Italian Journal of Educational Technology,
ISSN 2532-4632 (print) – ISSN 2532-7720 (online)
Accepted Manuscript Online
DOI: 10.17471/2499-4324/1300
https://ijet.itd.cnr.it

Data literacy ecosystem development framework: Approach for bridging the gender gap in the digital economy of the Western Balkan countries

Il framework per lo sviluppo dell'ecosistema dell'alfabetizzazione dei dati: un approccio per colmare il divario di genere nell'economia digitale dei paesi dei Balcani occidentali

Dejan Zlatkovski[A]*, Riste Temjanovski[B], Vancho Chabukovski[C]

[A]INNU Ltd., Skopje, North Macedonia, zzdejan@gmail.com

[B]Goce Delchev University, Shtip, North Macedonia, riste.temjanovski@ugd.edu.mk

[C]Ss. Cyril and Methodius University, Skopje, North Macedonia and University of Southampton, Southampton, UK, v.chabukovski@soton.ac.uk

* corresponding author

HOW TO CITE Zlatkovski, D., Temjanovski, R., & Chabukovski, V. (2023). Data literacy ecosystem development framework: Approach for bridging the gender gap in the digital economy of the Western Balkan countries. *Italian Journal of Educational Technology*. Advance Manuscript Online. doi: 10.17471/2499-4324/1300

ABSTRACT This paper is a position paper that is not based on formal research. Its purpose is to propose a Data Literacy Framework for support in the process of the bridging the gender gap in Western Balkans among women entrepreneurs. To succeed in today's data-driven economy, women entrepreneurs need data skills and digital skills to unlock opportunities and grow businesses. The focus of any successful business in modern economies is how to equip women with suitable data and digital literacy so they can pursue careers in the digital economy, to contribute to the digital transformation of the economy and the public sector, especially in the Western Balkans developing countries. The proposed Data Literacy Framework should be used as an instrument to devise public policy measures for providing education and training opportunities, design customised data literacy upskilling for women entrepreneurs, implement career guidance services, promote the role of the women in the digital economy, and provide support for more effective deployment of various concepts of the digital society.

KEYWORDS Data Literacy; Gender Gap; Digital Skills; Data Science; Women's Entrepreneurship.

SOMMARIO Questo articolo è un documento programmatico che non si basa su una ricerca formale. Il suo scopo è proporre un Data Literacy Framework per supportare il processo che mira a colmare il divario di genere

nei Balcani occidentali. Per avere successo nell'economia odierna basata sui dati, le donne imprenditrici hanno bisogno di competenze in materia di dati e competenze digitali per aprire nuove opportunità e far crescere le imprese. L'obiettivo di una impresa di successo nelle economie moderne è dotare le donne di una alfabetizzazione sui dati adeguata in modo da poter intraprendere una carriera nell'economia digitale, e contribuire alla trasformazione digitale dell'economia e del settore pubblico, in particolare nei Balcani occidentali, paesi in via di sviluppo. Il framework per l'alfabetizzazione dei dati proposto dovrebbe essere utilizzato come strumento per promuovere misure di politica pubblica atta a fornire opportunità di istruzione e formazione, progettare un miglioramento delle competenze in materia di alfabetizzazione dei dati personalizzato per le donne imprenditrici, implementare servizi di orientamento professionale, promuovere il ruolo delle donne nell'economia digitale e fornire sostegno per una diffusione più efficace dei concetti della società digitale.

PAROLE CHIAVE Alfabetizzazione dei Dati; Divario di Genere; Competenze Digitali; Scienza dei Dati; Imprenditorialità Femminile.

1. Introduction

1.1. Background: the developing countries in Western Balkan

Despite the social and political instability, the Western Balkans region has clear aspirations to improve its economic competitiveness and increase the wealth of its citizens. Achieving these aspirations will position the region for further integration into Europe, as outlined by the European Commission's Strategy for the Western Balkans. One of the factors in this endeavour - continuous provision of a highly skilled population, is integral to creating the dynamic productive economies that the region desires. This is especially challenging in situations when these countries are facing intensive brain-drain trends, emigration and increasing skills mismatch on the labour market. Development of the data literacy skills and more generally digital skills is significantly a difficult task in these countries due to the inappropriate and low-quality education and training systems. Consequently, there is a shortage of skilful workforce that will be able support the digital transformation of these societies. Furthermore, there is a significant skills gap between the skills of the potential workforce supplied by the education and training systems and the skills required by the economies of these countries.

