, although some of the competencies entailed have recently been included as part of **information literacy** standards. The latter provide a reference framework for the competencies needed to use information efficiently in problem-solving and generating new knowledge. These competencies generally include: the ability to define precisely the informational need; the ability to locate information sources suited to that need; the ability to assess critically both the sources and the ideas expressed therein; the ability to manage the information selected; the ability to analyse and synthesise information to support arguments or generate new ideas; the ability to document the sources used; and the ability to record or communicate the results in an ethical manner.

One of the best ways to improve data literacy is through visualisation. A new breed of platforms like LINQ enables you to reconnect the data-information-knowledge-wisdom value chain within your business. LINQ not only helps you to develop your data literacy through the capture of **information supply chains**, but also allow you to visualise how the flow of information supports your business. LINQ enables you to see all of the activities that people perform as they use data and information to create new data, information and knowledge. The LINQ vocabulary is simple: you can describe your business in terms of information, actions, systems and people and how they work together. When you visualize the flow of information through your business, you are creating knowledge about where all data and information exists based on who or what touches it.

One step further from Data Literacy

In the massive and continuous flow of information we have today available, decision making or problem-solving is no longer the act of making simple logical decisions. It has evolved into a series of complex issues, often with multiple layers. The type of elevated thinking required to tackle these issues is in increasing demand throughout society and industry. The knowledge-based economy requires people to be able to navigate difficult situations in diverse ways, which is challenging, but critical to success in the 21st century (Liquete, 2012; Gunter, 2007; and Erwin, 2015).

Going one step further from data literacy, (Bhargava, 2015) defines it as the "the desire and ability to constructively engage in society through or about data". Data literacy is a collection of sub-kinds of literacy:

- Information literacy,
- Scientific literacy,
- Media literacy,
- Statistical literacy,
- Computational literacy,
- Digital literacy.

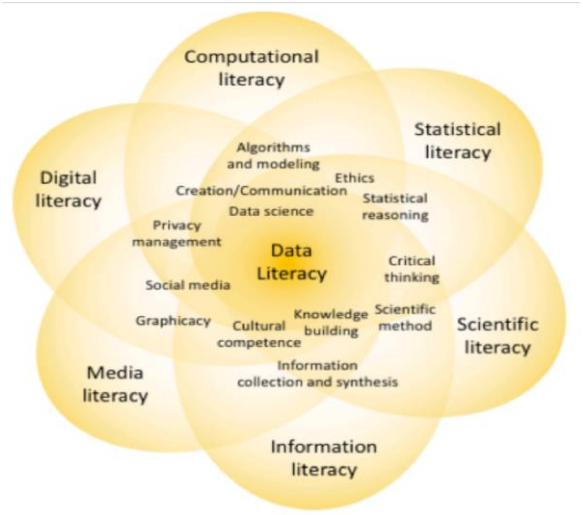

Figure 5 Sub-kinds of data-literacy (Source: Bhargava, 2015)

Data literacy interacts with and builds on all six of these approaches and requires a combination of the technical, critical, quantitative and conceptual skills on which they are based (Figure 5). It is difficult to promote information literacy or data literacy without promoting statistical literacy for instance. While their relative importance varies, they are dealing with similar problems. This definition—as well as the nature of data itself—encompasses elements and principles from each of these sub-kinds of literacy, moving away from medium-centred definitions of literacy towards a more encompassing one. Like the history of other literacy efforts, data literacy will not be a quick fix, but a rather slow exercise in behaviour change.

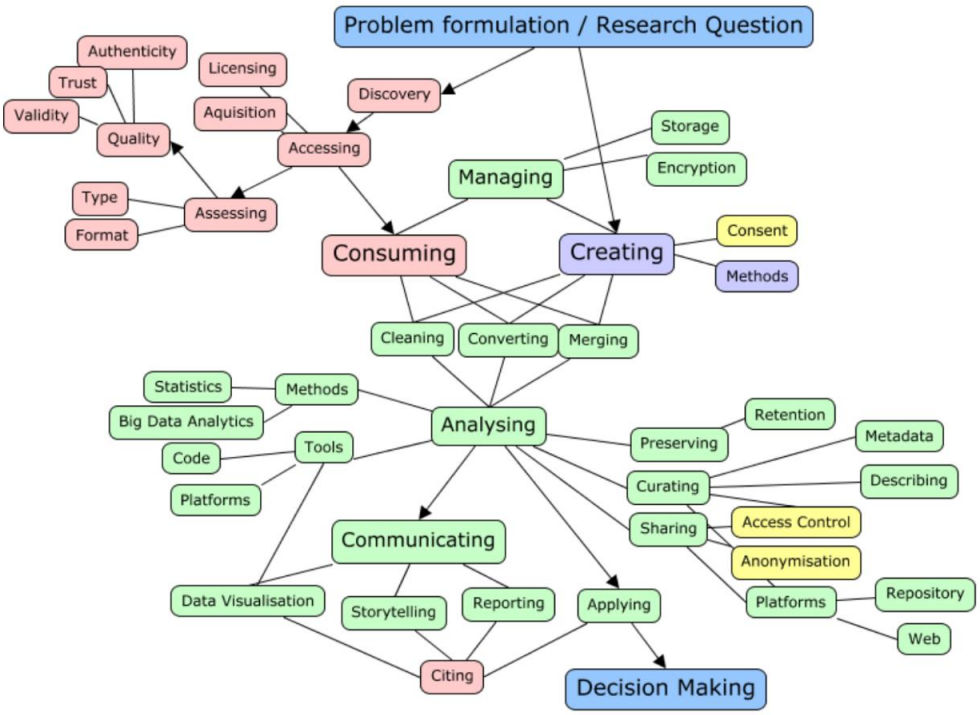

Figure 6 Data Literacy concept map (research in progress) Source: Koltay, 2015

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