Digital transformation missing ingredients: Data Literacy

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Abstract. Employees with data literacy skills have become highly valuable in today's economy and labor market. More than ever before, employers demand some degree of data literacy from all employees, regardless of their professional role. New technologies offer many exciting possibilities, but there is no point in having increasingly quantities of data if nobody knows how to explore it efficiently. The aim of this study is to examine data literacy at the Universities and industry as well as the study of existing certification systems for data literacy competences. Our analysis uses results from online survey conducted in 20 countries in Europe and North Africa. The results will support the universities and industry to offer innovative, competence-based, cross-cutting data courses for all the students interested in developing or fine tuning their data competences needed for a successful digital transformation process in the job market.

Keywords: Desk research, Digital competences, European competence frameworks, Open learning systems.

1 Introduction

Employees with data literacy skills have become highly valuable in today's economy and labor market \cite{1}. More than ever before, employers demand some degree of data literacy from all employees, regardless of their professional role. New technologies offer many exciting possibilities, but there is no point in having increasingly quantities of data if nobody knows how to explore it efficiently.

Data literacy courses provided by the universities are fragmentary in time and space. The duration of a data science course ranges from one week to a semester or a 1-2-year master's degree. They are organized as face to face lessons, or through web platforms.
The syllabuses of these courses are very different. Even though the data literacy profile is often connected to competences in data visualization, statistics, machine learning, each course gives different weights to these macro topics. As a result, there is not a homogeneous competence profile for data literacy. The needs of the job market have not been adequately analyzed. It's clear that there is still not a mature debate on this topic between academia and businesses. We aim to fill this gap. In response to this, we intend to address the following research question in this study:

- Which competencies are the most important for a "data literate" person from the perspective of businesses?

We used a questionnaire developed by the DATALIT consortium. The DATALIT consortium is composed by 14 experienced partners from 4 Program EU Countries (Italy, Germany, Portugal, Lithuania), 1 Non-EU Program Country (Serbia) and 1 Partner Country from Western Balkans (Albania). In particular we have 5 Universities, 5 SMEs, 1 Educational center, 1 EU network, 1 umbrella organization. The data was collected from 705 professionals from 20 countries. More than 80% of respondents are skilled in data literacy. Data evaluation is found to be the most critical soft skill and creating data classification or rules as a hard skill. The findings of this study can be used to develop new syllabuses underpinned with data literacy related competencies.

The remainder of the paper is organized into four sections. Section 2 presents a state-of-the-art data literacy. Section 3 describes the materials and methods. Section 4 presents the results of survey. This section also includes a discussion. Finally, in Section 5, a conclusion and directions for future research are provided.

2 Literature review

Data literacy is an emerging concept [2] and its definition is an argument of different researchers [3]. Gartner defined "data literacy as the ability to read, write and communicate data in context, with an understanding of the data sources and constructs, analytical methods and techniques applied, and the ability to describe the use case application and resulting business value or outcome" [4]. Other studies stated that data literacy is the ability to access, analyze, use, interpret, manipulate and argue with datasets in response to the ubiquity of data in different fields [2], [5]. All definitions are similar and focus on skills, knowledge and attitudes related to the use of data in order to solve business problems.

When it comes to the industry, it is argued that there is a shortage of data-savvy managers and analysts [2]. Therefore, all stakeholders should pay more attention to data literacy competences and integrate them into current training programs and university curriculum. For instance, Amicis et al. [6] argue that data literacy can enhance the digital transformation of STEM study programs. On the other hand, academia can learn from the trends seen in business where data-driven practices have been embedded for many years [7]. Academia need to work closely with the industry to identify most important competences related to the data literacy.
3 Methodology

Our analysis uses results from an online survey conducted in 20 countries in Europe and North Africa. The focus was on employees who have a good understanding of data literacy. To increase the generalizability of the results, respondents were spread across 27 countries. A total of 705 responses were received. After conducting non-engaged bias analysis, one response was deleted, and the remaining 704 useful responses were available for data analysis. Approximately, 59% of the respondents were male. Age distribution was as follows: under 30 (41.2%), between 31 and 40 (32.9%), between 41 and 50 (15.9%), between 51 and 60 (7.3%), and over 61 (2.7%). About 55.4% of respondents work in private companies, 20.2% work in Higher Education Institutions (HEIs), and the remaining 24.3% work in other fields, like is shown in Figure 1. 26.7% of respondents said that they have high knowledge on data literacy, 54.2% medium, 12.2% low, while 6.9% admit they have none.

Fig. 1. Type of organization where respondents work in.

4 Results and discussion

The competences related to soft skills that respondents consider that are most important, for a “data literate” person, are described in order in Figure 2, according to the respondents ranking. The data evaluation was found as the most important soft competence related to the data literacy, followed by the critical thinking, problem solving, communication, and learning to learn. In other word, from the perspective of the industry the most valuable soft skill of an employee is the ability to evaluate or reflect data. For
example, a data literate person can assess and use data according to the specific objectives and needs of management.

Also, an essential data literacy competence is critical thinking. Critical thinking allows employees to critically select, assess, and analyze data. Previous studies have also found that a data literate decision maker needs to be able to think critically about data to make informed decisions [3].

Fig. 2. Most important soft skills for a "data literate" person.

In terms of functional competences, the respondents consider that reading/creating data classification or rules (56.2%) is most important competence, while reading/creating time trends and forecasts (38.9%) is the least important. From the perspective of the business, their employees need to equipped with the skills related to reading or creating data classification. It is of particular importance when it comes to risk management, compliance, and data security. As the second most important hard skill is the ability to search and find data that has already been released. Many sources frequently release data sets for public use. For instance, many governments host open government data platforms for the data they create (see [8]).

Fig. 3. Ranking of importance of functional competences, related to data literacy.
5 Conclusion

Bridging the gap between academia and industry regarding the key data literacy competences is becoming critical since they are considered the most important issue of the 21st century [2]. The present study showed that the most valuable data literacy competence of an employee is the ability to evaluate or reflect data, and the skills related to reading or creating data classification. The results will support the universities and industry to offer innovative, competence-based, cross-cutting data courses for all the students interested in developing or fine tuning their data competences needed for a successful digital transformation process in the job market.

Finally, this study has its limitations. The notable one is that we used only one research instrument. It is assumed that questionnaire along with desk research can shed the light on all data literacy related competences. Future studies should focus on different methods, such as interviews with experts and focus groups, to confirm or reveal new competences.

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