Having in view the firm dedication of these countries to exert fast digital transformation, which is clearly defined in their economic development strategies, the question about the planning of the development of their labour markets with provision of digitally literate and equipped with advanced digital skills workers becomes of utmost importance.

Bridging the gender gap for the digital economies of these countries could effectively contribute to successful realisation of the strategies in question. The digital divide and the gender gap are not only a problem of the developing countries of the Western Balkans. Even the most developed countries in Europe, including the democratic countries in Scandinavia, have not fully met the goals set by the European documents for women's equality (European Institute for Gender Equality, 2013). This assessment is confirmed by numerous research studies in the world, as well as in the Western Balkan. If digitization unites people on a global level, certain measures and activities are necessary to increase the share of women in the digital economy labour market. With

the absence of appropriate data literacy and digital literacy among the female population, the gender gap increases, which creates appropriate repercussions in all social spheres. On the one hand, it results in reduced opportunities for the real inclusion of women in social processes, and on the other hand, it causes their personal doubt in the magnitude of their own values.

In order to discontinue this negative trend in the digital distribution of skills between the genders in the countries of the Western Balkans, we will try to encourage activity in the digital sector through specific measures and guidelines to support the development of data literacy and digital literacy competencies, as a propulsive and dynamic factor, in which women will be able to present their own. In the future digitally based economies of this countries, these competencies will enable them to start new businesses, will be more presented on the labour market, have a more prominent role in decision-making processes, initiate new businesses and through appropriate programs they will be able to be networked at a higher regional and cross-border level.

1.2. The skills mismatch challenge

Skills mismatch and the potential mitigation solutions in Western Balkan has been the subject of many studies. Some of them, argue that the competitiveness of these countries "*is hindered by a lack of entrepreneurial and technological know-how, a significant skills gap, weak institutions and low levels of investment and infrastructure quality*" (Kyrkilis, & Nikolaidis, 2003).

Dealing with data literacy is seen as the job of data scientists, not average employees who generally have little to no formal training or education in working with data effectively. Additionally, academia has so far failed to keep up with enterprise demand for data literate graduates, meaning even younger, digitally native professionals often lack the competencies they need to work with the data (Shull, 2022) (Centeno, Karpinski, & Urzi 2022) argue that Europe, in general, is facing a significant gap in the digital skills. The digital skills mismatch has been ranked high in the EU priorities, and consequently in 2020 EU has set the ambitious objective in its European Skills Agenda to ensure that 70% of 16-74 years old have at least basic digital skills by 2025. EU has recognized that digital competence has become crucial for employability, and one of its key elements is the data literacy.

The GSMA study (GSMA, 2018) indicates that the share of women leaders in the technology sector in the world is uneven. Just for comparison, in Great Britain, which is considered one of the countries with the most democratic forms of governance, the representation of female leaders is only 5 percent. Overall, in the world, the GSMA study estimates that women are 26% less likely than men to use mobile Internet services. This equates to 327 million fewer women using mobile Internet than men. While mobile phone ownership is basically the same for men and women in China, women are 4% less likely to use mobile Internet. In Mexico, women are about 5% less likely to own a mobile phone and 10% less likely to use mobile Internet. Women are also limited in access to digital resources, lack of financial resources and fear of online safety. Such social distortions and disproportionalities discourage women for their more active approach in the technological sectors (OECD, APEC, 2019).

For any business-minded woman, developing digital competencies and knowledge of the concept of data literacy is an important means of accelerating her career. Digital tools, when properly structured and combined with appropriate self-management skills, increase her employability, opportunities for development and advancement in their careers.

The problem of under-representation of women in economically critical sectors - such as digital economy – and in relation to EU policies and initiatives to address the data literacy skills shortage, emphasizes the need to design

and implement data literacy activities and training opportunities that will upskill/reskill and activate the female population in the target level of training, selection and participation in entrepreneurship and employment with a focus on, but not limited to, digital economy. This is an important cause for concern, due to the strategic importance of digital economy in achieving the EU's goals of a more competitive international economy. The situation is alarming and worrying, but also promising for the future of young, qualified employees, who see huge potential in the application of digitization in the social ecosystem.

The low-quality education systems of the developing Western Balkans countries result in evident skills mismatch between the skills that possess participants on the labour market, and those required by the economy. This issue is impeding the planned digital transformation of these economies, due to the lack of the most valuable asset required for the transformation, i.e. the qualified and skilled workforce.

We identify the skills mismatch problem as a two-fold problem:

- continuous lack of digitally skilled workforce and
- underrepresentation of women in all occupations which require significant data literacy competencies and data skills

The solution is based on the premise that data literacy is the foundation for the development of digital literacy. Proper training for data literacy skills will contribute to supply of more quality digitally skilled workforce. The key data literacy competencies are related to understanding of and practical application of the knowledge related to *Data types, Data structures, Data sources, Processing Data (Collecting, Conversion, Analysing), Data visualisation, Data interpretation* and *storytelling*. The solution consists of four steps (strands): digital skills needs-assessment, data skills and literacy evaluation, career guidance and provision of training opportunities. Career guidance needs special focus on the gender gap in the digital economy and must take into account the specific needs of the women entrepreneurs.

A Regional Cooperation Council study (Andjelkovic et al., 2021) proposes development of a Methodological framework for a fully-fledged assessment of digital skills needs and gaps. It is based on approach that includes recognition of the digital competencies required for different sectors (areas of work) and job categories through interviews, deepening the findings of the obtained research through work with specific focus groups (in our case women entrepreneurs), preparation of general questionnaire, preparation of tailor-made, user-friendly questionnaires for specific target groups, sectors and/or industries (in our case women entrepreneurs). There is a set of digital competence indicators incorporated in the framework distributed in five competence areas: Information and data literacy, Communication and collaboration, Digital content creation, Safety and Problem Solving. However, the *Information and Data Literacy* area is constrained only to the following competencies:

- browsing, searching and filtering data, information and digital content;
- evaluating data, information and digital content;
- managing data, information and digital content.

For each of these competencies there are proposed questions, that are supposed to help the examination of the competencies, respectively:

- Is the employee able to use Internet search engines to find relevant information?
- Is the employee able to evaluate the reliability of information found on the Internet?

Can the employee save and store data, information and content (text, images, audio, video, internet pages) and retrieve them?

We argue that - although this approach is effective - still in the area of data literacy much more focus should be put on analysing the competencies related to *Data types, Data structures, Data sources, Processing Data (Collecting, Conversion, Analysing), Data visualisation, Data interpretation* and *storytelling.*

1.3. What is Data Literacy

Proper definition of Data Literacy is key for developing wide public understanding and increasing the sensibilisation about the impact of the data and data literacy on the development of the economies and the efficiency of the public sector. There are multiple definitions of the term Data Literacy. According to Wollf, Gooch Montaner and Kortuem (2016), all these definitions are mainly forged around the eight areas of competencies with respective sets of skills. The *Inquire Process Competence* includes set of skills that are relevant for investigation, with analysis and interpretation of the gathered data. Hence, this competence includes two set of skills: Plan, implement and monitor the course of action; Undertake data inquiry process. The *Ethics Competence* includes all skills related to understanding the ethical use of the gathered and processed data. Further, the study suggests that third area of competence, *Real world problem-solving context*, encompasses set of skills for usage of data to solve real problems and understanding the role and impact of data in society in different contexts. The set of skills for identification of problems or questions that can be solved with data are part of the fifth area of competencies (*Ask questions from data*). The fifth and sixth area of competencies are related to *developing hypotheses and identification of potential sources of data* and *collect/acquire data*. Probably, the seventh area of competencies *Analyse and create explanations of data*, is the foundational area and it contains vast set of skills related to transformation of data into information and ultimately actionable knowledge, creation of explanations from data, accessing data, analysing data, understanding data types, converting data, preparing data for analysis, combining quantitative and qualitative data, using appropriate tools, working with large data sets and summarizing data. Finally, the "*Evaluation of the validity of explanations based on data and formulate new questions"*, the eighth competence area, encompasses the skills that enable critique of the presented interpretations of data and interpretation of information derived from datasets.

As result of their comprehensive analysis, Wollf et al. suggest the following definitions of data literacy:

> *"Data literacy is the ability to ask and answer real-world questions from large and small data sets through an inquiry process, with consideration of ethical use of data. It is based on core practical and creative skills, with the ability to extend knowledge of specialist data handling skills according to goals. These include the abilities to select, clean, analyse, visualise, critique and interpret data, as well as to communicate stories from data and to use data as part of a design process."*

We point to the last sentence of the definition, and we argue that the listed abilities must have central focus in the education and training programmes of the future workforce, and specifically for the women entrepreneurs professional development.

1.4. Evaluation, skills assessment, monitoring and skills verification

The digital transformation of the economy is not a new phenomenon. However, although it has been around for decades, there is a general consensus that the digital economy will create, destroy or replace jobs. There are many open questions in regard to this:

- Which sectors will be most affected?

- What new skills and qualifications will be needed to strengthen competitiveness?
- How will this sectoral transition take place?

There is no single answer to these questions. The global effects on the quality of employment, working conditions, forms of work can hardly be precisely assessed. In general, the risk, or the "dark side" of the digital revolution that threatens us, should be "illuminated" by strengthening digital knowledge and skills. If gender unequal representation in digitization is added to these problematic issues, then the concern has reached the point of real alarm.

The new generation of women entrepreneurs need specific data literacy training models and skills to advance their career development in general, but also enhance their deployment of digital technologies in the workplace for better efficiency, effectiveness and innovation. Research is clear that women sometimes lack self-confidence and trust in their own abilities. Therefore, encouragement and support from other women in social networks seems to be of great importance. This brings us to the conclusion that the support for the women entrepreneurs in the digital age needs much more than training opportunities. We think about support ecosystem that will encompass education and training, networking and peer support, institutional capacities, inter-institutional links, monitoring and evaluation, developing supporting policies. Creating appropriate evidence-based policies requires systematic data collection aimed at identifying priorities and defining and monitoring key lines of action. The analysis suggests that there is strong potential for positive policy action to provide the fundamental foundations to bridge the digital gender divide and build a more inclusive digital future.

Gender equality advocates are unique in their view of the seriousness, importance, and relevance of gender equality in all social domains. For this purpose, certain recommendations have been identified that relate to achieving better results in supporting the representation of women in the digital economy:

- knowledge and access to data literacy and opportunities for training to acquire basic skills are insufficient to promote equal access and participation of women in the digital economy;
- the increased involvement of women in the development of educational content that corresponds to their needs and priorities deserves more attention;
- younger women have greater opportunities to overcome data literacy knowledge and participate in jobs and environments with data literacy skills;
- a critical starting point for achieving gender balance in the digital economy is high-level education.

However, the existence and deployment of quality education and training opportunities requires continuous process of refinement and tuning to the needs of women entrepreneurs. This can be facilitated with a set of instruments and processes for evaluation of the training programmes and institutions that are implementing them, assessment of the women entrepreneurs data literacy knowledge and skills, monitoring of the overall enhancement of the impact of the data literacy at institutional and social level. Evaluation and assessment can provide valuable input for the designers of the education and training programmes so they can design more effective content and instructional methodology that suits the needs of the women entrepreneurs.

The enormous potential and unlimited possibilities offered by data literacy are the basis for defining clear recommendations for public policies for women entrepreneurs in the digital environment. Such actions and initiatives will make it possible to strengthen, promote and support the active participation of women as entrepreneurs and employees in the digital economy, as well as in other sectors of the economy.

2. Formal education: accurate defining and maintaining the learning outcomes

Education within any national economy is the main cornerstone on which the country's future competitive directions depend. According to certain studies, entrepreneurship is a feature of only about 2% of the world's population, but with permanent education and appropriate training, a larger part of the population can be encouraged to develop their entrepreneurial abilities and creativity (Temjanovski, 2018).

In order to overcome such obstacles, the education sector plays a major role. To this end, the European Commission is fully committed to increasing the participation of girls in ICT and Science, Technology, Engineering and Mathematics (STEM - Science-Technology-Engineering-Math) and continues to encourage Member States to address the gender segregation in education. The Digital Education Action Plan (2021-2027), presented in September 2020, defines measures to improve the development of digital skills in education and training, including guidelines to encourage the participation of women in STEM, which is led, inter alia, in collaboration with the European Institute of Innovation and Technology. The plan emphasizes the need to ensure that girls and young women are equally represented in digital studies. Similar to these policies, a European skills agenda was adopted in July 2020, where the Commission proposed to work in close cooperation with EU member states to implement measures to promote gender-balanced participation in ICT-related occupations. These measures include increasing the proportion of women studying science, technology, engineering and mathematics and encouraging women taking roles in the realm of entrepreneurship. In the future global economy, effective participation of women in entrepreneurship would be almost impossible without acquiring satisfactory level of digital skills, and therefore data literacy skills. Women entrepreneurs need to be quickly trained and involved in digital transformation processes of the economy. Fast results could be achieved through high quality professional development training courses. However, appropriate impact on the long-term supply of qualified women entrepreneurs workforce for the future economy could be only achieved through careful design of education and study programmes in the formal education, i.e. all levels. The design process should be focused on defining learning outcomes around the data literacy skills as defined in the Pillar C of our Framework. This could be vertically emphasized in the IT or computer science subjects and study programmes, as well as horizontally in the curricula of the other non-IT subjects and study programmes (in humanities, social sciences, natural sciences and engineering, etc.).

3. The need for creation of data literacy framework

The enormous potential and unlimited possibilities offered by the digital tools and solutions are the basis for defining clear recommendations for public policies for women entrepreneurs in the digital environment. Such actions and initiatives will make it possible to strengthen, promote and support the active participation of women as entrepreneurs and employees in the digital economy.

Greater involvement of women in scientific and inventive activities is good not only for women themselves, but also generates stronger economic growth and improved social well-being. Innovation resulting from mixed teams or groups (diversity carries value, both social and economic), appears to have broader technological dimensions than those involving men. Therefore, it is estimated that such programs can be economically far more valuable and long-term sustainable.

Programs for the application of digital technology for new knowledge and professional restructuring, especially among women with a different profession, must be implemented by well-trained staff and competent persons. In the context of professional development, competence refers to one's capacity to apply a set of related skills, knowledge, and attitudes for the successful performance of critical job functions, in the given profession. The set of competences needed for a particular profession are described in a Competence Profile (CP); a CP provides insight in the functioning of professionals within the specific job context and can be used as a starting point for the professional development within this context (Papamitsiou et al., 2021, p.2).

Competence Profiles should adopt a systematic process for using data in order to bring evidence to bear on their instructional decisions and improve their ability to meet woman's digital learning needs. Information profiling should offer new opportunities and new challenges, new digitized programmes, which will strengthen the profiling of women, either on the labour market or as independent entrepreneurs. Therefore, it is necessary to design frameworks that will sustainably contribute the development not only the data literacy skills but will depict the entire support system for initial education, professional development of women entrepreneurs and their integration into the economy. Most of the existing frameworks are focused only the skills acquisition.

Prado and Marzal (2013) proposed a framework as a reference for incorporating data literacy into library information literacy training programmes. The framework includes five generic dimensions, it associates competences to each dimension, and translates these competencies into instructional topics to facilitate interpretation and direct implementation. The dimensions and respective competences are:

- understanding data, i.e., general knowledge and awareness of data, how they are generated and what are the different types and sources of data;
- finding and/or obtaining data, i.e., skills required to access/assess data sources;
- reading, interpreting and evaluating data, i.e., competences relevant to presenting data and to critically evaluating them;
- managing data, i.e., skills related to metadata data management repositories and data reuse; and
- using data, i.e., skills and knowledge required to properly and ethically handle and synthesize data.

Although the proposed scheme aspires to be universal, the key to its success lies in the depth to which it is developed, after adaptation to each library's particular needs.

However, the foundation for the development of all these skills are the data literacy skills. Most of the studies however refer to the acquisition and use of digital skills among women entrepreneurs. Future research on data literacy skills, including assessment of the related competencies, are needed to design more effective education and training programmes.

The data from EUROSTAT (2019) represents individuals who have basic or above basic overall digital skills by sex. Digital skills indicators are composite indicators based on selected activities related to using the internet or software applications conducted among people aged 16-74 in four specific areas: information skills, communication skills, problem solving skills, software skills. The data shows that women with the highest levels of digital skills are found in countries in Northern Europe, the Scandinavian countries and Benelux, such as Iceland (80%), Norway (77%), Finland (80%), the Netherlands and Switzerland (77%), Sweden (65%), Denmark (66%), and the lowest basic knowledge of digital skills among the countries of the Western Balkans: Albania (23%), Bosnia and Herzegovina (33%), Kosovo (24%) and in North Macedonia (31%). This group also includes women in Turkey with a digital competence value of (26%).

Similarly, data from the OECD Business Survey of Small and Medium Enterprises (SMEs) registered on Facebook (April 2018) shows that 65% of management positions in SMEs are held by men. According to the survey, only one in three SME representatives have mainly female management, and only one in four SMEs has a gender-balanced management team (OECD, 2018).

The main findings and conclusions of experts from various fields for the successful handling of women in the digital economy can be summarized in the following few points:

- women's careers due to family responsibilities – may be disrupted or fail; therefore, women must learn how to be flexible and rational in fulfilling professional obligations;
- women managers and entrepreneurs develop at work; they also develop their data literacy skills at work;
- women managers and entrepreneurs are oriented towards practice in relation to the digital transformation;
- digital transformation offers opportunities for career advancement, especially for women;
- to avoid the danger of burnout, digital technologies should be properly adapted and combined with management skills;
- women need encouragement, but also appropriate role models and networks to find their digital career paths.

We must apostrophize the key recommendations for the implementation of public policies to overcome gender inequality and which are of equal importance to all stakeholders, to ensure access and improvement of businesses and the use of business opportunities through digitization and the use of new digital opportunities. Namely, they are extremely important for those who make the legislation to support business and entrepreneurship, but also for those who implement the legislation. The six findings and conclusion imply that the solutions for bridging the gender divide in the digital economy need more than just provision training for professional development.

Holistic approach is needed that will create entire ecosystem for support of women entrepreneurs who will actively participate in the digital transformation of the economies in the Western Balkans; the ecosystem must ensure sustainability and continuous improvement of the policies, in addition to the provision of quality education programmes in formal education and appropriate professional development courses for women entrepreneurs already participating on the labour market.

4. The proposal for design of women entrepreneur's data literacy ecosystem development framework

We propose introduction of the term Women Entrepreneurs Data Literacy Ecosystem. We define the Women Entrepreneurs Data Literacy Ecosystem as interlinked elements that provide sustainability of Data Literacy among the individuals and institutions. The functions of these elements are to support the identification of the talent and development of the skills, perform their evaluation, provide advisory on the career guidance, build the institutional capacities to utilize the data literacy and contribute to its development, conduct analyses and research, design training programmes, and other functions. The elements of this ecosystem are the women entrepreneurs in different roles, the education and training institutions, companies, public institutions, research centres, etc. The roles of women entrepreneurs in this ecosystem may be individuals who poses, develop and apply data literacy skills,

network contact points in various institutions, advisors, counsellors, evaluators, corporate managers or decision makers.

We organize these elements and their functions into a Development Framework to support the sustainable development of the Women Entrepreneurs Data Literacy Ecosystem. The four pillars of the framework we propose are: Institutional and Social support; Continuous Evaluation and Monitoring; Data Literacy Education and Training Opportunities; Networking and Communication shown in figure 1.

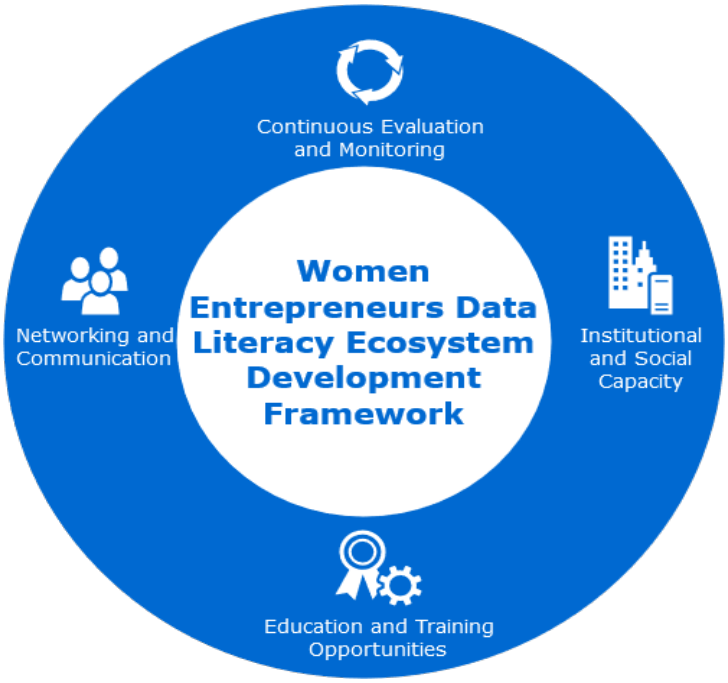

Figure 1. The pillars of the women entrepreneurs data literacy ecosystem development framework.

4.1. Pillar A: Institutional and Social Capacity: leadership knowledge and understanding of the data literacy for women entrepreneurs to build ecosystem to support their progress/development

This pillar is key for institutionalization and provision of leadership for the functioning of the ecosystem. The main element in this pillar is a formal entity i.e. an organisation active in the area of promotion of women entrepreneurship, that will develop its capacities and infrastructure, setup the vision, advocate for women entrepreneurs and their role in the digital economy and their place on the labour market.

The Institutional and Social Capacity pillar is based on:

1) Institutional Capacity Development: establishes a formal entity, organization, to advocate for the women entrepreneurs professional development opportunities, work on promotion and sensibilization, evaluate the progress of women entrepreneurs, propose policy measures. The institution must position itself to be able to contribute to the national entrepreneurships and digital development strategies emphasizing thereby the interests of women entrepreneurs.

2) Leadership Capacity Development: commitment to building society-wide professional development practices for data literacy. The widely accepted vision exists around what data literacy is, and how it contributes to the development of entrepreneurship ecosystem.
3) Fundraising: Certain elements of the Ecosystem perform the function of fundraising to financially support the implementation of the activities and contribute to sustainability. The key responsibility for this function will have the established organisation.
4) Management: the organisation will be responsible for the management of the functions in the other three pillars of the framework. The organisation should manage and develop the necessary infrastructure, such as online platforms, databases, facilities, etc.

4.2. Pillar B: Continuous Evaluation and Monitoring of the Data Literacy Skills and Competencies.

This pillar is essential for validation of the data literacy skills and competencies among women entrepreneurs. It will cover data literacy skills acquisition at all education and training levels and during the professional development of women entrepreneurs. The findings, results, and reports that will be outcomes from the evaluations, assessment and monitoring will serve as an input for the design and development of the education and training programmes. These functions can be performed internally (by schools, universities, companies, training centres) or externally (by accredited assessment/examination centres).

The Continuous Evaluation and Monitoring pillar foundations are:

1) Evaluation and assessment design: methodology for evaluation and assessment designed. The methodology considers various domains of knowledge for women entrepreneurs (finance and banking, industry and construction, etc.).
2) Evaluation and assessment deployment: tools and instruments developed and deployed to facilitate the data literacy evaluation and assessment of women entrepreneurs. Tools provided and staff and students trained in agile evaluation processes.
3) Monitoring procedures: these should enable processes for monitoring the women entrepreneurs professional development and provide input for career guidance. Training needs assessment to be performed.

4.3. Pillar C: Data Literacy Education and Training Opportunities

The Data Literacy Education and Training Opportunities pillar should be continuously providing education content/materials and training programmes that will be incorporated into the relevant subjects' curricula in the formal education and in the portfolio of programmes of the training institutions, respectively. Online training courses, and the production of digital content, is especially important for the professional and career development of women entrepreneurs. Asynchronous learning opportunities combined with quality tutorship is especially convenient for the women entrepreneurs.

The design of the training programmes must be based on the principle that skills related to *Data types, Data structures, Data sources, Processing Data (Collecting, Conversion, Analysing), Data visualisation, Data*

interpretation and *storytelling* are the foundation of the Data Literacy. The rationale behind this principle is that proper mastering of these skills will make application of any higher-level digital skills more effective and efficient. This process of design and development must be continuous and should take into account the results and findings from the evaluation and assessment of the digital skills acquired by women entrepreneurs. The objective of such approach is to provide improvement of the training progress and their adjustments to the actual needs and technological trends.

Certification and tracking of the progress in acquisition of the data literacy skills is recommended, to ensure higher motivation and competitiveness among women entrepreneurs.

The Data Literacy, Education and Training Opportunities pillar is based on:

1) Training programmes design: continuous data literacy training programmes design based on relevant data literacy skills anticipation approach. Learning outcomes relevant for entrepreneurs; focus must be on concepts closely related to innovation, such as Open Data.
2) LMS & Content development: Deploy infrastructure and produce digital content for the LMS.
3) Regular and online training programmes development: incorporate programmes design, digital content and needs assessment in the process of development of the programmes.

4.4. Pillar D: Networking and Communication

Networking and communication pillar is essential for creating the synergy among all elements in the ecosystem, and to provide instruments and content for effective outreach of their activities. Institutions that are elements of this ecosystem should set up contact points to support the creation of synergy in the ecosystem (inter-institutional links), exchange of information and good practices, and to influence decision making that is relevant for the progress of women entrepreneurs in the digital age. These inter-institutional links can be supported by associations of women entrepreneurs; one example of such institution is the National Platform for Women Entrepreneurship in the North Macedonia.

The Networking and Communication pillar foundations are:

- Communication and Visibility: support the professional development of women entrepreneurs by provision/publishing knowledge products, case studies, analyses, and successful practices of the use of data skills in development of business models, cases, products, etc. Furthermore, this function provides promotion, understanding and awareness raising instruments. Setting up a shared language about women entrepreneurs' significance and achievements, and the role of data literacy in the digital age.
- Networking: setting up a wide network of contact points in companies and research organizations. The synergy among contact points will ensure and inspire cooperation, exchange of good practices, and creating constituencies for raising the question on the political agenda.

5. Conclusion

This position paper proposes establishing a Data Literacy Ecosystem to support the initial and continuous progress of the women entrepreneurs in the digital economy. This ecosystem that encompasses not just design and provision

education and training opportunities, but is also upgraded with Monitoring, Evaluation, Networking and Career Guidance *functions* as a foundation for a holistic approach for support of women entrepreneurs in the times when skills gap becomes an immense problem for digital transformation of the economy. *Elements* of this ecosystem are women entrepreneurs, companies, training centres, schools and universities, and public institutions each of them with specific role(s) in realisation of the function of this data literacy ecosystem.

Data literacy, of course, remains critical to success in almost any business endeavour, and data and analytics initiatives will be a cornerstone of any company's competitiveness and success. But must bear in mind that creating a high level of data literacy culture, or a set of practices that bring together digital data talent, and tools, will become the most important and basic support for company operations.

Strengthening digital literacy will enable business policymakers to make better decisions within their current workflow, keep what works and improve it by supporting the analytics process derived from digital data.

The proposed framework will be the ground for policy makers to design effective public policy measures that will result in provision and continuous supply of digital ready young women entrepreneurs, by supporting the upskilling of the existing women entrepreneurs to be ready to support the fast digital transformation of the economic sectors they are working in. The recommendation from this study is that governments need to have holistic approach and to provide support ecosystem based on the proposed framework in this study for women entrepreneurs to enhance their employability and performance in the digital age.

References

Andjelkovic, L. J., Kovacevic, I., Krivokapic, D., Mucaj, E., Sotra, M., & Topic, P. (2021). *Digital skill needs and gaps in the Western Balkans: Scope and objectives for a fully-fledged assessment*. Regional Cooperation Council Publication, September 2021.

Centeno, C., Karpinski, Z., & Urzi, B. (2022). *Supporting policies addressing the digital skills gap: Identifying priority groups in the context of employment. EC: Joint Research Centre.* Retrieved from https://publications.jrc.ec.europa.eu/repository/handle/JRC128561

Digital Education Action Plan (2021-2027). *Resetting education and training for digital age*. Retrieved from https://education.ec.europa.eu/focus-topics/digital-education/action-plan

European Institute for Gender Equality. (2013). *Gender equality index report 2013*. Retrieved from https://eige.europa.eu/

Eurostat. (2019). *Individuals' level of digital skills Female 16-74*. Retrieved from https://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do

GSMA. (2018). *Connected Women. The mobile gender gap. Report 2018*. GSMA Association. Retrieved from https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2018/04/GSMA-The-Mobile-Gender-Gap-Methodology-Report-2018_20pp_WEB.pdf

Kyrkilis, D., & Nikolaidis, E. (2003). Regional integration in Southeastern Europe. In G. Petrakos, A. Kotios, & D. Chionis (Eds.). *International and monetary aspects of transition in Southeastern Europe* (pp. 269-282). Volos, GR: SEED Center, University of Thessaly Press. Retrieved from https://www.getadministrate.com/blog/how-training-teams-boost-data-literacy-by-developing-data-culture/

National Platform for Women Entrepreneurship - Retrieved from https://en.weplatform.mk/ METTERE IN NOTA?

OECD. (2018). *Bridging the digital gender divide*. Retrieved from https://www.oecd.org/digital/bridging-the-digital-gender-divide.pdf

OECD, APEC. (2019). *The education in and the bridging digital gender evidence from APEC economies*. Retrieved from https://www.oecd.org/sti/education-and-skills-in-bridging-the-digital-gender-divide-evidence-from-apec.pdf

Papamitsiou, Z., Filippakis, M.E., Poulou, M., Sampson, D., Ifenthaler, D., & Giannakos, M. (2021). Towards an educational data literacy framework: enhancing the profles of instructional designers and e-tutors of online and blended courses with new competences. *Smart Learning Environments*, *8*(18). https://doi.org/10.1186/s40561-021-00163-w

Prado, C. J., & Marzal, A. M. (2013). Incorporating data literacy into information literacy programs: Core competencies and contents. *Libri*, *63*(2), 123-134. https://doi.org/10.1515/libri-2013-0010

Shull, C. (2022). *How training teams can boost data literacy by developing a data culture.* [Blog – learning analytics]. Retrieved from https://www.getadministrate.com/blog/how-training-teams-boost-data-literacy-by-developing-data-culture/

Temjanovski, R. (2018). Entrepreneurship [Претприемаштво]. Shtip, North Macedonia: University “Goce Delcev”. Retrieved from https://e-lib.ugd.edu.mk/706

Wolff, A., Goosh, D., Montaner Cavero, J., & Kortuem, G. (2016). Creating an understanding of data literacy for a data-driven society. *The Journal of Community Informatics*. Retrieved from https://doi.org/10.15353/joci.v12i3.3275